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PART 2/2

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT REPORT

ANNEXES

Accompanying the

Proposal for a Regulation of the European Parliament and of the Council

on roaming on public mobile communications networks within the Union (recast)

{COM(2021) 85 final} - {SEC(2021) 90 final} - {SWD(2021) 27 final} -
{SWD(2021) 29 final}

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Annex 1: Procedural information

1. LEAD DG, DECIDE PLANNING/CWP REFERENCES

The Directorate-General (DG) for Communications Networks, Content and Technology was leading the preparation of this initiative and the work on the Impact Assessment in the European Commission. The planning entry was approved in Decide Planning under the reference PLAN/2020/6784 - Initiative for reviewing and prolonging the "Roaming Regulation". This initiative is included in the Commission's Work Programme 2020 under the Policy Objective "A Europe fit for the Digital Age" addressing the specific objective "Digital for consumers".

2. ORGANISATION AND TIMING

The planned adoption date included in the Commission Work Programme adopted on 29 January 2020, was changed from Q4 2020 to Q1 2021in the revised version adopted on 27 May 2020 following the COVID-19 crisis.

An inter-service steering group (ISSG), was previously established for the review of the Roaming Regulation. This ISSG was consulted for preparing this initiative. The ISSG met **three times**, in the scope of this initiative, in the period from March 2020 until adoption in **November 2020**. The ISG was also consulted through written procedure **two times** in the same period.

3. CONSULTATION OF THE RSB

An upstream meeting was held with the Regulatory Scrutiny Board (RSB) on 5 October 2020. A draft Impact Assessment was submitted to the RSB on 19 October 2020. Following the Board meeting on 18 November 2020, it issued a **positive** opinion on 20 November 2020. The Board's recommendations were addressed as presented below. The Board also noted the useful additional information provided in advance of the meeting and commitments to make changes to the report. These additional changes are also presented in the table below.

RSB Opinion of 20 November 2020

The Board's Recommendations	**IA modification**
Improvements addressing suggestions from the RSB in the Opinion	
(1) The report could better explain how increasing demand for services leads to economic risks for inbound operators if unit costs decrease with increasing usage of the network.	- The impacts of the chosen caps levels were further explained in Section 6.3.1 (Sustainable provision of RLAH and other economic impacts on operators).
(2) The report should better explain the reasoning behind the choice of the level of the price caps, particular the specific cap proposed for data. In this regard, it should discuss which alternative options were considered and explain why these price cap variants were eventually discarded.	- The choice of level of the wholesale caps was further explained in Sections 5.2.2 (Option 3A. Sustainable provision of RLAH) and in Section 2.1.2 further discussing the sustainability problem.
(3) The report should better explain the various combinations of measures it considered in defining the preferred option. It should set out more clearly, why certain potentially beneficial measures were not included.	- An explanation of the choice of measures for the preferred option was added in Section 5.2 (Description of the policy options). - Measures under option 4 are considered overly burdensome and disproportionate and are therefore

	not included in the preferred option. This has been clarified in Section 7.2 and in Section 8)
(4) The report should further develop and analyse the impact of the COVID crisis on the baseline. It should assess its impact on the sustainability of RLAH, both for outbound and inbound operators. It should expand the sensitivity analysis by explaining how the discussion of sensitivity results reflects the possible impacts of the COVID crisis.	Impacts of the COVID-19 crisis were further elaborated in sections (5.1.2 Option 1 - Baseline: Prolong the Roaming Regulation without amendments), and the sensitivity analysis (Annex 4A) was elaborated to further present the assessment on the impact of the COVID-19 crisis, with four additional COVID-19 scenarios.
(5) The report should present upfront the broader political and regulatory context of the initiative. It should explain the importance of the initiative and how it contributes to the development of other EU policies.	The broader political context was further explained in Sections 1 (Introduction) and 4.1 (General objectives).
(6) The report should better highlight what key problem is tackled by this initiative in terms of its magnitude and urgency.	The magnitude of problems was further clarified, particularly as regards sustainability and QoS. Additional evidence from the Annex was incorporated in Section 2.1.2 (A. Problems to ensure sustainable provision of RLAH), to further clarify the expected magnitude of the problems related to sustainability and referring to the extensive discussion on safeguards and the limited amount of the overall roaming traffic currently subject to fair use and sustainability derogations. Evidence supporting the regulatory intervention on quality of service (QoS) has been more prominently presented in Section 2.1.3 (B.1. Low perceived QoS and information failure on QoS and RLAH).
Additional improvements addressing elements from the Impact Assessment Quality Checklist	
Content and scope	Section 1 and 4 were amended to explain the coherence and complementarity of this Initiative and its objectives with other EU policies. - The possible impact of COVID-19 based on the sensitivity analysis has been further clarified in Section 1 and Annex 4, presenting ad hoc sensitivity scenarios.
Problem definition	- The key problem of sustainability for wholesale operators has been better defined in terms of magnitude and urgency to act. Additional evidence from the Annex has been incorporated in Section 2.1.2 (A. Problems to ensure sustainable provision of RLAH), to further clarify how substantial the problems related to sustainability are, also referring to the extensive discussion on safeguard. - Section 2 also further reports on the findings as to why there is at this stage no need to intervene on fair use and sustainability also based on the data presented in the Annex and Review report. In particular, the impact assessment highlights the limited amount of the overall roaming traffic

	currently subject to fair use and sustainability derogations. - The factors underlining the need for and the evidence supporting the regulatory intervention on QoS has been more prominently presented in Section 2.1.3 (B.1. Low perceived QoS and information failure on QoS and RLAH). - Additional clarification of the supportive positions of BEREC and NRAs as well as other stakeholders in this area has been included in Section 5.2. (See specifications in Baseline and options below).
Objectives and intervention logic	- As regards the specific objectives B1 and C1, the difference and link between those two objectives related to QoS has been further clarified in Sections 4.1 (General objectives), 4.2.2 (B. Ensure a genuine RLAH experience for end-users) and 4.2.3 (C. Ensure the same QoS as at home and access to all network technologies and generations, facilitate innovation and avoid misuse/fraud from the operator perspective) - The consistency of the three general objectives with the broad policy strategies and other relevant policy initiatives has also been further developed in Section 4.
Baseline and options	- The hypothesis about the sensitivity analysis and the impact over time of the COVID-19 crisis have been clarified in the baseline Section 5 making a stronger link with the sensitivity analysis presented in Annex 4. - The rationale behind the proposal of the preferred lower caps for data has been clarified in Section 5.2.2 - The presentation of the stakeholder views by stakeholder category (operators) for some options as well as NRA views through the BEREC opinion has been expanded in the report to provide an analytical and fully transparent picture on the views expressed. See Sections 5.2.1 (Option 2B Increase transparency regarding QoS and Option 2C Introduce a minimum level of simplification), 5.2.2 (Option 3A Ensure enhanced sustainability of RLAH and cost recovery at wholesale level, 3B Prohibiting home operators from deliberately offering lower QoS, Option 3B Increase transparency regarding VAS, Option 3B Ensure access to emergency services free of charge as at home, Option 3C Ensure the same QoS while roaming as at home and respond to technological and business developments by clarifying the obligation on visited MNOs to give access to all network technologies and generations, upon a reasonable wholesale roaming access request,

	Option 3C REFIT Horizontal simplification and improvement measures), Section 5.2.3 (Option 4A Ensure enhanced sustainability of RLAH and cost recovery at wholesale level, Option 4B Opt-in functionality for additional information on available alternative means of access to emergency services) and in Annex 2C (The outcome of the public consultation). - As regards REFIT and monitoring, the report clarifies in the report that the main means of simplifying the monitoring procedure is through merging and streamlining monitoring processes. See Section 5.2.2. Option 3C and 8.2.5 (8.2.5 Rationalize reporting monitoring obligations).
Impacts	- Section 6 has been modified to ensure full coherence between the various tables presenting the approach for assessing impacts and the summary table presenting impact results. - Annex 4 further explains how the sensitivity analysis considers the impact of COVID-19 pandemic in the framework of the sustainability analysis. - The coherence between Cost benefit tables in Annex 3 and REFIT tables in Section 7 has been ensured.
Comparison of options and proportionality	- The tables in Section 7 comparing the policy options have been streamlined and refer consistently to the baseline. - The scoring of different options in Section 7 has been amended to a categorical scoring instead of numerical. - The report has further clarified that various combinations of measures have been considered in defining the preferred option. However, option 3 includes measures that were considered preferable for each thematic area, also considering possible interdependencies. - Measures under option 4 are considered overly burdensome and disproportionate and are therefore not included in the preferred option. This has been clarified in Section 7.2)
Future monitoring and evaluation	- The report already presents additional indicators to be monitored on QoS, inbound traffic negotiated in a non-discriminatory manner and on the functioning of roaming in the context of the M2M market. The need of additional progress monitoring indicators has been verified and presented in Section 5.2.2 Sections 8.2.5 (Rationalize reporting monitoring obligations),
Consultation, information base and methodology	- More clarity has been provided on how the sensitivity analysis of the sustainability assessment

	has taken COVID-19 into account. - Annex 2 on the results of the public consultation has been further verified to ensure that views of specific/disaggregated stakeholders groups is systematically reported when they differ significantly and differences are relevant for the assessment of options.
Presentation	- The glossary has been further elaborated to better assist accessibility of the report to non-specialists - The subsidiarity grid has been taken out from the Annexes of the Impact Assessment. It will be attached to the explanatory memorandum that accompanies the draft legal proposal. Annexes have been re-numbered accordingly.

4. EVIDENCE, SOURCES AND QUALITY

The evidence used in the IA have been collected along the following streams:

I. **BEREC data collection:**

a. **BEREC semi-annual international roaming benchmark reports**[1] (adopted in March and October each year). Data submitted by the operators on roaming developments at retail and wholesale levels. These are based on a dedicated questionnaire, which is run by BEREC and the NRAs twice a year. It particularly includes data on volumes of roaming traffic (retail and wholesale), wholesale roaming revenues, wholesale roaming rates and information on wholesale roaming contracts.

b. **BEREC annual report on the transparency and comparability of roaming tariffs**[2] (adopted in December each year since 2017). BEREC is mandated by the co-legislator in the Roaming Regulation to collect data from NRAs on transparency and comparability of roaming tariffs once a year. For this purpose, NRAs are running another data collection from mobile operators in August every year. Based on these data, BEREC publishes country-level results in the BEREC Report on Transparency and Comparability of International Roaming Tariffs in December every year.

II. **Joint Commission/BEREC online survey -** Market input has been collected through annual online surveys of MNOs, MVNOs and NRAs, which are jointly run by the Commission and BEREC. So far, two such online surveys gathered in June 2018 and March 2019 information on the implementation of fair use policy, of the sustainability derogation and other elements of implementation. A third online survey has been launched in March 2020 covering various elements to be assessed under this review such as QoS, value added services, emergency communications, technology changes and M2M, cost of implementation and administrative burden.

[1] The last five benchmark reports (covering the period from April 2017 to September 2019) can be found in the following links: 20th benchmark report (April 2017 to September 2017), 21st benchmark report (October 2017 to March 2018), 22nd benchmark report (April 2018 to September 2018), 23rd benchmark report (October 2018 to March 2019) and 24th benchmark reports (April 2019 to September 2019).

[2] BEREC Report on Transparency and Comparability of International Roaming Tariffs, available in the following links: for 2017, for 2018 and for 2019.

III. **Market monitoring and data analysis** based on BEREC and Commission **data collection -** The Commission analysed independently the data, collected by BEREC based on which the following analysis was performed:

a. **The Report on the Review of the roaming market** COM(2019) 616 final, and **its accompanying SWD(2019) 416 final** adopted on 29 November 2019, available here, has gathered and presented evidence on how this intervention has performed. It has also assessed whether there were unintended/unexpected effects like for example increases in domestic or international roaming prices.

b. **The interim report to the European Parliament and the Council** on the implementation of the Roam-Like-At-Home (RLAH) rules over the first 18 months Adopted on 12 December 2018, available here.

c. **The Staff Working Document (SWD) on the findings of the review of the rules on fair use policy and the sustainability derogation** laid down in the Implementing Regulation (EU) 2016/2286 published on 28 June 2019, available here.

IV. **BEREC Opinions and inputs –** Consultation of BEREC resulted in extensive BEREC input, including forward looking elements and comprehensive analysis on the monitoring of the roaming market.

a. BEREC provided its formal Opinion on the functioning of the roaming market[3] available here, published on 19 June 2019,
b. as well as a supplementary cost analysis[4], published on 20 September 2019, available here and
c. an input to the impact assessment on Commission request[5] (June 2020, available here).

V. **AXON Cost Model for Assessment of the cost of providing wholesale roaming services in the EEA.** In order to estimate the costs of providing wholesale roaming services in the EU/EEA, the Commission ordered an external study to AXON Partners (SMART 2017/0091), available here. The study was conducted between March 2018 and June 2019. The contractor has developed a cost model to estimate the costs of providing wholesale roaming services in the EU Member State and EEA countries. The cost model was developed in close collaboration with the BEREC International Roaming Working Group and was submitted twice to public consultation. Further, a designated Steering Group composed experts from six different NRAs followed the project closely from start to finish.

VI. **WIK Consult (SMART 2018/0012)** - The Commission ordered to WIK Consult an external study on technological and market developments that might have an impact on the roaming market, available here. The purpose of the study was to assess the availability and QoS, which are an alternative to regulated retail voice, SMS and data roaming services, in particular in the light of technological developments. The study was conducted between December 2018 and June 2019. The contractor followed a modified

[3] BEREC Opinion on the functioning of the roaming market as input to EC evaluation, BoR(19)101, 19 June 2019, available here (hereinafter 'BEREC Opinion').
[4] BEREC Supplementary analysis on wholesale roaming costs, BoR(19)168, 20 September 2019, available here.
[5] BEREC input on EC's request for the preparation of the legislative proposal for the new roaming regulations, BoR (20) 131, of 30 June 2020.

greenfield approach to assess the competitive impact of various technological developments in the roaming market.

VII. **Joint Research centre (JRC) analysis** – JRC has provided extensive support in preparation of the IA, in particular:

a. developing the sustainability model (annex 4A) and the Consumer benefit counterfactual analysis (Annex 4B)
b. JRC initiated a project (SMART 2018/0011) on measuring the quality of roaming services in view of an evidence-based assessment of roaming performance and user experience of QoS of retail roaming services. JRC carried out field tests on mobile broadband in order to collect data to compare roaming performance in several EU MSs. The network performance data collected were used to compare home and roaming network performance.

VIII. The **Mobile Broadband Prices in Europe** SMART 2018/0045 published yearly by the Commission reports on the level of domestic retail mobile prices in EU Member States and in a number of non-EU countries. For the purpose of cross-country comparisons, the study uses the standard mobile internet usage baskets defined by the Organisation for Economic Co-operation and Development (OECD).

IX. **Targeted online survey** on potential impact on the roaming market of technological evolution[6] addressed to MNOs, MVNOs/MVNEs and business stakeholders/vertical industries was organised during the first half of March 2018, in the framework of the SMART study 2018/0012 "Technological developments and roaming" – the contractor received 51 responses that informed the analysis and the conclusions of the study.

X. **Flash Eurobarometer Survey 468**[7] – the survey was conducted one year after the end of roaming charges (June 2018). It provides a better understanding about the impact on consumers of the roaming regulation. It contained questions that covered roaming use when travelling within the EU, asked about the awareness of the end of roaming charges, perceived benefits, perceived costs of roaming among non-travellers and the use of mobile services in other EU countries. Another Eurobarometer survey is planned for 2020 where some specific roaming elements will be investigated, e.g. QoS.

XI. **Roaming: One year after implementation**, published by the European Parliament in November 2018. It was prepared at the request of the European Parliament's Committee on Industry, Research and Energy (available here). The study reviews the retail and wholesale roaming markets during the first year after the introduction of the RLAH regime. It acknowledges its benefits to the retail roaming market and makes certain recommendations focusing mainly on the wholesale regulation, including adjusting the wholesale caps.

XII. **Input received to the Inception Impact Assessment feedback period**[8]

XIII. Input from **Public Consultation on the review and prolongation of the Roaming Regulation** (EU) 531/2012 launched for 12 weeks, from 19 June to 11 September 2020. The consultation gathered information fulfilling the following objectives:
(1) Collect views on retail roaming services and on the impact of prolonging these rules. In addition, collect views on the impact of introducing clarifications and improvements to the Roaming Regulation, that are relevant for consumers, e.g. related to QoS, value-added services and emergency communications.
(2) Collect views on the provision of wholesale roaming services, the prolongation of these rules, on the sustainability of wholesale caps and on the need to respond to new

[6] For more information on online survey, please see the final report of the study, available here
[7] Flash Eurobarometer 468 "The end of roaming charges one year later", June 2018, available here.
[8] See relevant web page on Europa Have your say, available here.

technological and business developments (e.g. on Machine-to-Machine services and Internet of Things).
(3) Collect views on the possible reduction of the administrative burden and the impacts of possible simplifications.

Annex 2: Stakeholder consultation

Annex 2 presents main consultation activities' outcomes and is divided in four sections:

Annex 2A: Summary of the Stakeholders Consultation Activities

Annex 2B: The Inception Impact Assessment Feedback

Annex 2C: The outcome of the Public Consultation

Annex 2D: The outcome of the Joint Commission-BEREC Online Survey 2020

ANNEX 2A: THE SUMMARY OF THE STAKEHOLDER STRATEGY

A continuous and active stakeholder consultation strategy was devised and followed for the review of the Roaming Regulation. From the outset, key ideas for the prolongation and review of the Roaming Regulation were outlined in an Inception Impact Assessment (IIA). The published IIA informed citizens and stakeholders about the Commission's plans in order to allow them to provide feedback on the intended initiative and to participate effectively in future consultation activities. This fed into the subsequent consultation activities that ensured an inclusive process with all interested parties having an opportunity to contribute.

Several joint Commission/BEREC online surveys were launched, in June 2018, March 2019 and March 2020. The online survey gathered market inputs from MNOs, MVNOs and NRAs, on the implementation of the Roaming Regulation. The most recent survey covered various elements to be assessed under the review of the Roaming Regulation, such as QoS, value added services, emergency communications, technology changes and M2M, cost of implementation and administrative burden.

A dedicated 12 week public consultation was launched on 19 June to 11 September 2020. The Commission consulted EU citizens, the telecommunication operators, the industry and the administrations in the Member States, to gather information for the Impact Assessment (IA) of a Commission legislative proposal concerning the review of the Regulation (EU) 531/2012 on roaming on public mobile communications networks within the Union (Roaming Regulation).[9] The consultation activities aimed at collecting the views from all relevant stakeholder groups, and in particular of consumers and their associations, national regulatory authorities (NRAs), the Body of European Regulators for Electronic Communications (BEREC), Mobile Network Operators (MNOs), Mobile Virtual Network Operators (MVNOs), business stakeholders (including SMEs), government authorities and industry associations and other stakeholders. All these different stakeholder groups were expected to have important information and insights that could feed into the preparation of the Impact Assessment on a possible legislative proposal to the European Parliament and the Council, extending the Roaming Regulation beyond June 2022.

The other consultation activities were organised along the following streams that are further detailed in Annex 1:

I. **The publication of the Inception Impact Assessment for a four-week feedback[10] and of a Public Consultation with targeted questions depending on the type of the respondent**

[9] As amended by Regulation (EU) 2015/2120 laying down measures concerning open internet access and Regulation (EU) 2017/920 as regards rules for wholesale roaming markets.

[10] See relevant web page on Europa Have your say, available here.

II. **Consultation of BEREC and market monitoring**, which resulted in extensive BEREC input, including forward looking elements and comprehensive analysis on the monitoring of the roaming market:

   a. **BEREC Opinions and Inputs**: Opinion on the functioning of the roaming market - BoR(19)101, a supplementary BEREC cost analysis of wholesale roaming costs BoR(19)168, and BEREC input on EC's request for the preparation of the legislative proposal for the new roaming regulations, BoR (20) 131
   b. **BEREC Reports: the semi-annual international roaming benchmark reports**[11] and **BEREC annual report on the transparency and comparability of roaming tariffs**[12]
   c. **Data collection by BEREC**

III. **Joint Commission/BEREC online survey**

IV. **Targeted interviews on roaming market evolution with actors of various typologies involved in the global connectivity value chain**

V. **Targeted online survey** on potential impact on the roaming market of technological evolution[13]

VI. **Flash Eurobarometer Survey**[14] – the survey was conducted one year after the end of roaming charges (June 2018).

[11] The last five benchmark reports (covering the period from April 2017 to September 2019) can be found in the following links: 20th benchmark report (April 2017 to September 2017), 21st benchmark report (October 2017 to March 2018), 22nd benchmark report (April 2018 to September 2018), 23rd benchmark report (October 2018 to March 2019) and 24th benchmark reports (April 2019 to September 2019).

[12] BEREC Report on Transparency and Comparability of International Roaming Tariffs, available in the following links: for 2017, for 2018 and for 2019.

[13] For more information on online survey, please see the final report of the study SMART , available here

[14] Flash Eurobarometer 468 "The end of roaming charges one year later", June 2018, available here.

Consultation activity	**Public Consultation (PC)**	**Public Feedback on the Inception Impact Assessment**	**Targeted consultation and study interview/survey**	**BEREC reports and data collection (Joint Commission/BEREC Survey, BEREC Transparency questionnaire)**	**BEREC semi-annual benchmark report data collection (BMK)**	**Flash Eurobarometer Survey**
Expected information	Factual information (as much as possible), Information directly related to the legislative review, sharing experiences, diversity of opinions, alternative solutions, impacts	Factual information, diversity of opinions, Information directly related to the legislative review	Information directly related to the legislative review, impacts	Factual information, qualitative information	Factual information, quantitative information	Factual information, impacts, opinions
Available languages	23 official EU languages	EN	EN	EN	EN	23 official EU languages
Indicative planning → **Stakeholders ↓**	Q2-Q3 2020	Q2 2020 (4 weeks)	Q1-Q3 2019 Q2 2020	Q2 2018 Q1-Q2 2019 Q2 2020	Q2-Q4 2018 Q2-Q4 2019 Q2-Q3 2020	Q2 2018 Q3 2020
Consumer/citizen associations and other non-governmental organizations	X	X				
Citizens	X	X				X
MNOs and their associations	X	X	X	X	X	
MVNOs / MVNEs and their associations	X	X	X	X	X	
National Regulatory Authorities (NRA) and other competent authorities	X	X	X	X	X	
BEREC	X	X	X		X	
Business Stakeholders and their associations	X	X	X			
Experts	X	X	X			
Government Authorities	X	X				
Trade, business and professional association	X	X				

ANNEX 2B: THE INCEPTION IMPACT ASSESSMENT FEEDBACK

In total there were 11 feedback replies on the IIA: 5 company/business organisation, 2 business associations, 2 EU citizens, 1 consumer organization and 1 NGO.

The main points addressed by the stakeholders were wholesale caps, QoS, M2M/IoT, emergency communications, VAS and misuse/fraud. In general the stakeholder feedback can be summarised as follows:

One respondent suggests maintaining the wholesale caps in the current Roaming Regulation, while three respondents suggest lowering the wholesale caps. The main argument for lowering the wholesale caps is that MVNOs pay higher wholesale rates than MNOs. On the other hand, the respondent who suggests maintaining the current regulated levels, argues that the wholesale rates are already below the cap and that further reduction of the caps would lead to a disincentive to maintain these discounts.

Five of the respondents do not support obligations on offering the same QoS while roaming in EU/EEA as at home. However, two of these respondents do support transparency requirements in regards to QoS and one supports clarifications as regards to deliberately lowering the QoS. One respondent does support further clarifications as regards to obligations related to QoS.

Four respondents note that the scope of the Roaming Regulation should cover M2M/IoT services, while one respondent does not support any roaming regulations on this market. Another respondent stresses the importance of a thorough impact assessment of any such intervention.

Three of the respondents do not support any intervention as regards seamless access to emergency communications, as the communication to "112" is working well in their view. Two respondents noted that alternative emergency communication solutions vary across EU Member States, thus making it difficult to implement unified rules. Two respondents welcomed a further assessment of emergency communications, but requested a clarification as to why such an intervention would be justified.

Four respondents support further assessment of value-added services, or numbers associated with higher costs. One respondent suggests that the current "best practice" is better suitable to address such issues than regulatory intervention. Three respondents support further assessments of how to address fraud cases in roaming, while one stakeholder suggests that this problem is better resolved by market best practice.

From the consumers' perspective, BEUC indicates that consumer awareness about the scope of the roaming rules is insufficient, for example there is a difficulty to distinguish between international roaming in the EU/EEA and intra-EU calls, since consumers may not be aware that RLAH does not apply on international calls from the home country. There might be also unawareness of the non-application of RLAH on ships and planes. BEUC furthermore suggests to abolish the price difference between international roaming in EU/EEA and intra-EU calls, address the lack of transparency regarding value-added services, strengthen the transparency requirements on data FUP limits and making the FUP rule less restrictive for consumer so that they can fully enjoy RLAH. BEUC suggests to lower wholesale caps, since this will allow less restrictive fair use policies.

ANNEX 2C: THE OUTCOME OF THE PUBLIC CONSULTATION

The factual summary report summarising the main outcome of the public consultation carried out for the review of the telecoms framework has been published on the Commission's web page.

Introduction

The European Commission ran a public consultation on the review and prolongation of the Roaming Regulation (EU) 531/2012 for 12 weeks, from 19 June to 11 September 2020. The consultation aimed to gather information for the Impact Assessment of a Commission legislative proposal for the review of the Roaming Regulation. This initiative is included in the Commission's Work Programme 2020 under the Policy Objective "A Europe fit for the Digital Age" addressing the specific objective "Digital for consumers".

In particular, the stakeholder consultation had the following objectives:

(1) Collect views on retail roaming services and on the impact of prolonging these rules. In addition, collect views on the impact of introducing clarifications and improvements to the Roaming Regulation, that are relevant for consumers, e.g. related to the QoS, value-added services and emergency communications.

(2) Collect views on the provision of wholesale roaming services, the prolongation of these rules, on the sustainability of wholesale caps and on the need to respond to new technological and business developments (e.g. on Machine-to-Machine services and Internet of Things).

(3) Collect views on the possible reduction of the administrative burden and the impacts of possible simplifications.

This report analyses the replies to the public consultation. The online questionnaire had a mix of closed and open questions in 23 EU languages. The questions were both backward and forward looking, as well as seeking input on impacts of potential policy options. Out of the 175 respondents, 16 respondents sent position papers in attachment to the questionnaire replies. An additional 4 respondents sent separate position and non-position papers via e-mail, and did not reply to the questionnaire.

The consultation targeted a broad range of stakeholders listed below according to their interest and presumed expertise in the subject matter.

Table 1: Respondents to the Open Public Consultation

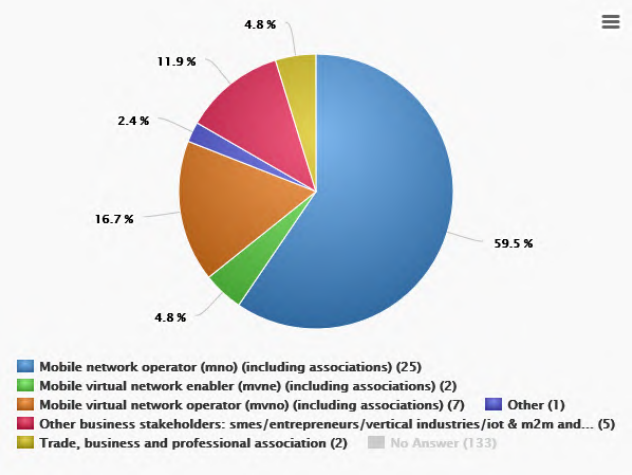
Stakeholders	Interest	Direct Expertise[15]	Broad Expertise[16]
Consumer/citizen associations (e.g. BEUC) and other non-governmental organizations	High	Medium	Medium
Citizens	High	Low	Medium/Low
MNOs and their associations	High	High	High

[15] Direct expertise refers to expected knowledge of the Roaming Regulation.
[16] Broad expertise refers to sector-wide knowledge.

MVNOs / MVNEs and their associations	High	High	High
National Regulatory Authorities (NRA) and other competent authorities	High	High	High
BEREC	High	High	High
Business stakeholders (SMEs/entrepreneurs/vertical industries) and their associations	Medium/High	Medium	Medium
Experts	Medium/High	Medium/High	Medium/High
Government Authorities	Medium	Medium	Medium
Trade, business and professional association	Medium/Low	Medium/Low	Medium

This report uses the above categorisation of stakeholders in presenting converging or differing views on issues addressed in the consultation. The contributions of the stakeholders who gave their consent to publication are available online.

Out of 175 respondents from 26 countries, 108 were EU citizens and 2 non-EU citizens, 5 consumer organisations, 10 business associations, 5 public authorities, 3 NGOs, 42 company/business organisations of which 25 were Mobile Network Operators or representing them, 9 Mobile Virtual Network Operators/Enablers or representing them and 8 trade or other business stakeholders (e.g. vertical industries, SMEs).



The respondents' profile reflects the self-selecting nature of a public consultation and imposes a certain caution on interpreting the results, since the responses cannot be considered as a representative random sample of all European users. For instance this public consultation does not represent the views of national electronic communication regulators, which were subject to a targeted consultation and did not participate widely in the public consultation (3 national regulatory authorities and 2 government authorities). In fact BEREC, the Body of European Regulators for Electronic Communications, did not participate in the public consultation since they provided extensive input to the Commission on three occasions:

- BEREC Opinion on the functioning of the roaming market as input to EC evaluation, BoR(19)101, 19 June 2019, available here
- BEREC supplementary analysis on wholesale roaming costs, BoR(19)168
- BEREC input on EC's request for the preparation of the legislative proposal for the new roaming regulation, BoR (20) 131, of 30 June 2020

The number of mobile operators participating in the consultation was limited. For comparison, it can be noted that 25 MNOs and 9 MVNO/Es participated in the public consultation. The respective number participating to the target joint Commission-BEREC online survey 2020 (see annex 2D) was 85 MNOs and 110 MVNOs.

Analysis of responses

All online contributions were analysed when drafting this report, and used for further analysis in the impact assessment. The European Commission services have taken into account the position and non-papers received in analysing the contributions to the public consultation.

Citizens could opt-in to reply to sections 3-9. Within in a section, all closed questions were mandatory (it was not possible to skip them), but some questions were only visible to targeted stakeholders. The percentages below refer to the number of actual respondents to the given questions, not to the total number of respondents in the consultation.

The report follows the structure of the questionnaire to the most part. It includes 9 sections addressed to various stakeholders.

The consultation did not contain questions on the combined package including all the measures covered by the four different policy options assessed in the Impact Assessment. It asked for views on the specific measures for each thematic area that have been proposed within the different policy options.

This analysis does not represent the official position of the Commission and its services and thus does not bind the Commission.

Benefits for end-users and overall functioning of the Roaming Regulation

On the perceived benefits of the Roaming Regulation, the overall perception is positive. These questions were primarily targeted at citizens and consumer/citizen organisations (in total 118 respondents).

The respondents of the public consultation confirm the overall success and the effectiveness of the Roaming Regulation. 96% of the **citizens** strongly agree (87%) or agree (9%) that they can enjoy the benefits that the Roaming Regulation aims to bring. The benefits include staying connected without having to restrict their usage of roaming mobile services when travelling in the EU/EEA, not worrying about having to pay excessive costs for the use of mobile services while travelling in the EU/EEA and continuing to use mobile services like at home while travelling in the EU/EEA. 65% of all the respondents replied that the Roaming Regulation has significantly promoted the interests of the citizens and businesses in the EU/EEA. 21% think that the achievement has been moderate. When asked about the achievement of the development of the Digital Single market, 48% think that the Roaming Regulation has been significantly effective in the development of the Digital Single Market, while 27% think it has been moderately effective, and 8% think it has had little effectiveness.

On the overall functioning of the Roaming Regulation at retail level, the overall perception is positive. 89% of all the 175 respondents across all respondent groups agree that the EU intervention has had a positive effect on ensuring that roaming users do not pay excessive roaming prices in the EU compared to what could be achieved by Member States themselves. The respondents express that there is continued need of the Roaming Regulation for EU citizens and businesses. As regards the relevance of the Roaming Regulation, 74% of all respondents think that the relevance is significant. 83% of all respondents agree that end-users would lose the benefits of using mobile services like at home, without regulation of EU roaming. Approximately 10% of the respondents disagree and 7% do not take a position. The vast majority of citizens and consumer organisations strongly agree that the benefits would be lost. Among the business organisations and associations, which represent 30% of the respondent, half expressed

that they agree or strongly agree that the benefits would be lost, while 33% of them disagree or strongly disagree.

The question on the efficiency of the Roaming Regulation was answered by 57 stakeholder, in particular by business associations and company organisations. It appears difficult for many respondents to compare the costs towards the benefits, therefore one third of those who replied declared they do not know (12%) or had a neutral opinion (21%). Of those respondents who expressed a view, 47% (18 respondents) believe that benefits exceeds the cost or significantly exceed the costs, while 52% (20 respondents), believe that costs exceed benefits, or significantly exceed benefits. In total 20 out of 34 **M(V)NO/Es** and their associations think that the costs exceed the benefits, while 6 think that the benefits exceed the costs. All **public authorities** (5 in total) agree that the benefits exceed the cost.

Among the **MNOs**' that think the costs exceed the benefits of the Roaming Regulation, the main reasons cited are the resources and costs incurred at the time of introducing RLAH, especially with regard to implementing the monitoring mechanism of the fair use policy and the sustainability mechanism. Among the MNOs that indicated that significant benefits for end users exceed the costs, some also indicate that the reduction in roaming charges have been compensated by higher demand, thereby by higher revenues. Some indicated that abolishing roaming charges induced a positive level of additional competition, as for example by increasing the EU-allowance in the tariff plans or including non-EU destinations in the mobile subscription.

Emergency communications and public warning systems

The EU legislation on emergency communications ensures that all EU citizens have free access to emergency services through the single European emergency number "112". End-users with disabilities should benefit from equivalent access through SMS, emergency applications, total conversation, etc. Roaming customers should enjoy the same level of service, when it comes to emergency communications as national customers.

41% of respondents (51 in total) agreed or strongly agreed with the statement that communications with emergency services works well. Respondents that gave a positive answer were individual **citizens** and one **public authority**. These answers indicate that the emergency communication through a voice call to 112 seem to work well. On the other hand, two **non-governmental organizations** (NGOs) for end-users with disabilities, the European Disability Forum and the European Union for Deaf, disagreed and, strongly disagreed with the statement. This answer indicates that, while calls to emergency services may work well, the alternative means of access do not seem to function with the same effectiveness for end-users with disabilities.

The answers on the awareness on the alternative means of access for end-users with disabilities indicate an important information gap in this respect. The majority of answers (76%), including the relevant NGOs (European Disability Forum, European Union for Deaf and European Emergency Number Association) and three public authorities, indicate a total lack of awareness on these means of access. The abovementioned NGOs strongly disagree with the statement that the access to emergency services works well for end-users living with disabilities. The wide majority of citizen respondents did not know or had no opinion.

The proposal to introduce an obligation on mobile operators in the Roaming Regulation at wholesale level to ensure that customers have seamless "free of charge" access, to emergency services by using 112, was considered relevant by 30% of respondents, while it was considered not relevant by 26% of the respondents.

As regards the proposal to introduce an obligation on mobile operators in the Roaming Regulation, at wholesale level, to ensure that the establishment and transmission of caller location in the visited EU Member State is free of charge for the end-user, the results were similar. 26% of the respondents expressed that this measure would be relevant, while it was considered not relevant by 28% of the respondents. As regards the proposal to introduce an obligation on the home operator to inform disabled end-users on the availability of alternative means of access available in the visited EU Member State (opt-in), gained equally mixed reactions. Amongst those respondents that expressed their opinion on the relevance of the proposal (52%), 16 found it relevant and 18 did not find it relevant. However, among those who considered the proposal relevant (relevant (11) or very relevant (5)) the European Disability Forum, European Union for Deaf and European Emergency Number Association consider it very relevant.

Review of wholesale roaming markets

In total 65 respondents replied to questions on the review of the wholesale roaming markets. Respondents in general acknowledge that the EU intervention had a positive effect on (a) the sustainability of the roaming markets and (b) competition on the wholesale roaming markets. In parallel, the vast majority of respondents do not consider that sustainability depends on the Member State. In addition, the vast majority of respondents do not consider that there exist Member States where the EU intervention did not have a positive effect in ensuring that roaming markets are more competitive, compared to what could be achieved by Member States acting alone.

According to the respondents, the main factors that influence the sustainability of the wholesale roaming markets are the existence and size of a positive or negative imbalance of roaming traffic. The same factors plus the number of mobile operators influence most, according to the respondents the competitiveness of the wholesale roaming markets.

Almost half of the respondents express the view that retail roaming services are not sustainable with the current wholesale roaming caps. The majority of M(V)NOs agree with this view (28 out of 52 respondents), as well as the consumer organisations (5 out of 5) and public authorities (5 out of 5). Opposing views do not exceed 15% of respondents. In parallel, almost half of the respondents express the view that retail roaming services are not sustainable with the current wholesale roaming caps, effectively supporting a reduction to wholesale caps. By contrast, only 1 out of 5 respondents support the opposite view. All responding MVNOs (9 out of 9) express that retail roaming services are not sustainable. MNOs are more divided and 11 out of 25 think that retail roaming services are not sustainable with the current wholesale roaming caps, 9 think that they are and 5 remain neutral. The most important obstacles to the sustainability of retail roaming services appear to be the (high) level of wholesale caps and the lack of bargaining power of smaller mobile operators. The vast majority of respondents do not consider that these obstacles depend on the Member State.

More than half of the respondents (54%) agree or strongly agree with the statement that wholesale roaming markets depend on wholesale price regulation to be able to provide RLAH at the retail level in line with the domestic charging model. Less than 1 out of 5 disagree or strongle disagree. A substantial number (1 out of 3) either does not express an

opinion or remain neutral. On the other hand, respondents present diverging views on policy options, regarding the wholesale price caps. There is balanced support for maintaining them at the current level or reducing them. On the other hand, there is very little support in favor of lifting wholesale regulation and (expectedly) no support at all for increasing caps. The majority of respondents expect that the possible impacts of lifting wholesale price regulation would be negative, specifically increase of wholesale roaming prices and retail domestic prices and a decrease of the sustainability of MVNOs. On the other hand, they are more reserved towards the possible impacts of lowering wholesale rates and more or close to half either do not express a view or express a neutral one. Respondents were also reserved to express a view on alternative measures, including an MNO obligation to pass on discounts they get on wholesale roaming prices to MVNOs and a measure to ensure that regulated maximum wholesale caps also apply to alternative wholesale agreement solutions. Out of the respondents who expressed a view 16 out of 17 MNOs do not think such an obligation would be relevant, while 7 out 9 MVNO/Es think it is relevant. A limited number of other respondent group replied to this question, however the small number of responding consumer organisations and public authorities in general support this option.

Quality of Service (QoS) of regulated roaming services

The Roaming Regulation Article 3(3) requires that wholesale roaming access shall cover access to all network elements and associated facilities, relevant services, software and information systems necessary for the provision of regulated roaming services to customers. Out of 65 respondents, including MNOs, MVNOs, business associations, citizens and others (including SMEs/entrepreneurs/vertical industries/IoT & M2M and industry associations), 46% consider that the wholesale roaming access obligation in the current Roaming Regulation is sufficient to ensure that M(V)NOs are given access to 4G and 5G for wholesale roaming. 31% of the respondents do not think that the current wholesale obligations are sufficient. **MNOs** in particular, but also some **business associations** agree that the current provision in the Roaming Regulation is technology neutral. Several **MVNO/Es** on the other hand welcome a clarification. They note that they have experienced long delays in being granted access to 4G networks. They fear that bottlenecks on 5G roaming could emerge. Therefore, the Roaming Regulation needs to be reinforced, making clear that visited networks must grant wholesale roaming access (incl. resale) for all technology generations deployed in their network (e.g. 2G, 3G, 4G incl. LTE-M and NB-IoT, 5G). A clear provision could avoid delays and unnecessary costs.

The majority of **MNOs** and **MVNO/Es** agree that the current Roaming Regulation is sufficient to ensure that roaming consumers are given access to newest network generations (e.g. 4G, 5G) while roaming when 4G or 5G is/will be available. Business stakeholders tend to disagree. Both stakeholder who agree and stakeholder who disagree are inclined to raise the same argument, in particular that the QoS is dependent on the visited network and as such it cannot always be guaranteed that the same QoS level as at home is offered.

The majority (52% or 23 in total) of **M(V)NO/Es** and **business associations** express that they can easily gain wholesale roaming access to all network elements and associated facilities, relevant services, software and information systems, necessary for the provision of regulated roaming services to customers, from MNOs in other EU/EEA Member States. However, 30% of the respondents experience some difficulties in getting access while others do not get it at all because of the difficulties. The main reasons stated

for these difficulties among **MVNOs** are the lack of possibility to negotiate with MNOs on their own (negotiations through wholesale resellers), restricted access to 4G and MVNOs experiencing long delays (several years) in being granted wholesale access to 4G networks, including for wholesale roaming. **MNOs** note that difficulties to gain access are related to capacity constraints/availability and competing MNOs being excluded from the newest service, by groups of MNO's with broader EU footprint.

As regards ensuring the same QoS as at home, out of all respondents (141) 49% agree, and 28% disagree, that the current Roaming Regulation is sufficient to ensure that roaming users are given access to newest network generations (e.g. 4G, 5G) while roaming when 4G or 5G is/will be available. **MNOs** mostly agree (21 out of 24) but **MVNOs** are more inclined to disagree (5 out of 9, while 3 out 9 agree) with this statement. Among stakeholder groups, for example citizens and consumer organisations 25 out of 84 who expressed a view disagree that the current Regulation sufficiently ensures access to all network generations, while 45 agree.

Mobile operators indicate that they actively try to ensure QoS of retail roaming services through traffic steering techniques (22 out of 30). According to the respondents steering roaming traffic is a dynamic way of increasing QoS for the end-user. This practice enables the domestic operator to offer the end-user roaming services on chosen networks based on quality parameters. This practice does not limit the access to other networks for the end-user, e.g. in case of poor coverage or other service limitations at any given time the end-user will automatically be given access to another network. In this regard, dynamic steering techniques allows the domestic operator to manage the best QoS for the domestic customers when roaming. 68% (28 in total) of M(V)NOs apply roaming traffic steering techniques in the EU/EEA (i.e. routing their own customer traffic while roaming) to one specific visited network. 30% (13 in total) steer traffic from a visited network, to a domestic network.

There is an overall support from stakeholders for strengthening the QoS requirements in the Roaming Regulation. In particular **citizens** and **consumer organisation** support additional measures, while the mobile operators are more divided. **MNOs** are less inclined to agree that additional measures on QoS would be relevant, while **MVNO/Es** are overall more supportive. As regards the option to include a transparency obligation, e.g. requiring mobile operators to provide clear information about the QoS in the visited country, 63% of all respondents, including all respondent groups, have replied that it would be very relevant. The prevailing respondent group that finds this option relevant are **citizens and consumer organisations**. **M(V)NOs** are less positive to such an obligation; 15 out of 34 do not think it is relevant, 9 are neutral and 6 are positive. Among the **other business stakeholders**, 2 out of 5 respondents think it would be relevant, 2 are neutral and 1 thinks it would not be relevant.

As regards additional QoS obligations on wholesale and retail level respondents are almost equally supportive of introducing obligations on the home mobile operator (73%) as on the visited operator (78%), prohibiting deliberately lowering the QoS for roaming services. The majority of these respondents are **citizens** and **consumer organisations.**

MNOs are less inclined to support such obligations. **MVNO/Es** on the other hand are more positive, and support in particular obligations on the visited operator. **Other business stakeholders** think such a measure would be relevant.

Lastly, regarding the obligation on MNOs to give access to all network technologies and generations(2G, 3G, 4G, 5G etc.), upon a reasonable wholesale roaming access request, a

strong majority, 75% of all respondents, are supportive. The majority of these respondents are **citizens and consumer organisations**. 7 out of 25 **MNOs** have expressed that such an obligation would be relevant, while 8 do not think it is relevant and 6 are neutral. Among the **MVNO/Es,** 7 do think it is relevant while 2 are neutral. Among the **other business stakeholders**, 4 out of 5 think such a measure would be relevant.

Roaming and Machine-to-Machine (M2M) services and Internet of Things (IoT)

As regards the measures in Article 3(4) of the Roaming Regulation (to be read together with Recital 11), that allows mobile operators to negotiate alternative pricing schemes for wholesale roaming, 19 out of 65 respondents disagree (or strongly disagree) with the assertion that the current rules are sufficient to develop more efficient, integrated and competitive markets for roaming services for M2M, while 14 respondents agree (or strongly agree). Among those who do not think current measures are sufficient, some find that less regulation and more commercial flexibility is needed, while others on the contrary would welcome targeted regulation for the M2M wholesale market. **MNOs** consider that regulatory intervention would be irrelevant or premature. **Vertical companies** (i.e. that use the network for industrial applications) and most **MVNOs** consider that intervention for M2M would be welcome.

A consensus seems to emerge to support the introduction of a clear distinction of M2M from person-to-person communication.

At wholesale level, **MNOs** rather disagree with the need for specific rules for M2M in contrast to **MVNOs** and **verticals**. A vast majority the respondents across categories would not support specific rules at retail level.

Regarding permanent roaming for M2M, **MNOs** find that it would affect competition and possibly open a back door for unauthorised entry into other national markets. **MVNOs** either have no opinion or on the contrary they rather support permanent roaming for M2M. Regarding the impacts of such an obligation some **MNOs** warned of the risks of fraudulent use of the EU roaming regulation would increase with the possibility to roam permanently. 7 respondents noted that an extension of the benefits of the Roaming Regulation to IoT/M2M users, would in practice grant non-EU providers preferential access to EU markets, without reciprocity for EU providers on non-EU markets (i.e. if the regulated wholesale access rights and prices can be used for permanent roaming, in practice the obligations would expand to the national roaming market). **MNOs** warn that intervention could disadvantage cellular vs non-cellular connectivity.

Regarding the idea of obliging MNOs to negotiate wholesale agreements in good faith or making permanent roaming explicitly enabled with alternative pricing models, MNOs have different and balanced views while MVNOs and verticals rather agree. **Most respondents** across the categories agree that an obligation on MNOs to provide separate wholesale agreements for permanent international roaming in EU/EEA for M2M/IoT communications would decrease the bargaining power of MNOs and increase the one of MVNOs. While **MNOs** respond that it would decrease their sustainability but would not lower the rates, nor increase competition, nor increase the level of EU connectivity, nor facilitate access to the market, **MVNOs and verticals** are of the opposite view.

As regards separate wholesale regulation of M2M/IoT services imposing a cap on wholesale prices for permanent international roaming for M2M/IoT communication, with non-volume based pricing for wholesale access, **MNOs** see negative effects while

MVNOs see positive effects. **Vertical industries** raise the need to use roaming services for connected objects. One public authority indicated that setting a single wholesale cap to cater for all M2M/IoT connectivity services use cases would be difficult and imply the risk that MNOs do not recover their efficiently incurred cost. Two large associations of telecom operators also consider that the Commission should focus on alleviating the challenges that the operators experience during the cross-border deployment of enterprise and consumer IoT applications, because of the existing fragmentation across Member States. Another association mentions that if roaming is artificially restricted or priced without a clear connection to underlying costs, the benefits will likely fail to materialize. One **business respondent** suggest electronic trading as part of the solution to offer price competition.

Roaming and technological developments

On the potential impact of technological developments on the roaming markets larger **M(V)NOs and associations** do not foresee any considerable changes in arrangements of roaming with 5G compared to other generations. Among the impacts that stakeholders have mentioned within the next 2 or 5 years are increased data traffic volumes, network slicing, increased use of M2M/IoT services and increased QoS requirements.

A large proportion of the respondents have not expressed an opinion or remained neutral on expected competitive pressure from various technological and business developments. When stakeholders have expressed an opinion the views are rather mixed between expected pressure and no expected pressure. The results indicate that stakeholders are more inclined to expect competitive pressure from certain technological and business developments. Of those stakeholders who have expressed an opinion, in particular **MNOs** are expecting that competitive pressure will be caused on voice and SMS service by OTT services and e-SIM. **MNOs** also expect that e-SIM will cause competitive pressure in particular on data roaming services. Some stakeholders, across the stakeholder groups, expect competitive pressure on data from public Wi-Fi services and Wi-Fi in the home/work place. On 5G and network, slicing the majority of respondent remained neutral or did not express any opinion.

Due to the lack of practical experience and the novelty connected to online trading platforms for wholesale roaming traffic, the majority of the 65 respondents have not expressed an opinion or remained neutral when asked about the willingness to use such platforms or the impacts of online trading platforms. Among the views expressed stakeholders noted in particular that online trading platforms, if introduced, should be on a voluntary basis. Several also noted that trading of roaming traffic does not only depend on the price but that other factors such as QoS and security requirements are significant.

Value-Added Services

There is general support for additional measures in the Roaming Regulation to mitigate bill-shock for end-users due to the use of Value-Added Services (VAS), and avoid inadvertent usage of such services. With regard to additional measures to avoid unexpected additional charges due to the use of value-added services while roaming in the EU/EEA, the majority, 72% of respondents confirmed such need. Only 12% of respondents (17) considered that there is no need to introduce measures to avoid unexpected additional charges. The replies prove that there is a general agreement **among all groups** of respondents that the measures to avoid unexpected additional charges due to the use of VAS while roaming in the EU/EEA should be introduced in the Roaming Regulation.

The public consultation confirmed a strong support (70% of respondents) for a database of VAS/PRN numbering ranges as a possible measure to address problems linked to value-added services and high termination rates subject to revenue share of roaming services in the EU/EEA, among all groups of respondents.

The proposal to introduce an obligation on mobile operators to include in the "Welcome SMS" an alert informing that these types of communications may not be under the RLAH principle was also supported by a majority of respondents (85, i.e. 62%).

The proposal to introduce an obligation that access to value-added services must be explicitly requested by the roaming end-user (opt-in) was again supported by over a half of respondents (78, i.e. 57%). This solution was mostly supported by **citizens** and **consumer organisations**. The respondents who did not support the proposal (43%), were quite evenly divided among those neutral and negative about it (53% and 47%, respectively).

Potential simplification/burden reduction

The relevant simplification measures that have been proposed by stakeholders to explore the potential for simplification and improving the efficiency of that legislation are summarised below. Stakeholders did not raise major problems related to simplification or burden reduction. These proposals have either been taken into consideration in the proposed options in the IA or discarded due to their limited relevance or regulatory limitations.

a. Retail regulation and transparency for customers

- One public authority suggests to simplify the annual revision of the regulated roaming surcharges, for currencies other than the euro. To address this problem the same date should apply for all retail surcharges that are laid down by the Roaming Regulation.
- Price information in the "Welcome SMS" should be the actual price paid, not maximum prices and a warning should be introduced against VAS.
- More efficient transparency obligations, e.g. mandatory information could be presented more transparently and better processed in an app than in an SMS.

b. Wholesale regulation

- Several MNOs suggest to keep price caps at the 2022 levels while MVNOs suggests further reduction of the wholesale caps.
- Separate wholesale charging model for M2M/IoT connections.
- Several M(V)NOs suggest the repeal of the obligation to provide local data break-out services.
- Wholesale FUP instead of retail FUP

c. Supervision/enforcement, dispute resolution, data collection

- Reduce and simplify the data and information gathering requests and extend deadlines for fulfilling the requests.
- Remove the "Welcome SMS" obligation as customers expect to incur no additional charges for EU/EEA roaming. The obligation to send "Welcome SMS" is therefore bringing no tangible benefits for customers anymore, but generates considerable costs and network load for operators.

d. Other

- The treatment of value-added services / premium numbers and price arbitrage under the Roaming Regulation should be clarified and, introduce a common database on VAS numbering ranges.
- Introduction of trading platforms that would introduce self-regulation mechanisms to the wholesale market

ANNEX 2D JOINT COMMISSION-BEREC ONLINE SURVEY 2020

Introduction

The joint Commission-BEREC online survey was organised in March-May 2020 and targeted three focus groups:

- National Regulatory Authorities (NRAs)
- Mobile Network Operators (MNOs)
- Mobile Virtual Network Operators (MVNOs)

The survey was announced on 31 March 2020 with the deadline of 24 April 2020. Taking into consideration the difficulties faced by both operators and regulators, due to the COVID-19 pandemic, the survey remained open until 15 May 2020.

The number of responses is shown in the following table:

Table 2: Number of responses to joint Commission-BEREC online survey 2020

Survey	Responses	Representativeness
NRA	28	NRAs from 27 EU Member States (except UK) and Norway
MNO	81	Approximately 80% of the MNOs active in the EU
MVNO	106	Approximately 44% of the MVNOs active in the EU.

NRA Questionnaire

Compliance and infringements

Since 1 January 2019, 8 out of 28 NRAs have started 29 formal procedures for violations of Roaming Regulation. Most formal procedures concerned incorrect application of the FUP (7) or QoS (6). Following these formal procedures, in 9 cases the NRAs imposed administrative fines, ranging between €400 and €15,000 while 3 closed with a warning or moral suasion, 7 closed following the correction of the infringement and 2 closed with a decision that there was no infringement.

Quality of Service (QoS)

Since 1 January 2019, 8 out of 28 NRAs have received consumer complaints about the quality of the roaming services provided by their operators when travelling abroad in the EU/EEA (total 62 complaints). Out of the 8 NRAs, only 1 reports an increasing trend. 22 out of 28 NRAs report that they do not consider that QoS would require any action from their part and only 3 NRAs have either taken formal procedures or are investigating, if there are any violations of the roaming rules concerning QoS. At the same time, almost 2 out of 3 NRAs report that operators in their countries do not provide information on their websites about the QoS (3G vs 4G) offered to their roaming subscribers when travelling within EU.

Wholesale roaming access

In general, NRAs do not report issues concerning wholesale roaming access. Only 1 out of 28 NRAs received a request for authorization to terminate a wholesale roaming

agreement according to Art 3 (6) and a request for conflict resolution concerning roaming access. The case concerned permanent roaming.

Technological developments / M2M communications

Only 6 out of 28 NRAs have received complaints from operators or have become aware in any other way of any issues with M2M-based permanent roaming from foreign SIM cards. Almost all concern permanent roaming and only one concerns wholesale charges for M2M roaming. Two concern the same case, of using foreign M2M SIM cards, to provide permanent roaming to consumers (non M2M). At the same time, only 1 out of 28 NRAs was aware of negotiations or requests, in which operators from other member states requested from or negotiated with operators in their country to establish wholesale agreements allowing permanent roaming. The NRA was not aware of any disputes in this process

Emergency communications – 112

The majority of NRAs (25 out of 28) do not seen to be aware of any mechanisms which ensure that roaming customers with disabilities are informed of the available means for non-voice access to emergency services, when they enter the NRA country.

Simplification and administrative burden

The effort that NRAs have put in 2019 concerning the implementation of the roaming regulation varies significantly. For general monitoring, the effort ranges from 20 person days or less to more than 300 but the majority of NRAs have spent between 1 and 6 person months, with a median of 30 person days. For formal procedures during 2019, 16 NRAs have not put any effort while only 1 NRA has spent more than 3 person months. The median of non-zero values stands at 26 person days. Finally for examining sustainability derogations during 2019, 17 NRAs have not put any effort while only 3 NRAs have spent more than 2 person months. The median of non-zero values stands at 22 person days.

Operator Questionnaire (MNOs / MVNOs)

Wholesale Quality of Service (QoS)

Only two MNOs (less than 2.5% of respondents) report including only 3G roaming access in their reference offer. One of them claims not having 4G access.

The majority of MNOs report not having any 3G only wholesale access agreements (62% when acting as host networks and 53.5% when acting as home networks). On the other hand, for a substantial minority of MNOs more than half of their wholesale agreements are 3G only: 16.3 when acting as host networks and 15.1% when acting as home networks. The outlook changes substantially in resale agreements, as more than 80% of MNOs report that they do not have any 3G only resale roaming agreements and less than 5% report that more than half of their resale roaming agreements are 3G only.

The outlook is less positive, when seen from the MVNO perspective, as 26% responded that only 3G is available either in certain specified countries in the EU (4%) or in certain networks in certain countries in the EU (14%) or in general in the EU (8%). However, the main reason cited by MVNOs for not being granted 4G access is the need for technical developments from their part.

Almost 3 out of 4 MNOs report that they intend to include 5G in their reference offer, when it becomes available.

Retail Quality of Service (QoS)

The vast majority of operators (97%) claim that they do no limit the QoS/ data speed of roaming services to 3G for their customers, while roaming in the EU. This is in contrast to the responses on wholesale roaming agreements.

On the other hand, there seem to be some (though not necessarily many) consumer complaints on QoS. From the around 150 operators that have provided data on the number of complaints per category 18% have received complaints on only max 3G available (2.1% report more than 1,000 complaints) and 22% have received complaints on no full 4G speeds possible (1.4% report more than 1,000 complaints). Lack of coverage seems to be most common complaint.

Misuse

Misuse seems to be an important issue, as almost half of the MNOs (but only 16.5% of MVNOs) have reported being 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. International revenue share fraud seems to be a major (but not the only) case of misuse.

According to the data provided in the survey, the financial impact seems to be quite substantial, even though just around 40% of operators that encountered abusive use of SIM cards provided concrete data on revenues lost. Based on the collected data, the median value of lost revenues is €70,000 yearly, while one quarter of operators report lost revenues in excess of 350,000 euros yearly.

The above do not take into account indirect non-financial impacts to operators, including (as reported in the questionnaire) increased resources, loss of business and reputation and increased consumer complaints.

While operators do not report an increasing trend, we can safely assume that inability to effectively combat misuses will inevitably lead to increase of the phenomenon and increasing impact.

Operators offer various suggestions to address misuse. Common suggestions include:

- Transparency measures regarding the numbers related to premium rate numbers and value added numbers, including a database with number ranges with high termination rates.
- Regulation of numbering plans to allow identifying number ranges with high termination rates, including harmonisation of prefixes for premium rate/ value added services in all Member States (which however falls outside the scope of the roaming regulation).
- Simplifying fair use policies (which however is outside the scope of the present review).
- Barring calls to or more generally closing down high-cost destinations/network codes within EU/EEA and globally.
- Increasing wholesale roaming caps (MNOs) or decreasing wholesale roaming caps (MVNOs).

Value Added Services (VAS)

One out of four operators (but more than one out of three MNOs) report having received complaints from their clients about communications related to value-added services while roaming in the EEA. The majority of these complaints concern bill shocks and lack of transparency on the cost of VAS while roaming.

In parallel, 1 out of 5 operators (but more than 30% of MNOs) report having incurred extra costs resulting from unexpected wholesale charges for communications related to value-added services by their customers while roaming in the EEA. There are sufficient data to allow sizing the losses that operators face, but in general we consider that such losses have been in general reported in the section on misuse.

Operators have employed different approaches to remedy such issues. Some have tried to collect information on VAS number ranges but acknowledge that ensuring up-to-date information on VAS number ranges is complex, due to the fragmented numbering landscape and the lack of EU wide rules on VAS. Others seek solutions by renegotiating their wholesale roaming agreements. In some cases, operators have opted blocking VAS but this has often resulted in consumer complaints. Few operators have reported such issues to the competent NRAs but without any result.

Operators propose various approached to address VAS related issues. The most frequently cited proposals are to harmonise VAS number ranges in all EU/EEA member states and to establish a VAS database. Few operators propose excluding VAS from RLAH, allowing operators to block VAS numbers, mandating transparency of wholesale VAS rates, regulating premium rate numbers and free phone usage or mandating relevant provisions in wholesale agreements.

Emergency communications – 112

While calls to 112 are routed to the most appropriate PSAP, non-voice communications for end-users with disabilities are, in most of the cases, not. For SMS and applications (59%) and, respectively, (64%) of home operators indicate that adequate routing is not ensured. In addition, home networks do not monitor (83%) whether the routing of the emergency communications is ensured by the host operators. In case of calls to 112, operators tend to rely on initial testing of the roaming services. Monitoring or testing of non-voice access is missing from the practice of MNOs. MVNOs rely mostly on the arrangements of their host MNO.

The provision of caller location is not ensured in the majority wholesale agreements, not for network based location (58%), nor for handset-derived location (74%). The majority of operators do charge at retail level the provision of handset-derived location through both SMS (55%) and data channel (57%). In turn, host MNOs indicate that only 84% of them ensure the provision of network based caller location to customers roaming in their network. In case of handset-derived AML localisation, this is available only in half of the cases when AML is deployed through SMS transmission and even less when AML is deployed through data transmission (36.4%).

In contrast with the calls to 112 (85%) a very low percentage of MNOs ensures through the roaming agreements that end-users with disabilities have access to emergency services. Only 34% of operators provide for the possibility to access emergency services through SMS, where such means are deployed in the visited country. In case of emergency applications for end-users with disabilities the percentage is even lower: 26%. The failure to share information and failure to ensure the adequate division of

responsibilities in the wholesale agreement is reflected in the fact that end-users with disabilities are charged for the means of access employed by the home operators: 56% of operators in case of SMS and 68% of operators in case of emergency applications. The responses of the host MNOs confirm that an important share of roaming customers living with disabilities are precluded to have access to emergency services through the means of access deployed in the visited Member States. In case of SMS only 62%, in case of emergency applications only 58% and in case of other mean only 58% of MNOs would ensure access to emergency services.

A significant bottleneck for end-users with disabilities to access emergency services when roaming is the lack of awareness. While other end-users are informed that they could call 112 free of charge when they enter in an EU Member State, end-users with disabilities are not prompted to this relevant and potentially lifesaving information. According to the responses provided 90% of all operators (92% of MNOs and 88.6% of MVNOs) do not inform roaming customers with disabilities on the available means of non-voice access to emergency services in the visited country. This situation puts end-users with disabilities in a comparatively more vulnerable situation than other end-users that are informed when entering and EU country that they may call 112 free of charge in case of emergency. In view of the variety of alternative (non-voice) means of access deployed in the EU it is all the more important that end-users with disabilities are provided with the relevant information on how to access emergency services in the visited country.

Only 16% of both home and host operators are informing roaming customers on the public warning systems deployed in the visited EU country. This information can be potentially lifesaving when visiting another EU Member State that deploys an alerting technology that needs an end-users action to enable his/her device to receive the public warning messages.

Technological developments / M2M communications

The responses of operators to the question about whether technologies or techniques could work as alternatives to the classic data roaming services, confirm the conclusions of the study on technological developments and roaming. The use of eSIM seems to be the most promising development but still does not seem to be mature enough to provide a viable substitute in the medium term.

The majority of MNOs and a small number of MVNOs offer M2M services. However only 1 out of 2 MNOs and 1 out of 4 MVNOs seek to establish specific agreements for M2M, which might imply that often those services are enabled through standard roaming agreements. In the limited cases when specific agreements are requested, most probably also to address the need of permanent roaming, some concerned operators report facing difficulties.

On the other hand 1 out of 4 MNOs report having experienced issues with M2M-based permanent roaming from foreign SIM-cards in their network, including unauthorised use of (M2M intended) SIM cards for non M2M services.

The above reflect that the provision of international roaming services specifically intended for M2M communications could benefit from clarifications.

Simplification and administrative burden

The effort that NRAs have put in 2019 concerning the implementation of the Roaming Regulation varies significantly. We also observe, as expected, a significant difference in the effort put by MNOs and MVNOs.

Reporting on the implementation of the Roaming Regulation: more than two thirds (68.2%) of the operators that provide data, report an effort of up to 1 person month, with a median of 12 person days (20 for MNOs and 12 for MVNOs).

For the remaining categories, a large minority (ranging between 27% and 42%, depending on the question) did not provide data or report that they cannot distinguish these costs from the data provided for the first question. This implies that for a substantial number of respondents the above is the all-inclusive cost for the implementation of the roaming regulation.

Running (not implementing) the transparency obligations: The reported values are equally distributed in 4 groups: 0; 0-1,000; 1,000-10,000; 10,000-100,000 (each with 23-25%). The median is 3,000 (10,000 for MNOs and 1,000 for MVNOs). The third quartile value is at 15,000 (38,000 for MNOs and 15,000 for MVNOs).

Applications for sustainability derogations: Around two thirds of the operators that provide data do not report any effort (which is expected). The median for those who report some effort is 20 person days (18 for MNOs and 20 for MVNOs)

Running (not implementing) the fair use policy: 17.5% of operators (the majority being MVNOs) report 0 effort, which reflects operators that do not implement an FUP themselves. The median for those who report some effort is 20 person days (30 for MNOs and 10 for MVNOs).

Annex 3: Who is affected and how?

PRACTICAL IMPLICATIONS OF THE INITIATIVE

I. Overview of who is affected and how?	
Who?	How
Operators	Decrease in wholesale caps will affect operators in different ways: • Inbounder MNOs will see their positive roaming margin reduce, as a result of the reduced wholesale prices. • On the other hand, outbounder MNOs and MVNOs will see their negative roaming margin decrease (and in some cases become positive), as a result of the reduced wholesale prices. However, as a result of the reduction in the caps, operators might see their fair use policy retail revenues decrease because the open data bundle and pre-paid limits are increased and because the maximum fair use policy surcharge (equal to the wholesale cap) is also decreased. All operators will have to expand their "Welcome SMS", to include information on alternative means of access to emergency services and risk of increased charges for communications to value added services (VAS) while roaming. All operators will have to include a link to a web page where information on the risk of bill-shocks when calling VAS while roaming is provided. They will have to send a warning SMS on the above topics to all their subscribers who have opted out of the "Welcome SMS". MNOs will have to be ready to respond to reasonable requests for roaming access to higher network generations (e.g. 4G, 5G) and technologies, including changes in agreed QoS parameters. All operators will have to update their retail contracts to include a warning on the risk of facing increased costs for communications to VAS while roaming, and information about the QoS that end-users can reasonably expect while roaming. Operators will be called on to report on the development of the roaming market for M2M (e.g. volumes, revenues, expenditures from roaming M2M traffic). The visited network operator will have to absorb the cost of calls/ SMS to emergency services or the cost of data to access emergency communication applications. All operators will have to modify their wholesale roaming agreements, to provide free emergency services and free of charge provision of caller location information for end-users, including end-users with disabilities. They will also have to verify and amend, if needed their (retail and wholesale) billing systems, to ensure that data traffic to emergency applications is free of charge.
Consumers and business end-users	Consumers and business end-users may see improved QoS and be better informed about the QoS they can reasonably expect when travelling abroad. They will have

	access to applications and services on modern technologies. They will be less likely to face hurdles, when they try to access emergency services while roaming. They will have better awareness about the risk of higher costs for communications to VAS, thus, it will be less likely that they will face bill-shocks. Subscribers of outbounder MNOs and MVNOs are less likely to face sustainability derogation (hence more likely to enjoy the full benefits of RLAH), thanks to the reduced wholesale prices and the ensuring improved sustainability. For business end users this would mean less risk of having to pay for the use of online productivity and business tools while roaming. Those who consume substantial volumes while roaming might run the risk of facing fair use policy surcharges, will benefit from reduced costs for two reasons: (i) reduced caps cause thresholds used in the open data bundle and pre-paid fair use limits to drop, which means less amount of consumed data becoming subject to a fair use policy surcharge; (ii) at the same time the maximum applicable surcharge is reduced (being equal to the regulated wholesale cap).
Application providers	Reduced risk of sustainability derogation and reduced FUP limits imply increased chance to use online applications while roaming. Indirect innovation benefits to developers of applications that require high QoS, especially if those applications and services might operate exclusively on 5G networks.
NRAs	NRAs will be requested to monitor the new measures, and this is likely to create additional work (estimated to 5 person days per year). NRAs are likely to face reduced complaints on QoS and on VAS.
BEREC	Will be called to develop and maintain the European database with VAS number ranges.

SUMMARY OF COSTS AND BENEFITS

Table 3: I Overview of Benefits (total for all provisions) - Preferred Option

I. Overview of Benefits (total for all provisions) – Preferred Option		
Description	Amount	Comments
Direct benefits		
Improved QoS for end-users while roaming and transparency about the expected QoS	Cannot be monetised	As a result of the QoS related measures.
Increased awareness of means to access	Cannot be monetised	As a result of the emergency communications related measures,

emergency services while roaming		roamers will be informed through the Welcome SMS about the means of access to emergency services, especially for disabled end users.
Reduced calls to VAS by end users while roaming, leading to reduced bill shocks	Cannot be monetised	As a result of the VAS related measures.
Reduced frustration from bill-shocks from calls to VAS	Cannot be monetised	Complaints to NRAs concerning calls to VAS are relatively low (according to the transparency and comparability report 2020, more than half the NRAs have not received any complaints and about 40% have received 2 complaints in the past year while only 3 appear to have a higher number). Still the number can be reduced, if consumers are adequately warned.
Reduced negative roaming margin for outbounder operators and MVNOs	42% in 2023 and 53% in 2025	Sustainability improvement leads to a reduction of the total (negative) roaming margin of the operators with negative sustainability by these percentages.
Reduced risk of losses from calls to VAS for operators	14,000	Median saving per operator facing losses due to misuse, assuming a modest 20% reduction, following the measures concerning calls to VAS
Administrative cost reduction	Estimated as follows: • Over €50,000 per annum for operators (total) • €15,000 per annum for NRAs and member states • Savings that cannot be monetised for the co-legislators.	As a result of the REFIT measures and the overall effort to streamline the reporting process and reduce administrative burden.
Indirect benefits		
Contributing to the safeguarding of end-users health, life or	Cannot be monetised	Reduced risk for roamers to be unable to place an emergency call, when needed. The estimated impact

property		is 0.45 lives saved and 4,37 lives impacted[17] per 100,000 calls.
Reduced risk of not enjoying RLAH benefits	Cannot be monetised	In 2025, the percentage of EEA end-users that could be subject to sustainability derogations, hence not enjoy the full RLAH benefits, is reduced from 14.1% to 8.6%.
Reduced cost from fair use policies for users making significant use of services while roaming	The reduction of the wholesale data caps form 2.5 €/GB in 2022 to 2 €/GB in 2023 and to 1.5 €/GB in 2025 will lead to reduced fair use policy surcharges by 20% in 2023 and another 25% in 2025.	
Higher customer satisfaction and improved reputation, by improving QoS	Cannot be monetised	According to the joint Commission/BEREC online survey, 18% of operators have received complaints on only max 3G available (2.1% report more than 1,000 complaints) and 22% have received complaints on no full 4G speeds possible (1.4% report more than 1,000 complaints). We can expect a substantial reduction to complaints, as a result of the proposed measures.

The following two tables present the summary of costs. The first analyses the costs incurred by each measure while the second gives a comprehensive view of all costs involved per measure and category of stakeholder.

Table 4: Measures of the preferred option and costs they incur

Measure	Description of the measure	Description of the cost
	Quality of Service	
B.1.a	Increase transparency regarding quality of service roaming end-users can reasonably expect.	Negligible one-off (compliance) cost for enhancing the content of the Welcome SMS.
B.1.b	Prohibit home operators from deliberately offering their customers lower QoS while roaming than in the home country.	None, but enhancing the QoS could result in increased data consumption, hence higher wholesale costs (indirect cost).

[17] Lives impacted are those persons that have a diminished or prevented injury as a consequence of accurate location.

C.1	Clarify that wholesale access obligation is technology neutral. Clarify obligation of MNOs to give non-discriminatory access upon a reasonable wholesale roaming access request, to all network generations. Clarify that alternative tariffs could be used in such M2M roaming agreements.	Estimated costs are 0.5 person days per year for the operators (administrative) and 1 person day per year for the administrations (monitoring).
	<u>Emergency communications</u>	
B.3.a	Mandate operators to inform in the "Welcome SMS" about alternative means of access to emergency services	Negligible one-off (compliance) cost for enhancing the content of the "Welcome SMS".
B.3.b	Mandate operators to provide through the wholesale agreement all technical and regulatory information necessary for the implementation of free of charge access to emergency services and free of charge caller location for all roaming end-users, including end-users with disabilities.	Operators will need to update their wholesale roaming agreements (one off compliance cost). The cost cannot be estimated. It depends on the number of agreements per operator and the precise way to implement this obligation. We further anticipate that each operator must spend approximately 1 person day per year for reporting to the NRA (administrative cost). By analogy, administration will incur an estimated (monitoring) cost of 1 person day per year.
B.3.c	Introduce obligation to not charge the wholesale traffic pertaining to emergency communications	All operators will have to verify and amend, if needed, their (retail and wholesale) billing systems, to ensure that data traffic to emergency applications is free of charge (one off compliance cost). At retail level this is trivial and practically cost free, as this practice has been routine in mobile billing. On the other hand, the cost at wholesale level could be more substantial. In addition, MNOs will have to absorb the cost of access to emergency communications, when acting as visited networks. NRAs will have to monitor the implementation of this provision (recurrent monitoring cost), which we estimate to 1 person day per year.
	<u>VAS</u>	
B.2.a	Inform all users that the use of Value Added Services while roaming is likely to incur an additional retail cost than when used nationally (through contracts and the "welcome SMS").	Estimated cost of 2 person days (one off compliance) to add warning in contracts that informs end-users about the risk of bill shocks from calls to VAS while roaming and enhance the contents of the "welcome SMS" message.

C.2.a	European solution: Create and maintain a European database, for operators and NRAs, of value-added services' number ranges (and where necessary individual numbers). Assign the task to BEREC.	BEREC will be mandated to develop the data base (one off implementation cost) and to maintain it (recurrent implementation cost). These costs cannot be assessed and will be determined in the project definition phase. Administrations will be called to update its contents (recurrent implementation cost) but this cost is expected to be negligible.
	Sustainability	
A.1.a	Reduce wholesale caps to 2 EUR/GB; 2.2 EUR-cents /min; 0.4 EUR-cents/ SMS.	No additional costs, compared to the baseline.
A.1.b	Monitoring of trading roaming traffic in a non-discriminatory/ anonymous manner,.	Estimated costs are 0.5 person days per year for the operators (administrative) and 1 person day per year for the administrations (monitoring).

Table 5: II. Overview of costs for the preferred option

II. Overview of costs – Preferred option							
		Citizens/Consumers		Businesses (operators)		Administrations	
		One-off	Recurrent	One-off	Recurrent	One-off	Recurrent
B.1.a	Direct costs	None	None	Negligible	None	None	None
	Indirect costs	None	None	None	None	None	None
B.1.b	Direct costs	None	None	None	None	None	None
	Indirect costs	None	None	None	Increased data consumption	None	None
B.3.a	Direct costs	None	None	Negligible	None	None	None
	Indirect costs	None	None	None	None	None	None
B.3.b	Direct costs	None	None	Update all wholesale agreements	1 person days/ year	None	1 person days/ year
	Indirect costs	None	None	None	None	None	None
B.3.c	Direct costs	None	None	Amend billing system	Absorb wholesale cost	None	1 person days
	Indirect costs	None	None	None	None	None	None
B.2.a	Direct costs	None	None	2 person days	None	None	None
	Indirect costs	None	None	None	None	None	None
C.1.	Direct costs	None	None	None	0.5 person days/ year	None	1 person day/ year
	Indirect costs	None	None	None	None	None	None

A.1.a	Direct costs	None	None	None	None	None	None
	Indirect costs	None	None	None	None	None	None
A.1.b	Direct costs	None	None	None	0.5 person days/ year	None	1 person day/ year
	Indirect costs	None	None	None	None	None	None
C.2.a	Direct costs	None	None	None	None	Develop database	Maintain & update DB
	Indirect costs	None	None	None	None	None	None

Annex 4: Analytical methods

Annex 4 presents main analytical methods and is divided in four sections:

Annex 4A – Sustainability assessment: methodological overview

Annex 4B – Counterfactual evaluation of the impact of RLAH and assessment of benefits for consumers

Annex 4C – Cost model for the wholesale roaming cost

ANNEX 4A - SUSTAINABILITY ASSESSMENT: METHODOLOGICAL OVERVIEW

Introduction

The provision of RLAH under specific wholesale caps configurations, may hamper the sustainability of an operator's charging model. Sustainability is threatened any time the cost for providing roaming services is higher than the expected revenues.

The Commission Implementing Regulation 2016/2286 (Article 10, par. 1), stipulates that the ability of a roaming provider to recover its costs of providing regulated retail roaming services, would be undermined, only where the negative roaming retail net margin is equivalent to 3% or more of its mobile services margin.

In this Annex we describe the analysis we have undertaken to assess the sustainability for mobile operators of the wholesale price caps we propose under Options 2, 3 and 4 of our impact assessment. Our assessment follows the approach described in the Regulation and was conducted by the Competence Centre on Microeconomic Evaluation (CC-ME) of the Joint Research Centre (JRC)[18] under the guidance of DG CNECT's services.

Data used to assess sustainability

The sustainability analysis has been made possible thanks to the data provided by the 19th – 25th waves of the International Roaming Benchmark Data Report conducted by BEREC. The data collected has been cleaned and rationalized in a panel database (BEREC database, hereafter) covering the period 2016 Q4 – 2020 Q1. The consumption forecasts are based on the information on outbound and inbound volumes from 2017 Q2 up to 2019 Q4, as well on the EUROSTAT monthly data on "*Nights spent at tourist accommodation establishments"*.

The final number of operators for which we have been able to assess sustainability is 96. We have to get rid of some operators because of missing data in the domestic variables, both on volumes and on revenues, as will be explained in the next section.

[18] The Joint Research Centre (JRC) is the European Commission's in-house science service employing scientists to carry out research in order to provide independent, evidence-based scientific advice and support to EU policy. For further information, please visit the JRC's website at: https://ec.europa.eu/jrc/. The CC-ME has been established in 2016 with the aim of providing scientific support to policy DGs in the field of Counterfactual Impact Evaluation.

Moreover, we have been obliged to exclude Ireland and Luxembourg from the analysis because no data on the "*Nights spent at tourist accommodation establishments"* were available for these two countries.

Table 6: Number of MNOs and MVNOs per country

	MNOs	MVNOs	Total
AT	3	6	9
BE	3	0	3
BG	2	0	2
CZ	3	4	7
DE	3	0	3
DK	3	0	3
EE	2	0	2
EL	3	0	3
ES	3	1	4
FI	3	0	3
FR	5	0	5
HR	1	0	1
HU	3	1	4
IT	4	3	7
LT	2	1	3
LV	3	0	3
MT	3	0	3
NL	3	2	5
NO	2	0	2
PL	4	0	4
PT	2	1	3
RO	4	2	6
SE	3	0	3
SI	2	2	4
SK	3	1	4
Total	72	24	96

Roaming consumption forecasts

The sustainability assessment exercise requires to have forecasts on inbound and outbound roaming volumes up to 2025. The forecasts have been produced on the basis of the country quarterly level BEREC database[19]. In particular:

- we use quarterly level data in order to take seasonality into account when forecasting volumes. Therefore, we have 9 quarters available and we use them to forecast volumes up to Q4 2025;

[19] More specifically, the econometric model that has been used is an Autoregressive Moving Average (ARMA) with up to 4 lags built on the differences of the series.

- instead of producing forecasts at the operator level, we prefer to use country level aggregates to reduce the probability of strange outliers dynamics due to misreporting from operators.

We base our forecasts on the *Nights spent at tourist accommodation establishments - monthly data* by Eurostat. The rationale for the choice relies in the fact that the number of points in time available for the series to be forecasted is too little to produce reliable projections. The *Nights* series is strongly related to the series on inbound roaming volumes, and therefore we decide to use the former as the basis to forecast the latter. In particular:

1. Making use of an econometric model, we estimate the relationship between inbound tourism and inbound roaming traffic in the period in which we can observe both;
2. we forecast the inbound tourism flow and use the coefficients estimated before to compute the forecasts of the inbound roaming volumes;
3. we compute the ratio between inbound and outbound roaming traffic for each Member State and each quarter of the year, i.e. first, second, third and fourth quarter, on the basis of the information reported in the BEREC database, in order to adjust for seasonality;
4. we use the relationship between inbound and outbound volumes calculated in the previous point to obtain forecasts on outbound roaming traffic;
5. finally, we aggregate the quarterly forecasts to have annual projected volumes at the country level.

Upon country level forecasts, we retrieve operators' level forecasts using reported traffic in BEREC database to compute the ratio between the volumes produced by each operator and the total country level volume for each service, ending up with a proxy for the operator specific market share in each service. We then apply this ratio to forecast country level traffic to redistribute it among operators, and obtain operators' level traffic.

In view of the discussion in section 5, all forecasts ignore the COVID-19 pandemic impact, assuming that it will have elapsed by the time that the proposed Roaming Regulation enters into force. The potential impact of COVID-19 is examined in the framework of the sensitivity analysis.

Sustainability test based on operators' data

The sustainability will be assessed comparing – at the operator level - the "Roaming Margin" with the "Domestic Margin". The "Roaming Margin" is defined as the difference between the revenues obtained from the provision of retail roaming services and the costs of providing such services. On the other hand, the "Domestic Margin" is calculated multiplying the revenues from the provision of domestic services by the assumed retail domestic margin.

Therefore, the sustainability index is calculated as:

$$(1) \qquad sustainability_{ict} = \frac{RoamingMargin_{ict}}{DomesticMargin_{ict}} * 100$$

It reflects the magnitude – in percentage – of the roaming margin compared with the domestic one. Sustainability will be negative any time the roaming margin will be negative, i.e. when the costs of providing roaming services will overcome revenues.

In the remainder of the analysis we seek to estimate the number of operators with sustainability that is less than -3%, that is the roaming margin is negative and in excess of 3% of the domestic margin.

Roaming Margin

As already mentioned, the roaming margin is computed as follows:

$$(2) \qquad RoamingMargin_{ict} = RoamRev_{ict} - RoamCost_{ict}$$

Retail Roaming Revenues

Roaming revenues are obtained summing up the revenues coming from "exceeding FUP" volumes, those originated by alternative tariffs – for each service k (voice, SMS, data) and the proportion of domestic revenues which can be imputed to roaming traffic.

$$(3)\ RoamRev_{ict} = \sum_k (RevFUP_{kict} + RevAltTar_{kic2019}) + RoamRev(Dom)_{ict}$$

where

$$(4) \qquad RevFUP_{kict} = FUPTraffic_{kict} * WholesaleCap_{kt}$$

In order to retrieve FUP traffic the BEREC database has been used and the following methodology has been implemented:

- for each service, we compute the proportion of reported traffic generated under FUP over total roaming outbound reported traffic for the points in time available and then the average over time has been computed;
- we apply this ratio to the forecasts on outbound traffic to estimate future volumes;

For the sake of simplicity, we are presuming that the proportion of FUP over total roaming traffic will remain constant over time. Indeed, forecasting FUP traffic would be quite challenging because we have little knowledge about the determinants of their dynamics (as we have done with inbound forecasts where we exploited the fact that it is tourism flows what drives roaming consumption).

As for Alternative Tariffs revenues, we assume them to be constant and we take the 2019 values as the reference level.

To estimate the proportion of domestic revenues that can be attributed to roaming consumption ($RoamRev(Dom)$) we need first of all to produce forecasts of the domestic revenues series.

Unfortunately, data on the domestic market contain many missing values and a handful of outliers. Moreover, similarly to the case of FUP volumes, we do not have any series which is correlated to the domestic revenues one and it is long enough to be used to produce forecasts as we have done for inbound volumes. It is also worth remarking that in the BEREC Benchmark Survey, domestic revenues are not disaggregated per service, but are reported for the three services together.

First, to tackle the missing values problem, we use the reported data available at the quarterly level and regress the domestic revenues series on the domestic volumes one. Then, we apply the coefficients of the regression to impute values for domestic revenues

where these were missing.[20] It is not possible to implement this method whenever both revenues and volumes are missing, and hence we get rid of operators displaying such data configuration.

Second, once filled the gaps in the domestic revenues series, we produce forecast applying the following approach:

1. We compute the European average annual growth rate of domestic revenues as:

   (5) $$EUGrowthRate = EUGrowthRate_{QoQ} * 4$$

   where $EUGrowthRate_{QoQ}$ is the quarter-to-quarter average growth rate from Q1 2018 up to Q4 2019. The quarter-to-quarter growth rate is then multiplied by 4 (the number of quarters) to retrieve an annual estimate, which is equal to 1.03%. The European level growth rate has been preferred with respect to the country level one in order to alleviate the problem of operators - and therefore countries - reporting outlier figures for domestic revenues.

2. Domestic revenues for each operator are computed as:

   (6) $$DomRev_{ict} = (EUGrowthRate_{t-1} * 1.1) * DomRev_{ict-1}$$

   The growth rate computed at point 1 works as reference for 2019. Then, it is assumed to slightly increase of 10% on a year-to-year basis. Moreover, we take the operator level domestic revenues in 2019 as the initial level, and use the dynamics of $EUGrowthRate$ to predict domestic revenues up to 2025.

Once predictions on domestic revenues have been made, we can compute the proportion of such revenues that can be imputed to roaming consumption.

As already mentioned, domestic revenues are not reported separately for service, and therefore it is not possible to use the proportion of each service roaming traffic over domestic one to impute roaming revenues. To tackle the problem we make the assumption that, given the importance data consumption have and will acquire in the future, the main driver of the proportion of domestic revenues to be imputed to roaming is the proportion of roaming data consumption over domestic data consumption, what we call "Roaming-to-Domestic" (roam-to-dom, hereafter) ratio. However, we only have roaming volumes predicted at the operator level, whilst no prediction is possible on domestic volumes at this level.

Therefore, since it is not possible to predict the components of the "roam-to-dom" ratio, we establish a reference level for it, and then estimate its future dynamics according to the following procedure:

1. We calculate the "roam-to-dom" ratio for each operator for 2018 and 2019 and we then take the average of the ratio over the two years as the initial reference level;
2. we calculate the "roam-to-dom" ratio at the European level for 2018 and 2019;

[20] The regression estimates the relationship between revenues and volumes. Whenever a missing value is reported in the revenues series, we apply the coefficient obtained to the volumes series in order to have an estimation of the corresponding revenues.

3. we compute the year-to-year growth rate of the "roam-to-dom" ratio at the European level between 2018 and 2019[21] and we take this growth rate as the initial reference level;
4. coherently with the evidence pointing out that roaming volumes will grow in the future faster than domestic ones even though their growth will not be exponential anymore[22], we assume that the roam-to-domestic ratio will continue growing at a diminishing rate:

$$(7)\quad GrowthRate"RoamtoDom"_{it} = GrowthRate"RoamtoDom"_{EU\ t-1} * 0.8$$

5. Finally, we apply the $GrowthRate"RoamtoDom"_{it}$ to the initial level of the ratio we've calculated at point (1) to project the ratio up to 2025.

Roaming Revenues are hence computed as:

$$(8)\quad RoamRev(Dom)_{ict} = DomesticRevenues_{ict} * RoamtoDom_{it}$$

Retail roaming costs

The costs of providing retail roaming services corresponds basically to the wholesale roaming cost beard by operators for the unbalanced traffic.

$$(9) RoamCost_{ict} = \sum_k (OutRoamTraff_{ikct} - InbRoamTraff_{ikct}) * WholPrice_{kt}$$

Forecasts of outbound and inbound traffic for each service k ($OutRoamTraff_{ikct}$ and $InbRoamTraff_{ikct}$ respectively) have been obtained as described in section 2. In calculating roaming costs we assume unbalanced traffic to be either zero or positive. In this way, we rule out the possibility for a net receiver of wholesale roaming traffic to have a negative wholesale roaming payment balance (i.e. revenues at the wholesale level from the provision of wholesale roaming services

Domestic margin

The domestic margin is computed multiplying the revenues from the provision of domestic services by the assumed retail margin:

$$(10)\quad DomesticMargin_{ict} = DomRev_{ict} * RetMargin$$

where Domestic Revenues are derived in the previous section.

Sensitivity analysis

In order to analyse how sensible are results on the sustainability index to variations in the main variables we are considering, we perform a sensitivity analysis. In particular, we design two alternative scenarios with the assumptions listed in the Table below:

[21] We choose to stick with the European level aggregation instead of country level one to be consistent with what we have implemented in forecasting domestic revenues, which will be the basic element to compute roaming revenues.

[22] Between 2018 and 2019, roaming data volumes at the European level have grown by almost 44% compared to domestic data volumes that have increased by 23.3%.

Table 7: Sensitivity on sustainability scenarios: description

	Scenario 1 – Low Sustainability	Scenario 2 – Base case scenario	Scenario 3 – High Sustainability
Domestic Retail Margin	10%	30%	50%
Domestic Revenues	Unchanged	As per forecasts	+10% per year
Outbound volumes	+10% per year	As per forecasts	-10% per year
Inbound volumes	+10% per year	As per forecasts	-10% per year

Low Sustainability scenario: For this scenario, we assume a Domestic Retail Margin lower than in the Base case scenario. Moreover, we assume Domestic Revenues do not change with respect to our forecasts, while Outbound and Inbound volumes increase by 10% each year with respect to our forecasts. All these elements represent a threat for sustainability, and for this reason we think this scenario is likely to produce the lowest sustainability.

High Sustainability scenario: For this scenario, we assume a Domestic Retail Margin higher than in the Base case scenario. Moreover, Domestic Revenues increase by 10% per year with respect to our forecasts, while Outbound and Inbound volumes decrease by 10% each year with respect to our forecasts. Sustainability should be enhanced by this combination of elements, and for this reason we think this scenario is likely to produce the highest sustainability.

COVID-19 sensitivity scenarios

The present section examines the sensitivity of the sustainability analysis in view of different scenarios on the impact of the COVID-19 pandemic on the roaming market.

For this purpose, we have developed some additional sensitivity scenarios, which seek to examine how a prolonged impact of the COVID-19 pandemic on international travelling could influence the ability of roaming providers to offer RLAH services in a sustainable manner.

In particular, the scenarios are based on the estimation of the drop in touristic flows in 2020. Eurostat data[23] suggest that, on average, while travelling in Europe, in 2020 European citizens have spent almost 45% of the total nights spent in the previous year. Consequently, we assume that roaming volumes could have decreased – in 2020 – by almost 50%.

On the basis of this assumption, we then speculate roaming volumes recovery speeds through which the gap with the forecasted figures could be filled. The main assumptions of the COVID-19 sensitivity scenarios are presented hereby and summarized in table:

COVID-19 Minimum Impact scenario: We assume that roaming volumes in 2023 will have partially recovered with full recover in 2025. In particular, they will be 10% lower

[23] The reference time series is the "*Nights spent at tourist accommodation establishments*". The latest available data refer to August 2020.

than those expected by the forecasts produced. The domestic market will not be impacted by the crisis and therefore domestic revenues as well as the domestic margin will be as for the baseline scenario.

COVID-19 Low Impact scenario: We assume that roaming volumes will not fully recover by 2025. In particular, they will be 20% and 10% lower than expected in 2023 and in 2025 respectively. As before, we also conjecture that the domestic market will not be influenced and figures will remain at the baseline level.

COVID-19 Medium Impact scenario: We assume here that the recovery in roaming volumes will be slower, and that roaming traffic will be 30% and 20% lower than expected in 2023 and 2025 respectively. Moreover, here we let the COVID-19 crisis to have an impact on the domestic market too. In particular, we speculate that due to the bankruptcy wave caused by the crisis – especially hitting SMEs – domestic revenues could decrease being 10% lower than those expected while the domestic margin will remain unchanged.

COVID-19 High Impact scenario: In this final scenario, the recovery of roaming volumes will be even slower and we assume the roaming traffic to be 40% and 30% lower than expected in 2023 and 2025 respectively. As before, we speculate a high impact of the crisis on the domestic market: besides domestic revenues being 20% lower than expected, we also set the domestic margin at 20% instead of 30%.

Table 8 COVID-19 sensitivity scenarios

		A. Minimum impact	B. Low Impact	C. Medium Impact	D. High Impact
Domestic Retail Margin	2023	Unchanged	Unchanged	Unchanged	20%
	2025	Unchanged	Unchanged	Unchanged	20%
Domestic Revenues	2023	Unchanged	Unchanged	-10%	-20%
	2025	Unchanged	Unchanged	-10%	-20%
Outbound volumes	2023	-10% in 2023	-20%	-30%	-40%
	2025	Unchanged	-10%	-20%	-30%
Inbound volumes	2023	-10% in 2023	-20%	-30%	-40%
	2025	Unchanged	-10%	-20%	-30%

Results

The following tables present the sustainability results for the baseline scenario (first row in each option) and for the high and low sustainability scenario (range of second row in each option).

Table 9: Number and % of operators with sustainability < -3% for each policy option and sensitivity scenarios. 2023 estimates

		MNOs	MVNOs	Total	High sustainability	Low sustainability
Option 1	Operators	12	14	26		

	%	17%	58%	27%	19%	35%
Option 2	Operators	11	14	25		
	%	15%	58%	26%	17%	35%
Option 3	Operators	8	10	18		
	%	11%	42%	19%	16%	31%
Option 4	Operators	8	8	16		
	%	11%	33%	17%	13%	27%

Table 10: Number and % of operators with sustainability < -3% for each policy option and sensitivity scenarios. 2025 estimates.

		MNOs	MVNOs	Total	High sustainability	Low sustainability
Option 1	Operators	13	15	28		
	%	18%	63%	29%	20%	38%
Option 2	Operators	12	15	27		
	%	17%	63%	28%	18%	36%
Option 3	Operators	8	10	18		
	%	11%	42%	19%	15%	30%
Option 4	Operators	8	7	15		
	%	11%	29%	16%	14%	27%

Table 11 COVID-19 sensitivity results - 2023

	Option 1	Option 2	Option 3	Option 4
High sustainability	19%	17%	16%	13%
COVID-19 High impact	18%	17%	17%	15%
COVID-19 Medium impact	19%	18%	17%	14%
COVID-19 Low impact	19%	19%	17%	14%
COVID-19 Minimum impact	23%	20%	19%	16%
Baseline	27%	26%	19%	17%
Low sustainability	35%	35%	31%	27%

Table 12 COVID-19 sensitivity results - 2025

	Option 1	Option 2	Option 3	Option 4
High sustainability	20%	18%	15%	14%
COVID-19 High impact	26%	24%	19%	17%
COVID-19 Medium impact	25%	24%	18%	16%
COVID-19 Low impact	26%	25%	18%	16%
COVID-19 Minimum impact	29%	28%	19%	16%

Baseline	29%	28%	19%	16%
Low sustainability	38%	36%	30%	27%

According to the tables on the COVID-19 sensitivity, we conclude that a prolonged impact of the COVID-19 pandemic would ameliorate the sustainability challenges but in most cases without surpassing the high sustainability scenario. Therefore, the COVID-19 sensitivity analysis confirms the choice of not considering the COVID-19 impact in the baseline forecasts.

ANNEX 4B - COUNTERFACTUAL EVALUATION OF THE IMPACT OF RLAH AND ASSESSMENT OF BENEFITS FOR CONSUMERS

Introduction

The aim of this section is to quantify how much European consumers have benefited from the implementation of the RLAH.

RLAH brought about huge benefits for consumers. After the introduction on the new roaming rules consumers started to pay less (the domestic price) for something (roaming volumes when traveling abroad) which - in principle - they would have been willing to pay more for. This `extra' benefit is what in Economics is called `Consumer Surplus'.

In order to measure how Consumer Surplus has changed since the RLAH implementation, we first need to estimate the impact of RLAH on roaming volumes which is *only* imputable to the enforcement of the new rules, excluding all other concurring factors. In other words, what this section is looking for is the causal impact of the RLAH on roaming volumes, upon which the change in Consumer Surplus can be computed. Ultimately, the result will give a precise idea of how much European consumers have gained uniquely from the implementation of the regulation.

The causal impact of a policy is retrieved adopting Counterfactual Impact Evaluation (CIE) methods. CIE replies to the fundamental question "What would have happened if the Regulation were not implemented?" The reply is based on the comparison of the outcomes of two groups. One is composed of treated individuals. The other is formed by all individuals who are totally comparable - under a list of characteristics - to the treated ones but for having not benefited from the policy. It is called control group and serves to mimic what would have happened to the outcome in the absence of the Regulation.

As previously mentioned, in this analysis CIE - namely a *Difference-in-differences* model (DiD hereafter) is used to derive the causal impact the implementation of RLAH had on a number of outcomes, with a specific focus on roaming volumes. In particular, it will derive the change in volumes attributable solely to the regulation, i.e., through CIE it will be possible to distinguish the effect of the regulation on volumes from all other factors that could have influenced the roaming volumes over time (e.g. technological developments, consumption habits, specific tourism dynamics, etc). Finally, these causal changes are used to compute the corresponding change in Consumer Surplus brought about by the new roaming rules.

Data description

The analysis presented in the following has been made possible by the availability of detailed data on the European roaming market collected by (BEREC. who quarterly sends to NRA a survey through which data on pricing and consumption patterns of both domestic and roaming services - being the latter generated either within the EEA or in the Rest of the World - are asked. The survey also gathers data related to domestic and roaming revenues. Finally, on the basis of the survey results, BEREC publishes the aggregated information on the evolution of roaming traffic on a regular bases in the form of the International Roaming Benchmark Data Reports. For the sake of this analysis, access to the 19th, 20th, 21st, 22nd and 23rd of the International Roaming Benchmark Data Reports has been granted. In particular are used, information on wholesale and retail revenues and volumes for voice, data and SMS services in both domestic and foreign markets (disaggregated for intra EU and Rest of the World countries) for each quarter

between q4 2016 and q1 2019 as they were declared by mobile operators of all 28 EU Member States (either MNOs and MVNOs) to their NRAs and then reported to BEREC.

Empirical strategy for the evaluation of the RLAH

The evaluation of the RLAH is made adopting the so called DiD method. The rationale for the double difference resides in the possibility of overcoming several problems related to comparing outcomes either only between groups or only overtime.

The first difference of the DiD method, that is, the before/after difference in outcomes for the treated group, takes charge of all the factors that are constant over time -or at least in the time interval of the analysis - in this group (it is the case, for example, of the structure of the national market, the level of competition).

However, if one were to use this difference to evaluate the impact of RLAH, one would end up biasing our assessment because many other time-varying factors could have contributed to the dynamics of roaming volumes, like for example seasonality, macroeconomic fluctuations, network infrastructure development or increased availability of smart phones.

In order to capture these time varying factors one can calculate the same type of difference for a group that is perfectly comparable to the treated one. In particular, the control group should be comparable specifically for what concerns the time-varying factors influencing the outcome. Finally, the impact of the policy can be obtained by subtracting the second difference from the first one.

To understand if the control group has been appropriately chosen - and to ensure the validity of the methodological choice - it is essential to verify that the outcome between the two groups was similar before the policy intervention. Indeed, if trends were already diverging before the intervention, then it would mean that the time-varying factors influencing the outcome in the treated group were not the same as the ones influencing the controls. This could be the case, for example, if the treated group was influenced by network-technological developments while the control group was not: in this case, we would observe a difference in outcome-trend even before the implementation of the policy, because the technological improvements were already pushing roaming volumes in the treated group. Under these conditions, it is impossible to impute the difference observed ex-post to the implementation of the policy itself.

The RLAH came into force all over Europe at the same time, on 15 June 2017. As for the control group, the natural candidates to be part of it would have been all countries not belonging to the EU (e.g. considering OECD countries), but there is no operators' level information available for them as detailed and complete as the BEREC's one.[24]Therefore the lack of comparable data makes it impossible to use non-European countries as the control group.

The BEREC database collects very detailed data on roaming volumes and revenues from the majority of operators all over Europe. On top of information about European roaming, i.e. the roaming traffic generated among the EEA, the database contains data regarding the roaming traffic produced outside the EEA, that is, the traffic produced by European citizens while traveling outside the EEA.

[24] To this respect, it is worth highlighting the importance of the data collection implemented by BEREC in coordination with DG CNECT. This should be consider a good-practice example to be disseminated.

This type of traffic is produced by the same users consuming roaming volumes in the EU, since each operator reports to BEREC the roaming traffic imputable to its subscribers generated either in the EEA or outside of it. Moreover, being produced by the same devices through which the roaming traffic is generated, it is subjected to almost identical technological improvements and conditions (i.e. time-varying factors) to which the EU one is exposed. Nonetheless, the roaming regulation does not apply to it. Hence, the extra-EEA roaming traffic could be used as the proper `control group' to evaluate the RLAH.

Therefore, to identify the causal parameters of interest we implement a DiD model where the treated units are operators' retail volumes as generated by European customers while traveling in Europe. The control units are those accumulated by European citizens while travelling in extra-EU countries (e.g. outbound extra-EU roaming traffic). As already mentioned, volumes in the control group could not be influenced by the RLAH Regulation because only the traffic produced by European people in Europe is affected by the new rules.

In formal terms, the equation we estimate is:

(1) $Y_{iat} = \beta_0 + \beta_1 PostRLAH + \beta_2 PostRLAH \times EU + \beta_3 EU + \mu_{ia} + \gamma_t + \varepsilon_{iat}$

where Y_{iat} is the outcome of interest (roaming volumes) for mobile operator *i* in area *a* – (*a* can be *EU* or *extraEU*) - at time *t*. *PostRLAH* is a dummy variable that takes value 1 only in the periods after RLAH implementation, while *EU* is a dummy variable valued 1 only if the area where the traffic has been generated is the EU. β_2 is the coefficient of interest and it is related to the $PostRLAH \times EU$variable which takes value 1 if the outcome is measured in a post RLAH period and the area is *EU*.

From a formal point of view, the dummy variable *EU* captures all the possible differences between the treated group and the control group that do not change over time. The variable *PostRLAH* accounts for all the aggregate factors that would have influenced roaming volumes even in the absence of the RLAH, such as the growing number of smart-phones, the increasing production of new apps for mobile phones, the network improvements, macroeconomic shocks and fluctuations in traveling habits. All these factors impacted in the same way the EU roaming as well as the non-EU roaming.

We increase the equation with operator-area specific dummy variables ( ) that help us to take into account the fact that operators may implement different marketing/productive strategies according to the reference area - either EU or non-EU - which eventually impacts on roaming volumes. This could be the case of differentiated tariffs, for example. Moreover, we make use of time dummy variables that help us remove events happening in specific years and that could have influenced both types of roaming volumes. This is the case, for example, of macroeconomic dynamics: an economic boom taking place in a particular year will most probably lead to higher roaming volumes because users travel more, both in the EU and outside of it.

Y therefore measures the causal impact of the RLAH regulation. It informs by how much the roaming volumes produced within the EEA have increased with respect to the pre-RLAH period and with respect to what has happened - in the same time span - to the volumes generated outside of it. In particular, the change measured is clean from any other factor that could have influenced roaming volumes.

In order to verify the existence of similar trends in the outcome between the treated and the control group before the implementation of RLAH, a methodology that it is

commonly used in the literature and that has been pioneered by the work of David H. Autor[25] is implemented. Basically, we assess whether statistically significant differences in the outcome variable existed in *each* quarter before the implementation of the RLAH. If no difference is detected, than it means that the two series - EU roaming VS Rest of the World one - were following the same dynamics.

Consumer Surplus

Consumer surplus is the difference between the consumers' total willingness to pay for roaming services and the amount they actually pay. The RLAH regulation reduces the price for roaming services to the level of domestic services, and this changes consumer surplus in two ways. First, consumers pay less for the volume of roaming services they previously consumed (i.e. before the RLAH regulation). Second, consumers increase their demand for roaming services, which provides an additional benefits.

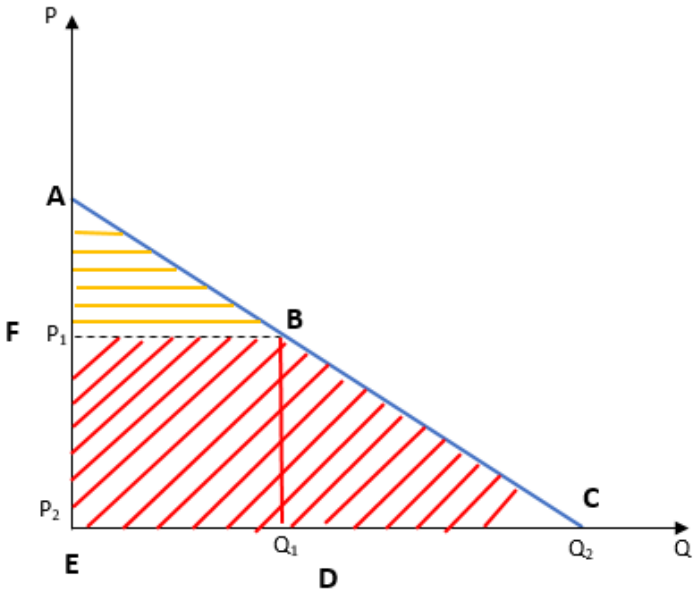
Figure 1 offers a graphical representation of these two effects, which will both be incorporated in the quantification of consumer benefits. The figure shows the price P for roaming services on the vertical axis, and the consumed volume Q of the services on the horizontal axis, and it plots a downward sloping (linear) demand curve for roaming services.

Before the RLAH regulation, consumers paid a price for roaming equal to P_1 and correspondingly consumed a volume of Q_1. Consumer surplus was the yellow triangle ABF, i.e. the difference between the total willingness to pay (area ABDE) and the actual expenditures P_1 (FBDE). After the RLAH regulation, the price drops to the domestic price P_2, so that demand increases to Q_2. Consumer surplus has increased to the larger triangle ACE.

The change in consumer surplus because of the price drop is therefore the red area, FBCE, and this indeed consists of two parts. First, consumers gain because they experience a reduced price on the volume consumed before the RLAH, Q_1. This reduction in expenditures is the area FBDE, and it can be easily calculated without a causal effects analysis. Second, consumers gain because they now consume a higher amount of roaming volumes (increase from Q_1 to Q_2). This gain is given by the triangle BCD, and is calculated from the causal effects analysis.

[25] Autor, David H. "Outsourcing at will: The contribution of unjust dismissal doctrine to the growth of employment outsourcing." *Journal of labor economics* 21.1 (2003): 1-42.

Figure 1: Consumer Surplus graphical representation



More formally, based on the linear approximation of demand, one can show that the change in consumer surplus is the sum of consumer expenditures before the regulation, plus half of this amount multiplied by the percentage increase in demand caused by the RLH regulation, that is, the area of the FBCE polygon. The latter - for each roaming service *k*, i.e. voice, data and SMS - can be computed summing up the area of the *FBDE* rectangle and the area of the *BCD* triangle. In mathematical terms:

(2) $\Delta CS_k = q_{1k}p_{1k} + \frac{1}{2}(q_{2k} - q_{1k})p_{1k}$

Even though the roaming price p_{1k} is not observed, it can be derived dividing revenues r_{1k} by volumes q_{1k}. Consequently, Equation 2 becomes:

(3) $\Delta CS_k = r_{1k} + \frac{1}{2}\frac{\Delta q_k}{q_{1k}}r_{1k}$

The term ΔCS_k represents the percentage change in roaming volumes between the pre RLAH implementation and the post implementation period. The latter term can be estimated through the β_2 coefficient in Eq. 1, therefore obtaining the causal change in Consumer Surplus, that is, the variation in the CS *exclusively* imputable to the enforcement of the RLAH regulation.

Results

This section presents the results about the counterfactual analysis and the Consumer Surplus calculation which have been estimated referring to the period 2016 Q4 up to 2019 Q1. Specifically, the computation of the Consumer Surplus has been implemented on an annual basis, and the results have to read as the change in CS only for the year after the RLAH enforcement.

Table 13 displays the counterfactual estimated changes in voice and data roaming volumes. [26]

Table 13: Impact of RLAH on roaming volumes [3]

	Voice volumes - log	Data volumes - log
	1.100***	2.672***
	(0.163)	(0.634)
Observations	2388	2344
R^2	0.9685	0.9464

Note: Robust standard errors in parentheses. Errors clustered at the country and operators' level.

***p<0.01, **p<0.05, *p<0.1

Specifically, it says that because of RLAH, voice and data volumes have increased by 110% and 267,2% respectively[27]. The numbers here represent the change in volumes that is uniquely imputable to the implementation of RLAH, excluding all other concurrent and confounding factors.

Indeed, if we were to calculate the simple change in EU roaming volumes before and after the new roaming rules, controlling for no factors among the ones listed previously (i.e. seasonality, technological change, macroeconomic fluctuations, etc) we would end up with a percentage change in voice volumes of 112,7% and a percentage change in data volumes of 489,2%.

The comparison between the counterfactual and the simple before/after percentages is very informative. As for voice, it tells us that the change in volumes that we observe after the RLAH is almost entirely due to the new roaming rules. The voice market seems to be a consolidated one, where technological changes or other factors play little role. The one thing that made consumers change their consumption habits was indeed RLAH.

The data market looks pretty different. The counterfactual estimates accounts for around 50% of the before/after scenario, suggesting that RLAH had a significant effect in increasing data volumes whilst also other factors contributed.

Confronting the results on data volumes is useful to understand what a counterfactual estimation does. If we had evaluated the impact of RLAH solely on the basis of the before/after comparison, we would have ended up overestimating the impact of the regulation because we would have given the same weight to all the factors that influence the roaming volumes dynamics. On the contrary, having found a proper control group, we are able to disentangle how much of the observed increase can be credited to the regulation.

[26] The model described in Equation 1 is a log-linear one, in that the dependent variable in expressed in logarithmic terms while the treatment variable is a dummy variable. In all these cases, the effect magnitude of a one-unit change of the explanatory variables on the outcome is calculated and reported in Table 13.

[27] Following Autor's methodology previously mentioned, we find evidence for the parallel trend assumption to hold.

Finally, Table 14 presents the estimates related to the Consumer Surplus change.

Table 14: Change in Consumer Surplus

	Voice	Data	Total
Change in Consumer Surplus	608.1 Million Euro	1792.6 Million Euro	2400.7 Million Euro

The quantification proposed above informs that the Consumer Surplus of European consumers increased by 2.4 Billion Euro because of RLAH. The growth has been particularly strong in the data market, given the unprecedented high data volumes consumed in the market and the fact that the price charged on roaming data (i.e. for 1 GB used) was very high in most European countries.

The calculation refers to the period 15th June 2017 – 15th June 2018. However, it is possible to roughly extrapolate the Consumer Surplus change for the two-year period after RLAH, by exploiting the relationship between the volumes produced in the second year (Vol_2) and those generated in the first year (Vol_1).

Basically, it is assumed that:

$$\Delta CS_2 = \frac{Vol_2}{Vol_1} \Delta CS_1$$

Upon this hypothesis, the total Consumer Surplus change is quantified in the range of 5.4 Billion Euro.

Evaluating waterbed effect in the domestic market

The quantification of the Consumer Surplus we have presented so far is valid as long as we assume that RLAH did not affect the domestic market, and in particular, that the price for domestic services has not increased because of RLAH (what is called "waterbed effect"). Indeed, it could have been that mobile operators, in order to counteract the loss in revenues suffered from not being able to apply high surcharges to roaming traffic, decided to increase prices at the domestic level. In this case, consumers would have been confronted with a significant reduction of prices in the roaming market and at the same time an increase in tariffs for their domestic consumption. Overall, their change in surplus – which we have previously computed – could have been negatively influenced.

To evaluate the assumption of no waterbed effects, we rely upon quarterly data on domestic mobile retail prices for representative consumption baskets[1] collected by Teligen. The data cover a total of 36 OECD countries, among which 24 are EEA countries. The data refer to the period 2016 Q3 – 2017 Q4.

The empirical strategy we implement is similar to the one adopted before. In this case, the DiD model is built such that the treated group is represented by the 24 EEA countries, whilst the remaining 12 non-EEA countries form the control group.

The outcome variables are the prices of the 2006 consumption baskets defined by the OECD for high, medium and low voice volume users.

In order to be sure to capture only the impact of the roaming regulation, and to get rid of any other confounding factor, in the estimation we take into account specific characteristics that do not vary over time at the country-basket level (i.e. consumption patterns of users in a country with respect to patterns of users from other countries), as well as for specificity at the basket-quarter level.

The resulting coefficient of interest informs about the impact of the regulation on domestic prices in the EEA with respect to the rest of the world. In particular, a not statistically significant coefficient would mean that domestic prices in the EEA have not increased nor decrease significantly with respect to prices in the rest of the world, suggesting that no waterbed effects has materialized[2].

Table 15: Impact of RLAH on domestic prices

	Baskets price
High Consumption	0.012
	(0.063)
Medium Consumption	0.016
	(0.077)
Low Consumption	0.106
	(0.089)
Observations	648
R^2	0.926

Note: Robust standard errors in parentheses. Errors clustered at the country-basket level.

***p<0.01, **p<0.05, *p<0.1

The results of the analysis presented in Table 15 supports the hypothesis of a null waterbed effect. The domestic prices of the three consumption baskets show small but insignificant increases in the EEA countries after the regulation, relative to the other OECD countries.

Overall, these findings suggest that the regulation did not imply statistically significant waterbed effects on the domestic market. One possible explanation is that domestic and international roaming services are only very weak substitutes or complements, so that operators have no incentives to adjust their domestic prices. Another explanation is that the roaming market is only a relatively small part of the overall business of the mobile operators, so that any adjustments in price strategies would be small and difficult to detect.

[1] Consumption baskets are built following OECD guidelines. See for more details: OECD (2017), "Revised OECD Telecommunication Price Baskets". Working paper, OECD, Directorate for Science, Technology and Innovation Committee on Digital Economy Policy.

[2] The definition of baskets has changed since 2018 making price data from 2018 on not comparable with those before. This is the reason why our analysis covers only the time period up to 2017 Q4. Nonetheless, we believe that there is no reason to believe that

operators would have waited to increase domestic prices, had they planned to do so once the date of implementation of the regulation was known.

ANNEX 4C COST MODEL FOR WHOLESALE ROAMING COSTS

The cost model used for estimating wholesale roaming costs

In order to assess the costs of providing wholesale roaming services in the 31 EU/EEA countries for the purposes of the roaming review, an independent study was commissioned[28]. The study's dual objective was to assess the cost of providing both wholesale roaming services and voice call termination rates. For the purposes of this SWD, the main focus of this summary of the study is on the estimated costs related to roaming, whilst taking into account the outcomes of the estimated costs of providing wholesale voice termination services.

The cost study was conducted by Axon Partners Group from mid-March 2018 to mid-July 2019. At the start of the study, a first workshop was organised with all relevant stakeholders on 10 April 2018 in order to collect feedback on the methodology proposed by Axon. A comprehensive data gathering aimed at the European mobile operators was then conducted in June-July 2018, via the NRAs, in order to obtain, from mobile operators, the relevant information and inputs needed to populate a country-specific model for each Member State. The aim was to build 31 models with a similar skeleton, based on country-specific input, facilitating as best possible the estimation of the relevant mobile wholesale costs in each of the 31 Member States.[29] The models would rely on country-specific input where relevant and, where not, on averages/common values across the EU/EEA. On 29 October 2018 the first draft cost model was shared with stakeholders for consultation, followed by a second version of the draft model shared on 15 February 2019 for a second round of consultation. The relevant comments and suggestions received during both consultations were implemented in the draft final model, which was presented to stakeholders at a second workshop on 28 May 2019. The cost model was then finalised and published on 24 July 2019.

To ensure transparency throughout the project, several steps were taken to associate the NRAs, operators and other stakeholders. First, two workshops were held and two rounds of consultation were organised over the period going from October 2018 to March 2019.[30] Stakeholders were also consulted on the structure and content of the data gathering exercise of June-July 2018 itself. Also, a steering committee composed by experts from NRAs was established and regular meetings between the Commission, Axon and the Steering Committee were held throughout the project. The steering committee consisted of representatives from 8 NRAs and was composed of members of the two BEREC Expert Working Groups dealing with roaming and with termination rates.

The final cost model estimates the costs of providing wholesale mobile roaming services as well as voice termination in 28 EU/EEA countries.

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[28] Study SMART 2017/0091: "Assessment of the cost of providing mobile telecom services in the EU/EEA countries", Axon Partners Group Consulting, published on 24 July 2019, available here.

[29] Iceland, Liechtenstein and Luxembourg decided not to participate in the data collection process and therefore the estimation of costs was not possible for these countries. Accordingly, the full set of models produced by Axon is 28.

[30] See the full publication for all the documents related to interaction with stakeholders, from the two workshops and the two consultation processes here.

A cost model enables the user to evaluate costs of all elements required to offer mobile services. For the purposes of the roaming review, the relevant costs to be estimated are those related to wholesale roaming services, specifically the estimated costs for:

- Data roaming
- Outgoing voice calls
- Outgoing SMS

The Axon cost model allocates costs related to wholesale roaming services following the so-called Long-Run Incremental Cost (LRIC) plus some allocation of joint and common costs (LRIC+). This cost standard can be divided in two parts, essentially the LRIC and the plus (+). LRIC is a way to derive the cost of producing an additional increment of a given output, when assessed over a long period of time (long-run). In economic theory, the long-run means that all inputs relevant to the production of the output are considered variable. The LRIC+ cost standard allows for including joint and common costs which are relevant for other services as well. Accordingly, costs estimated under the LRIC+ cost standard are higher than costs derived under LRIC. However, as these shared elements are also necessary for the relevant service, and in line with the regulatory obligation for the wholesale roaming cap to cover such costs[31], the Axon Cost model deploys the LRIC+ standard for all services related to roaming. This approach ensures that for shared equipment needed for e.g. data and voice the costs are captured in the estimation. As companies need to recover joint and common costs to ensure long-term sustainability, joint and common costs are shared among the services that generate them and accordingly recovered by any price cap set above the estimated costs for those services.

In contrast, incoming voice (voice termination) is calculated purely on the basis of the LRIC cost standard (pure LRIC), in accordance with the Commission's 2009 Recommendation on Termination Rates[32], which recommends the estimation of termination rates based on a bottom-up pure LRIC approach. For incoming SMS, the Axon cost model follows the approach adopted in the previous cost model[33], where no costs are allocated to termination of incoming roaming SMS.[34] To ensure cost recovery for these services, the cost of incoming roaming SMS is re-allocated to outgoing roaming SMS.

The cost model takes into account a wide selection of relevant parameters including radii (coverage) of the mobile sites, the different geo-types in each Member-State, whether or not a Member State exerts seasonal consumption-spikes and many other elements. As an example, seasonality is taken into account for Croatia, France, Greece, Malta and Spain who were able during the data collection exercise to prove that seasonality had an effect on the dimensioning of their networks. Essentially, any network must support the peak demand and the seasonality assessment determines whether traffic is distributed evenly across months or whether it peaks at specific months (e.g. summer period or winter

[31] Article 19(1) in the Roaming Regulation.
[32] Commission Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU.
[33] TERA Consultants, SMART 2015/0006.
[34] This is to ensure consistency with Regulation No 531/2012 which states that "roaming customers should not be required to pay any additional charge for receiving a regulated roaming SMS or voicemail message while roaming on a visited network, since such termination costs are already compensated by the retail charge levied for the sending of a roaming SMS or voicemail message".

period). Therefore, seasonality is assessed on a country-by-country basis to ensure that the relevant peak-time of the country is considered. For a full description of seasonality and the other elements considered, please see the full set of published materials.

Relevant results of the cost model

The Axon cost model estimates network costs incurred by an efficient operator. Accordingly, any additional (non-network) costs incurred by the visited network when providing wholesale roaming services must be considered in order to ensure full cost recovery. In order to apply the estimated costs in the exercise of setting adequate caps for roaming wholesale services, costs for transit (data and voice) and termination (voice) must be added to ensure cost recovery for providing these services. The results presented in this section therefore includes these additions.

For roaming data services, transit rates must be added to the estimated network costs. For voice roaming, transit and call termination rates must also be taken into account. This is because the visited network is paying the network operator where the call placed by the roaming customer will terminate. For example, a Spanish customer visiting Germany makes a call back to Spain. To complete the call, the German (visited) operator must first originate the call on the German operator's network and then transit the call through a number of countries back to Spain where the call is finally terminated at the receiver. The German operator must cover these transit and termination costs, therefore these costs must be considered to ensure cost-recovery by the German (visited) operator.

As roaming SMS are transited without extra costs incurred by the visited network, for the purpose of comparison, no further costs needs to be added to these estimates. For this purpose and to illustrate a more complete estimate of the cost of providing roaming voice and data services, this section describes these results of the model including transit and call termination costs.

The Commission services acknowledge the need to consider call termination and transit costs when assessing the appropriate level of any potential wholesale roaming price cap. Transit costs added here are estimates performed outside of the Axon cost model and not subject to the same modelling exercise. The estimated transit costs used are based on a data collection performed jointly by BEREC and the Commission, where operators provided transit costs incurred in year 2018. These calculations are subject to some uncertainty, as not all operators (or even countries) were able to reply to this specific data collection. However, from the reported data available to the Commission services, the following average transit costs have been estimated:

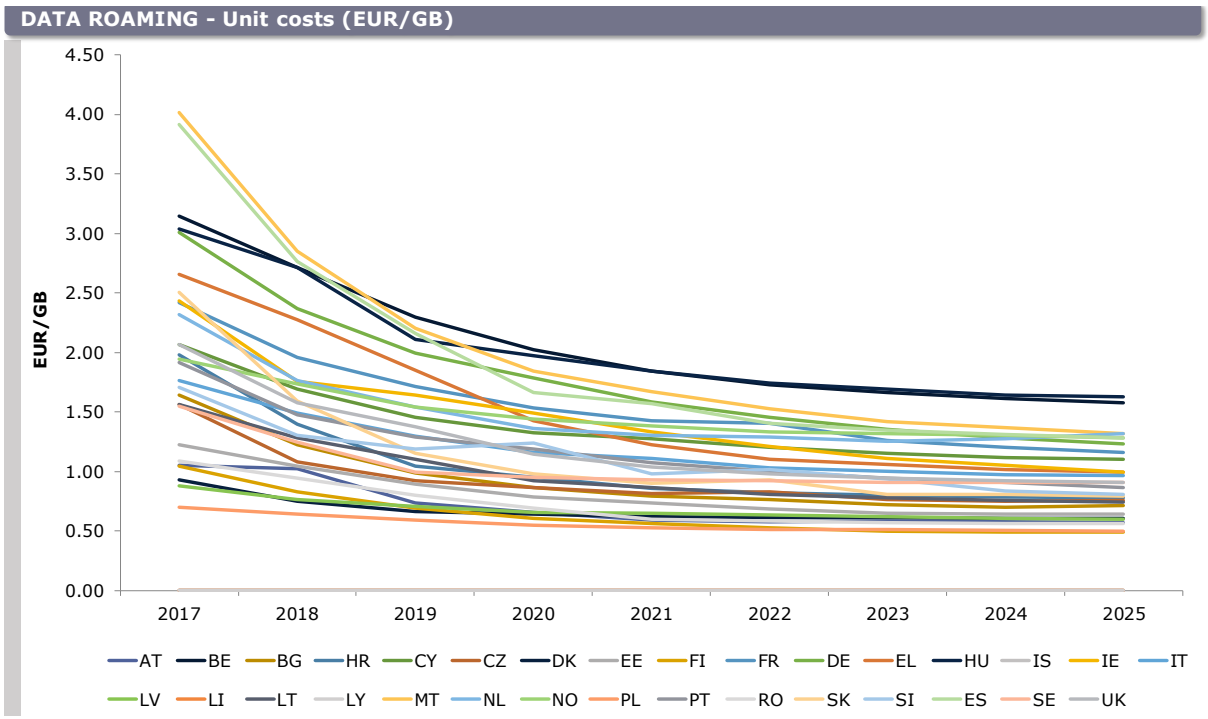
- Transit price for roaming data service, 2018: 0.20 €/GB
- Transit price for roaming voice service, 2018: 0.0050 €/minute

As these estimates are only available for year 2018, these costs are applied to each year under evaluation here. The above transit costs were consulted with operators during the first consultation round in November 2018, where 75% of NRAs and 48% of MNOs agreed with these estimates. For MNOs it must be noted, that although less than half agreed with the estimates, those who disagreed had contradictory views and considered the estimate to be either too high or too low[35].

[35] See on slide 16 in "Workshop 2 – Full consultation outcomes" available with the full set of publications.

Adding the transit costs to the results of the Axon cost model, the estimated costs are illustrated in Figure 2 below.

Figure 2: Estimated costs for providing data roaming services including transit



Source: Axon Consulting, SMART 2017/0091 and Commission service estimates

The cost model estimates that costs are declining across all countries, with estimates between 0.7 and 4 €/GB in 2017 and converging downwards to a range of 0.7 to 1.6 €/GB in 2025. The convergence is most apparent for Spain and Malta where the largest decreases are observed, followed by Belgium and Hungary. A number of countries, e.g. in Poland, have very limited developments in costs throughout the period. For 2025, the highest estimated costs for roaming data services are found in Hungary.

For voice roaming services, in addition to transit, termination rates shall also be a part of costs to be recovered by the host operator, meaning that one must add the costs of terminating the call in another European network. For termination rates, these will under a Delegated act be set by the European Commission, from 2021 and until 2025 in accordance with article 75 of the Code[36]. The delegated act proposes the following maximum mobile termination rates, which are added to the costs of the Axon cost model for wholesale roaming voice services:

2022: 0.0055 €/min

2023: 0.004 €/min

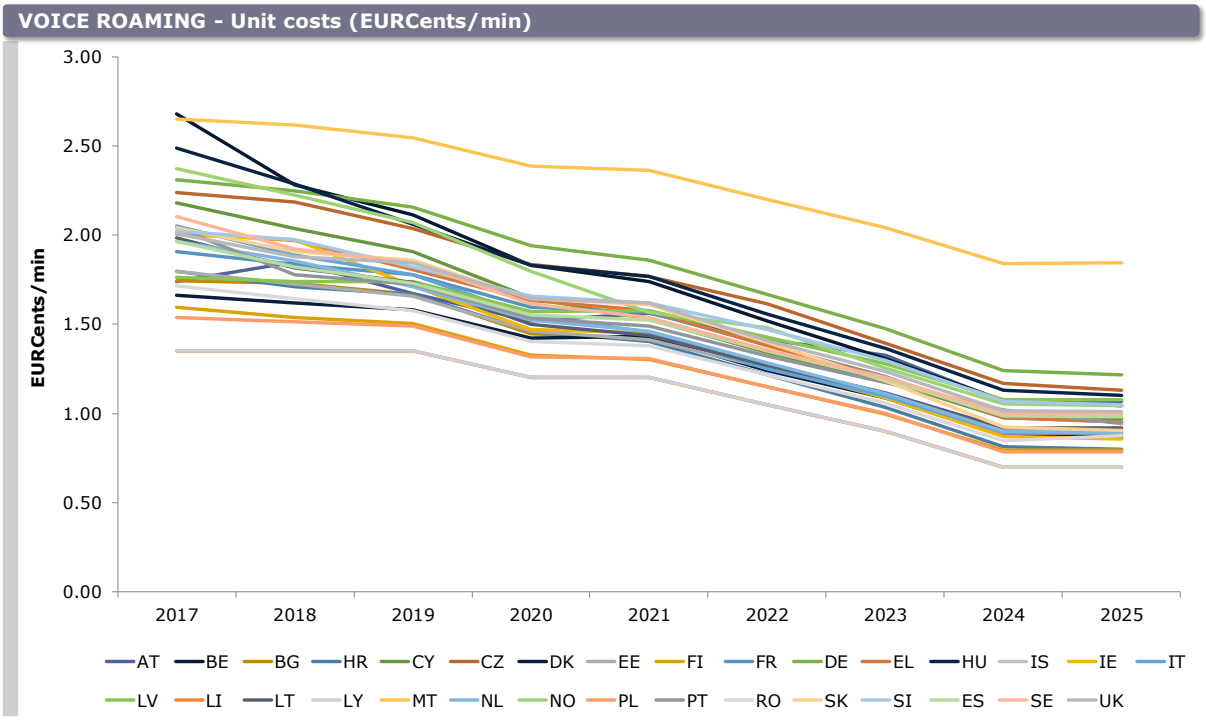
2024: 0.002 €/min

2025: 0.002 €/min

Adding the termination rates and transit to the costs estimated in the Axon cost model, the costs are derived as shown in Figure 3 below.

[36] Reference to the code – do we refer to this elsewhere in the review?

Figure 3: Estimated costs for providing voice roaming services, including transit and termination



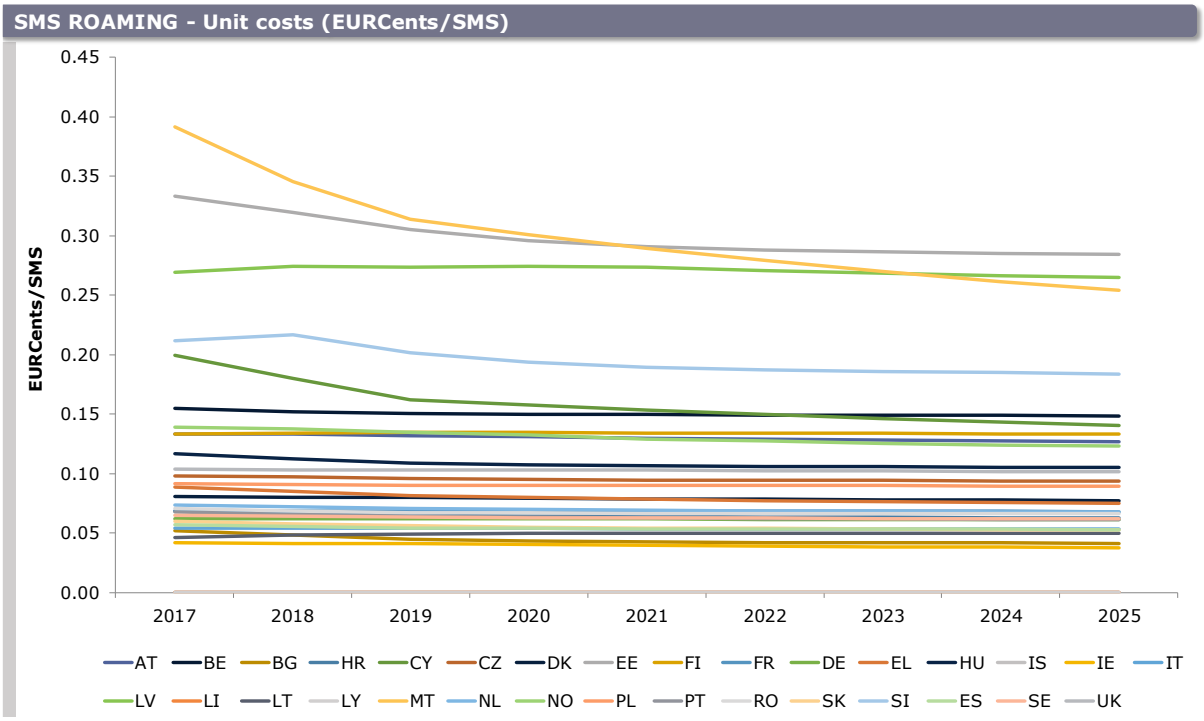
Source: Axon Consulting, SMART 2017/0091, Commission service estimates and input from the Delegated act setting Union-wide termination rates.

In 2017, voice roaming costs are estimated between 1.4 and 3.3 €cents/minute, when including costs of transit and termination. Poland displays the lowest costs whereas Belgium and Malta are the two highest cost countries in 2017. The estimated costs for 2025 converge to a range of 0.7 to 1.2 €cents/minute for almost all countries, with Malta being the only country remaining above 1.2 €cents per minute throughout the period, with 1.84 €cents/minute estimated for 2025. Looking at the other high-cost country in 2017, Belgium, convergence with the other Member States is observed already in 2018 and continues downwards until 2025. For Malta, these high estimates are driven by the thickness of walls in Maltese buildings, requiring operators to build and maintain a comparatively larger number of sites than elsewhere seen[37].

As roaming SMS are transited without extra costs incurred by the visited network, no further costs needs to be added to these estimates and the estimates can be evaluated directly from the Axon cost model, as seen in Figure 4.

[37] See p. 136 in the "Methodological approach document" accompanying the full publication of materials.

Figure 4: Estimated costs for providing SMS roaming services, including transit and termination



Source: Axon Consulting, SMART 2017/0091

For roaming wholesale SMS, the estimated costs are presented in Figure 4 showing a more constant level across countries than for roaming voice and data. Unlike voice and data, the cost estimates for roaming SMS derived from the cost model are not subject to additional costs, such as termination or transit, due to the construction of the SMS wholesale regime. This follows from the roaming regulation, attributing any termination costs for incoming SMS to the equivalent outgoing service to ensure cost recovery. [38] Incoming roaming SMS are not charged at neither retail nor wholesale level, which means that the costs generated are reallocated to roaming SMS outgoing (origination of roaming-SMS). This approach towards roaming SMS considered in the cost model is consistent with the previous approach taken in the TERA Consultants cost model.[39]

As shown in Figure 29, the cost model estimates unit costs for roaming SMS between 0.05 and 0.4 €cents/SMS in 2017, i.e. a factor 8 between the lowest and highest costs. A couple of countries display some downwards convergence, but not to the extent seen for roaming voice and data. By 2025, the costs are estimated between 0.05 and 0.3 €cents/SMS, indicating a six-fold difference between high- and low- cost countries.[40]

[38] Regulation (EU) No 531/2012, recital 63.
[39] See p. 49 in COM(2016) 398 Staff working document accompanying the "review of the wholesale roaming market.
[40] Top-three high cost countries for SMS: Estonia, Latvia and Malta.

Proposed caps resulting from the cost model

From the results derived from the Axon model, a proposed cap for each relevant roaming wholesale service is needed for the impact assessment. For this purpose, the Commission takes into account the applicable caps in 2022, costs derived from the Axon cost model (including transit and termination), interest of ensuring cost recovery and current wholesale prices charged by operators. Option 3 of the impact assessment proposes a reduction of the applicable wholesale caps and this section outlines the proposed caps for that option.

Wholesale roaming data services

Until 1 July 2022, applicable glide path rate defining the maximum wholesale rate for data service stands at 2.5 EUR/GB. The highest estimated cost from the Axon cost model including transit in 2022 is 1.74 EUR/GB and average cost estimated in the model standing at approximately 1 EUR/GB. According to the latest available BEREC benchmark report (25th edition), the average wholesale cost per GB paid in Q1 2020 is 1.53 EUR/GB. In 2025, the Axon cost model estimates a highest cost of 1.63 and average cost around 0.9 EUR/GB.

Considering the above observations, the Commission proposes a continuation of the decreasing cap observed since 2017. Specifically, the Commission proposes to set a two-step glide path accommodating both the decreasing costs observed in the cost model whilst gradually reducing the caps to minimize disruptions for the operators. Therefore, from 1 July 2022, the Commission proposes a cap of 2 EUR/GB for data services, decreasing in 1 January 2025 to 1.5 EUR/GB. These values will be the foundation for the sustainability analysis performed in the impact assessment under option 3.

The cap of 2 EUR/GB proposed in 2022 is slightly above the maximum efficient cost of 1.74 EUR/GB estimated for the same year. This cap is proposed to balance the transition to the cost proposed in 2025 of 1.5 EUR/GB and ensure that the operators have sufficient time to negotiate wholesale agreements reflecting the decreasing caps.

To this regard, the Commission acknowledges that the proposed cap of 1.5 EUR/GB for 2025 is slightly below the observed highest estimated costs (including transit of 0.2 EUR/GB) in two Member States, namely Hungary (1.63 EUR/GB) and Belgium (1.58 EUR/GB). Current actual charged wholesale costs (25th BEREC report, Q1 2020) in Hungary and Belgium reveals charges of 1.37 EUR/GB and 1.56 EUR/GB respectively. This indicated to the Commission, that a cap of 1.5 EUR/GB in should also ensure cost recovery in these two Member States, especially taking into account the efficiency gains and accordingly decreasing costs observed in the past. As the cap of 1.5 EUR/GB proposed for 2025 is either above (Hungary) or very close (Belgium) to the actual cost charged in 2020, cost recovery should also be ensured in these Member States.

Further, the Commission has projected the traffic for data, voice and SMS in the two Member States and analysed the total impact of the proposed caps for option 3 (including for voice and SMS as described below), finding that a total cost recovery will be ensured under the full proposal.

Therefore, option 3 propose for data services the following two-step glide path:

- From 1 July 2022: 2 EUR/GB
- From 1 January 2025: 1.5 EUR/GB

Wholesale roaming voice services

In the current roaming regulation, voice services have since 15 June 2017 seen an applicable cap of 0.032 EUR/min. The Axon cost model estimates a decreasing cost from 2022-2025, enhanced when accounting for the outcome of the Delegated act setting Union wide termination[41]. The highest estimated cost decrease from 0.022 EUR/min in 2022 to 0.0184 EUR/min in 2025. In 2022, the average cost estimated for wholesale roaming voice service is 0.0135 EUR/min, decreasing to 0.0096 EUR/min in 2025.

From the 25th BEREC report on roaming, the average wholesale price per minute was 0.0166 in Q1 2020. The Commission is therefore certain, that the costs as estimated from the Axon cost model, including transit and termination, will ensure cost recovery for operators providing roaming wholesale voice services.

The cap for roaming voice services has remained constant since 2017 and in the current proposal the Commission proposes under option 3 a two-step decreasing glide path, based on both the decreasing costs from the Axon model and the decreasing termination rates resulting from the delegated act. As caps will apply from 1 July 2022, the proposed two-step glide path follows the same dates as observed for data caps above. As such, the Commission proposes the steps to follow the cost-decreases seen from the Axon model and accordingly proposed the caps seen below:

- From 1 July 2022: 0.022 EUR/min
- From 1 January 2025: 0.019 EUR/min

Wholesale roaming SMS services

The wholesale cap setting the maximum charge for one SMS while roaming has been constant since the introduction of RLAH, at 0.01 EUR/SMS as of 15 July 2017. The Axon cost model estimates a fairly constant cost for delivering this service in the modelled period of just under 0.003 EUR/SMS from 2022-2025. The average estimated cost for an SMS in the relevant period is 0.0011 EUR/SMS. No additional costs for transit and/or termination is needed when setting the cap for this service. From the BEREC report, an average price of 0.0021 EUR/SMS is presented for Q1 2020. For reference, in 2018 the average price paid for a SMS was 0.0031 EUR/SMS.

The efficient unit cost for an SMS is by the Axon cost model estimated to just under 0.003 EUR/SMS. Taking the current cap of 0.01 EUR/SMS and average prices paid just over 0.0031 EUR/SMS as well as the efficient cost, a two-step reduction of the SMS cap is proposed, to mitigate the transition to the efficient cost.. As such, option 3 involves the below cap for wholesale roaming SMS services:

- From 1 July 2022: 0.004 EUR/SMS
- From 1 January 2025: 0.003 EUR/SMS

[41] Here, maximum Union-wide mobile termination rates are set to follow a glide path starting in 2021 at 0.7 EUR cents/min, decreasing to 0.55 (2022), 0.4 (2023) and 0.2 (2024).

Annex 5: Baseline

BASELINE A. SUSTAINABLE PROVISION OF RLAH

A1. Sustainability of RLAH and cost recovery at wholesale level preserving incentives to invest in visited networks and avoiding distortion of domestic competition in visited markets

Measures in place

The Roaming Regulation provides a number of measures to enable providing of RLAH in a sustainable manner throughout the Union:

At wholesale level, where operators have a wholesale access obligation to ensure provision of roaming services, in order to make wholesale costs sustainable in a "Rome-Like-At-Home" regime, there has been a substantial reduction of wholesale roaming price caps applicable to wholesale agreements between operators, while ensuring that operators providing the wholesale service can recover their costs.

Specifically, Regulation (EU) 2017/920 set price caps at 3.2 €c/min for voice (reduced by 36%), at 1 €c/SMS (reduced by 50%) and at 7.7 €/GB for data (reduced by 85%) It also defined a glide path for further reducing price caps for data, with a last step at 2.5 €/GB in 2022. These wholesale roaming price caps ensured that wholesale costs could be fully recovered by the operator providing the wholesale roaming service.

At retail level, where operators have the obligation to provide roaming services at the same conditions as domestically for periodic travelling, they have the possibility to apply:

(a) a fair use policy to prevent abusive or anomalous use of roaming services at domestic prices (such as permanent roaming); and (b) exceptional and temporary derogations to forestall any risk of domestic price increases.

The Commission Implementing Regulation (EU) 2016/2286 (CIR) stipulates detailed rules a) on the application of fair use policy and b) on the methodology for assessing the sustainability of the abolition of retail roaming surcharges and the application to be submitted by a roaming provider for the purposes of that assessment.

Baseline data

The report on the roaming review of 29 November 2019 concludes that both safeguard rules at retail level (fair use policy and sustainability derogation) have worked adequately. Therefore, the Commission does not intend to amend the rules laid down in the Implementing Regulation (EU) 2016/2286.

According to data collected by BEREC for the International Roaming Benchmark Report, the use of fair use policies has been stable in general, not exceeding 4% of total roaming traffic for voice and 6% for data.

At the same time, the number of sustainability derogations exhibit a broadly declining trend. Furthermore, as the 2019 review report concludes, operators that have obtained sustainability derogation have been using it in general with parsimony. As shown in the 2019 SWD, voice and data traffic subject to derogation in the EU does not exceed in average 3% and 1.5% of total roaming traffic respectively. Furthermore, the only

country, where voice or data traffic subject to derogation exceeds 12% of total roaming traffic is Lithuania.

The following table illustrates the number of derogations granted per member state in the period 31 August 2018 to 31 August 2019[42]

Table 16: Sustainability derogations granted 31 August 2018 to 31 August 2019

Austria	2
Belgium	1
Finland	3
France	2
Italy	4
Lithuania	3
Poland	7
Romania	1
Slovenia	1
Total	24

While wholesale caps have remained stable for both voice and SMS, actual wholesale rates paid have declined moderately for voice but more substantially for SMS. Specifically, the average wholesale rate for voice calls has reduced between Q3 2017 and Q3 2019 by 14% (from 0.022 to 0.0189 €/min). In the same period, the average wholesale price for SMS has reduced by 54% (from 0.52 to 0.24 €/SMS). Similarly to SMS, the average wholesale price for data has reduced between Q3 2017 and Q3 2019 by 56% (from 3.6 €/GB to 1.59 €/GB). This reduction has been sharper than the corresponding reduction in wholesale caps (42%, from 7.7 €/GB to 4.5 €/GB). However, between Q1 2019 and Q1 2020, we observe an increase in average wholesale rate for voice (3.5%) and SMS (11%). For data we observe a reduction which is however lower than the reduction in the wholesale caps in the same interval (13% versus 22%).

Two factors mainly determine this decline. Firstly, new (and, for data, annually decreasing) maximum wholesale roaming prices laid down in the Roaming Regulation have acted as much lower ceilings on prices, triggering competitive market dynamics between operators offering wholesale roaming access below those ceilings. Secondly, the introduction of RLAH has resulted in significant increases in roaming volumes, thereby fuelling further competition in wholesale roaming prices.

The 2019 review report concludes that, while there is some evidence of economic space between the wholesale price caps currently programmed until 2022 and the level of costs of all operators, the case for further reductions in order for the RLAH regime to function better while maintaining domestic competitive dynamics needs to be further analysed. To reach this conclusion, the review has taken into account the findings of the external

[42] 7th BEREC Report on Transparency and Comparability of International Roaming Tariffs, BoR(19)235.

study, commissioned for the needs of the roaming review[43], and the BEREC Supplementary cost analysis[44], published on 20 September 2019.

Problem evidence

Challenges faced by MVNOs and some MNOs have been presented in the 2019 SWD (section 7.4.) While wholesale prices have been decreasing and are on average well below the wholesale caps (see 2019 SWD, figures 42 and 43) a substantial number of operators paid rates that were close to or even equal to the wholesale caps (see 2019 SWD, figures 49 and 50).

According to data collected in the International Roaming BEREC Benchmark Report, three out four operators charged in Q1 2019, up to 60% of the wholesale cap for data traffic and up to 72% of the wholesale cap for voice traffic. However more than 40% of MVNOs and 10% of MNOs paid rates for data traffic that were close to or even equal to the wholesale caps. Similarly, for voice traffic more than 65% of MVNOs and 12% of MNOs paid rates for data traffic that were close to or even equal to the wholesale caps.

The level of wholesale rates is not the only challenge, faced by MVNOs. In the joint Commission/BEREC online survey report additional challenges, including difficulties to get wholesale access from their domestic host MNO. Several MVNOs report that they have to pay wholesale charges, in addition to the regulated wholesale roaming charges, or that they do not get discounts on the wholesale roaming price caps. These factors may also explain the higher wholesale rates paid by MVNOs. On the other hand, data collected in the framework of the BEREC international roaming benchmarking questionnaires, indicate that MVNOs have managed to maintain their competitive position (see 2019 SWD, section 5.7).

According to the public consultation, almost half of the respondents (46%) express the view that retail roaming services are not sustainable with the current wholesale roaming caps. In contrast, only 1 out of 5 respondents express the opposite view, that retail roaming services are sustainable with the current wholesale roaming caps, while 1 out of 3 respondents either do not answer or express a neutral view. Furthermore, more than 2 out of 3 respondents consider too high wholesale caps as a significant challenge to the sustainability or retail roaming services.

Nevertheless, according to the joint Commission-BEREC online survey of 2018, less than 20% of MVNOs that responded to the survey had requested a sustainability derogation. While some MVNOs express concerns that imposing a derogation surcharge could have a negative impact in their competitiveness, data collected in the International Roaming BEREC Benchmark Report do not confirm this concern. From the (few) operators that have made isolated use of the sustainability derogation and provided data for the Benchmark Report, no one has reported losing domestic market share.

The sustainability analysis presented in full in Annex 4A, indicates that there would be sustainability challenges for some operators, if actual caps were maintained and roaming volumes would continue to increase. According to it, in 2023, 27% of operators will have a negative roaming margin that exceeds 3% of their domestic profit margin, which would

[43] Study SMART 2017/0091 'Assessment of the cost of providing mobile telecom services in the EU/EEA' by AXON, July 2019, available here

[44] BEREC Supplementary analysis on wholesale roaming costs, BoR(19)168, 20 September 2019, available here.

make them eligible for sustainability derogation, according to the Commission Implementing Regulation 2016/2286.

BASELINE B. ENSURE A GENUINE RLAH FROM AN END USER PERSPECTIVE

B1. Perceived quality of service and transparency

Measures in place

The Roaming Regulation does not include any explicit obligation on the QoS, neither in terms of transparency nor level of QoS. QoS is an integral part of the price-regulated roaming service. The Roaming Regulation already implicitly requires that the end-user has access to the same service abroad in the EU/EEA for the same price, as long as such services can be delivered on the visited network.

The Roaming Regulation Article 6e (4) includes an obligation on the roaming provider to ensure that a contract which includes any type of regulated retail roaming service specifies the main characteristics of that regulated retail roaming service provided. This information shall also be published.

In addition to the general transparency requirements (Article 102 and 103), the EECC (Article 104) requires that operators publish comprehensive, comparable, reliable, user-friendly and up-to-date information for end-users on the quality of their services, to the extent that they control at least some elements of the network either directly or by virtue of a service level agreement to that effect, and on measures taken to ensure equivalence in access for end-users with disabilities. This information on QoS should be included in the contract. The EECC (Annex VIII) requires that operators provide information on, any minimum levels of QoS, as part of the main characteristics of each service, provided to the extent that those are offered and, for services other than internet access services, the specific quality parameters assured. QoS parameters which should be included in the contract are specified in the EECC (Annex X); three parameters for internet access services (latency, jitter, packet loss) and three for publicly available interpersonal communication services (supply time for initial connection, failure probability and call signalling delays). On the level of QoS, the EECC does not specify a minimum QoS level for electronic communications services.

The Implementing Regulation requires that the end-user has access to retail roaming services, subject to a fair use policy, in the EU/EEA for the same price and under the same conditions as at home.

Access to networks for the provision of roaming services is ensured by the current rules in place. The Regulation does not explicitly require that an operator needs to ensure the same QoS or access to the same network generation while roaming as domestically. The Roaming Regulation Article 3(3) requires that wholesale roaming access shall cover access to all network elements and associated facilities, relevant services, software and information systems necessary for the provision of regulated roaming services to customers. Pursuant to Article 16(5) of the Roaming Regulation end-to-end connectivity and interoperability of roaming services has to be ensured, in accordance with Article 5 of the Access Directive (Article 61 EECC). Home operators rely on infrastructure provided by visited operators for delivery of their services. National regulatory authorities should have the power to secure, where commercial negotiation fails, adequate access and interconnection and interoperability of services in the interest of end-users.

The measures in place ensure access at wholesale level for operators to provide retail roaming services. The Roaming Regulation does not ensure that the roaming end-users have access to retail roaming services with QoS equivalent to the domestic QoS.

Baseline Data

The November 2019 Review Report concluded that there was no particular evidence that roaming users get lower data speed than local users, due to a stable and relatively low number of complaints regarding QoS. In the accompanying SWD it is also indicated that these conclusions were linked to a certain inconclusiveness and incompleteness of information related to the findings of when operators would apply limitations to 3G access. In its Report on Transparency and Comparability of International Roaming Tariffs (December 2019) BEREC asked the operators whether they offer 3G roaming when 4G roaming is available. 46% of the respondents gave a positive answer. However, BEREC acknowledges in this report that the question did not specify that operators replying positively offer 3G across all roaming networks and all Member States. Therefore, it is not clear, if those operators responding yes, apply 3G instead of 4G nor if the restriction is applied to all countries and networks or only in few instances. According to the BEREC Opinion, almost all operators surveyed (98% of MNOs and 94% of MVNOs) report that they do not themselves limit QoS or data speeds of roaming services to 3G besides exceptional circumstances (brief limitation of data roaming speeds in order to provide a consistent level of service, lack of 4G roaming implementation for one MVNO, dependence on the speed from the selected MNO in the host country).

The results of the joint Commission-BEREC online survey 2020 show that since 1st January 2019 8 out of 28 NRAs have received consumer complaints about the quality of the roaming services provided by their operators when travelling abroad in the EU/EEA. Only two NRAs received more than 10 complaints. 3 of these NRA's reported that the most frequent issue in these complaints was about the speed (no 4G available or lower data speeds). The other five NRA's reported most frequent issues which are not directly linkable to lack of 4G or lower data speeds but do involve complaints about access to data services during roaming. The results from the year before shows that the number of consumer complaints regarding roaming has not increased in most Member States following the introduction of RLAH. End-users' dissatisfaction with the QoS while roaming ranks low among the consumer complaints received by NRAs. Only 3 NRAs found it necessary to undertake some investigations on the speed of data roaming services. None of them concluded on a specific problem in that regard. The above are to a large degree confirmed in the BEREC Report on Transparency and Comparability of International Roaming Tariffs (December 2019). According to it, fewer than half of the responding NRAs (14 out of 30) reported that they received complaints regarding QoS between July 2018 and August 2019 and only one of them received more than 10 complaints (30).

The joint BEREC-Commission Online Survey 2020 shows that the vast majority of operators (97%) claim that they do no limit the QoS/data speed of roaming services to 3G for their customers, while roaming in the EU. From the around 150 operators that have provided data on the number of complaints per category 18% have received complaints on only max 3G available and 22% have received complaints on no full 4G speeds possible. Lack of coverage seems to be most common complaint.

According to the public consultation results 18 out of 24 MNOs agree that the current Roaming Regulation is sufficient to ensure that roaming consumers are given access to newest network generations (e.g. 4G, 5G) while roaming when 4G or 5G is/will be

available. 7 out of 9 MVNO/Es agree as well. Among the other business stakeholders, including SMEs/entrepreneurs/vertical industries/IoT & M2M and industry associations 4 out of 5 disagree.

Out of all respondent groups (143 respondents) to the public consultation, 55% agree or strongly agree that the Roaming Regulation ensures that roaming customers are offered the same services, under the same conditions (including QoS), as domestically while roaming in the EU/EEA. 28% of the respondents disagree or strongly disagree. Among the respondents, MNOs are more inclined to agree (11 out of 25 agree and 2 out of 25 strongly agree), while 5 disagree. MVNOs are more inclined to disagree or strongly disagree (4 out of 9). 5 respondents representing the vertical industries all disagree or strongly disagree that the Roaming Regulation ensures that roaming customers are offered the same services, under the same conditions when roaming. Both stakeholders who agree and stakeholder who disagree are inclined to raise the same argument, in particular that the QoS is dependent on the visited network and as such it cannot always be guaranteed that the same QoS level as at home is offered.

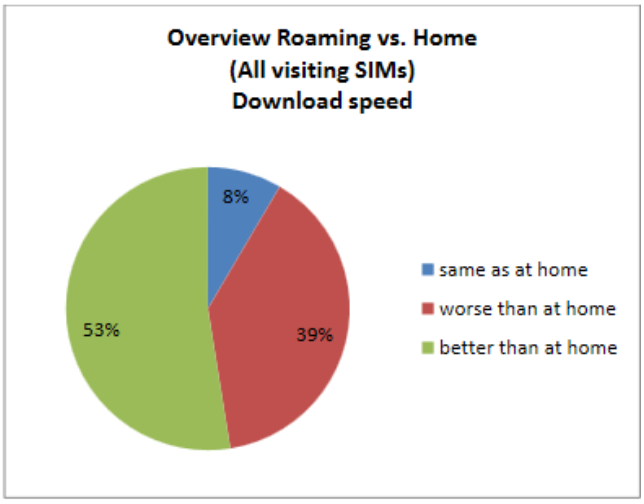
The public consultation also confirms that 31% of the stakeholders consider that the wholesale roaming access obligation in the current Roaming Regulation is not sufficient to ensure that M(V)NOs are given access to newest network generations (e.g. 4G, 5G) for wholesale roaming. 46% consider it sufficient to ensure that M(V)NOs are given access to 4G and 5G for wholesale roaming. Several MVNO/Es note that they have experienced long delays in being granted access to 4G networks. They fear that bottlenecks on 5G roaming could emerge.

Although available data shows that operators do not deliberately lower the QoS of roaming services, there is evidence of limitations to wholesale access. There is also evidence that end-user experience variations in QoS delivered compared to the QoS at home and compared to other roaming customers on the same visited network (see problem evidence section).

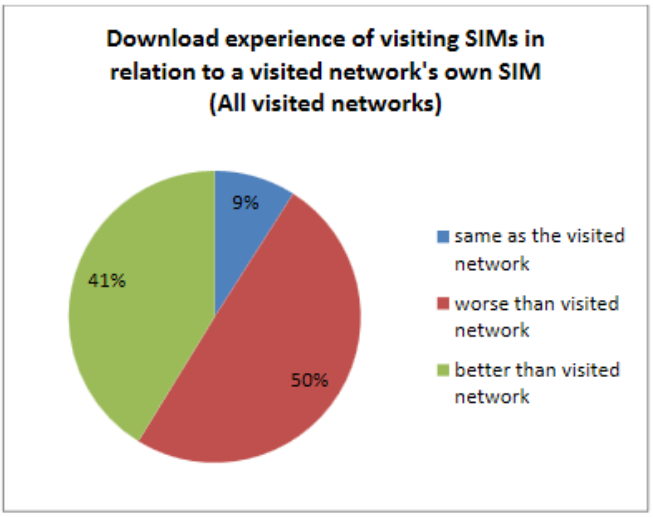
Problem evidence

The BEREC Opinion on the roaming market notes a lack of transparency of a number of operators as regards the data speed provided to their customers while they roam abroad. According to it, 23 NRAs have reported that some operators provide no information about QoS on their websites, while some do have roaming QoS information available. JRC has conducted a field study to assess the technical performance and user experience of EU roaming in a sub-set of EU MSs during the first two years of the RLAH rules taking effect (between October 2017 and October 2019).[45] The results of the JRC study indicate that there are some instances where roaming customers have lower QoS than at home [see Figure on overview roaming vs. home]. Compared to the QoS that roaming customers had on their home network, the results showed that 53% of the customers had better experience while roaming, while 39% had worse experience while roaming.

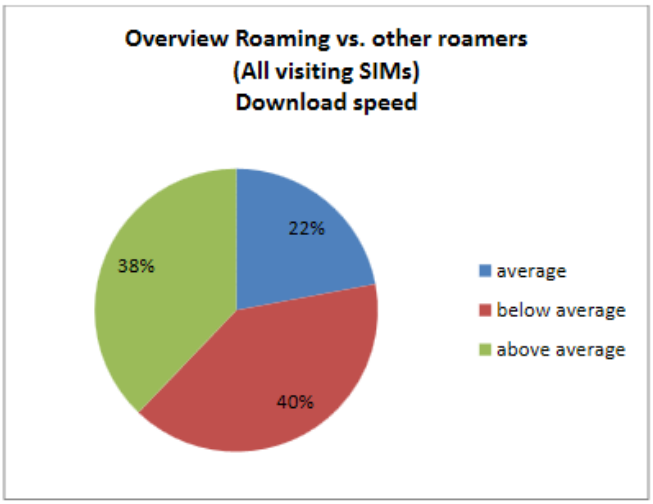
[45] JRC quality of service study, 2018/0011.



Comparing the QoS of the visiting SIM cards to the visited operator's own customers [see Figure on download experience of visiting SIMs in relation to a visited network's own SIM] results showed that (for download traffic) 50% of the roaming customers had lower QoS than the customers of the visited network while 41% of the roaming customers had better QoS than the visited network's own customers.

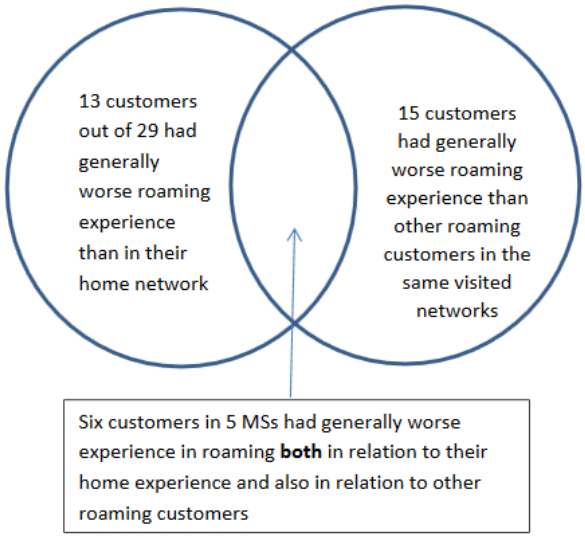


The results also show that in comparison to other roaming customers 38% had better QoS on the visited network, while 40% had worse than other roaming customers on the same visited network [see Figure on overview roaming vs. other roamers].

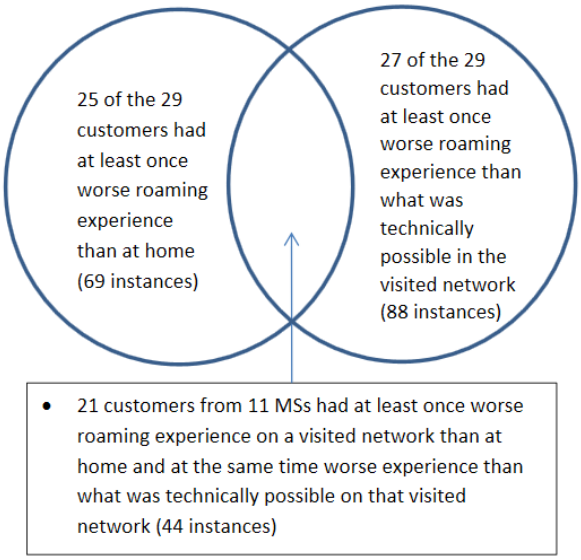


Overall, the results show that the QoS delivered varies. This could be partly explained by factors such as the available capacity in the visited network, e.g. if the home network has better capacity and thus can offer better QoS than the visited network can.

Analysis of these results shows that at least in 13 cases the roaming customers had generally lower QoS than at home and in 15 cases frequently lower QoS compared to other roaming customers on the visited network. 6 of these roaming customers had worse experience in both respects. This indicates that in these 6 cases out of 29 (in 5 out of 13 different Member States), the offered QoS was limited, even when better QoS was in practice offered to other roaming customer.



Furthermore, 21 customers often had worse roaming experience than at home and worse experience than what was technically possible on at least one of the networks that they visited.



B2. Transparency on higher prices for value added services

Measures in place

The Roaming Regulation does not include any other specific measure on value added services (VAS) either at retail or wholesale level. 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. There is no consistent approach on VAS in EU. Member States treat VAS differently in terms of definition, numbering, services offered and prices.

Baseline data

As highlighted in the BEREC Opinion of June 2019, there seems to be a lack of transparency both at retail and wholesale level concerning VAS. In the 2019 joint Commission-BEREC online survey, several operators 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. According to the BEREC Opinion, 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. Some operators reported having taken measures to tackle this situation, including negotiation of wholesale agreements, obtaining information about numbering ranges of other EEA countries, and blocking access to value-added communications/services to their customers while roaming.

The joint BEREC-Commission Survey shows that 15% (40% of MVNOs but only 6.7% of MNOs) of the operators that took measures against issues with the use of VAS, negotiated wholesale agreements, to address such problems. 52.5% of operators (60% of MNOs and 30% of MVNOs) obtained information about number ranges in other EU countries. The remaining 32.5% (33.3% for MNOs and 30% for MVNOs) opted for other measures. Therefore, MVNOs tried to address the situation mainly by renegotiating wholesale agreements and MNOs mainly by obtaining information on number ranges.

The joint BEREC-Commission Survey reveals that one out of four responding operators (but more than one out of three MNOs) report having received complaints from their clients about communications related to VAS while roaming in the EEA. The majority of

these complaints concern bill-shocks and lack of transparency on the cost of VAS while roaming.

Problem evidence

On retail level, there is insufficient transparency on the higher charges applied to calls to numbers of VAS, numbers and the resulting bill-shocks due to calls to such VAS while roaming. This might erode customers' confidence in roaming and may reinforce phone restriction abroad. The Eurobarometer 2018 showed that in 2018, 12% of consumers decided to switch off their mobile phone while abroad.

The joint Commission-BEREC online survey 2020 shows that 26.5% of the responding operators report having received complaints from their clients about communications related to VAS while roaming in the EEA. 20% of the operators (30% of MNOs and 12.4% of MVNOs) report that they have incurred extra costs resulting from unexpected wholesale charges for communications related to VAS by their customers while roaming in the EU/EEA. When explaining the situation, operators refer, among other things, to the lack of transparency in wholesale agreements and that calls to VAS are often excluded from the wholesale agreements.

In its additional input to the Commission, BEREC notes that according to the responding NRAs, most of the complaints are related to Premium Rate Services (PRS) and national freephone numbers. Especially national freephone numbers are also mentioned as the most frequent source for complaints by the operators. Although the lack of transparency seems to result in very few customer complaints, BEREC is of the view that regulatory certainty concerning VAS in roaming scenarios must be improved. The Roaming Regulation does not include any explicit provisions neither at the wholesale nor the retail level with regard to VAS. Currently, customer complaints are solved mainly on a case-by-case basis by operators where charges sometimes are waived.

B3. Access to emergency services

Measures in place

Access to emergency services free of charge by calling 112

Access to emergency services through calls to the single European emergency number '112' is mandated in the EU telecom legal framework since 2002 in Article 26 of the Universal Service Directive (USD). Since 2009, Member States are obliged to ensure that mobile and fixed operators make caller location information available free of charge to the authority handling the call. Equivalent access to emergency services for end-users with disabilities is mandated since 2009 in the Citizens Right Directive, amending article 26 of the USD accordingly. The EECC seeks to give access to emergency services through emergency communications through a single, cost-free number. It is thus indispensable to ensure that roaming customers enjoy the same level of service while roaming, when it comes to emergency communications as when at home. This also applies to the provision of caller location information for all roaming customers.

In its input to the Commission, BEREC notes that, although at the retail level the call to emergency services must be free-of-charge, at the wholesale level costs could occur. Neither the Roaming Regulation nor the USD or EECC includes provisions about wholesale charging for accessing emergency services by calling '112'.

Baseline data

The joint Commission-BEREC online survey 2020 results show that, all MNOs and 85.7% of MVNOs ensure that access to emergency services through emergency calls to 112 by their customers, when they roam in another EU/EEA member state, is free of charge. 85.7% of operators (95.3% of MNOs and 78.1% of MVNOs) report that they ensure through all roaming wholesale agreements, access to emergency services in the visited country. 89.3% of MNOs ensure access to emergency services also for pre-paid users without credit (such data are not available for MVNOs). However, 10% of MNOs do not ensure through wholesale agreements access to emergency services through calls to 112 to pre-paid users without credit.

Alternative means of access to emergency services

Measures in place

Under Article 26 USD (Art. 109 EECC) end-users with disabilities should enjoy access to emergency services, equivalent with all other end-users who may place a voice call to 112. Member States are under the obligation to implement an equivalent means of access with the calls to 112 that would benefit end-users with disabilities. The current regulatory framework of the EECC does not require harmonisation with regards the means of access to be deployed. Consequently, Member States deploy various means of access including SMS and a range of national emergency applications. The location of the user of the alternative means of access should be provided by virtue of the equivalence obligation.

The yearly COCOM reports highlight that a great variety of means of access are deployed in Member States (SMS to 112 and long numbers, emergency applications, web services). As a consequence, end-users with disabilities are not aware and sometimes they do not have access to emergency services in roaming.

The legislative framework does not restrict the availability of access to emergency services to national users, but it is applicable to all end-users, including roaming end-users.

Baseline data

The 2020 COCOM questionnaire[46] results indicate no Member State has the jurisdiction or monitoring capability to ensure that the use of the means of access deployed in their jurisdiction is not charged by the home operator.

Home operators tend to charge at retail level alternative means of access to emergency services also because of the undifferentiated treatment at wholesale level of the various types of traffic (IP data, SMS). In a national context originating networks bear the cost of domestic emergency communications traffic at retail and/or wholesale level that is placed from national SIM-cards, which amount to 99% of the total emergency communications traffic. Meanwhile, for 1% of the emergency communications traffic, that is initiated by roaming end-users, wholesale tariffs may be charged by the originating networks that are the visited operator in the roaming context.

Problem evidence

The COCOM report[47] (COCOM20-05) and the report of the Commission to the European Parliament and the Council[48] confirms the lack of free of charge access to

[46] These responses provided in September 2020 feed into the report to the European Parliament and the Council that has to be submitted by the Commission pursuant Article 109(4) of the Electronic Communications Code

emergency services for roaming end-users with regard the implementation of emergency communications for end-users with disabilities with a cross-border element in the EU.

The results of the joint Commission-BEREC Online Survey 2020 show that disabled end-users are charged for the means of access employed by the home operators: 56% of operators in case of SMS and 68% of operators in case of emergency applications. The responses of the host MNOs confirm that an important share of roaming customers living with disabilities are precluded to have access to emergency services through the means of access deployed in the visited member states. In case of SMS only 62%, in case of emergency applications only 58% and in case of other mean only 58% of MNOs would ensure access to emergency services.

Free of charge provision of caller location for the end-user

Measures in place

Under the Roaming Regulation, a visited operator can charge regulated wholesale fees for emergency communications from roaming SIM cards. In a national context originating networks bear the cost of domestic emergency communications traffic at retail and/or wholesale level that is placed from national SIM-cards, which amount to 99% of the total emergency communications traffic. Home operators tend to charge alternative means of access to emergency services and for transmission of caller location information because of the undifferentiated treatment at wholesale level of the various types of traffic (IP data, SMS).

Baseline data

Data reported by Member States indicates that caller location information is not provided consistently for all roaming end-users placing an emergency call. In particular, the very accurate handset based location solution (Advanced Mobile Location) that is being successfully deployed in the EU since 2016, is not available for roaming end-users in the majority of Member States, according to the latest replies to the COCOM questionnaire (COCOM20-19REV). In addition, such caller location is not provided free of charge as for the national end-users of the visited network.

According to the latest replies to the COCOM questionnaire[49], while Advanced Mobile Location is deployed in 19 Member States, all Member States indicate that they cannot ensure that the end-user is not charged by the home operator for the transmission of the handset-derived caller location information. This can be explained by the limits in jurisdiction and lack of monitoring capacity.

Member States cannot always ensure that handset-derived caller location is available to roaming end-users. Even when caller location information is available, it is not in the remit of Member States' authorities to monitor or enforce that its transmission is provided for free. The current implementations indicate that Member States authorities do not have the competence, capacity and jurisdiction to ensure free access through

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47 https://ec.europa.eu/digital-single-market/en/news/2019-report-implementation-european-emergency-number-112

48 The report to be submitted to the European Parliament and the Council by 21 December 2020 (Article 109(4) EECC)

49 These responses provided in September 2020 feed into the report to the European Parliament and the Council that has to be submitted by the Commission pursuant Article 109(4) of the Electronic Communications Code

alternative means to emergency services and free of charge provision for caller location information. Some national authorities indicate that a very cumbersome negotiation process would be needed by the NRA with all the EU operators to inform what are the technical and regulatory settings in their Member States of the alternative means of access and the specific handset-derived caller location architecture. For example, the handset-derived caller location of the end-users would be sent to a long number SMS to the PSAP servers. The home network that does not know what long number is applicable for emergency communications caller location would charge the SMS at retail level. In the worst case, as a consequence, an end-user that does not have any credit left on its prepaid card would not be located accurately. However, as a general rule, roaming end-users would be charged for handset-derived caller location transmission, contrary to Art 26 USD and Art 109 EECC.

Problem Evidence

The results of the Joint BEREC-Commission survey shows that failure to share information and failure to ensure the adequate division of responsibilities in the wholesale agreement is reflected in disabled end-users being charged for the means of access employed by the home operators: 56% of operators in case of SMS and 68% of operators in case of emergency applications.

As for the provision of caller location free of charge, the results of the joint BEREC-Commission online survey 2020 show that more than half of the MNO/MVNOs do not ensure free of charge caller location for their customers roaming in another EU country. While network-based location does not incur a wholesale or retail charge, handset-derived location transmitted by the MNOs might incur both wholesale and retail charges. The current regulatory framework seems to not be fully implemented in roaming conditions and there is a risk that this is the case for the even more ambitious EECC provisions.

The joint survey shows that the provision of caller location is not ensured in the majority of wholesale agreements, neither for network-based location (58%), nor for handset-derived location (74%). The majority of operators do charge at retail level the provision of handset-derived location through both SMS (55%) and data channel (57%). In turn, host MNOs indicate that only 84% of them ensure the provision of network-based caller location to customers roaming in their network. In case of handset-derived AML localisation, this is available only in half of the cases when AML is deployed through SMS transmission and even less when AML is deployed through data transmission (36.4%).

Only 21% of MNOs ensure through the wholesale agreement that AML caller location is provided through data SMS or, respectively, 17% of MNOs ensure it through data connection. In case of MVNOs the rates are higher, 31% and 30% respectively.

Transparency of alternative means of access for end-users with disabilities

Measures in place

While the Roaming Regulation ensures that end-users are informed about the cost-free call to number “112” when entering another Member States, there is no equivalent provision for alternative means of access to emergency communications. Roaming customers with disabilities are not informed about how to contact emergency services when travelling in another Member State. Besides the lack of such an obligation in the Roaming Regulation, the problem is due to the lack of unified European approach to

alternative means of access to emergency services. There is a large variation across the Union[50]. Home operators are often not aware of the various means of access to emergency services in other Member States.

Baseline data

Relevant EU level associations[51] confirm that the lack of awareness on the means of access to emergency services represents a real bottle-neck to the ability to contact emergency services in case of an emergency encountered in the visited country.

The joint BEREC-Commission online survey shows that the majority of NRAs (25 out of 28) are not aware of any mechanisms which ensure that roaming customers with disabilities are informed of the available means for non-voice access to emergency services, when they enter the NRA country. According to the responses provided, 90% of all operators (92% of MNOs and 88.6% of MVNOs) do not inform roaming customers with disabilities on the available means of non-voice access to emergency services in the visited country. This situation puts end-users with disabilities in a more vulnerable situation than other end-users that are informed when entering and EU country that they may call 112 free of charge in case of emergency.

According to the responses provided in the online survey 90% of all operators (92% of MNOs and 88.6% of MVNOs) do not inform roaming customers with disabilities on the available means of non-voice access to emergency services in the visited country. This situation puts end-users with disabilities in a comparatively more vulnerable situation than other end-users that are informed when entering an EU country that they may call 112 free of charge in case of emergency. In view of the variety of alternative (non-voice) means of access deployed in the EU it is all the more important that end-users with disabilities are provided with the relevant information on how to access emergency services in the visited country.

Problem evidence

In the public consultation on the question regarding the awareness on the alternative means of access for end-users with disabilities the majority of answers (76%), including the relevant NGOs (European Disability Forum, European Union for Deaf and European Emergency Number Association) and three public authorities, indicate the total lack of awareness on these means of access. The proposal to introduce an obligation on the home operator to inform disabled end-users on the availability of alternative means of access available in the visited EU Member State (opt in) was considered very relevant by European Disability Forum, European Union for Deaf and European Emergency Number Association.

[50] Real time text, total conversation, SMS, emergency applications, web services, relay services. As defined in Article 2 EECC: (35) 'total conversation service' means a multimedia real time conversation service that provides bidirectional symmetric real time transfer of motion video, real time text and voice between users in two or more locations. Currently real time text is mandated in the Accessibility act for disabled end-user as of 2025.

[51] European Disability Forum, European Union of Deaf.

BASELINE C. QUALITY OF SERVICE, ACCESS TO NETWORKS, FACILITATE INNOVATION, AND AVOID MISUSE FROM THE OPERATOR PERSPECTIVE

C1. QoS of service while roaming, innovation and access to networks

Measures in place

The Roaming Regulation, Article 3(3), requires that wholesale roaming access shall cover access to all network elements and associated facilities, relevant services, software and information systems necessary for the provision of regulated roaming services to customers. It applies also in case such access is sought for the purposes of M2M communications.

Roaming rules explicitly provide for the possibility to negotiate alternative wholesale roaming tariffs which could be applicable also to IoT/M2M. In order to facilitate the development of pan-European M2M services in particular, the EECC provides that Member States shall ensure that NRAs make available numbers that may be used on a permanent basis outside of the Member State (known as "extra-territorial use of numbers")[52].

As described under Baseline A1 (Perceived QoS), access to networks for the provision of roaming services is ensured by the current rules in place. The Roaming Regulation does not explicitly require that an operator needs to ensure the same QoS or access to the same network generation while roaming as domestically.

Baseline data

According to the public consultation, 28% of the respondents disagree that that the current Roaming Regulation is sufficient to ensure that roaming consumers are given access to newest network generations (e.g. 4G, 5G) while roaming when 4G or 5G is/will be available.

55% agree or strongly agree that the Roaming Regulation ensures that roaming customers are offered the same services, under the same conditions (including QoS), as domestically while roaming in the EU/EEA. 28% of the respondents disagree or strongly disagree. Among the respondents, MNOs are more inclined to agree (11 out of 25 agree and 2 out of 25 strongly agree, while 5 disagree). MVNOs are more inclined to disagree or strongly disagree (4 out of 9). 5 out of 5 respondents representing the vertical industries all disagree or strongly disagree. Several MNOs and business associations note that while the Roaming Regulation does not include any specific provision on QoS, this is ensured by the market players on a best effort principle. However, several stakeholder also noted that, in particular QoS is dependent on the visited network and as such it cannot always be guaranteed that the same QoS level as at home is offered.

According to the public consultation 68% of M(V)NOs apply roaming traffic steering techniques in the EU/EEA to one specific network (i.e. routing their own customer traffic while roaming) to one specific visited network. 30% of the M(V)NOs steer traffic from a visited network, to a domestic network. One of the main reasons indicated by M(V)NOs and associations for traffic steering is for increased QoS (22 out of 30 respondents). Several respondents have indicated that steering of roaming traffic is a dynamic way of increasing QoS for the end-user. This practice enables the domestic operator to offer the

[52] Article 93(4) of the EECC.

end-user roaming services on chosen networks based on quality parameters. This practices does not limit the access to other networks for the end-user, e.g. in case of poor coverage or other service limitations at any given time the end-user will automatically be given access to another network. In this regard, dynamic steering techniques allows the domestic operator to manage the best QoS for the domestic customers when roaming.

There is clear indication that QoS may be a parameter for negotiation, in which the level of QoS can be compromised. Respondents also quote that preferred partners are selected based on the best price/QoS combination. In order to maximize both aspects, the traffic is steered based on commercial agreements. Traffic needs to be steered to partners according to the committed volumes to ensure that operators get best possible prices on the wholesale level. One respondent indicates that different operators offer different wholesale rates and steering network to lower cost networks is commercially beneficial depending also on the availability of services and QoS.

In the joint BEREC-Commission online survey the responding MNOs indicated that only 2% of their wholesale agreements that MNOs conclude as a home network are limited to 3G only, while 55% of the agreements that they do not limit any access agreements to 3G only. Wholesale agreements that MNOs conclude as host network which are limited to 3G only represent 3.5%, while 62% of the host wholesale agreements do not include any limitations to 3G access only. For wholesale resale agreements the respective percentages are 3.5% of agreements limited to 3G access only, while 82% of the agreements do not contain any limitations to only 3G access.

The majority of MNOs report not having any 3G only wholesale access agreements (62% when acting as host networks and 53.5% when acting as home networks). On the other hand, for a substantial minority of MNOs more than half of their wholesale agreements are 3G only: 16.3% when acting as host networks and 15.1% when acting as home networks. The outlook changes substantially in resale agreements, as more than 80% of MNOs report that they do not have any 3G only resale roaming agreements and less than 5% report that more than half of their resale roaming agreements are 3G only.

The outlook is less positive, when seen from the MVNO perspective, as 26% responded that only 3G is available either in certain specified countries in the EU (4%) or in certain networks in certain countries in the EU (14%) or in general in the EU (8%). However, the main reason cited by MVNOs for not being granted 4G access is the need for technical developments from their part.

Market data underline the importance of the M2M / IoT market. According to OECD statistics, in June 2019, there were more than 110 million M2M SIM cards in the 22 EU countries that are OECD members (i.e. excluding Bulgaria, Cyprus, Croatia, Malta and Romania), up by almost 20% compared to a year ago. According to WIK Consult estimates[53], the number of M2M SIM cards in the EU will exceed 1.1 billion by the year 2030. IoT Analytics has estimated[54] the global number of IoT connected devices to approach 10 billion in 2020 and to exceed 20 billion in 2025 and forecasted the global IoT market to exceed 1.6 billion US$ by 2025. BEREC points out[55] that all reports

[53] Study "Technological developments and roaming", SMART 2018/12.
[54] See https://iot-analytics.com/state-of-the-iot-update-q1-q2-2018-number-of-iot-devices-now-7b/
[55] BEREC Report on Internet of Things indicators, BoR (19) 25. https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8464-berec-report-on-internet-of-things-indicators

predict an exponential growth of IoT, which could eventually place important demands on the deployment and capabilities of communication infrastructures and services.

At wholesale level, a reference offer may include conditions to prevent permanent roaming or anomalous or abusive use of wholesale roaming access for purposes other than the provision of regulated roaming services to roaming providers' customers while the latter are periodically travelling within the Union. The visited network operator may terminate the wholesale roaming agreement unilaterally on grounds of permanent roaming or anomalous or abusive use of wholesale roaming access. However, the Roaming Regulation allows operators to negotiate roaming agreements that permit permanent roaming or to negotiate innovative wholesale pricing schemes which are not directly linked to volumes actually consumed. The negotiating parties can therefore agree not to apply the regulated volume based maximum wholesale caps. The need for roaming access on permanent basis for the M2M market therefore depends on the goodwill of the visited operator to enter into such an agreement.

The joint Commission-BEREC online survey 2020 shows that 87% of the responding MNOs and 13.3% of the responding MVNOs offer M2M services. However, fewer than half of those MNOs reported attempting to establish permanent roaming agreements for M2M communications. From the operators that seek to establish wholesale agreements (44 in total), some report having encountered difficulties in the process, including late or no response at all, refusal, unreasonable restrictive terms or excessive wholesale rates. From MVNOs, fewer than 5% reported attempting to establish permanent roaming agreements for M2M communications and the majority of them reported encountering problems.

Evidence of the problem

The joint BEREC-Commission Survey 2020 shows that in general, NRAs do not report issues concerning wholesale roaming access. Only 1 out of 28 NRAs has received a request for authorization to terminate a wholesale roaming agreement according to Art 3 (6) and a request for conflict resolution concerning roaming access. The case concerned permanent roaming.

Out of the 105 responding MVNOs, 23 have entered into negotiations to include 4G services. Out of them, 6 claim that they have not faced any difficulties while 7 have faced difficulties, notably lack of availability, delays, expensive or complex process and/ or refusal from the (contacted) MNO.
As for MVNOs BEREC notes in its additional input to the Commission that, the actual bottleneck is because MVNOs do not come to an arrangement as to 4G roaming access with their host or roaming hub. In cases where an MVNO does offer 4G roaming services the service is limited by the arranged access technology of the selected visited networks in the roaming footprint of the host or hub.

The public consultation results confirm that 30% of the respondents, including MNOs, MVNOs and business association, can get wholesale access with some difficulty or not at all because of the difficulties. The main reasons stated for these difficulties among MVNOs are that negotiations are only possible through wholesale resellers, restrictions in particular relating to 4G roaming access and MVNOs experience long delays (several years) in being granted wholesale access to 4G networks, including for wholesale roaming. MNOs cited capacity constraints/availability and that some groups of MNO's with broader EU footprint may choose to exclude competing MNO's from the newest services for competitive reasons for a certain period of time.

The June 2019 BEREC Opinion, the BEREC response to the Commission questions, the study on technological developments and roaming, and the responses to the Inception Impact Assessment, provide evidence of problems, relating to the provision of wholesale roaming services adapted to the needs of M2M communications / IoT / connected devices (including permanent roaming) and the establishment of relevant agreements. There are differing rules in different countries or different approaches by operators to permanent roaming, which could affect the potential to deploy IoT services. It also reports on a potential lack of clarity about whether a roaming application is "M2M" or involves personal interaction. A relevant case concerns connected cars, where different applications may be provided by the same global connectivity provider under the same contract for different purposes in parallel (e.g. telemetry and in-car entertainment).

Many MVNOs and companies providing connected machines answered the public consultation and raised that they faced issues when trying to negotiate wholesale agreements for M2M communications. In particular, they consider that permanent roaming in this case is not a problem but actually a feature of many business models involving machines.

In its opinion on the functioning of the roaming market, BEREC reports on difficulties that some MVNOs express, getting wholesale access to dedicated IoT technologies. BEREC also reports on comments by some MNOs that the current volume-based charging model like in RLAH is not fit for covering network costs like signaling and location updates. BEREC believes that there is a need for more clarity regarding the applicability of the Roaming Regulation for IoT and M2M and supports the feedback suggesting that the regulation should be adapted to better capture this development.

In addition to the above, BEREC reports about the issues that some of the MNOs have experienced with M2M-based permanent roaming from foreign SIM cards in their networks. Several of them have 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 signaling 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.

In its response to Commission questions of June 2020[56], BEREC observes a disparity in operator views on how M2M should be treated under the current regulation and concludes on the need for some clarifications. BEREC observes that the notion of M2M communications is well defined within the Code. However, it considers that taking into account permanent roaming only for M2M services might not be sufficient. In this respect BEREC refers to its conclusion in the Report on the Internet of Things indicators of 2019 that IoT is a wider concept than M2M and that these two terminologies cannot be used interchangeably.

C2. Transparency on value-added services, misuse and fraud

Measures in place

Provisions of the Roaming Regulation aim to address abusive or anomalous use of wholesale roaming access for purposes other than the provision of regulated roaming services to roaming providers' to customers periodically travelling within the Union (see Article 3(6) with possible inclusion in reference offers of specific conditions). Furthermore, a national regulatory authority may require the immediate cessation of a breach of the obligations set out in this Regulation, pursuant to Article 16(6) and to the right of the visited network operator to apply adequate measures in order to combat fraud. Those rules have according to stakeholders not been sufficient to hinder abusive use of roaming services.

The EECC keeps essentially the same provisions as the current regulatory framework in that regard[57]. The applicable EU legal framework does not exclude charges for international and roaming calls to freephone numbers accessed through standard international dialling codes, but provides that the user should be duly informed prior to the call[58].

The Roaming Regulation also does not impose that freephone numbers should be free of charge when called by a roaming SIM card[59]. Therefore, the Roaming Regulation itself does not prevent an operator from charging any price for the freephone service when it is called by a roaming SIM card.

Operators have employed different approaches to remedy such issues. Some have tried to collect information on VAS number ranges but acknowledge that ensuring up-to-date information on VAS number ranges is complex, due to the fragmented numbering landscape and the lack of EU-wide rules on VAS. Others seek solutions by renegotiating their wholesale roaming agreements. In some cases, operators have opted for blocking VAS but this has often resulted in consumer complaints. Few operators have reported such issues to the competent NRAs but without any result.

Baseline data

VAS

According to the joint BEREC-Commission Online Survey 2020 one out of four operators (but more than one out of three MNOs) report having received complaints from their clients about communications related to value-added services while roaming in the EEA. The majority of these complaints concern bill shocks and lack of transparency on the cost of VAS while roaming.

In parallel, one out of five operators (but more than 30% of MNOs) report having incurred extra costs resulting from unexpected wholesale charges for communications

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57 Recital 254 of the Code provides that "Tariffs charged to parties calling from outside the Member State concerned need not be the same as for those parties calling from inside that Member State. Users should be fully informed in advance and in a clear manner of any charges applicable to freephone numbers, such as international call charges for numbers accessible through standard international dialing codes."

58 Recital 46 of Directive 2009/136/EC provides that "users should be fully informed in advance and in a clear manner of any charges applicable to Freephone numbers, such as international call charges for numbers accessible through standard international dialing codes."

59 Recital 43 of that Regulation specifies that it does not apply to the part of the tariff that is charged for the provision of value added services (this part is equal to zero in the case of a freephone number), but only to the tariff for the connection to such services.

related to value-added services by their customers while roaming in the EEA. There are sufficient data to allow sizing the losses that operators face (see section on misuse/fraud).

Misuse/Fraud

The joint BEREC-Commission Online Survey 2020 shows that almost half of the MNOs (but only 16.5% of MVNOs) have reported being 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 Roaming Regulation. International revenue share fraud seems to be a major but not the only case of misuse. According to the data provided in the survey, the financial impact seems to be quite substantial, even though just around 40% of operators that encountered abusive use of SIM cards provided concrete data on revenues lost. Based on the collected data, the median value of lost revenues is €70,000. The first and third quartile values are respectively 10,000 and 350,000 euros. Few operators report losses in excess of €1,000,000 but we consider these values as outliers. The above do not take into account indirect non-financial impacts to operators, including (as reported in the questionnaire) increased resources, loss of business and reputation and increased consumer complaints.

Problem evidence

VAS

According to the joint BEREC-Commission Online Survey 2020 one out of four operators (but more than one out of three MNOs) report having received complaints from their clients about communications related to VAS while roaming in the EEA. The majority of these complaints concern bill shocks and lack of transparency on the cost of VAS while roaming.

In parallel, one out of five operators (but more than 30% of MNOs) report having incurred extra costs resulting from unexpected wholesale charges for communications related to value-added services by their customers while roaming in the EU/EEA.

In terms of timing, the majority of operators (more than 60% of MNOs and more than 75% of MVNOs) consider that VAS related issues are either stable or oscillating. Several relate them with the seasonality of roaming; the higher the roaming traffic the more the number and volume of incidents.

Misuse/Fraud

The joint BEREC-Commission Online Survey 2020 shows that almost half of the MNOs (but only 16.5% of MVNOs) have reported being 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 Roaming Regulation. International revenue share fraud seems to be a major but not the only case of misuse. According to the data provided in the survey, the overall financial impact seems to be quite substantial, even though just around 40% of operators that encountered abusive use of SIM cards provided concrete data on revenues lost. Based on the collected data, the median value of lost revenues is €70,000. The first and third quartile values are respectively €10,000 and €350,000. Few operators report losses in excess of €1,000,000 but we consider these values as outliers. The above do not take into account indirect non-financial impacts to operators, including (as reported in the questionnaire) increased resources, loss of business and reputation and increased consumer complaints.

C3. Horizontal simplification

Measures in place

As regards Monitoring and data collection, According to Article 19 of the Roaming Regulation the Commission shall submit biennial reports to the European Parliament and to the Council, accompanied if appropriate by a legislative proposal to amend the maximum wholesale charges for regulated roaming services. The Commission shall consult BEREC before submitting such a review report. The first such report was published in November 2019.

To fulfil all reporting obligations and its consultation function BEREC is responsible for extensive data collection, pursuant to Article 19 of the Roaming Regulation:

- Collect information annually from national regulatory authorities on transparency and comparability tariffs offered by operators to their customers.

The following data shall be notified to the Commission twice per year:

- Data collection from NRAs on development in retail and wholesale charges for regulated voice, SMS and data roaming services, including wholesale charges applied for balanced and unbalanced roaming traffic.

- Data on the wholesale roaming agreements not subject to the maximum wholesale roaming charges, and contractual measures at wholesale level aiming to prevent permanent roaming or anomalous or abusive use of wholesale roaming access.

Based on the data collected, BEREC shall report regularly on:

- The evolution of pricing and consumption patterns in the Member States both for domestic roaming and roaming services, the so called international benchmarking report.

B5 Baseline data

The joint BEREC-Commission online survey 2020 shows that the effort that NRAs have put in 2019 concerning the implementation of the roaming regulation varies significantly. For general monitoring, the effort ranges from 20 person days or less to more than 300 but the majority of NRAs have spent between 1 and 6 person months, with a median of 30 person days. For formal procedures during 2019, 16 NRAs have not put any effort while only 1 NRA has spent more than 3 person months. The median of non-zero values stands at 26 person days. Finally for examining sustainability derogations during 2019, 17 NRAs have not put any effort while only 3 NRAs have spent more than 2 person months. The median of non-zero values stands at 22 person days.

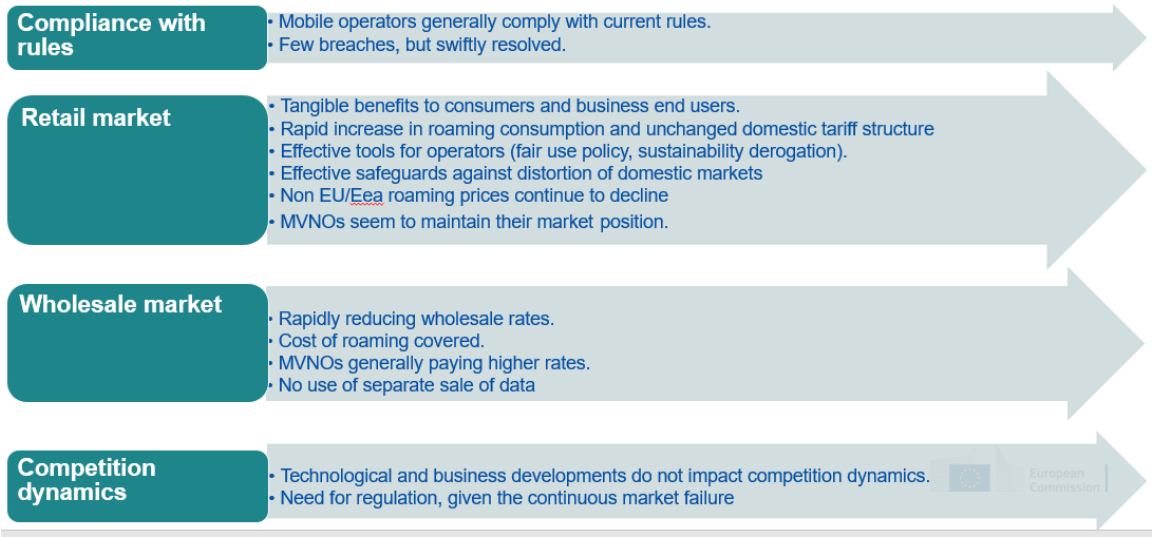
Annex 6: Evaluation - Findings from the Review report on the functioning of the Roaming Markets

Introduction

On 29 November 2019 the Commission has adopted a Review report[60] and the accompanying Staff Working Document[61] (the "SWD") and have made use of a broad range of data to evaluate the effects of the Roaming Regulation on the roaming market.

The Review Report confirmed the overall good functioning of the roaming markets under the new RLAH rules, as summarized in the table below.

Figure 5: Good functioning of roaming market under RLAH rules



The analysis in the Review report and SWD has been developed following a consultation with BEREC, a data collection with NRAs and mobile operators, and inputs from external studies. It takes into account BEREC's Opinion on the functioning of the roaming market published on 19 June 2019 (hereinafter "BEREC Opinion"), as well as BEREC's Supplementary analysis on wholesale roaming costs published on 20 September 2019. In addition to this data, in order to estimate the costs of providing wholesale roaming services in the EU/EEA, the Commission commissioned an external study to AXON Partners[62]. The study resulted in a cost model to estimate the costs of providing wholesale roaming services in the EU Member State and EEA countries.

The Commission has also taken into account a number of BEREC reports, notably the semi-annual international roaming benchmark reports (published in March and October each year) and the annual reports on the transparency and comparability of roaming

[60] Report on the review of the roaming market, COM(2019)616 final, and SWD(2019)416 available here.
[61] Commission Staff Working Document on the findings of the review of the rules on roaming fair use policy and the sustainability derogation laid down in the Commission Implementing Regulation (EU) 2016/2286 of 15 December 2016, SWD(2019) 288 final, available here
[62] SMART 2017/0091, available here

tariffs (published in December each year since 2017)[63]. The Commission also analysed independently the data, collected by BEREC for the needs of the benchmark report.

Market inputs were collected through an online survey (run jointly by the Commission and BEREC) and also taken into duly account. The survey was held twice; in June 2018 and March 2019. It gathered information on the implementation of fair use policy, of the sustainability derogation, as well as other elements assessed in the review, such as QoS or misuse/fraudulent usage of roaming services. The results of the public consultation are presented in Annex 2: Stakeholder Consultation. The Flash Eurobarometer Survey 468, on the end of roaming charges one year later, published in June 2018, gives some indication on its impacts and the consumers views. For the purpose of a forward-looking assessment, the Commission ordered, from WIK Consult, an external study on technological and market developments that might have an impact on the roaming market.[64] The purpose of the study was to assess the impact on the roaming market of technological developments, which are alternatives to regulated retail voice, SMS and data roaming services.

Market input was further collected through the public consultation. One of the main objectives of the public consultation included collecting backward-looking views on the overall benefits and functioning of the Roaming Regulation. The backward-looking aspects of the public consultation complement the conclusions of the roaming Review report published in November 2019. The results of the public consultation are presented in Annex 2: Stakeholder Consultation.

Review report findings supporting proposed measures

The 2019 review report reaches the following conclusions, as regards the areas of intervention analysed in this Impact Assessment:

Table 17: Conclusions of the 2019 review report

Extension of the Roaming Regulation	The review shows that, despite signs of some competition dynamics on both the retail and wholesale roaming markets, the underlying basic competition conditions have not changed, and are not likely to change in the foreseeable future, to such an extent that retail or wholesale regulation of the roaming market could be lifted (see Section 4- Conclusions).
Revision of wholesale caps	BEREC recommended to further lower the wholesale roaming price caps "*in order to increase the competitive strength for MVNOs in the years to come*" and the Commission concluded that this is feasible. While there is some evidence of economic space between the wholesale price caps currently programmed until 2022 and the level of costs of all operators, the case for further reductions in order for the RLAH regime to function better while maintaining domestic competitive dynamics needs to be further analysed (see Section 4- Conclusions).
Fair use policy and	In view of the adequate functioning of the safeguard rules at retail level

[63] All available on BEREC' website – Documents section

sustainability derogation rules	(fair use policy and sustainability derogation), the Commission does not intend at this stage to amend the rules laid down in the Implementing Regulation (EU) 2016/2286 (see Section 4-Conclusions)
Quality of Service	The Commission shares BEREC's view that operators may not deliberately provide lower data speed to their customers while roaming than at home. The Commission considers the QoS as an integral part of the product whose price is regulated. By paying a certain price, the user has access to a given mobile service domestically. The Roaming Regulation requires that the user has access to the same service abroad in the EU/EEA for the same price, as long as such service can be delivered on the visited network. The Commission will consider introducing the relevant clarifications in the Roaming Regulation, as well as transparency obligations on the QoS while roaming. The Commission also supports BEREC's proposal to further monitor the quality of roaming services (see Section 3-Functioning of the roaming market).
Emergency communications	No reference to emergency communications
Calls to Value Added Services	The lack of transparency on the higher charges applied to calls to value-added services numbers has been also reported by some operators as an issue: 23 % of the responding operators referred having incurred extra costs at wholesale level from unexpected termination rates related to value-added roaming communications within the EU/EEA. As specified in the BEREC Retail 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. Numbering ranges for such value-added services cannot always be recognized by an operator in all countries in advance, hence the unexpected additional costs incurred upon reception of wholesale roaming bills. In addition to measures taken individually by operators, BEREC considers in its Opinion the possibility to create and maintain a European database of value-added services' number ranges. Additional transparency measures could also be considered to protect consumers against bill-shocks due to calls to value-added services while roaming, for instance including information in the "Welcome SMS" that calls to such services are subject to specific tariffs linked to the service itself (see 2019 SWD, Section 7-Competition in wholesale roaming markets).
Non-discriminatory trading of wholesale traffic	The Commission takes note of the very recent development of new ways of trading wholesale roaming traffic, such as online trading platforms, mentioned in the study. They have the potential to foster competition on the wholesale roaming market and facilitate the negotiation process between operators. As such platforms are now becoming operational, the Commission encourages operators to start trading part of their capacity via that channel, subject to full compliance with EU law. The Commission will closely monitor the

	related developments in order to determine whether the use of such platforms could justify over time a different approach to wholesale roaming regulation (see Section 3-Functioning of the roaming market).
Roaming in M2M communications	The Commission notes that, while the Roaming Regulation was designed for the benefit of end-users using their mobile device while periodically traveling abroad in the EU/EEA, it does not exclude machine-to-machine communications from its scope. Wholesale roaming access obligations laid down in Article 3 of the Roaming Regulation therefore also apply in case such access is sought for the purposes of machine-to-machine communications. As to permanent roaming, it is not prohibited as such by the Roaming Regulation and can be agreed by two roaming partners in the wholesale roaming contract. According to information available to the Commission, operators often have an interest to host machine-to-machine communications traffic on their networks, including on a permanent basis, in order to benefit from the related wholesale revenues. The relevance of volume-based maximum wholesale charges for low-volume, narrow-band machine-to-machine communications requires further attention. In order to facilitate the development of pan-European machine-to-machine services in particular, the European Electronic Communications Code provides that Member States shall ensure that NRAs make available numbers that may be used on a permanent basis outside of the Member State (known as "extra-territorial use of numbers"). The Commission will consider introducing the relevant clarifications regarding the wholesale access conditions for permanent roaming for the purposes of connectivity for machine-to-machine/Internet of Things where necessary in the Roaming Regulation (see Section 3-Functioning of the roaming market).

Effectiveness

The Review Report confirms the overalls success of the RLAH reform demonstrated by the rapid and massive increase in roaming consumption, a high level of consumer satisfaction, largely unchanged overall domestic tariff structures, MVNOs maintaining their position on the market and continuous decline in average roaming prices in the rest of the world indicating that there are no waterbed effects linked to the introduction of RLAH in EU/EEA countries.

The rapid and massive increase in roaming traffic since June 2017 has shown that the Roaming Regulation has met its objective of unleashing the untapped demand for mobile consumption by travellers in the EU. Specifically, between summer 2016 and summer 2018, retail roaming traffic has increased by 3 times for voice and by 12 times for data. In this sense, the review confirms the success of the reform and the overall good functioning of the roaming market under the new rules.

While the increase in data consumption can be partly attributed to an overall increase in data volumes, data collected for the BEREC benchmark report indicate that the increase

in data consumption while roaming in the EU has been more than three times higher than the increase[65] in domestic data consumption. Similarly, the increase in voice consumption while roaming in the EU has been almost twice as high as the increase in domestic data consumption.

An assessment of the extent to which external factors might have influenced the overall achievements observed has been conducted with the JRC counterfactual analysis presented in Annex 4 and confirms the benefits are largely linked to the RLAH measures.

The review report indicated that there is room for improvement as regards QoS, Value Added Services, and sustainability for MVNOs.

In order to ensure that RLAH is provided in a sustainable manner throughout the Union, the Roaming Regulation has in place three measures:

- Substantial reduction of wholesale roaming caps. The reduction was based on a study[66] commissioned for this purpose and following a consultation with BEREC. The wholesale caps were set above the estimated wholesale costs, to ensure that operators can fully recover their costs. In 2017, the Commission commissioned a second study, to estimate the costs of providing wholesale roaming services.[67] The second study also confirmed the existence of economic space between the wholesale caps and the actual costs of offering wholesale roaming services in the EU/EEA. In fact, operators (especially in inbound countries) have benefited from the increase in demand for wholesale roaming services.
- The Roaming Regulation provides the possibility for operators to apply a fair use policy to prevent abusive or anomalous use of roaming services at domestic prices. Fair use policy aims in particular at ensuring that roaming at domestic price is used only when periodically travelling in the EU/EEA. In addition, in order to allow for the continuous development of the best data offers on domestic markets (e.g. unlimited data), an operator may apply a volume safeguard on roaming data consumed at domestic prices[68]. Beyond that volume, the operator may apply a small roaming surcharge not exceeding the wholesale roaming price cap on data[69] (see in more detail below in this section).
- The Roaming Regulation also provides an exceptional and temporary derogation system for operators to forestall any risk of domestic price increases. In order to obtain such a derogation, an operator must demonstrate that the provision of roaming services without the application of a surcharge would not be sustainable with its current domestic charging model. In that case, the NRA may authorise the operator to apply a small roaming surcharge.

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[65] The term "increase" here refers to the ratio between the total volumes after RLAH (Q4 2017 - Q2 2018) and the total volumes over the last period before RLAH (Q4 2016 - Q2 2017).

[66] Study SMART 2015/006 "Assessment of the cost of providing wholesale roaming services in the EU", TERA Consultants, published in June 2016, available here.

[67] Study SMART 2017/0091 'Assessment of the cost of providing mobile telecom services in the EU/EEA' by AXON, July 2019, available here.

[68] Implementing Regulation (EU) 2016/2286 provides that such a volume limit on roaming data must be equal to or greater than twice the retail price of the mobile bundle divided by the wholesale roaming price cap. This means that the user can consume the double (or more) of the data volume that their operator can buy (with the price paid by the user) at wholesale level to the visited operator, if the latter charges at the level of the cap.

[69] Exceeding a data volume safeguard can only lead to the imposing of roaming surcharges on data roaming retail services (see BEREC Retail Roaming Guidelines, BoR (17) 56, point 70).

The effectiveness of the system described above is confirmed by the findings of the roaming review that RLAH has not affected domestic price structures, as also reported both in the BEREC Opinion on the roaming market and in the Commission study "Mobile Broadband Prices in Europe"[70], which indicates that between 2018 and 2019 there is not trend for increasing domestic prices.

At wholesale level, the regulation has triggered on one side considerable reductions in wholesale prices that have benefited net outbounder operators and, on the other, increased roaming demand that benefited net inbounder operators and ensured recovery of costs for the provision of wholesale roaming.

Relevance

The roaming review report has addressed, among others, the continuing relevance of the roaming regulation, taking into consideration the current and future technological and business developments. For this purpose, the Commission has commissioned a study on technological developments and roaming.[71] The study concludes that, despite signs of some competition dynamics on both the retail and wholesale roaming markets, the underlying basic competition conditions have not changed, and are not likely to change in the foreseeable future to such an extent that retail or wholesale regulation of the roaming market could be lifted. As a result, if the roaming regulation were lifted, then the benefits of RLAH that consumers and business have enjoyed would be lost.

EU added value

In the past national regulatory authorities (NRAs) have already acknowledged that they were unable to autonomously tackle intra-Union roaming due to the cross-border nature of the roaming market[72]. Moreover the Court of Justice recognised that in the past "the high level of retail charges had been regarded as a persistent problem by NRAs, public authorities and consumer protection associations throughout the Community and that attempts to solve the problem using the existing legal framework had not had the effect of lowering charges" [73].

Because of the intrinsic cross-border nature of roaming services, actions at Member State level cannot address the issues linked to roaming in an effective manner

As demonstrated in the roaming review report, the interim review and the public consultation on the review of the Roaming Regulation, the RLAH regime ensured to citizens and enterprises tangible benefits.

The clear benefits of the EU level action were also confirmed by the results of the public consultation (see Annex 2C). The vast majority of respondents (including citizens, consumer organizations, and academic institutions) strongly agree that they can enjoy the benefits that the Roaming Regulation aims to bring. 65% of respondents in all respondent groups replied that the Roaming Regulation has significantly promoted the interests of the citizens and businesses in the EU/EEA.

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[70] "Mobile Broadband Prices in Europe in 2018" available here and "Mobile Broadband Prices in Europe 2019" (to be published), conducted for the European Commission by Empirica/TUV.
[71] Study SMART 2018/0012 "Technological developments and roaming" by WIK Consult, July 2019, available here.
[72] See December 2005 ERG letter to the Directorate general of the Commission's DG Information Society.
[73] Case C-58/08, available here.

Based on the data collected in the International Roaming BEREC Benchmark Report, in Q3 2019 (i.e. July-September 2019), almost 170 million Europeans roamed abroad to another EU/EEA member state and enjoyed the benefits of RLAH. They generated a total of more than 6.4 billion minutes of voice traffic, more than 2.1 billion SMSs and more than 240 million GB of data traffic that were not subject to any kind of roaming surcharge.

It is therefore necessary to continue to ensure that mobile telecommunication customers, both consumers and businesses, continue benefitting from RLAH once the current Roaming Regulation expires, in particular considering that the roaming review report concludes that the competitive landscape remains largely unchanged and it cannot suffice to ensure continuation of the RLAH principle in the absence of regulation.

Coherence

The Roaming Regulation has set as ultimate aim to eliminate the difference between domestic and roaming charges, thus establishing an internal market for mobile communications services (Recital 3). It further observes that high roaming charges constitute an impediment to the Union's efforts to develop into a knowledge-based economy and to the realisation of an internal market of 500 million consumers (Recital 4).

While successive Roaming Regulations since 2007 had brought tangible benefits to consumers in the form of price reductions for voice, SMS and data roaming services, many Europeans continued to avoid, or curtail, usage of their mobile phones and data services when travelling outside of their home Member State in order to avoid incurring mobile roaming charges. The TSM Regulation 2015/2120 has therefore set the aim that reforms in the field of roaming should give end-users the confidence to stay connected when they travel within the Union, and should, over time, become a driver of convergent pricing and other conditions in the Union (recital 1). It also provided that retail roaming charges should be abolished, by addressing the wholesale roaming charges, to achieve the ultimate aim to eliminating the difference between domestic charges and roaming charges (recital 21). This objective was also mentioned in the Digital Single Market strategy[74], which calls for "*the final elimination of roaming surcharges in particular for data*".

As reported in the conclusions of the Roaming Review Report, the RLAH reform met its objective to unleash the demand for mobile consumption among travellers in the EU. It also concluded that at wholesale level, the sharp reduction in price caps together with competitive dynamics below the caps have resulted in much lower wholesale roaming prices since RLAH is in place.

This shows the coherence of the intervention at stake with the wider EU Policy of contributing to the establishment of an internal market for mobile communications services, in line with the objective set in Article 114 of the TFEU, which is the legal basis of the Roaming Regulation. In particular, this Article is the legal basis for measures adopted with the aim of establishing or ensuring the proper functioning of the internal

[74] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee for the Regions: "A Digital Single Market Strategy for Europe", SWD(2015)100 final, 6 May 2015.

market, an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured as foreseen in Art. 26 TFEU.

Efficiency

The roaming Review report also concludes on the sustainability of the roaming regulation, which is achieved by means of three measures. The first measure concerned wholesale prices. Regulation (EU) 2017/920 of the European Parliament and of the Council of 17 May 2017 amending Regulation (EU) No 531/2012 as regards rules for wholesale roaming markets substantially reduced wholesale roaming caps. The reduction allowed home operators to provide RLAH but at the same time it also allowed host operators to recover all costs of providing regulated wholesale roaming services, including joint and common costs. The intention was to preserve incentives to invest in visited networks and to avoid any distortion of domestic competition in the visited markets caused by regulatory arbitrage by operators using wholesale roaming access remedies to compete in domestic visited markets.

The other two measures concerned a fair use policy, which operators could use to prevent abusive or anomalous use of roaming services at domestic prices, and an exceptional and temporary derogation system, which allowed operators to forestall any risk of domestic price increases. The fair use policy and the derogation system have been specified in the Commission Implementing Regulation 2016/2286 of 15 December 2016.

The administrative burden imposed on the Commission, BEREC and the NRAs, to monitor the implementation of the roaming regulation, and the administrative burden imposed on operators to report on the implementation of the roaming regulation are analysed in the BEREC input on EC's request for the preparation of the legislative proposal for the new roaming regulations[75] and should be considered as justified, compared to the benefits for the citizens and the SMEs and for the establishment of an internal mobile market in Europe[76].

Finally it has to be noted that in the above mentioned decision by the Court of Justice in case C-58/08, the Court found that "*in the light of the importance of the objective of consumer protection within the context of Article 95(3) EC* (now Article 114 TFEU)*, intervention that is limited in time in a market that is subject to competition, which makes it possible, in the immediate future, to protect consumers against excessive prices, such as that at issue, even if it might have negative economic consequences for certain operators, is proportionate to the aim pursued*".

[75] BoR (20) 131.
[76] See Annex 4b.

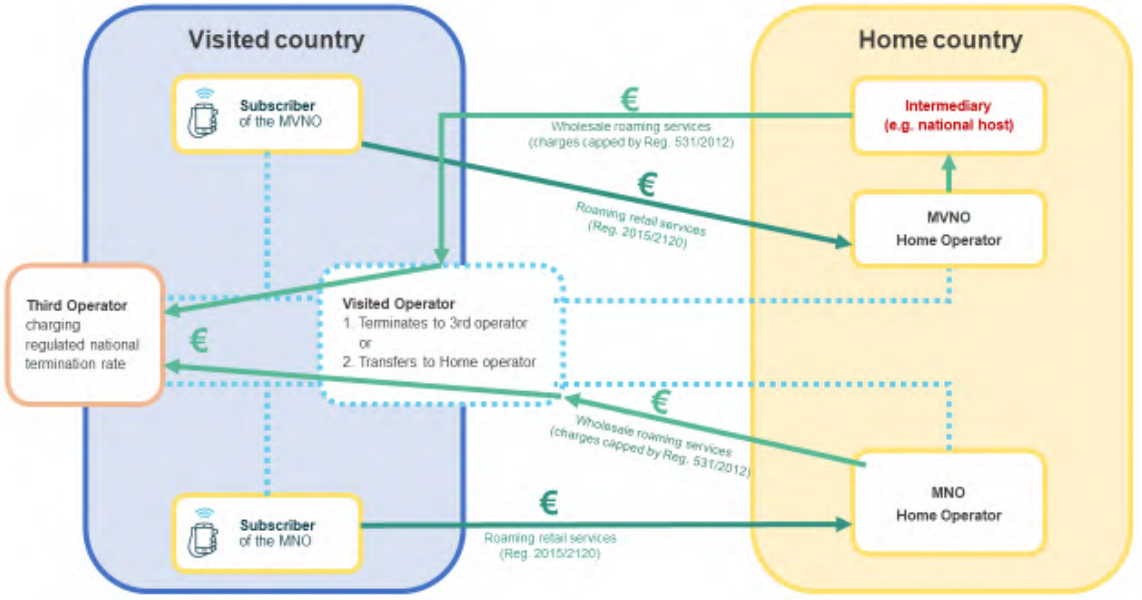
Annex 7: How roaming works

What is roaming?

Roaming, as defined by the Roaming Regulation, is a service that allows a customer (consumer or business) of a public Mobile (Virtual) Network Operator (M(V)NO) in one EU/EEA country (country A) to have access to mobile services (voice, SMS or data) from a Mobile Network Operator (MNO) when travelling in another EU/EEA country (country B).

The Operator A ensures that its customers remain connected to a mobile network of the Operator B when travelling abroad while using the same mobile handset (or possibly laptop or tablet in case of data roaming) and the same phone number. Operator A, that wants to offer roaming services to its customers ("retail roaming services") in country B, has to buy these services from a Mobile Network Operator (MNO) (Operator B) located in the visited country B through commercial wholesale roaming agreements ("wholesale roaming services").

In practice, when a customer of Operator A places a call or uses mobile data while roaming abroad in country B, that service is provided by an Operator B in the visited country B. The roaming customer's home Operator A has to pay the visited Operator B for that service. ("wholesale roaming charges"). The level of wholesale roaming charges is capped by the Roaming Regulation (for data the price caps is decreasing each year, since there is a glide path).



What is "Roam-Like-At-Home"?

Since 15 June 2017, customers can have access to mobile services (voice, SMS or data) at no extra cost when they travel periodically in the EU/EEA. In these cases mobile operators have, as a main rule, not been allowed to levy any charges in addition to the domestic price for the provision of (retail) roaming services. In order to prevent abusive or anomalous use of roaming services - such as permanent roaming - at domestic prices that may have detrimental effects on the domestic markets, mobile operators may apply a fair use policy.

How is "Roam-Like-At-Home" regulated in order to be sustainable over time?

For RLAH to be provided in a sustainable manner throughout the Union, the co-legislators have agreed:

- **At retail level,** where operators have the obligation to provide roaming services at the same conditions as domestically for periodic travelling, they were given the possibility to apply:

  (a) a fair use policy to prevent abusive or anomalous use of roaming services at domestic prices (such as permanent roaming); and (b) exceptional and temporary derogations to forestall any risk of domestic price increases.

- **At wholesale level**, where operators have a wholesale access obligation to ensure provision of roaming services, in order to make wholesale costs sustainable in a "Rome-Like-At-Home" regime, there has been a substantial reduction of wholesale roaming price caps applicable to wholesale agreements between operators, while ensuring that operators providing the wholesale service can recover their costs.

The agreed measures were further detailed:

- At retail level, the Commission Implementing Regulation (EU) 2016/2286 (CIR) laid down detailed rules on a) the application of **fair use policy** and b) 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.
- At wholesale level, Regulation (EU) 2017/920 substantially reduced the price caps with a 36% price reduction on voice (3.2 €c/min), a 50% price reduction for SMS (1 €c/SMS) and an initial 85% price reduction for data (from 50 €/GB to 7.7 €/GB), followed by a glide path with a last step of data price cap at 2.5 €/GB in 2022. These wholesale roaming price caps ensured that wholesale costs could be fully recovered by the operator providing the wholesale roaming service. In the case of data, the price caps were programmed to decline every year until 2022, in order to ensure that market players can benefit from wholesale rates that allow for the provision of roaming services to their customers without levying any charge on top of the domestic price.

Which are inbounder and outbounder operators/ countries?

The impact of RLAH on operators can vary markedly depending on the traffic flows of the given operator's customer base. Based on its traffic flows, an operator can be classified as an **outbounder** or **inbounder** operator.

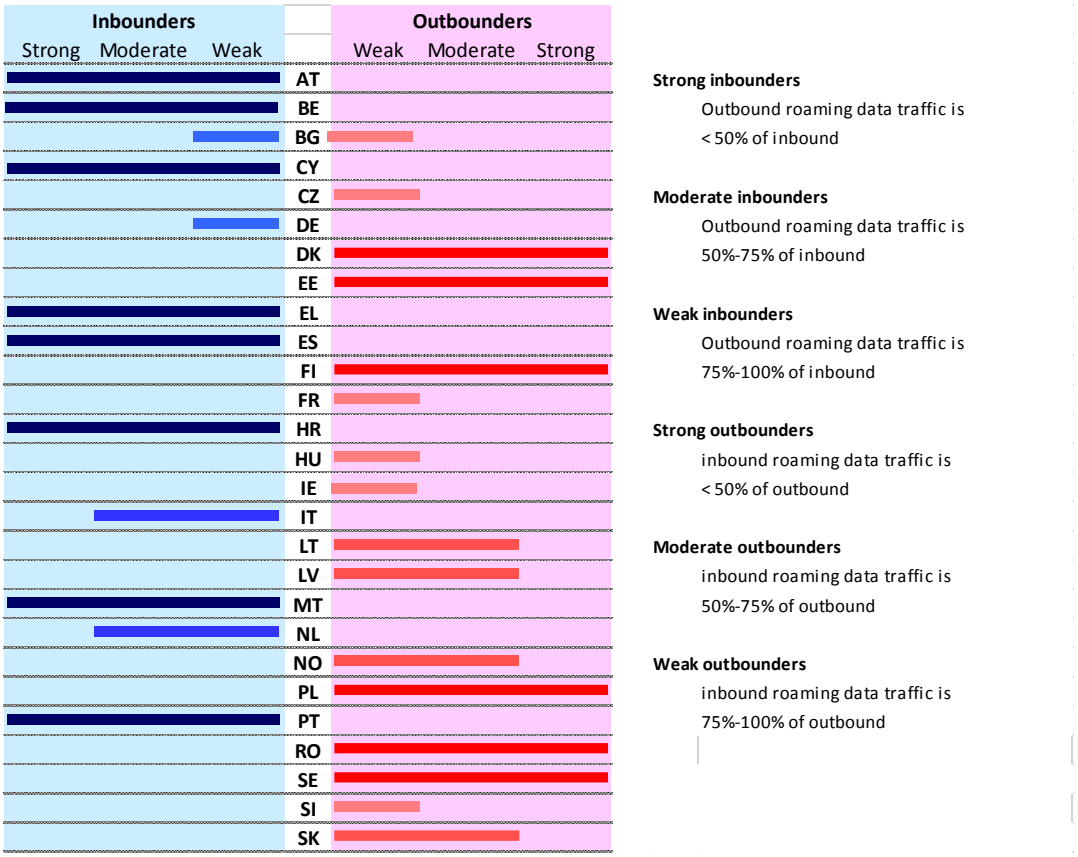
An outbounder operator has a customer base which consumes more mobile services abroad (i.e. on the networks of partner operators in other EU/EEA countries), than those consumed by the partner operators' customer base on its own network (i.e. when acting as a visited network). Conversely, an inbounder operator has a customer base which consumes less

mobile services abroad than those consumed by the partner operators' customer base on its own network.

The traffic consumed by customers of an operator, when they roam abroad, is called outbound roaming traffic. In contrast, the traffic consumed by roamers from other member states while roaming and connected to the network of an operator (i.e. acting as a visited network) is called inbound roaming traffic. Hence, outbounder is an operator that has more outbound than inbound roaming traffic and inbounder is an operator that has more inbound than outbound roaming traffic. By analogy, a country is called outbounder, when the total outbound roaming traffic of operators from this country is higher than the total inbound roaming traffic of operators form this country.

Due to tourist flows, typically, operators in Northern European countries are net outbounder operators of roaming traffic, whereas operators in Southern European countries are typically inbounders of roaming traffic.

Figure 6: Inbounder and Outbounder EEA countries



Annex 8: Technological developments and roaming

Summary of the Study SMART 2018/12: "Technological developments and roaming"

A variety of technological and market developments could affect competition in wholesale and/or retail roaming markets over the medium term (5-10 years). The study "Technological developments and roaming"[77] assesses such developments with a view to understanding whether regulation of data, voice and SMS roaming will continue to be necessary going forwards.

The developments examined in the study can be broadly categorised into:

(a) Developments which enable end-users to bypass data roaming or roaming calls and SMS by using alternative technologies to traditional mobile: Wi-Fi and Wi-Fi aggregation services; Over-The-Top (OTT) services; and Rich Communication Services (RCS).
(b) Technological developments and platforms which could facilitate competition in mobile roaming and cross-border connectivity: Virtual SIM (VSIM); Embedded SIM (eSIM), 5G and 5G network slicing; Voice over LTE (VoLTE); Internet of Things (IoT); Wholesale trading negotiating platforms; and Local data break-out.
(c) New business models and players entering the roaming space: Multi-MVNO agreements and cross-border MVNOs; entry of equipment, content and service providers into the roaming space.

The study analyses such developments, following a modified Greenfield approach[78]. It concludes that OTT voice and messaging services are likely to present the greatest competitive threat to traditional roaming offers for mobile voice and SMS, while eSIM and (especially for IoT) 5G and network slicing are also expected to disrupt roaming markets.

Main developments with the prospect for a substantial impact on roaming:

Wi-Fi has gained popularity across Europe and is likely to remain attractive thanks to its cost, convenience and quality. However, it is unlikely to present a comprehensive substitute for mobile data "roaming" for consumers or mobile IoT because it lacks complete coverage. Moreover, mobile operators may increasingly use the evolving capabilities to integrate seamlessly Wi-Fi technologies within their mobile offer in a 5G environment, thereby encompassing some of its advantages.

Over-The-Top (OTT) services are already replacing mobile calls and SMS for certain purposes, domestically as well as when roaming, in both the business and consumer sector. Conversely, more attractive roaming offers (based on RLAH) may have tempted end-users to switch to mobile voice rather than bypassing the network. There is likely to be residual demand for mobile communications from users without smartphones and for calls requiring any-to-any connectivity. However, OTT could limit the potential for mobile operators to increase voice and messaging prices, if cost-effective data roaming or alternatives are available.

Embedded SIM (eSIM) is an important development that could facilitate competition and switching in mobile connectivity including roaming. Its effects on competition may differ for different market segments, and depend on the way the standard is implemented and influenced by different interest groups including mobile network operators and device

[77] SMART 2018/0012 "Technological developments and roaming" by WIK Consult, July 2019,, available here.
[78] Following the modified Greenfield approach, the study considers the competitive constraints that each technology would introduce, under a hypothetical absence of the RLAH rules.

manufacturers. The most significant prospects of eSIM could be in connectivity for IoT including connected cars, where its use is already established. eSIM could also enable customers to select separate specialist roaming providers on their mobile handset, or facilitate their use of local mobile providers. However, customer take-up of specialist services might be limited, while the use of local mobile providers presents other challenges, including trust (for the end-user), identification and security. It is possible that the threat of such competition could limit the ability of MNOs to raise prices, but eSIM in consumer devices is in its infancy and the impact has yet to be seen. The effects of eSIM on competition in consumer roaming in the long term could be significantly improved if GSMA standards were to be revised so as to remove the current limitation of one profile per eSIM.

5G technologies are likely to change the nature of roaming services. Among others, it could potentially affect the commercial model applied, e.g. basing pricing on bandwidth as opposed to usage. Network slices could also provide options for MNOs and MVNOs to use access agreements as an alternative to traditional roaming. In this way they could enhance their flexibility on service differentiation (latency, security etc), which could prove to be very important for certain vertical use cases. However, as 5G roaming, wholesaling models and vertical use cases have not yet been defined, the impact of 5G on competition in roaming/global connectivity markets is not yet clear. 5G could provide increased potential for new entry and retail competition if MNOs see its capabilities as an opportunity to build a diverse wholesaling model. On the other hand, some multi-national MVNOs have expressed fears, that 5G could potentially present a threat to them, obliging them to renegotiate existing arrangements, which are often tied to specific technology generations.

The development of new models for **wholesale capacity trading** could also affect the roaming market. Their proponents claim two main benefits, which can help boost competition in wholesale roaming, if these new models are widely adopted. Firstly, such models can anonymise trading, which is currently conducted through face-to-face bilateral negotiations. Secondly, they can break the link between outbound and inbound traffic, which penalises operators and MVNOs with lower countervailing power. If such new models were indeed widely adopted and managed to achieve these expectations, they could in the long run abolish the need for regulating wholesale roaming rates. However, their case is still not proved. A key challenge with such models is that they rely on participation by multiple operators in each country, and there is a lack of incentive for larger mobile groups to participate.

Finally, the study notes that the separate sale of data roaming services (**local data breakout**) has not been used by the market. Since 2012, the Roaming Regulation has provided that end-users may not be prevented by operators from accessing regulated data roaming services on a visited network by an alternative roaming provider. This structural measure, known as local data breakout, was meant to foster competition on the roaming market. In its Opinion, BEREC also shows that this solution has not been deployed in practice[79]. Looking forward, based on surveys of the market conducted in 2019 for the purposed of this review, both BEREC and the study note the lack of interest by market players in implementing such solution in the future.

[79] In 2016, the BEREC International Roaming Benchmark Report identified only one operator offering local data breakout services in the EU. It seems however that this operator from Lithuania (Cheap Data Communications) does not exist anymore, at least not in its original form. Since then, according to the information available to the Commission, there has been no further use of the local data breakout solution.

Main actors in cross-border connectivity

The study considers that traditional mobile network operators will likely continue to play the most significant role in the provision of international roaming connectivity in the medium term. However, it expects that new IoT/M2M services and business models alongside entry enablers such as eSIM might increase the scope for new players or types of players to gain a foothold in markets for cross-border data connectivity. According to the study, the main beneficiaries seem likely to be mobile virtual network operators and aggregators. Device manufacturers and verticals are also likely to play an increasingly important role as they look to bundle connectivity or provide interfaces or options for connectivity into their offers.

M2M / IoT related issues

One issue that was raised by MVNO/As interviewed for this study is that differing rules in different countries or different approaches by operators to permanent roaming could affect the potential to deploy IoT services. This issue has also been raised in the joint Commission-BEREC on-line survey.

In this context, it should be noted that permanent roaming is not prohibited under the roaming regulations and is frequently offered on commercial terms for IOT/M2M purposes. However, there is scope in the roaming regulations for MNOs to include conditions in their Reference Offers which are designed to "prevent permanent roaming or anomalous or abusive behaviour".

Preventing effective roaming access for the purposes of ensuring connectivity for connected things could affect the single market by creating problems for the cross-border connectivity of connected things which are by their nature mobile. It could also restrict the potential for an operator to provide pan-European connectivity for connected objects (whether or not mobile) that may be manufactured in one country, but distributed and installed in different locations across the EU.

It could thus be helpful to assess whether there is a need for more explicit rules or guidelines governing access requests for permanent roaming for the purposes of connectivity for M2M/IoT. In the framework of the study, some interviewees noted a potential lack of clarity about whether a roaming application was "M2M" or involved personal interaction. A relevant case concerned connected cars, where different applications may be provided by the same global connectivity provider under the same contract for different purposes in parallel (e.g. telemetry and in-car entertainment).

The study suggests, providing guidance on how M2M should be distinguished from personal communications, which could reduce unintended use of permanent roaming for personal communications and address concerns of IoT connectivity providers, It also suggests assessing what action could reasonably and proportionately be taken by MNOs to enforce conditions they may apply for the use of permanent roaming.

The study concludes that there does not seem to be a case for significant changes to the regulatory rules for international roaming under the current review.[80]

As discussed above, while several of the examined developments are likely to disrupt roaming markets in the future, they do not seem likely to exert sufficient competitive pressure that would already call for immediate changes in the RLAH rules.

In the medium term, the study considers that OTT might be able to provide a sufficient constraint on pricing to enable the withdrawal of retail roaming obligations on voice and

[80] This conclusion is without prejudice to the review of maximum wholesale rates.

SMS. Still, it expects that reliance on managed communications services is likely to continue, at least for some customers and for some types of communication. The prospective competitiveness of the retail market could also warrant the deregulation of wholesale markets. However, in this case additional challenges will need to be considered, including with the migration to IP-based services by means of VoLTE and/or RCS, and with the associated development of new wholesale offers. All the above could be the subject of attention for a future review of the roaming rules.

At the same time, the reliance of OTT on data connections suggests (according to the study) that the need for retail obligations on data roaming will continue. This need could be relaxed, only if there is evidence that competition from alternative roaming provision (e.g. eSIM or local break-out) can effectively constrain retail data roaming prices.

The study also considers that the need for data roaming regulation at the wholesale level will also continue in the medium term not only for personal communications but also for the growing machine-to-machine (M2M) and IoT communications market. At the same time, possible future bottlenecks, regarding the wholesale provision of roaming services with assured QoS (e.g. for the M2M services), could call for additional interventions.

Annex 9: Discarded Options

Discarded option	Objective	Reasons for discarding
Non-prolongation of the Regulation	A	Political feasibility: Purely theoretical option, not effective since objectives wold not be reached. Benefits of RLAH would very likely be lost due to persisting market failure, negative economic impact, lost consumer benefits and bill shocks for consumers that are not restricting roaming consumptions under RLAH and would continue unrestricted usage if not aware of new surcharges allowed without regulation.
Personalised pricing information including cut-off limits	B	Relevance: The Regulation already ensures personalised pricing information and fair use policy. The fair use policy, if applied, is indicated in the automated "Welcome SMS" and in the message sent upon consumption of the fair use policy volumes, subject to Article 14 (2a) and Article 15 (2a) of the Roaming Regulation). Since cut-off limits are an opt-in measure and as such do not apply by default, it is sufficient that end-users are informed upon reaching the cut-off limit when roaming.
Make the cut-off limit on roaming charges an opt-out instead of an opt-in measure.	B	Relevance: Introducing an opt-out would have a more limiting impact on the end-user than the current opt-in. It could have the opposite effect and inadvertently hinder access to roaming services. End-users should be able to make an active choice. End-users who opt-in are more likely to make informed choices.
Additional measures to increase transparency regarding VAS to avoid bill-shock, e.g. through call centre, application, online enquiry service, voice alert.	B2	Relevance (Non effective and non-efficient) and technical feasibility: Costly solutions for a problem of rather small limited scale. Other more feasible transparency measures are included in Option 3, e.g. contractual information and SMS (see Option 3).
Cut-off limit on VAS.	B2	Technical feasibility: Conditional to the implementation of the database proposed in Option 3, as it requires accurate knowledge about the VAS numbers. VAS is quite a broad category covering different types of services and numbers with different tariffs. It is highly unlikely that an operator would be able to collect comprehensive information about different categories of VAS in a host MS. If some numbers are not recognized as numbers to VAS, end-users can incur additional costs beyond the cut-off limit.
Additional NRA powers in case of disputes between MVNOs and MNOs on wholesale prices.	A	Relevance (Non effective and non-efficient): this option is neither effective nor efficient, as it requires MVNOs to ask for a dispute resolution. This will be a cumbersome and costly process. In addition, MVNOs might be reluctant to initiate it.
Alternative wholesale tariffs based on signalling	A	Relevance: It is considerably more complex and less efficient, as it requires developments in the operators' billing systems. Hence, it is discarded as a clearly inferior alternative.

Separate wholesale charging model for M2M/IoT connections.	A&C1	Relevance (ineffective): The Roaming Regulation already foresees alternative pricing models on voluntary basis between operators. Matter of wholesale negotiation.
Price regulation for wholesale roaming M2M communications.	C1	In general not supported by the answers to the public consultation. This option might theoretically lead to better results in exploiting the full potential of the M2M Digital Single Market once in place, as it would introduce an explicit obligation to respond to reasonable requests for roaming agreements in the context of M2M communications (enabling permanent roaming) and regulation of the tariffs used in such roaming agreements. Being an intrusive measure, it could however have negative repercussions to the M2M market and act as a disincentive for innovation. It is complex to implement, and requires establishing an appropriate cost model for M2M communications services. This will also have a negative impact to its effectiveness, as this provision cannot be enacted before a cost model is established while the market is only emerging and is expected to further develop with the take-up of technologies like 5G. The existence of other technologies that also offer M2M communications but are not in scope of the Regulation because they are not ECS (e.g. by some pure narrowband IoT operators) is also a challenge to this intervention. In view of the above, this solution is deemed to have only limited impact in addressing the Digital Single Market and facilitating innovation in the short term and depends on further developments in the M2M market.
Eliminate FUP safeguards and allow permanent roaming	A	Economic feasibility: non-sustainable and might cause disruption on national markets leading to possible arbitrage, waterbed effects with a negative impact also on consumers that do not roam, especially in low cost countries
Harmonising VAS number ranges in all EU/EEA member states	C2	Legal feasibility and coherence with other EU policy objectives: Outside scope of the Roaming regulation. Member States are responsible for setting up their own national numbering plans. The only numbers harmonised at the EU level are 112 and harmonised numbers for harmonised services of social value (116xxx).The regulatory framework (Article 10(4) FD and Article 93(8) EECC) provide for a possibility of harmonisation of specific ranges or numbers in an implementing act.
Registration/identification of subscriber of pre-paid tariff plans	C2	Proportionality: Subject to national legislation.
Barring high-cost destinations/network codes (including VAS) within EU/EEA	C2	Legal feasibility and coherence with other EU policy objectives: Outside scope of the Roaming Regulation. According to the legal framework (Art. 28 USD, Art. 97 EECC), end-users should be able to access and use services using non-geographic numbers in the Union and access all numbers provided in the Union. There are limited exceptions to this general rule and they need to be in line with the indicated provisions.
Obliging operators to publish	C2	Legal feasibility and coherence with other EU policy

wholesale charges for VAS		objectives: Outside scope of the Roaming Regulation.
Extension of Wholesale Caps for VAS	A&C2	Legal feasibility: 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.