PRB | Performance review body of the single european sky

EU-wide target ranges for RP3

Part 1: An overview of target setting for RP3

For stakeholder consultation

Version N°2.0
Date 20th June 2018

Performance Review Body of the Single European Sky | Rond-Point Schuman 6, 4th Floor, Office 411, B-1040 Brussels
Office Telephone: +32 (0)2 234 7824 | regula.dettling-ott@prb.eusinglesky.eu / prb-office@prb.eusinglesky.eu | webgate.ec.europa.eu/eusinglesky

PRB Performance review body of the single european sky

Note from the PRB Chair

The present Performance Review Body (PRB) of the Single European Sky (SES) started working in July 2017, following appointment by the European Commission. Elaborating its first report on ranges for Union-wide performance targets has been a challenge and a great responsibility which the European Commission has conveyed on the PRB. This the first step towards setting the performance targets for the provision of air navigation services in the SES area for the years 2020 to 2024, during which each year more than 10 million flights will be navigated through the European airspace with almost 10 billion passengers on board. Airspace users pay for all the cost of air navigation services. The en-route part of the costs alone amounts to roughly 6 billion EUR per year.

As the PRB, we took a new approach to the target setting and reporting on it, being fully independent with our own support team. The PRB continues to closely work with the colleagues from Eurocontrol and EASA, using their pre-analysed data (as foreseen in the regulatory framework) and benefitting from their vast experience. In addition, we aim at changing the language. Previous reports were highly technical, full of abbreviations and so specific that only a few specialists were reading and understanding them. We believe that the future of the Single European Sky, including its economic regulation, must become a wider debate and that all those participating in this debate should understand the key issues. At the end of the day, target setting is about ensuring the highest level of safety, preserving the environmental sustainability of European aviation, balancing the cost of air navigation services with enough capacity, thereby reducing to a vast extent delays encountered by airspace users and, last but not least, keeping a human centred focus that has helped make air transportation safe.

There are four major points that the PRB considers crucial for the target setting for the years 2020 until 2024, taking into account the learnings from seven years of economic regulation of ANSPs at European level:

- Some ANSPs need to substantially increase their capacity in order to manage growing traffic. Aviation is expected to continue to grow in Europe. If the experience from the past years continue, we will see that most ANSPs will be able to cope with the growth, containing delays at or below the target levels. However, a few (11) air traffic control centres are not providing sufficient capacity causing high levels of delays or will lack capacity in the near future unless they take action, because of insufficient staff and/or adequate technology. These delays are not a local problem - they impair the performance of the entire network.
- ANSPs need to invest in operations/staff and technology. Postponing investments during RP1 and RP2, together with the growing traffic in the past years, has increased delays. ANSPs did not invest as planned and at (an aggregate level) accumulated so-called economic surpluses (surplus generated by en-route activity) which are much higher than planned. In addition, cost per air traffic controller have risen (in some cases substantially), whereas cost for other staff have decreased. ANSPs see this financial performance as a positive result, airspace users criticise that ANSPs have kept extra revenues stemming from increased traffic instead of investing this money in more staff and technology which would enable new operational concepts and sufficient quality of service.
- Economic Regulation for European air traffic management is complex and has provided results which need to be corrected at the level of target setting for RP3 and by amending the regulatory framework. The European Commission has started the revision of the Performance and Charging Regulation. More fundamental change will require a revision of the basic Single European Sky legislation to implement the required new operational concepts, providing ANSP services where they are needed, irrespective of national borders.

The European internal aviation market is a remarkable success, not only allowing European citizens to move freely within Europe at affordable prices. The European aviation sector also provides employment to more than 1.5 million people and overall supports around 5 million jobs. Air Traffic Management needs to do its part to preserve and foment this achievement. The PRB is committed to supporting this endeavour.

Many have contributed to the preparation of this report and I would like to thank them: My fellow PRB members, the PRB support team, the colleagues from DG MOVE, EASA and the PRU team as well as many discussions with representatives from Member States, NSAs and stakeholders.

The PRB hopes that this report initiates a constructive dialogue and we look forward to comments from all stakeholders.

Regula Dettling-Ott

PRB Chair

PRB Performance review body of the single european sky

Table of Contents

1. Purpose of the document

1 The purpose of this document is to give readers an overview of the considerations which the PRB deems important for the target setting for the upcoming Reporting Period (2020–2024). At the same time, the PRB aims to explain its positions in terms as simple as possible, taking into account that in some cases, certain statements could appear as being oversimplified. However, the PRP thinks it is important that not only the specialists familiar with the highly complex mechanics (and language) of the Single European Sky Performance and Charging scheme participate in the debate which conditions should apply in the next years for air traffic management. If this Part 1 foments this aim, it has fulfilled its purpose.

2. Current performance of Air Traffic Management under the Single European Sky

2.1 Overview of current performance

2 In 2017, the Network Manager recorded the day with the highest ever number of movements (30 June with 35,937 flights); and at the same time, the average delay per flight continues to increase. In other words: Air traffic management (ATM) in the Single European Sky member states, is currently – as network - only partially able to cope with the growing traffic demand; in many Member States, delays have reached levels which are far beyond the targeted values[1]

3 Air traffic management is a crucial part of the European aviation value chain delivering mobility for European citizens. For more than a decade, the EU has developed strategies for modernizing air traffic management. The European ATM Master Plan became the main planning tool for ATM modernization, defining the activities of the SESAR Joint Undertaking (SJU) and the SESAR Deployment Manager (SDM). The latest edition of the ATM Master Plan was released in 2015, with another update currently underway – due for release in December 2018.

4 In 2016, the European Court of Auditors conducted an audit of the SES initiative and concluded that the EU intervention was “justified” as “air traffic management was hindered by national monopolies and fragmentation”. However, it found that this obstacle has so far not been overcome, that “no substantive defragmentation” had occurred and that the Functional Airspace Block (FABs) have not delivered as expected: “They essentially provide a forum for cooperation between stakeholders of neighboring States but have proved ineffective in targeting fragmentation, whether at the levels of airspace management, service provision or procurement of technical equipment”[2].

5 The ATM Master Plan and the findings of the Court of Auditors are both essential for the PRB in defining the priorities for the performance of European air traffic management. The network needs to improve and deliver the services in a safe and cost-effective way.

[1] Overall, 10.6 million flights took place in 2017, a 4.4% increase compared to 2016. At the same time, in many parts of Europe, delays have reached highest levels. Airline reported delay (all causes) was 12.31 minutes per flight (+9% compared to 2016), 44% of which being reactionary delay. En-route ATFM delay was at 0.88 min per flight (0.86 min/flt in 2016)

[2] European Court of Auditors, 2017, Single European Sky: a changed culture but not a single sky, page 8

This is a challenge because, in many ways, the structure of the European air traffic management remains the same: EU Member States consider ATM as part of their national infrastructure and state-owned companies provide the services under statutory monopolies. Implementing change is challenging as Air Navigation Service Providers (ANSPs) remain part of the administration or are state-owned companies which can only act within the remits of their mandates. Privatisation of en route ANSPs has been limited (eg NATS is being party privately owned) and two ANSPs being stock listed (ENAIRE and ENAV). This brings more freedom to operate, but also introduces new limitations as the ANSPs naturally aim to optimize the value for their shareholders.

6 At present, en route ATM is not subject to competition, whereas most of the other parties of the aviation value chain are either competing fiercely (airlines, some manufacturers) or are at least partially exposed to competition (airports). In order to compensate for the lack of competition, the European Union introduced economic regulation for ATM in 2010, to support the objective of providing the travelling public with safe, efficient and sufficient services from ANSPs. This report on EU-wide target ranges for the next reference period is a core contribution to the ongoing economic regulation.

2.2 *Safety, operational efficiency and cost*

Safety

7 Safety has priority and none of the targets in other performance areas should impair it.[3] Maturity of Safety Management has improved with more and more ANSPs and NSAs reaching the EU-wide targets. However, it is still lagging behind in some States.

Operational efficiency and cost

8 Providing air traffic management services requires substantial money. The annual costs billed to airspace users by the air navigation service providers in the EU including Switzerland and Norway[4] in 2017 amounted to 6 585 M€$_{2009}$[5], up from 5 947 M€$_{2009}$ in 2013.

9 From the ANSP point of view, keeping the cost flat despite the growing demand and complexity seems an accomplishment. For airlines, keeping costs flat within the airline business model is not an option if they want to remain competitive.

2.3 *The principles of the current performance and charging scheme*

10 The cornerstone of the present SES performance and charging schemes are the following[6]:

- The European Commission and Member States through the performance scheme set binding targets for a defined period of time (Reference Period) in four key performance areas: **safety, environment, capacity and cost-efficiency**. The same

[3] EASA provides regulatory oversight of safety, with the performance scheme monitoring and targeting the Maturity of Safety Management use of reporting methods.
[4] The RP2 area
[5] True cost for users is different from the cost charged during the year due to adjustments foreseen in the Performance Scheme and SES Charging Regulation. In this context true cost for users is a better reflection of the cost efficiency performance from the airspace user's point of view. True cost for users in 2016 amount to 6 256 M€$_{2009}$ or 0.1% more than in the first year of RP2 (6 249 M€$_{2009}$).
[6] European Court of Auditors, 2017, Single European Sky: a changed culture but not a single sky

four areas have additional performance indicators that are monitored but not specifically targeted. The first reference period (RP1 - ie the duration during which the targets are applicable) lasted from 2012 until 2014, the second reference period (RP2) started in 2015 and lasts until 2019. The third reference period (RP3) will start in 2020.

- The **Safety KPA** is currently measured by the effectiveness of safety management and the application of the risk analysis tool (RAT) when reporting specific safety incidents. These are both leading indicators, which measure the a formal and pro-active approach to identifying hazards, analysing risks and taking control measures within the ANSP and the administration of the Member State in order to promote a safer system.
- The **impact on the environment** is measured by horizontal flight efficiency, comparing radar data of the actual trajectory (KEA) and the last filed flight plan (KEP) with the most direct route.
- **Capacity** is measured in average minutes of ATFM delay. The respective target defines how much delay per minute may be generated per flight within European airspace. This delay reflects the impact of a shortfall in capacity.
- With respect to **cost-efficiency**, the performance and charging scheme defines the cost which air navigation service providers can charge to the airlines as en-route and terminal charges. When the actual costs of the ANSPs deviate from the forecasted cost (Determined Unit Cost DUC), the charging regulation has two mechanisms to adjust the cost: the cost-sharing and traffic risk-sharing mechanisms which define how cost and revenue deviations are shared between the ANSPs and the airlines.
- The charging scheme contains further **adjustments** for inflation, and incentives (bonuses and penalties). It also exempts certain cost items from the determined costs; ANSPs can pass on these unforeseen costs to the airlines (eg pension costs).

11 The Court of Auditors concluded that the current performance and charging system is complex and should be streamlined. However, it did not question the fact that economic regulation is necessary to ensure that European ANSPs charge competitive prices for their services. There is no silver bullet to define economic regulation for ANSPs – the vast body of research shows that the different methods of economic regulation of infrastructure providers each has its own shortcomings.

2.4 Outcomes from previous reporting periods

12 **Safety:** During RP2, the maturity of safety management systems, for ANSPs and for NSAs has improved, but a few ANSPs and a number of the States are trailing behind the targets. With focused effort by these few, all ANSPs should be able to reach the targets by 2019. States are faced with multiple issues (such as staffing), which affect their ability to progress sufficiently on improving the maturity. The PRB has initiated activities to further understand the issues facing the States and what support can be provided.

13 **Environment:** Environmental performance, with respect to the KPIs, has improved despite the growing traffic. However, the routes planned by airlines remain considerably longer that the actual routes flown.

14 **Capacity:** Performance during RP2 has led to the EU-wide targets not being met. Delays have increased significantly during the second half of RP2 because capacity has not met the increased demand in a number of key locations in Europe. En route ATFM delay per flight reached 0.94 minutes in 2017, 0.44 minutes per flight above the target value.

15 **Cost efficiency:** During the first two years of RP2, as shown in Figure 1, ANSPs were able to reduce their determined unit cost both due to cost reductions by the ANSPs and the significant increase of traffic. However, the total en-route service provision costs did not decrease and have remained stable since 2009.

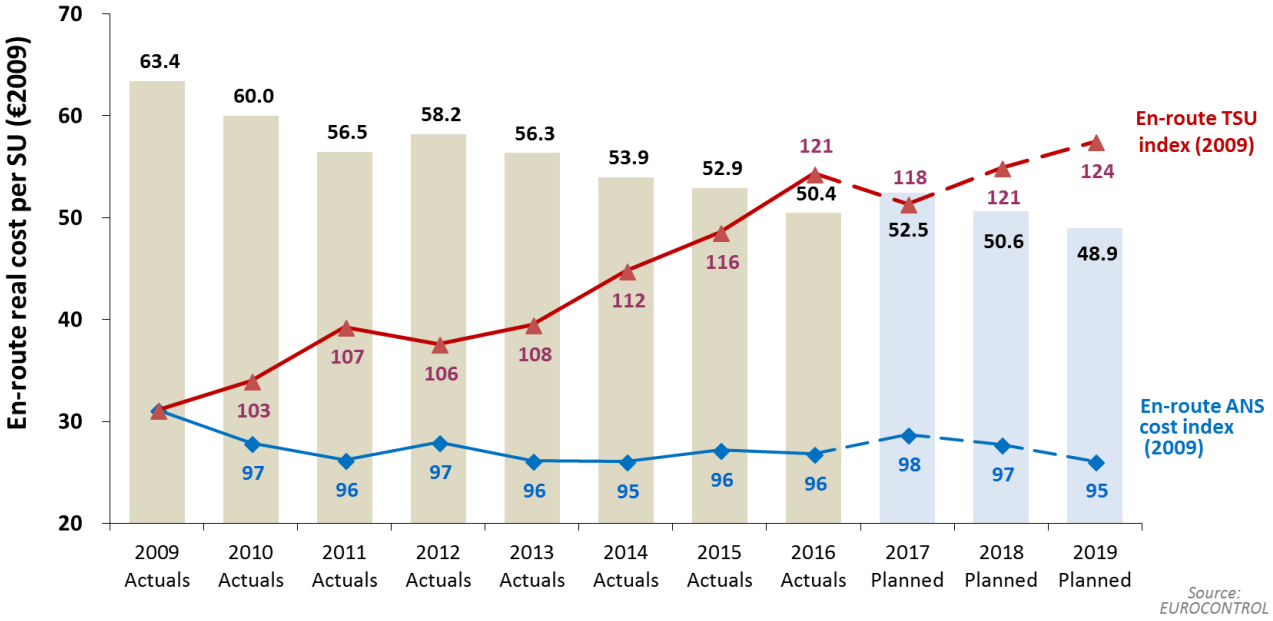


Figure 1: Evolution of traffic, costs and unit cost between 2009 and 2019

16 ANSP revenue continued to rise during RP2, contributing to the accumulation of additional surpluses over the past nine years, as permitted by the current regulatory framework. Despite the accumulated surpluses air navigation service providers were unable to provide the capacity to meet the delay target.

17 Between 2005 and 2015 the composition of cost also evolved. Based on analysis provided by EUROCONTROL, the cost of employment for air traffic controllers increased by 19%, whereas support costs fell. During the same period, air traffic grew by 13%. This means that ANSPs were able to reduce the overall cost per flight hour. Improvement in cost efficiency, however, was limited because increases in air traffic controller productivity (+16.5%) were offset by a 19% increase in the employment costs per controller hour.

18 **Traffic risk-sharing:** Between 2014 and 2018, traffic grew more than forecast by the STATFOR base or low scenarios adopted by Members States in the planning process for RP2. The level of deviation varied between states. In accordance with the current

regulations on performance and charging, ANSPs have to share the additional income received above 2% deviation with airspace users.

19 ANSPs will have to reimburse 76.7 M€$_{2009}$, 181.6 M€$_{2009}$ and 382.8 M€$_{2009}$ consecutively for the years 2015, 2016, and 2017 to the users. This makes a total of approximately 641.1 M€ mostly payable in 2017-2019[7]. If the latest STATFOR baseline (February 2018) projection materialises, ANSPs will have to reimburse 463.8 M€$_{2009}$ and 570.6 M€$_{2009}$ in 2018 and 2019, respectively. A total of 1034.4 M€$_{2009}$ mostly payable in 2020-2021. From the additional revenues, ANSPs kept 68.4 M€$_{2009}$, 140.2 M€$_{2009}$, and 199.1 M€$_{2009}$ respectively for the years 2015 to 2017. If the latest STATFOR baseline forecast materialises, ANSPs will be able to keep 208.7 M€$_{2009}$ and 219.9 M€$_{2009}$ consecutively in the year 2018 and 2019. The aim is for this additional revenue to cover the additional costs to provide the target level of service.

20 RP2 has shown that some ANSPs struggle with this reimbursement mechanism, since the delay to return the funds to airspace users can create difficulties within national processes and rules for retaining cash reserves.

21 **Inflation adjustment:** Inflation, assumed within the performance plan is adjusted to the actual situation two years after the airlines paid the charges. Analysis has shown that these adjustments amounted to relatively small amounts in RP2 to date. (2015 and 2016 are -84.3 M€$_{2009}$ and -155.1 M€$_{2009}$ respectively for en-route activity and -12 M€$_{2009}$ in 2015 and -21.7 M€$_{2009}$ in 2016 for terminal activity).

2.5 *Target setting for upcoming reporting period RP3 starting in 2020*

22 The legal framework requires the European Commission to set binding targets for the future Reporting Period from 2020. The main task of the PRB is to recommend to the European Commission what those targets should be.

23 More than 15 years ago, the policy objectives for the Single European Sky were defined, which were later included in the European ATM Master Plan:

> *"to enhance current air traffic safety standards, to contribute to the sustainable development of the air transport system and to improve the overall performance of air traffic management (ATM) and air navigation services (ANS) for general air traffic in Europe, with a view to meeting the requirements of all airspace users."*

24 Based on these objectives, the European Commission in 2004 set the high-level goals to be met by 2020: Enable a three-fold increase in capacity which will reduce delays both on the ground and in the air, improve safety by a factor of ten, enable a 10 % reduction in the

[7] Re-imburse" means that annual unit rates are adjusted to reduce the costs charged to airspace users by the amount to be 'reimbursed'.

effects flights have on the environment and provide air traffic management services to the airspace users at a cost of at least 50% less.

25 During the next reference period, the performance of the European air traffic management can and should improve towards these High Level Goals. There is no single aspect which will achieve the necessary improvements: each ANSP will have to contribute with various measures. The core region of Europe, in particular, is crucial to the overall performance of the European ATM network, where poor operational performance has a considerable impact on the network.

26 The PRB defined the following five priorities for RP3:

a. **Safety remains the priority;** Together with EASA, the PRB recommends to improve how the performance scheme measures safety and assesses the potential impact from other Key Performance Areas or from major functional or technological changes to be implemented.

b. **Improving environmental performance** is a central aspect of the performance of air traffic management, especially in light of forecasted traffic growth. What the Aviation Strategy of the European Commission stated in 2015 remains valid: The performance of the air traffic management should result in increased operational efficiency by reducing delays, fuel burn and flight time, an increase in capacity and a reduction of CO_2 emissions. The contribution of SESAR projects is an important factor.[8] Translating these principles into the performance scheme will be one of the priorities for the PRB.

c. **Better matching capacity to demand**: The PRB will set the **capacity** targets, with the aim of providing sufficient capacity, even if traffic will continue to grow as expected. Eliminating all ATFM delay is not realistic or economically optimal, but the current state of play with en route ATFM delay nearing one min/flight is not acceptable. The PRB recognises that most Members States are contributing adequately to the EU-wide performance target of 0.5 minutes of en-route ATFM delay by achieving their local/FAB reference values in RP2. Only a few Area Control Centres lack capacity to an extent that they impair the overall result at Union level. They will be key to deliver acceptable delay results in RP3.

d. When setting the **cost-efficiency** targets, the PRB will take into account that ANSPs can improve their financial and operational performance using available technology and organizational improvements (including recruitment) to match capacity to demand. Such improvements may not lower the cost of service provision directly, but improved performance through increasing productivity and organisational efficiency can support the lowering of costs for airspace users.

e. In order to meet the long-term performance goals to handle the increasing traffic, the **implementation of technology** is vital. The SESAR programme drives towards advanced air traffic services and optimized ATM network services. Although under review, a number of Pilot Common Project deadlines fall within RP3. In order to

[8] European Commission, 2015, An Aviation Strategy for Europe, page 6

ensure timely and long-term result-oriented implementation, the RP3 targets must support change driven deployment (e.g. System Wide Information Management SWIM), as well as implementation of technologies which facilitate network improvements.

3. *The basics for defining the performance for RP3*

3.1 *The legal framework will change*

27 In May 2018, the European Commission published a draft proposal for the revision of the current regulations (EU) No 390/2013 and (EU) No 391/2013. The PRB understands that it will take until later in 2018 to adapt and approve the new text. At the time of writing the present report on target ranges, the PRB cannot assess the outcome of the deliberations in the Single Sky Committee. The PRB expects that the revised Regulation will not fundamentally change the present performance and charging scheme, and that it will foremost implement improvements which in the past have proven problematic. Once the text of the revised regulation has become final, the PRB will review and if necessary adapt the ranges for the targets for RP3 it has defined based on the existing legal framework

3.2 *Consultation as an important part of target setting*

28 The PRB will deliver advice to the European Commission on performance scheme targets for RP3 by 30th September 2018. This current report is part of the formal consultation to prepare this advice and informs Member States and industry stakeholders how the PRB develops its recommendations to the Commission.

29 The consultation period on the report will start from its publication until 4th September 2018. The PRB recognises that the summer period is difficult for many stakeholders, and the duration has been extended to allow maximum possible input. Member States and stakeholder can comment through the PRB's comment spreadsheet, distributed with this document. We kindly ask for responses before the end of 4th September 2018.

30 In addition to the written consultation process, the PRB is engaging with stakeholders to understand the local factors and various industry perspectives. Meetings have been held with a broad range of stakeholders and the PRB welcomes further requests for such meetings. The PRB recognises the importance of consultation and will endeavour to accommodate further requests for meetings with stakeholders, wherever possible.

31 After the PRB has delivered its advice to the European Commission by the end of September 2018, the adoption of the EU-wide targets for RP3 will be in the hands of the Commission and the Single Sky Committee through the comitology process.

3.3 *Inputs and sources of data*

32 The PRB has used the most up-to-date data to develop the target ranges. Data sources include agencies such as the European Aviation Safety Agency (EASA), EUROCONTROL, the SESAR Deployment Manager (SDM) and the SESAR Joint Undertaking (SJU) whom each play a key role in European ATM and collect and analyse data relevant to the implementation of the performance scheme.

33 Commission Implementing Decision (EU) 2016/2296 requires the PRB to ensure that its methodology reflects the latest scientific standards. Therefore, the PRB Commissioned an academic study to assess the potential for cost reduction in the provision of air navigation services to complement the existing data and analysis. This analysis has been used to support the development of the target ranges for RP3.

34 The PRB notes that the PRB, SJU and SDM did not previously cooperate sufficiently regarding performance of future technologies. The PRB welcomes the recent cooperation with these organisations and would like to thank them, and all agencies contributing to the work, for their cooperation in preparing this report and look forward to their continued support.

4. *Specific issues which are important for target setting*

4.1 *Forecasted demand for air traffic management services*

35 The economic environment and the demand for air transport are linked. Economic downturns result in reduced demand, whilst economic growth fuels demand for air travel.

36 During the first two years of RP1, traffic demand declined by -3.0% and -1.3% in 2012 and 2013, respectively. European Gross Domestic Product[9] reflected the weak economic environment decreasing by 0.4% in 2012 and increasing marginally in 2013, by 0.3%. Traffic growth returned in 2014, with a 1.9% increase alongside a 1.8% increase in European GDP. This was the planning phase for RP2.

37 Member States remained cautious, although at the time, traffic forecasts projected a period of growth for RP2. A substantial number of Member States opted to plan based on a scenario with low traffic growth (STATFOR Low traffic scenario), even though the then PRB Chair highlighted the potential consequences of such a decision. Today, we know that this measure of caution was overly conservative. Several Member States found it difficult to cope with the consequences of this pessimistic forecast and asked the Commission to revise their targets.

[9] Eurostat, 2017, GDP annual accounts, (based on the Euro 28)

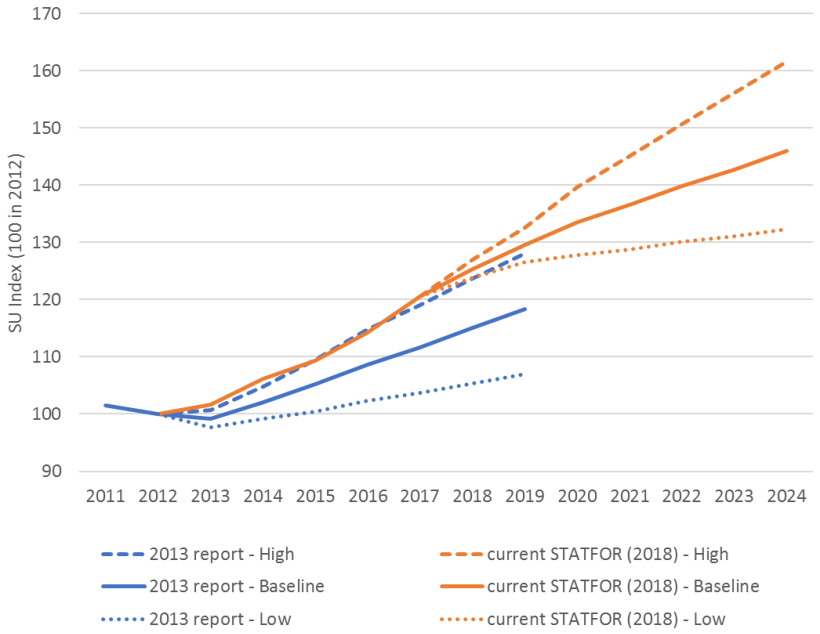


Figure 2: STATFOR forecasts in planning for RP2 and RP3 showing that in the beginning RP2 growth was difficult to anticipate

38 For RP3, traffic forecasts remain positive, but the substantial growth experienced in 2016 and 2017 is anticipated to slow down in the STATFOR 'Baseline' and 'Low' scenarios. IFR movements are forecasted to increase by 15% between 2018 and 2024, and service units (SUs) are forecasted to increase by 21% between the start of 2019 and 2024 in the STATFOR base case. The spread of values between the high forecast and the low forecast in RP3 is higher than that for RP2. Therefore, the forecast chosen by Member States within their performance plans is even more crucial than in RP2 – especially if Member States choose the low forecast, the amounts to be reimbursed under the traffic risk scheme could be substantially higher than during RP2.

4.2 ANSPs benefit from airlines using larger aircraft

39 The calculation of service units used in the traffic forecasts and route charges takes account of the weight of the aircraft. Larger aircraft are charged higher fees, which increases the revenue of ANSPs.

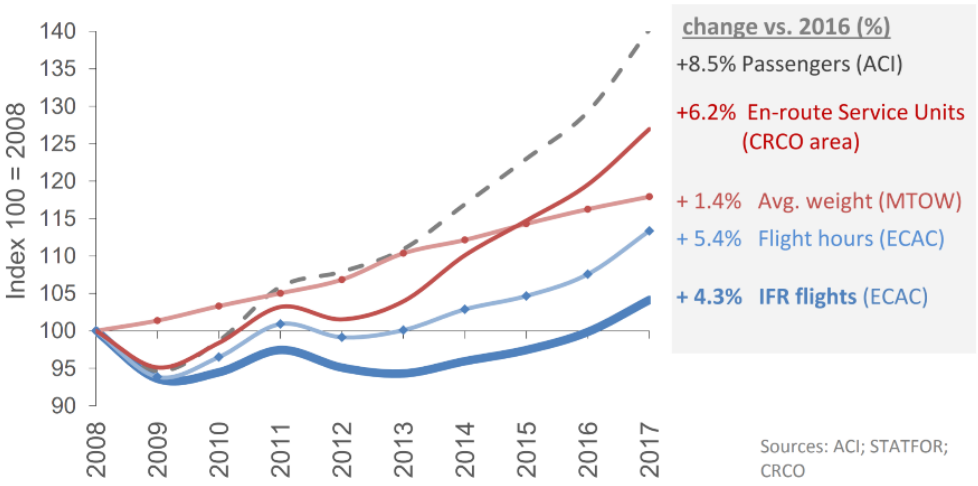


Figure 3: European air traffic indices (2008 – 2017) (source PRR2017)

40 During RP2 en-route Service Units (SUs) have been growing more quickly than the number of flights, as airlines employ larger aircraft to meet the increase in passenger demand, resulting in en-route ANSP revenue growing more quickly than the number of flight hours controlled.

4.3 Geographical Scope/Brexit

41 The PRB currently assumes that the scope of the performance scheme for RP3 is the EU28 and Norway and Switzerland. On 29th March 2019, the United Kingdom is expected to leave the European Union. At the time of writing, it is unclear whether the UK will remain part of the SES and EASA framework under (transitional) arrangements that would last until December 2021 and beyond. The PRB will assess the impact of the withdrawal of the UK on the performance scheme once the terms of withdrawal have been agreed and published.

4.4 New technology

Long term impact

42 The PRB recognises that the key to unlocking the performance gains required to cope with future traffic forecasts lies within technological innovation enabling optimized and new operational concepts as wells as new service models for ANSPs. Many elements are already outlined in the ATM Masterplan, and in the strategies of the Network Manager and SESAR Deployment Manager.

43 The move towards new operational concepts and new service models will require a number of intermediary steps, potentially with poor cost-benefit-analyses for a single ANSP, to pave the way for industry transformation and long-term network performance benefits. These 'transformation' projects are currently not incentivised by the RP2 regulatory framework. The PRB is of the view that timely implementation is necessary and supporting this within the performance scheme is vital. Therefore, the PRB is looking into the available methods within the regulation to do this, where possible for this coming reference period and if not, then periods thereafter.

44 Looking further ahead, to monitor the effects of the implementation of new technologies the PRB will be assessing the viability of various new indicators, eg change management and digitalisation, as part of a transformation KPA (with analysis conducted in co-ordination with willing ANSPs). The impact of technology implementation and resulting new operational concepts as well as service models, calls for strong change management, and therefore must be monitored, with any technological and operational change requiring support and co-ordination of ANSP staff. This calls for strong change management. The PRB will help to develop adequate means during RP3 to enhance and implement such support.

45 The performance and charging schemes must support digitalistion, disruptive technologies and high demand within air traffic management. From this perspective the PRB recommends that the upcoming regulation should enable major changes during the running period of RP3. Otherwise major developments in technology may be blocked by the running time of the performance and charging scheme.

Short term impact

46 By the end of RP3 many of the Pilot Common Project projects generating network benefits should be in operation. These have been estimated by the SESAR Deployment Manager to cumulatively (between 2014 and 2030) generate savings of 229 million minutes of delay, among others. Therefore, the target setting process should consider the expected benefits helping the ANSPs to achieve various targets, from PCP implementation.

47 However, this must be accompanied with caution, since the situation within the European ATM Network has changed significantly from the initial calculations of the benefits to be realised over RP2 and RP3 by the SESAR Joint Undertaking. For example, it was expected that there would be an 8.92% contribution to increased TMA and En-route capacity from PCP implementation in RP2. However, this will not have been realised. Currently, it is difficult to understand the direct performance benefits at this point in time from PCP implementation for individual ANSPs. Noting this, the SESAR Deployment Manager is in the process of re-developing the PCP cost-benefit-analysis to better represent the current position.

48 With this in mind, the PRB is working in close partnership with the SDM in order to understand the performance benefits coming from PCP implementation – and the impacts from the initiation of Common Project 2 and the Pilot Common Project review. The same is true for industry transformation initiatives of SESAR 2020 and of the SJU research projects. It must be noted that, beyond the regulation, it is for the ANSPs to implement the projects in a timely, harmonised manner, supported by the PRB where the targets prove to be a disincentive.

49 The PRB will be monitoring the implementation of these projects through the annual monitoring report – in order to understand the impact on performance. Given the current framework this will require assistance from the SESAR Deployment Manager.

4.5 Role of the military

50 Effective coordination between civil and military provision for air traffic services is crucial to the performance of the European ATM network.

51 Member States should make increasing airspace capacity a priority. This will require cooperation with the military to maximize benefits to network capacity and to minimize the impact of aviation on the environment. In many SES States, airspace sharing between civil and military can be improved particularly in areas affecting network performance. In addition, airlines and ANSPs should capitalize on released airspace; there is little point releasing airspace if it cannot be utilized due to operating constraints. The military need to ensure that airspace not in use is released.

52 The PRB recognizes that while the implementation of technology is crucial to improving performance, developments should not result in unnecessarily higher costs for the military.

4.6 Issues the PRB cannot influence

53 The performance and charging scheme is now in its seventh year. The PRB agrees with the conclusion of the Court of Auditors that the Regulations are too complex. The PRB aims to contribute to solutions. Some of the issues the PRB agrees require change are outside of its influence:

- Timing of the process for developing targets under the current regulatory framework. There is a lack of a harmonised process for linking the differing elements of the performance and charging schemes.
- Member States define the regulatory framework, both in terms of timing of adoption and the content. When and how the PRB needs to adapt the target setting for RP3 will depend on how the Member States decide to revise Regulations (EU) 390/2013 and (EU) 391/2013.The target setting process is subject to political compromises, namely if a Member State has an interest in the financial results of the ANSPs and count on their revenues.
- The final agreement on local targets takes too long (in some cases well into the reference period), which, given the long lead in ANSP implementation, may impact the scheme's effectiveness and credibility.

5. PRB approach to target setting

5.1 Key principles of the approach

54 In addition to the importance of safety, as defined in Section 1.2 and described in Part 2, the PRB will set the targets for RP3 adhering to the following key principles:

- Independence: The PRB relies on technical assessment of available data and evidence to propose targets. The PRB is independent from any economic, corporate or political interests or other potential biases. All PRB members are independent experts, with decisions taken by the PRB as whole. The PRB is also supported by an independent support function with a core team of experts dedicated permanently and exclusively to the support of the PRB.
- Analytical rigour: The robust evidence presented in this document is based on thorough analysis and traffic forecasts. The PRB has commissioned an academic study assessing the level of efficiency of air navigation service providers. This is

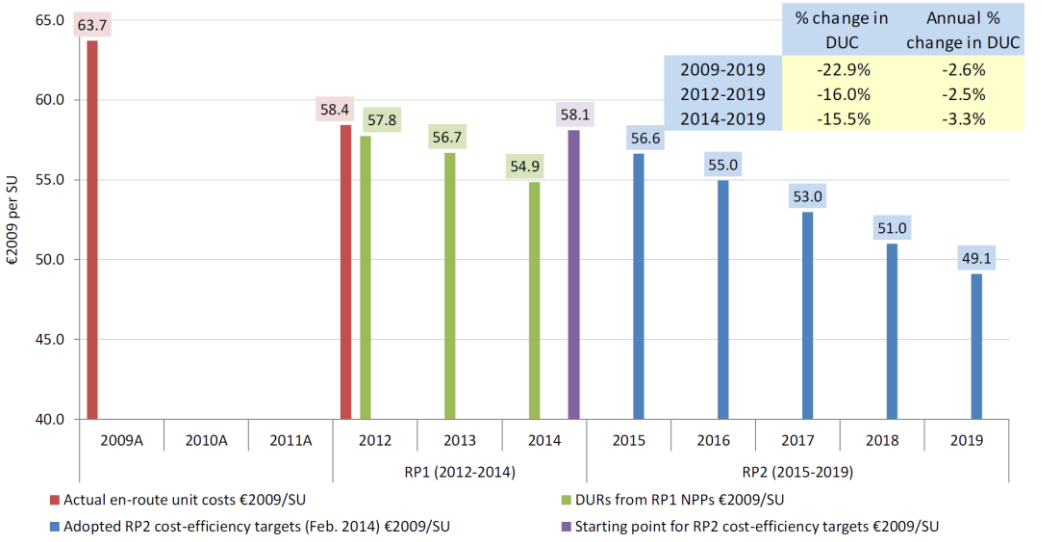
consistent with the European Commission Implementing Decision (EU) 2016/2296 setting up the independent group of experts designated as Performance Review Body of the Single European Sky, which requires the PRB to, "ensure, with the support of the Secretariat, that its methodology reflects the latest scientific standards."

- Consultation and transparency: The PRB is committed to involving stakeholders as much as possible within the target setting process to ensure transparency. The PRB will to take account of, and respond to, all comments received in the consultation process.
- Achievable ambition: The PRB recognises that the stakeholder community will have diverging views on targets for RP3. The PRB is analysing evidence carefully in a balanced approach so that targets are challenging and ambitious, but importantly, achievable and sustainable.
- Balance between KPAs: The PRB recognises the challenges associated with understanding and accounting for the interdependencies between KPAs – in particular safety, as well as the possible trade-offs. The PRB will, subject to further investigation, take account of impacts on social and human performance dimensions, consider inter-relationships and interdependencies between the Capacity, Cost Efficiency and Environment KPAs, where there is evidence to support them.
- Outcome-oriented targets: The targets proposed by the PRB will recommend the outcome of performance in European ANS, but it is the ANSPs, FABs, Industrial Partnerships, States and NM who will decide how to achieve them.

5.2 Defining the starting point for RP3

55 The PRB considers the starting points to be used for RP3 as being crucial, taking into account lessons learnt from RP1 and RP2.

56 At the end of RP2 in 2019, the Determined Unit Costs will be -23% lower compared with 2009, which is a substantial achievement. However, that result could most likely have been better if considered what happened at the beginning of RP2: The starting point for the Determined Unit Cost was not at the level reached at the end of RP1, but was set at a higher value – partially to take into account the revised traffic forecasts. This reset wiped out the cost efficiency gains of RP1. The PRB plans to avoid this situation for RP3.



Source: EUROCONTROL

Figure 4: Planned evolution of Determined Unit Costs since 2009

5.3 Interdependencies

57 Safety must be ensured at all times and takes precedence over the remaining KPAs. Targets are set for the Safety KPA before they are set on the other KPAs. The leading safety indicators within the performance scheme are used to support safe provision of air navigation services. Safety is managed at a local level and measured/monitored by EASA to ensure that the other targets do not impact on the level of safety.

Figure 5: Target setting hierarchy

58 The PRB recognizes that interdependencies remain difficult to quantify and depend greatly on the local circumstances. However, from the levels of performance observed during RP2 to date there remains scope for improvement.

5.4 *Need for performance improvement - level of ambition*

a) Total Economic Cost as an indicator of adequate ambition

59 Another useful indicator for assessing the performance of ANSPs is the Total Economic Cost, i.e. the total cost an air navigation service provider generates. This includes (direct) costs for providing the service and (indirect) costs which airspace users incur from the quality of service provided. Total economic cost considers all areas of performance and their interdependencies including tradeoffs between different KPAs.

60 The Total Economic Cost of air traffic management is a complex measurement. Until a formal definition is agreed, the PRB uses the total cost of airport and en route ATFM delay[10] and ATM/CNS provision to observe the impact of the interdependency between cost and capacity[11].

61 The total cost of service provision and delay in 2016 was only marginally lower than the value in 2009. During the same period, ANSPs kept their costs relatively stable, whereas delay has increased significantly. This resulted in overall costs to airspace users of €9.6 billion in 2016 (approximately €8 billion in charges and €1.6 billion in costs arising from delays).

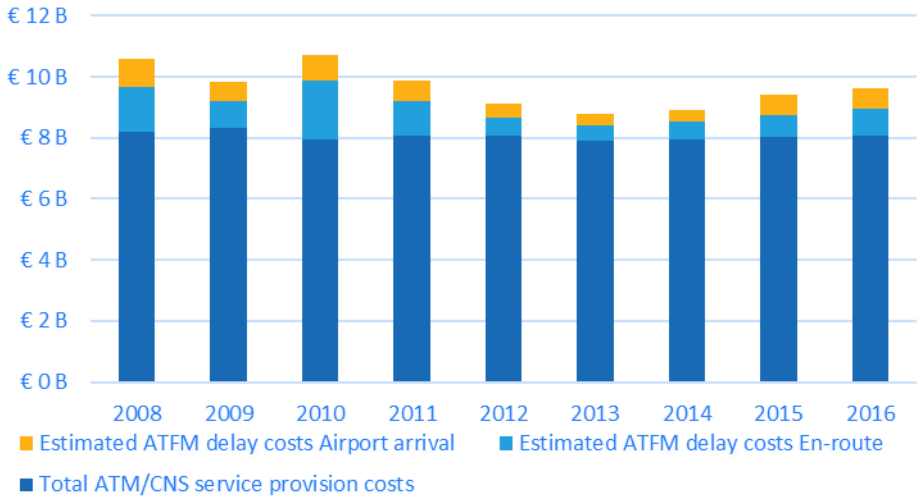


Figure 6: Cost of ATM/CNS service provision costs and ATFM delay costs

62 The PRB recognizes the value of the assessing the total costs to airspace users of charges and delays. The PRB proposes to continue to monitor this metric during the remainder of RP2 and RP3 to observe the balance between the cost and quality of the services provided.

b) Need for improvement to reduce delay

63 During RP2, delays should have been reduced from 0.76 minutes per flight (2015) to 0.5 min per flight. Air navigation service providers missed this goal. In 2016 and 2017, delays

[10] En route ATFM delay targeted within the Capacity KPA of the performance scheme Regulation.
[11] The true total economic cost should include the effects of flights on the environment, however this information is not yet available and therefore this analysis focuses on costs of service provision and the ATFM generated.

increased to 0.91 and 0.94 minutes per flight respectively. Air traffic controller staffing and capacity were the main causes for this increase (see Figure 22 in Part 2)

c) Need for improvement regarding environmental performance

64 During RP2, airlines have increasingly filed flight plans and flown more direct routes, supported by ANSPs and the management of the network. Performance is on track to reach the RP2 target in 2019 for the flown trajectory.

65 Target setting for RP3 will take into account Free Route Airspace (FRA) implementation and expected increases in traffic. Once FRA is operational in all states, there will be little scope for further improvement of efficiency of either last filed flight plan or actual trajectory. Any further major improvements in the environment would have to be achieved through other means, for example through improvements in the introduction of other targeted indicators (for example additional taxi out time, or additional time flown in the terminal area, or through increased implementation of continuous climb and descent operations (CCO/CDO) which are currently only monitored).

d) Surpluses indicate potential for improvement

66 During the preparation for RP2, Member States were told that they would be expected to make substantial efforts to achieve the targets for RP2. The (then) PRB stated that the focus for RP2 should be a reduction of real cost in order to improve cost efficiency and flight efficiency rather than capacity[12].

67 During RP2, ANSPs lowered their cost and their capital spending compared to the planned values. The actual determined unit costs were 4.5% and 6.1% lower in 2015 and 2016, respectively compared to the Performance Plans. This has mainly been achieved because traffic increased and air navigation service providers delayed 25% of investment during RP1. In the first year of RP2 delayed investment increased to 27%.

68 Up to the writing of this report (May 2018), PRU analysis shows that air navigation service providers have aggregated an overall estimated surplus of 1 179.7 M€$_{2009}$ in RP1 (7.6% of the revenues) and 964.4 M€$_{2009}$ in the two first years of RP2 (some 9.0% of revenue). This increase in the “overall economic surplus” of the main ANSPs is an indication that the level of ambition for RP1 and RP2 wasn’t as high as it could be. Whilst the PRB recognises that ANSPs should keep extra revenue if all targets are reached, underspending on investment projects when not reaching quality of service targets is detrimental to the overall objectives of the Single European Sky.

69 For RP3, the level of ambition must make sure air navigation service providers invest the available money towards technology/operational improvements as planned. The accumulation of money planned for investments must be avoided.

5.5 *Initial information from States’ forward-looking submissions*

70 Forward-looking information was received by 25 out of the 30 charging zones in time to be considered for the analysis of target ranges. The PRB recognizes that these forecasts

[12] Performance Review Body, 2013, RP2 EU-Wide Target Ranges for Stakeholder Consultation

are drafts and provide an indication of the plans at a local level for the remainder for RP2 and RP3.

71 The consolidated RP3 forecast data shows that total en route determined costs are expected to increase by 10.2% over the eight-year period while the number of service units is forecast to grow more, i.e. by +25.5%. The resulting en route determined unit cost are expected to, therefore, decrease by -12% between 2016 (last actual data available) and 2024 (last year of a five-year RP3)[13].

6. Target ranges for RP3

6.1 Safety KPA

Basis for proposing target ranges for the Safety KPA

72 The proposed targets in this paper are based on the indicators and metrics currently used in RP2. The Commission has proposed new indicators for use in RP3 that have not yet been adopted. Irrespective of the adoption, the PRB agrees with EASA that the method for measuring Effectiveness of Safety Management (EoSM) needs to better reflect the current best practices (i.e. to use a new metric). The PRB also considers that if the EoSM for NSAs is retained for RP3, the method should also evolve in parallel with the EoSM for ANSPs. The target setting on EoSM applies however the same methodology as used for RP2. Should the draft regulatory proposal for RP3 be adopted or a new metric implemented, an updated proposal for targets that shall apply during RP3 shall be drafted as the targets must be consistent with the metric.

73 The current performance of the two Union-level KPIs, EoSM and RAT Severity using 2015 to 2017 performance data shows: [14]

- It is likely that all ANSPs will achieve the RP2 target for the Effectiveness of Safety Management (EoSM). The current trend shows improvements in all areas that contribute to the KPI.
- NSAs still need important improvements in order to achieve the Effectiveness of Safety Management RP2 target. The number of states to achieve minimum score is currently low.
- The application of the Risk Analysis Tool shall also improve in order to reach the RP2 targets.

Proposed Target Ranges for the Safety KPA

74 The PRB considers the areas of Safety Culture and Safety Risk Management as important areas to focus on to ensure that safety management pro-actively can address changes expected during RP3. The targets for RP3 in these two areas should be increased for these

[13] i.e. from 50.44€$_{2009}$ in 2016 to 44.28€$_{2009}$ in 2024 which corresponds to a change of -1.6% per year on average over the 8-year period.
[14] Data used for 2017 is still preliminary data.

two reaching maturity level D (manage processes and measure performance) and E (continuous improvement of processes and process performance) respectively.

75 The PRB recommends retaining RP2 targets for EoSM for NSAs. The PRB recognizes their difficulties to progress towards RP2 targets, due to a combination of factors, including limited resources within the majority of Members States.

76 For the application of the RAT, the PRB considers the current targets should be maintained for RP3.

77 For the application of the RAT, the PRB will apply the three categories used in RP2[15], which should be retained for RP3 noting that the ATM Specific Occurrences will provide the basis to measure the potential consequences on safety of the changes to be introduced in e.g. technology. PRB considers the current targets should be maintained for RP3 for the two remaining categories (Overall Separation Minima Infringements and Runway Incursions).

78 EoSM: Effectiveness of Safety Management of ANSPs

	ANSP		State	
EOSM Component (MOs)	**Expected maturity value at end of RP2 (2019)**	**EU-target (2024)**	**Expected maturity value at end of RP2 (2019)**	**EU-target (2024)**
Safety policy and Objectives	D	D	C	C
Safety Risk Management	D	**E**	C	C
Safety Assurance	D	D	C	C
Safety Promotion	D	D	C	C
Safety Culture	C	**D**	C	C

Table 1: Proposed targets for EoSM for RP3 (E represents the highest level of performance)

Application of the RAT			
Categories		**Expected value at end of RP2 (2019)**	**Proposed EU-target (2024)**
Separation Minima Infringements	**Ground**	100%	100%
	Overall	80%	80%
Runway Incursion	**Ground**	100%	100%
	Overall	80%	80%
ATM Specific Occurrences	**Overall**	100%	100%

Table 2: Proposed targets for RAT application for RP3

[15] Ground Separation Minima Infringements, Ground Runway Incursions and Overall ATM Specific Occurrences

6.2 Environment KPA

Basis for proposing target ranges for the Environment KPA

79 The current performance of horizontal en route flight efficiency considers the two key performance indicators named in the performance regulation: the actual trajectory and the last filed flight plan compared to the great circle distance. [16]

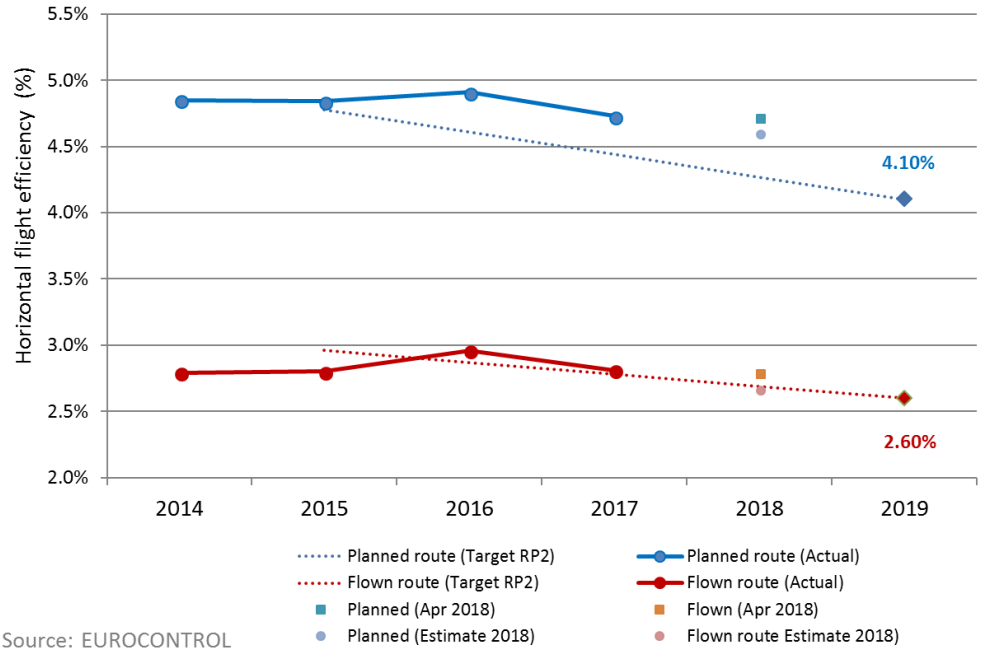
80 The current performance shows the following:

- During RP2 the target for the trajectories of the last flight plan airlines filed (KEP) remained above the indicative reference line for the 2019 target.
- The actual trajectories flown so far during RP2 significantly contribute to meeting the targets of RP2 in 2019, i.e. the flights path were sufficiently direct (Key performance Environment indicator based on Actual trajectory, KEA)

81 This means that airlines are close to operating the shortest routes, but they file flights plans which deviate from these routes for various reasons (see Section 9).

82 Figure 7 shows the:

- Evolution of performance of the actual and planned trajectories between 2014 and 2017 (red and blue lines).
- Estimated performance at the end of 2018.
- The reference line indicating the progress required to reach the targets in 2019 (dashed red and blue lines).



Source: EUROCONTROL

Figure 7: Horizontal en route flight efficiency (EU-wide)

[16] The KEA reflects the actual environment performance and is driven by the need to safely manage the flow of traffic and operational inefficiencies created by other ANS processes, systems and airspace and sector design. The KEP is the ultimate output of the flight planning process.

83 Significant developments in route and airspace structure[17] are planned by 2022, all of which will improve efficiency of both planned and actual trajectories. This provides a solid basis for the PRB to assume that both the flow and planned routes can improve by the end of 2022.

84 The Network Manager expects that actual trajectories could be improved by an additional 0.2% to 0.4%, based on timely implementation of network improvements proposed in the European Route Network Improvement Plan[18].

Target ranges for the Environment KPA

85 The PRB proposes the target ranges for the Environment KPA presented in Table 3.

Last filed flight plan (KEP): Percent of additional distances of the last filed flight plan compared with the great-circle distance		
Value in 2017	**RP2 target value (2019)**	**Range (2024)**
4.73%	4.10%	3.70% - 3.90%
Actual trajectory (KEA): Percent of additional distance of the actual trajectory compared with the great-circle distance		
Value in 2017	**RP2 target value (2019)**	**Range (2024)**
2.81%	2.60%	2.20% - 2.40%

Table 3: Proposed target ranges for the Environment KPA

6.3 Capacity KPA

Basis for proposing target ranges for the Capacity KPA

86 Current traffic levels (2017) are comparable with that of 2008, whilst ANSP performance in terms of providing adequate capacity, when comparing it to the year 2008, improved by almost 40 percent.

87 Reference Period 1 was characterized as a period of traffic variation (traffic decrease in 2013 and increase in 2014) with a record year in which the SES area (RP2) almost reached the Union-wide en-route ATFM delay target (2013 - 0.55 min/flight). Union-wide level ATFM delay levels have then increased in RP2 as well as the traffic, from 0.76 min/flight in 2015 to 0.94 min/flight in 2017.

88 For the remainder of the Reference Period 2, the Network Manager predicts even higher levels of delay.

[17] Such as FRA implementations, route changes, re-sectorisations, TMA projects, civil-military airspace developments and eliminations of unnecessary RAD restrictions
[18] ERNIP Part 2 ARN version 2017 – 2019/21, section 2.1 Total expected benefits

Year	Delay Forecast Full Year (min/flight) - inclludes estimations of industrial actions and technical failures included at a statistical level of 0.1 minutes per flight (min/flight)	Delay Forecast Full Year (min/flight) - excludes delays for disruptions such as industrial actions and technical failures.
2018	1.05	0.95
2019	1.01	0.91
2020	0.97	0.87
2021	0.82	0.72
2022	0.74	0.64

Table 4: Network Manager delay forecasts[19]

89 The PRB recognizes that the main drivers for the higher ATFM delay than the Union-wide target, are inadequate capacity (delay codes ATC Capacity and ATC staffing) and a high evolution of weather related delays.

90 During RP2, delay attributed to weather increased, exceeding the weather allowance within the EU-wide target.[20]. Members States may also exclude delay causes outside of an ANSP's control to calculate delay-related incentives[21]. This provision may allow ANSPs to allocate delays to 'weather' when the primary cause of delay may be related to Capacity or Staffing.

91 Additionally, the PRB has analysed the impact of network disruptions caused by industrial action and technical failures impact on the performance of the European network, which create significant delays to passengers.

92 According to the latest traffic and delay figures, delay increased in the first three years of RP2, generating additional costs of €1 060M above the targeted values for airspace users.

93 For 2017, excess delay was caused by two Functional Airspace Blocks (FABEC and South West FAB) not reaching the local targets. The other seven FABs reached their FAB targets. Overall the performance was not sufficient to reach the union-wide targets.

Target Ranges

94 The PRB proposes the targets in Table 5 for the Capacity KPA.

[19] Network Manager, 2018, Network Operations Plan
[20] Performance Review Body, 2013, RP2 EU-Wide Target Ranges for Stakeholder Consultation
[21] Commission Implementing Regulation (EU) No 391/2013, Article 15, Paragraph 1(g)

Target Ranges for Capacity KPI		
Minute per flight	Low bound	High bound
System wide cost optimum capacity[22]	0.08	0.16
Severe weather	0.08	0.22
Network disruptions	0.08	0.12
Total	0.24	0.50

Table 5: Proposed target range for capacity

95 Based on the calculation of the system wide cost optimum capacity and taking into account weather and network disruption attributed delay, PRB considers a range between 0.24min/flight and 0.50 min/flight.

96 The PRB is taking stakeholders views into account when determining the Capacity KPI target ranges, especially with the current level of ATFM delay performance on Union wide level. The PRB invites comments from stakeholders on the option to increase the intermediate values for the early years of RP3, under the condition that ANSPs use this tolerance to drastically improve capacity provision to meet the expected demand.

6.4 Cost-efficiency

Basis for proposed target ranges for the Cost Efficiency KPA

97 In the planning for RP2, the PRB noted a range of between 10-40% in the potential reduction in unit costs of service provision.[23]

98 In preparation for RP3, the academic study commissioned by the PRB identified a potential reduction of between 25-30% in the cost of en route service provision. The study identified differences across ANSPs and concluded that local cost efficiency targets should be considered for RP3.

99 The academic study analysed the impact of achieving a 27% reduction in service provision costs on determined costs and determined unit costs, which would be 5309€$_{2009}$ and 34.57€$_{2009}$, respectively by the end of RP3 assuming the baseline scenario of traffic forecast.

Starting points for en route cost efficiency KPIs

100 As presented earlier in Figure 4, defining the starting point is crucial for setting cost efficiency targets. The PRB recommends that the starting point should be based on costs increasing in line with the STATFOR baseline traffic to 6514 M€$_{2009}$ in 2019. The result is an average union-wide DUC value of **47.79**€$_{2009}$ as the starting point of RP3 taking into account the actual 2016 average Union-wide DUC of 50.44€$_{2009}$.

[22] The System wide cost optimum capacity defines the amount of delay which minimises the sum of the cost of service provision and the cost of delay incurred by airspace users.
[23] Performance Review Body, 2013, RP2 EU-Wide Target Ranges for Stakeholder Consultation

101 The proposed starting point is a balanced option, taking into account current levels of performance and adequate level of ambition. The value of 47.79€$_{2009}$ is higher than the forecast for costs in 2019, but is lower than what Members States have estimated for 2019 (48.54€$_{2009}$ aggregated from Member States' forward-looking submissions received in May 2018).

Possible Future Scenarios of En-Route Cost Efficiency KPIs

102 The PRB defines five future scenarios of the en-route cost efficiency KPIs. The scenarios are based on the starting point described above and define the level of ambition for RP3:

- Baseline or no action: ANSPs are assumed to take no action to reduce total en-route cost, with determined costs for service provision increasing by 20% from around 6060M€$_{2009}$ in 2016 to 7272 M€$_{2009}$ in 2024.
- 40% Gap closing: ANSP are assumed to reduce the total en-route cost compared to the baseline scenario to 6487M€$_{2009}$ in 2024. This achieves 40% of the potential cost reduction identified by the academic study. The remaining reduction should then be reached during RP4.[24]
- Cost reduction to 2016 level: ANSPs are assumed to reduce their en-route service provision costs from the starting point of 6 514 M€$_{2009}$ at the end of RP2 to 6 060M€$_{2009}$ in 2024. This would achieve 62% of the potential reduction identified by the academic study.
- 75% Gap closing: ANSPs are assumed to reduce the total en-route cost to 5800M€$_{2009}$ in 2024. This would achieve 75% of the potential cost reduction identified by the academic study. The remaining reduction should then be achieved in the middle of RP4.[24]
- 100% Gap closing: ANSPs are assumed to reduce the total en-route costs to 5308M€$_{2009}$.

103 PRB proposes the three middle scenarios as feasible options to define the target ranges for RP3.

End points for en route cost efficiency KPIs

104 Setting the end points for RP3 is equally important for defining the cost efficiency targets. Connecting the starting point to the end points determines the targeted reduction in determined unit cost. The PRB proposes three possible end points obtained by dividing:

- The total Union-wide en-route determined cost of the year 2024 as obtained from the 40% Gap Closing scenario by the traffic service unit of the latest STATFOR Base case scenario projection of the year 2024. The resulting determined unit cost is 42.25€$_{2009}$.
- The total Union-wide en-route determined cost of the year 2024 as obtained from the Cost Reduction to 2016 Level scenario by the traffic service unit of the latest

[24] Assuming that a Reference Period is 5-years long
[25] Assuming that a Reference Period is 5-years long

STATFOR Base case scenario projection of the year 2024. This resulting determined unit cost is 39.47€$_{2009}$.

- The total Union-wide en-route determined cost of the year 2024 as obtained from the 75% Gap Closing scenario by the traffic service unit of the latest STATFOR Base case scenario projection of the year 2024. This resulting determined unit cost is 37.77€$_{2009}$.

6.5 *Target ranges*

105 The PRB proposes the target ranges in Table 6.

	40% Gap Closing	Cost reduction to 2016 level	75% Gap Closing
En route total Determined Costs % per year	-0.09%	-1.4%	-2.2%
En route Service Unit growth per year (STATFOR base case)	+2.4%		
En route Determined Unit Cost reduction per year	-2.3%	-3.5%	-4.2%
End point - Determined Unit Costs (€$_{2009}$)	42.25	39.47	37.77

Table 6: Summary of the proposed RP3 (2019-2024) target ranges and scenarios (starting point in 2019 = 47.79€$_{2009}$)

106 The PRB is open to discuss the possibility of splitting RP3 into two phases, with less ambitious intermediate values in the early years, and more ambitious intermediate values thereafter to achieve the targets defined above. This would allow Member States to invest further during the first sub-period to achieve the quality of service targets.

7. *Next steps*

107 The PRB recognizes the importance of consulting with all stakeholders when providing advice to the Commission on targets for RP3. The PRB will present the target ranges at the stakeholder consultation meeting in Brussels on 4th July 2018.

108 The written consultation period will run until 4th September 2018 and the PRB welcomes the written views of stakeholders on the target ranges. The consultation period has been extended to enable stakeholders to provide comments over the summer period, however the PRB would appreciate receiving comments and input from stakeholders as early as is practicable.

109 In September the PRB will publish:

- a document answering the comments raised during the consultation process.
- the final document to the European Commission providing the PRB's advice on the target values for RP3 of the performance scheme.

PRB | Performance review body of the single european sky

EU-wide target ranges for RP3

Part 2: Evidence for target ranges

Performance Review Body of the Single European Sky | Rond-Point Schuman 6, 4th Floor, Office 411, B-1040 Brussels
Office Telephone: +32 (0)2 234 7824 | regula.dettling-ott@prb.eusinglesky.eu / prb-office@prb.eusinglesky.eu | webgate.ec.europa.eu/eusinglesky

8. Evidence for the Safety KPA

8.1 Introduction to the Safety KPA

110 For Union-wide target setting and performance monitoring at the Union level with respect to Safety, Regulation (EU) 390/2013, article 9 and sections 1 and 2 defines the Key Performance Indicators as:

- The effectiveness of safety management (EoSM) of Member States and their national supervisory authorities and air navigation service providers, are measured on following five Management Objectives:
  - Safety policy and objectives;
  - Safety risk management;
  - Safety assurance;
  - Safety promotion;
  - Safety culture.
- The percentage of application of the severity classification based on the Risk Analysis Tool (RAT) methodology to the reporting of, as a minimum, three categories of occurrences: separation minima infringements, runway incursions and ATM-specific occurrences at all air traffic services units.

8.2 Historic performance of Safety indicators[25]

Effectiveness of Safety Management of ANSPs during RP2

111 The effectiveness of Safety Management of ANSPs has increased in the last three years, with an EU average value for 2015, 2016, and 2017 of 79, 80.3 and 82, respectively.

112 Figure 8 presents the EoSM scores for all ANSPs within the performance scheme, ranked from the lowest EoSM score (ANSP 1) to the highest (ANSP 31) for 2015 to 2017. The score achieved has increased over the duration, particularly the lowest EoSM score within the sample. The majority of ANSPs have an EoSM score in excess of 80.

[25] EASA, 2017, Annual Safety Review 2017

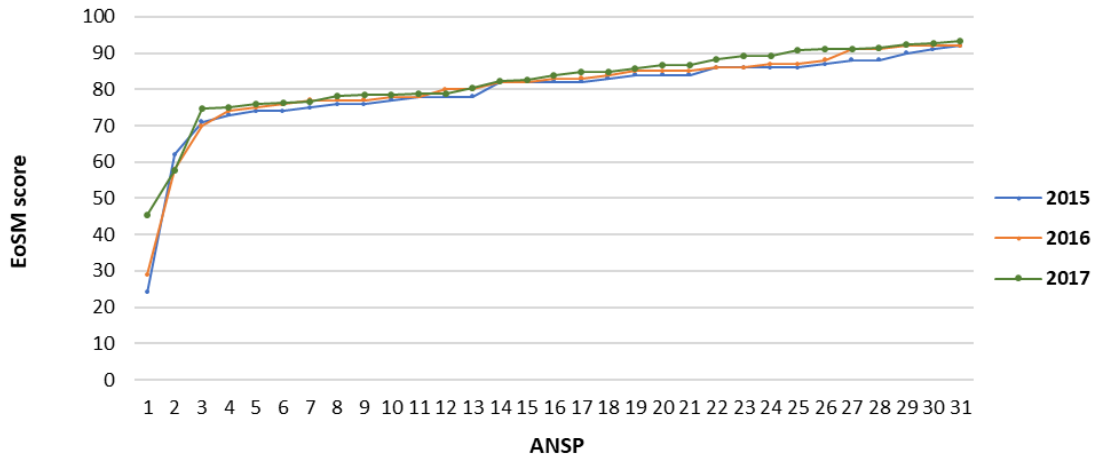


Figure 8: Evolution of EoSM score (source: PRU Dashboard)

113 The year on year performance of ANSPs within RP2 (Figure 2) shows that all ANSPs have achieved the target level C for Safety Culture, and that the number of ANSPs achieving the target level D for other management objectives has continuously improved during RP2. Safety Risk Management is the only management objective to see an increase in number of ANSPs below target.

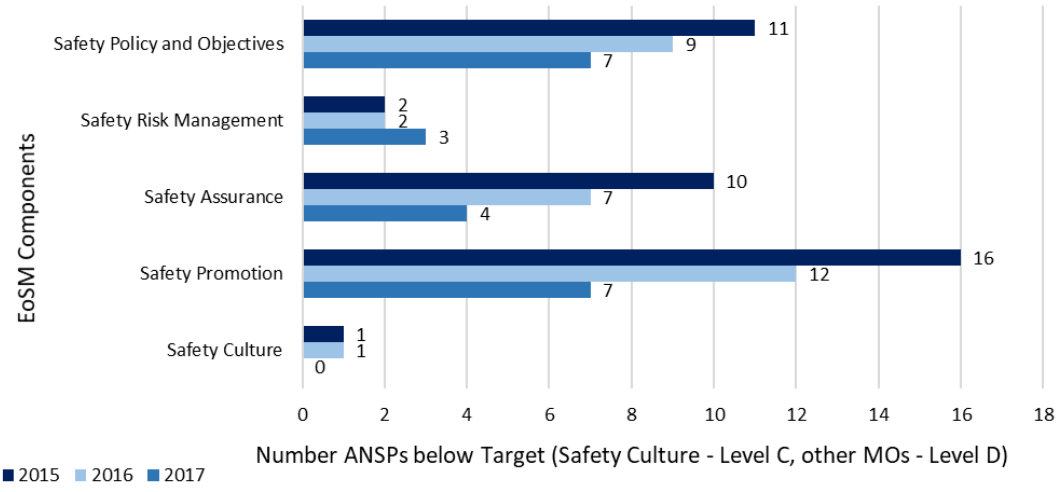


Figure 9: ANSPs below 2019 target levels in RP2 to date (2017) (source PRU dashboard)

114 The PRB expects ANSPs will achieve the RP2 targets by the end of 2019 if the current progress continues. Those ANSPs not meeting the target will need to focus on further strengthening their efforts to achieve the RP2 target.

Effectiveness of Safety Management of States during RP2

115 The Effectiveness of State Management Systems of States / NSAs has improved, but is still behind the targets set for RP2 and with a lower rate of improvement for the lowest scores when compared with ANSPs. Consequently, there is a need for further improvement.

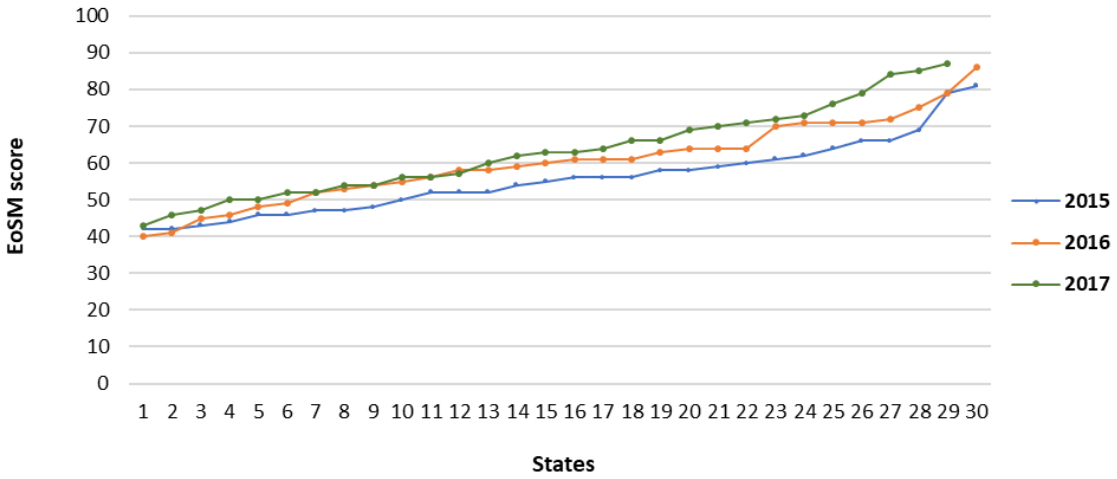


Figure 10: Evolution of EoSM score for States (source:PRU Dashboard)

116 While there has been improvement of the EoSM score over the period, there are still Management Objectives, such as Safety Policy and Objectives and Safety Culture where the progress need to improve to reach the targets.

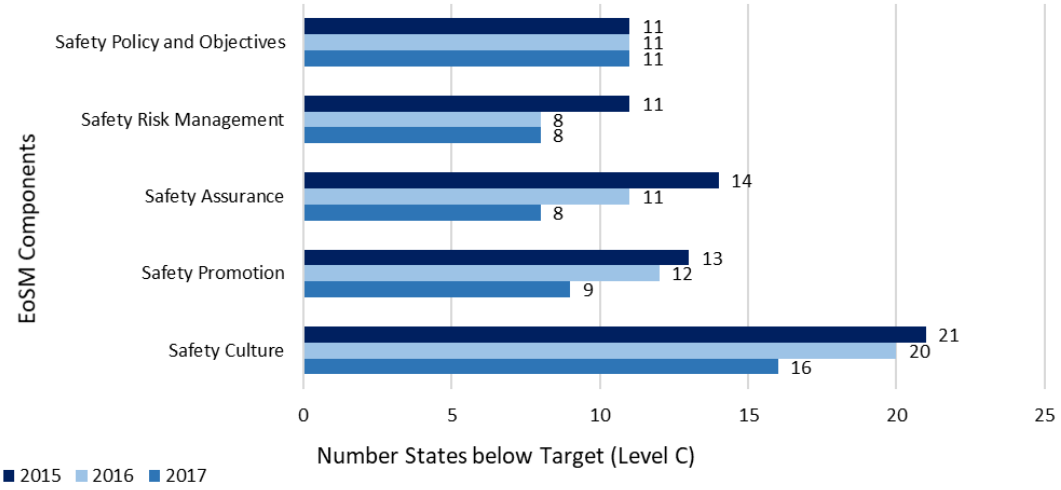


Figure 11: States below 2019 target levels in RP2 to date (source: PRU dashboard)

117 Overall, only a few States have reached the RP2 target (Level C) for the Management Objectives and no States have exceeded this minimum level.

118 With the rate of improvements seen in 2015, 2016 and 2017, combined with the number of States below the target in one or more Management Objectives, the PRB considers that progress is required to ensure all States will achieve the target for RP2.

Application of Risk Analysis Tool (RAT) during RP2

119 The performance regarding the use of the Risk Analysis Tool (RAT) shows mixed results. Overall, Member States in 2017 reached the targets for all categories except for the Runway Incursions, which is well below target in 2017. The reason for the decrease in 2017 is still being analysed. ATM Specific Occurrences showed improvements in 2017, but are still lagging behind to the target.

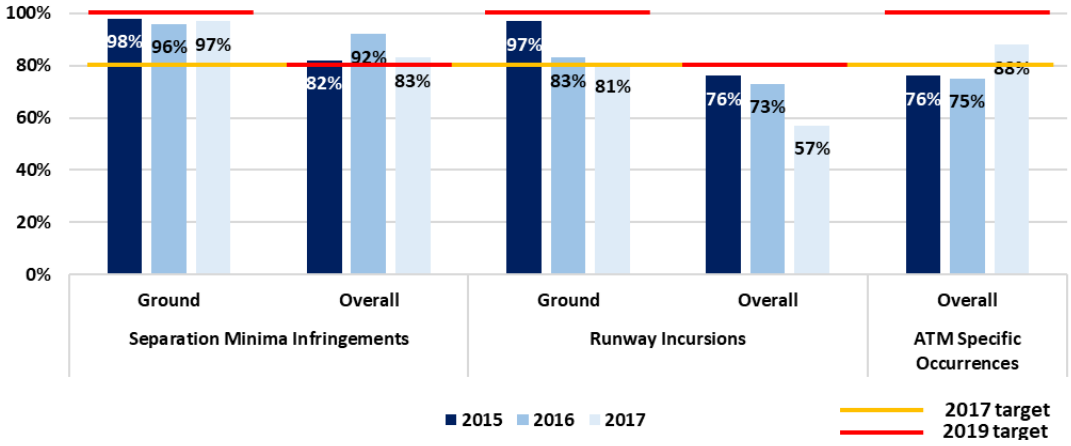


Figure 12: Application of Risk Analysis Tool to date (source: RP2 Dashboard)

120 For 2019, the category of Separation Minima Infringements is on target and it should be possible to retain this level. For Runway Incursions has been close to the target in 2015 and 2016. The reason for the lower application in 2017 is still under investigation, but if correct, it seems challenging to reach the targets for RP2. The ATM Specific Occurrences has improved between 2016 and 2017 and still need to continue the improvement seen to achieve the target for RP2.

8.3 *Target setting for Safety Management of ANSPs and States in RP3*

121 ANSPs should foresee significant changes in the technology for air traffic management over RP3 stemming from SESAR and the Common Pilot Projects of the SESAR Deployment Manager. In addition, improving performance in key performance areas may also drive changes within air traffic management. Therefore, targets for Management Objectives relating to change management, such as Safety Culture and Safety Risk Management, need to be more ambitious to prevent safety being impacted.

122 In relation to **Safety Culture** based on the current maturity (Level C), the PRB expects that ANSPs should maintain level D by the end of RP3.

123 In relation to **Safety Risk Management**, the majority of ANSPs (all but three) have achieved Level D in 2017. Thus, this is a mature component of the SMS in most ANSPs. The PRB expects that ANSPs can achieve a higher level of maturity by the end of RP3, i.e. Level E. This can be supported by the proposed Regulation (EU) 2017/373, which will enter into force beginning of 2020, introducing a set of requirements for change management (e.g. risk management of functional changes, obligations on assessment of any change in technology, procedures and operators of all service providers, coordinator in multi-actor changes, monitoring of "change drivers", etc.).

124 In relation to **Safety policy and objectives, Safety Assurance and Safety Promotion**, efforts should consolidate the levels achieved at the end of RP2 and ensure that the (few) ANSPs trailing behind on these Management Objectives reach Level D. Consequently, the RP3 targets should be set to Level D for the three Management Objectives.

125 For States as for the ANSPs, the implementation of new concepts and technology, the need to control effects from targets on other KPAs and the strengthening of requirements

to the States under Regulation (EU) 2017/373, gives reason to argue that the targets for States should be set higher for RP3 than for RP2, in particular for Safety Culture and Safety Risk Management.

126 On **Safety Culture**, 16 States are still below target in 2017, improving slightly from 2015. Even though desirable, it does not seem realistic to increase the target in RP3 like that for ANSPs.

127 **Safety Risk Management** is an advanced area in terms of maturity and it could be argued that considering the changes to be implemented during RP3, the target should be set at Level D. But the maturity did not improve from 2016 to 2017 and progress is still needed to reach the target for RP2.

128 Therefore, an achievable ambition for RP3 for the EoSM for States is to reach Level C on all Management Objectives, noting that maturity above Level C in e.g. Safety Risk Management may be seen for individual States, partly driven by Regulation (EU) 2017/373.

8.4 Target setting for RAT application in RP3

129 The overall objective for RP3 should be to stabilize and improve the RAT application and reach the RP2 targets during RP3. As the ATM Functional Systems (airspace, people, procedures and equipment) will undergo significant changes during RP3 implementing new technologies, the target for RP3 needs to ensure that severities are reported consistently. With some application reaching close to the RP2 target already, it should be realistic to consolidate the RP2 targets in RP3.

8.5 Proposed targets for RP3

130 Based on the achievements during RP2 and the assessment provided above, the PRB proposed targets for RP3 are shown in the tables below.

EoSM: Effectiveness of Safety Management of ANSPs				
	ANSP		State	
EOSM Component (MOs)	Expected maturity value at end of RP2 (2019)	EU-target (2024)	Expected maturity value at end of RP2 (2019)	EU-target (2024)
Safety policy and Objectives	D	D	C	C
Safety Risk Management	D	**E**	C	C
Safety Assurance	D	D	C	C
Safety Promotion	D	D	C	C
Safety Culture	C	**D**	C	C

Table 7: Proposed targets for EoSM for RP3

Application of the RAT			
Categories		Expected value at end of RP2 (2019)	Proposed EU-target (2024)
Separation Minima Infringements	Ground	100%	100%
	Overall	80%	80%
Runway Incursion	Ground	100%	100%
	Overall	80%	80%
ATM Specific Occurrences	Overall	100%	100%

Table 8: Proposed targets for RAT application for RP3

8.6 Adaptations of the RP3 performance framework

131 EASA has launched a working group in 2016 to develop safety indicators to be implemented in RP3. This proposal has been incorporated to the Commission's draft legal text repealing Regulation (EU) 390/2013. The proposal reduces the number of Safety Key Performance Indicators (SKPIs) to the effectiveness of safety management (EoSM) of Air Navigation Service Providers (ANSPs), replacing the current method to measure EoSM in RP2 based on questionnaires completed by the ANSP and computing scores and the level of maturity of the questions and notes. EASA will submit the proposal in the second half of 2018 which will be based on the **CANSO Standard of Excellence (SoE)** that most European ANSPs currently use.

132 The reasons for these changes are twofold. On the one hand, it considers the agreed new EASA Basic Regulation[26], which is being adopted soon, and ensures a coherent approach to the management of aviation safety avoiding duplication and contradictory initiatives between the said regulation and the Performance Scheme. The safety risk of the aviation system in Europe, including the ATM system, should be managed through the combination of actions at European and national levels though the European Plan for Aviation Safety (EPAS) and national Plans for Aviation Safety. Activities required under the Performance Scheme should not duplicate the risk management activities under the EASA system. In the context of the Performance Scheme, safety is considered as a control mechanism counterbalancing the other Key Performance Areas (cost efficiency, capacity and environment). The Performance Scheme therefore needs to monitor that no unintended effects are introduced in safety by the targets set in these other Key Performance Areas.

133 The current method to measure the Effectiveness of Safety Management for ANSPs is based on questionnaires completed by the ANSP and computing scores and level of maturity of the questions. The indicator has not substantially evolved since the beginning of RP1, however some verification processes were introduced in RP2. The indicator needs to be updated to ensure that it is operating correctly as a leading indicator and reflects most up to date practices. The questionnaire will be revised in the second half of 2018

[26] Final text has been agreed by the European parliament and of the Council and it is expected to be adopted at the end of 2018, repealing Regulation (EC) No 216/2008.

with an EASA Rulemaking Group that will develop Acceptable Means of Compliance. These will be based on the **CANSO Standard of Excellence (SoE)** improving readability of the questions and updating the meaning of maturity levels. This is the questionnaire that most European ANSPs are currently using. EASA will submit the proposal in 2019.

9. *Evidence for the Environment KPA*

9.1 *Description of Environment Key Performance Indicators*

134 Environment performance indicators considered in this section are those specified in Implementing Regulation (EU) No 390/2013, Annex I, section 1 paragraph 2.

- The average horizontal en-route flight efficiency of the last filed flight plan trajectory (known as KEP).
- The average horizontal en-route flight efficiency of actual trajectory (known as KEA).

135 Horizontal en-route flight efficiency compares the length of the en-route portion of the flight plan and the actual trajectories to the to the great-circle distance using the "achieved[27]" distance concept. Both indicators relate to fuel burn but refer to two separate domains: planning and operations.

136 The indicators are expressed in percent (Regulation (EU) No 390/2013, Annex I, section 1 para 2.1.b). For instance, an "inefficiency" of 5% means that a flight with a great-circle distance of 1000 NM planned or flew an additional 50NM.

137 The performance indicators are computed on an annual basis in order to smooth out the influence of unusual events. Additionally, the ten best days and the ten worst days for each measured area are excluded from the computation.

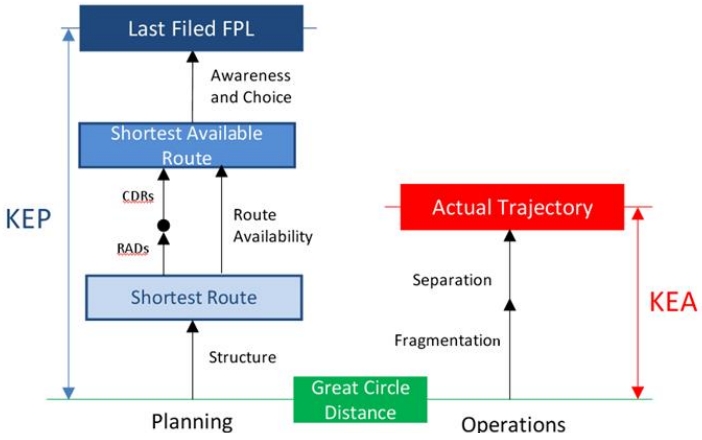


Figure 13: En route horizontal flight efficiency drivers

138 The indicators are a measure of environmental performance as they relate to the amount of fuel which has to be uploaded in accordance with the filed flight plan and the amount of fuel actually burnt.

139 Although the indicators relate to the fuel burn, they do not measure the actual fuel burnt and the PRB also recognizes that the great-circle route is sometimes not the most efficient or preferable for airspace users. The PRB notes the information needed to calculate the most efficient or preferable route is not currently available. The airspace users would

[27] The achieved distance apportions the Great Circle Distance between two points within the European airspace (reference area). For the vast majority of flights, the origin and destination coincide with the airports in the reference area. If the origin/destination airport is located outside of the reference area, the entry/exit point into the area is used for the calculation.

have to either provide detailed additional information or agree on a standard method for the calculation of the route "values".

140 The planned and flown trajectory indicators have the advantage of relying on a well-defined, standard measure (distance).

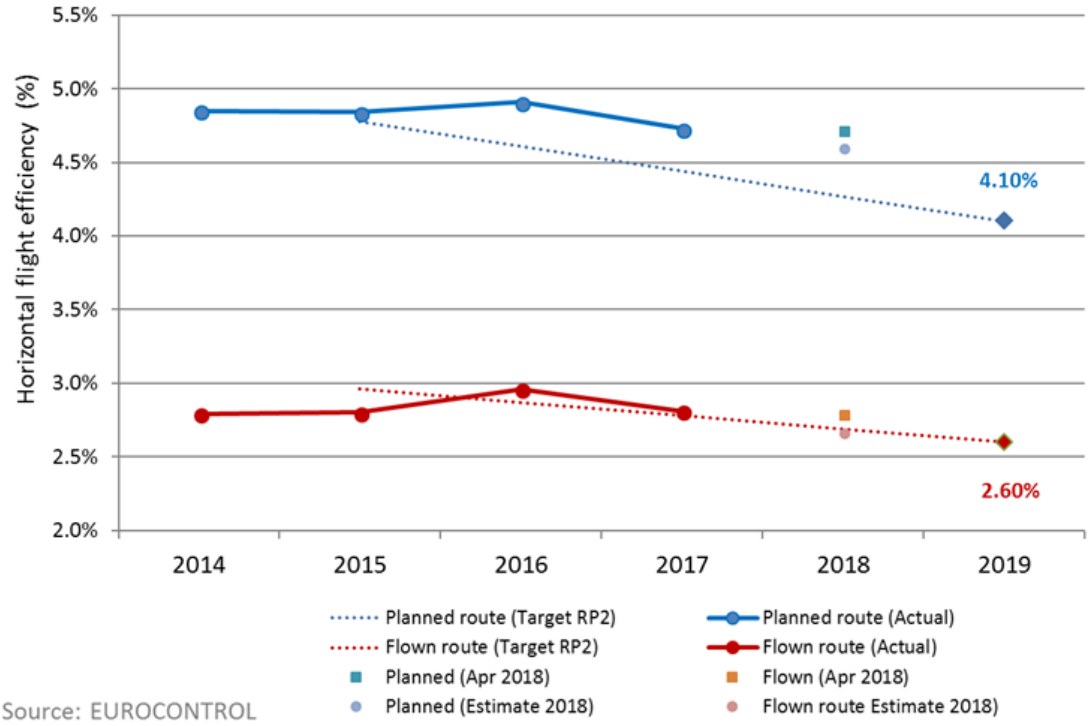
141 The PRB recognizes that ANSPs do not have ultimate control over the environmental indicators within the performance scheme, however, they can influence performance through improvements in the route structure design and route availability.

9.2 *Historic performance of the environment indicators*

Evolution of planned and flown performance indicators

142 Figure 14 shows the evolution of the planned and flown performance indicators between 2014 and 2017, estimated performance at the end of 2018 and the indicative reference line to reach the 2019 targets at the end of RP2.

143 Both indicators deteriorated in 2016 followed by an improvement in 2017. The value of the flown trajectory is close to the indicative (dotted red) reference line and appears to be on track to meet the RP2 targets set for 2019.



Source: EUROCONTROL

Figure 14: Horizontal en route flight efficiency (SES area)

144 Despite improvement from 4.91% in 2016 to 4.73% in 2017, the value of last-filed flight plan indicator remains above the indicative reference (dotted blue) line to reach the 2019 target.

Performance at Functional Airspace Block level

145 The PRB has taken account of the environmental performance at FAB level, as defined in Regulation (EC) 390/2013 Annex I Section II paragraph 2.1.

146 To understand the contribution of individual FABs towards achievement of the EU-wide RP2 targets it is necessary to take into account the flight efficiency indicator and the number of flights operated in the airspace of individual FABs.

147 Figure 10 shows the flight efficiency (KEA) (x-axis), the average additional distance per flight (Y-axis), and an indication of the traffic volume (flights) within the FABs (the size of the bubble).

148 FABEC (orange bubble), combines a large discrepancy between the actually flown route and the great circle distance with long average flight segments and a high traffic volume. FABEC accounted for 41.8% of total additional distance flown in 2017, followed by SW FAB, UK-Ireland FAB and BLUE MED FAB.

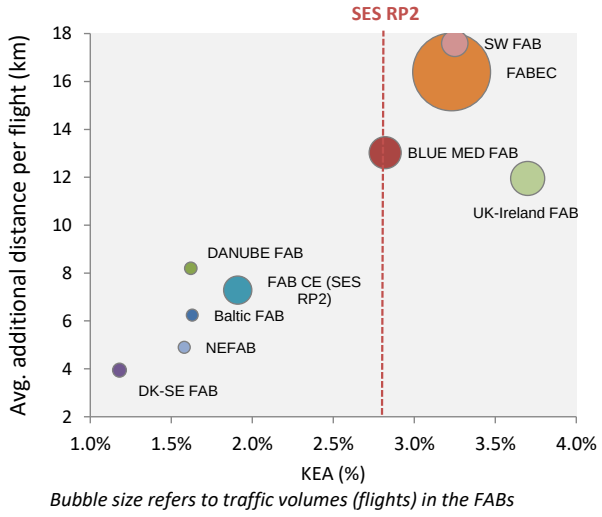


Figure 15: Horizontal en route flight efficiency (actual trajectory) by FAB in 2017 - (bubble size refers to FAB traffic)

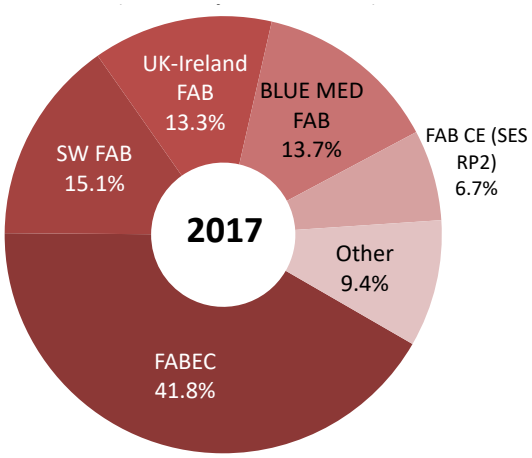


Figure 16: Breakdown of total additional distance (km) by FAB (actual trajectories – 2017)

Free Route Airsapce implementation

149 The Performance Review Report (PRR) 2016 underlined possible benefits of the implementation of Free Route Airspace (FRA) which offers a more flexible environment compared to a rigid route network and more choice to airspace users whilst contributing to reduced fuel consumption and emissions and higher flight efficiency.

150 Figure 17 shows FRA is now in place in large areas of European airspace[28].

[28] There are several levels of FRA implementation, with DCT-based implementation allowing "pseudo-FRA" operations using direct routings between pre-defined set of entry and exit points. In contrast, full FRA operations allow virtually any route specified by the operator, where, in theory, as few as only two points (origin and destination) of the route are required. Partial FRA implementations are limited by time of the day when the FRA can be used (e.g. night) and by the flight levels in which the FRA can be used.

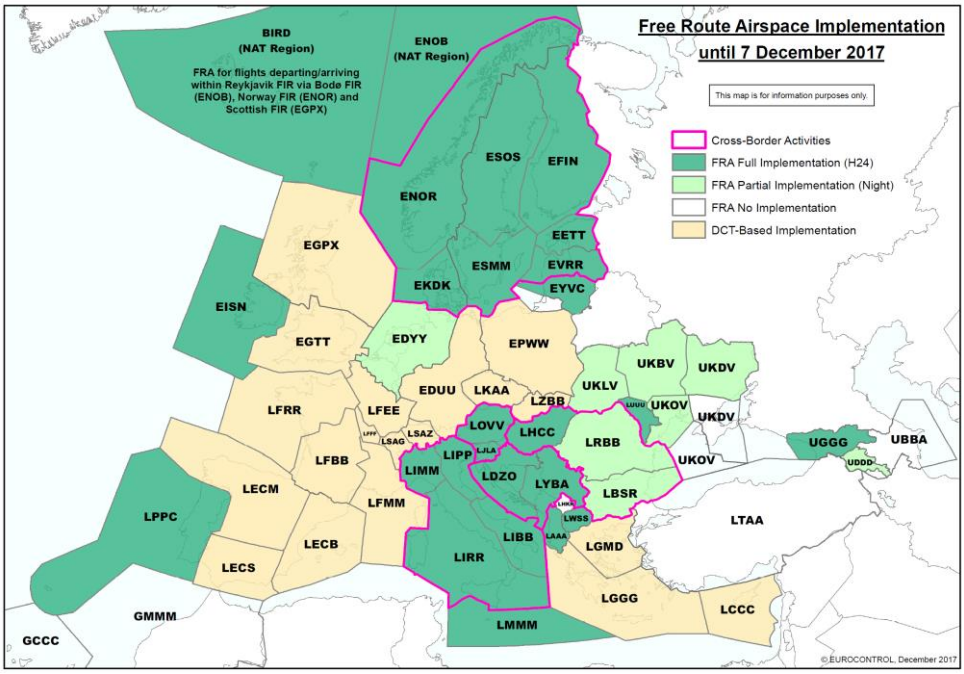


Figure 17: Free route airspace implementation (EUROCONTROL area – December 2017)

151 Even small improvements in the dense core area of Europe, together with improvements in flexible use of airspace (FUA), availability of conditional routes (CDRs) and additional improvements from SESAR are expected to bring both environmental (and capacity) benefits.

152 Nonetheless, these benefits need to be introduced gradually and in close coordination with the other key performance areas.

9.3 Target setting for RP3 - Forward-looking performance of the environment indicators

153 There is a need to ensure the performance of ATM system is sufficient to keep up with increases in demand and to reduce impact on the environment as much as possible. However, 100% flight efficiency is not achievable. It should be noted that the achievement of improved performance of the flown trajectory, becomes increasingly difficult as the airspace becomes more congested and capacity issues emerge.

Free Route Airspace (FRA) implementation (Outlook)

154 The PRB expects FRA to contribute towards reducing the impact of aviation on the environment through provision of operating environment which would allow operators to both plan and fly the shortest possible routes.

155 The European Route Network Improvement Plan (ERNIP) - Part 2 - ARN Version 2018 - 2019/22 (EUROCONTROL, Network Manager, ARN Version 2018 - 2019/22) provides an overview of planned improvements aimed at delivering a safe and efficient operation of air traffic. It is based on ANSP and FAB airspace plans until 2022 and contains, at this

stage, approximately 300 packages[29] of airspace proposals scheduled for implementation for the summer seasons 2018 - 2019/22:

- approximately 130 proposals for the Summer season 2018;
- approximately 110 proposals for the Summer season 2019;
- approximately 40 proposals for the Summer season 2020;
- approximately 30 proposals between Summer season 2021-end of 2022.

156 Besides FRA introduction in the European core area, the latest ERNIP Part 2 implementations have the potential to enable further flight efficiency improvements, if all projects are fully implemented as planned. The map in Figure 18 shows FRA initiatives that are already in place or planned for implementation by 2022, according to the latest ERNIP.

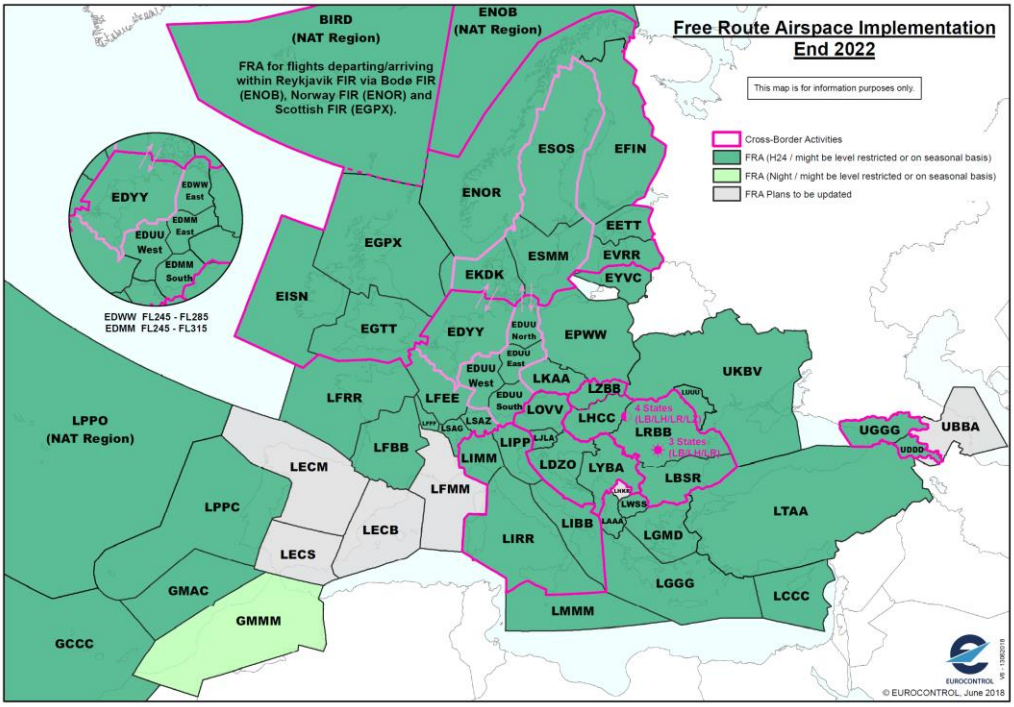


Figure 18: Free Route Airspace implementation plans proposed until end of 2022

157 With the exception of four, all other ACCs within the SES RP2 area have plans to implement FRA by 2022.

Horizontal en route flight efficiency of the actual trajectory (forward looking)

158 The value for the indicator measuring average horizontal en route flight efficiency of the actual trajectory for the end of April 2018 was 2.79%, which corresponds to an improvement of 0.14 percentage points with respect to the previous year (giving an estimate of 2.67% for the whole year). Hence, this indicator appears to be on track to meet the 2019 EU wide target.

[29] These proposals include more than 200 route changes, around 30 re-sectorisation plans, more than 30 TMA projects, more than 40 Free Route Airspace (FRA) projects, 1 civil/military airspace development as well as around 20 improvement measures eliminating unnecessary Route Availability Document (RAD) restrictions or improving flight efficiency.

159 Additionally, horizontal en route flight efficiency could be improved by another 0.4 percentage points between 2018 and 2022 if all currently planned airspace packages are fully implemented by 2022[30]. The NM estimates that an improvement of 0.2-0.3 percentage points would be feasible during this period.

160 Further improvements in horizontal flight efficiency will be difficult to achieve once FRA is fully implemented and utilized. Achievable performance as measured by KEA will then reach a plateau. Further improvements in environmental performance could be achieved in vertical flight efficiency, terminal areas (ASMA), taxiing, sequencing into airports, etc.

Horizontal en route flight efficiency of the last filed flight plan (forward looking)

161 The value for the indicator measuring average horizontal en route flight efficiency of the last filed flight plan for the end of April 2018 was 4.72%, which is an improvement of 0.13 percentage points with respect to the previous year (giving an estimate of 4.60% for the whole year). Whilst it appears to continue on a positive trend, additional effort is required to meet the EU wide target for 2019 (4.10%).

162 These values are much higher than for the actual route flown indicator, as shown in Figure 7. The following observations suggest that there is scope to reduce the planned route indicator more quickly than the actual route flown indicator.

163 The gap is greater in States where FRA has not been fully implemented[31]. FRA initiatives planned between 2018 and 2022 can therefore be expected to bring improvement in horizontal flight efficiency of the last-filed flight plan at EU wide level.

164 Airspace users and their flight planning systems might not always make the best use of route design improvements including free route airspace.

165 The PRB expects that new technology will improve environmental performance, with Trajectory Based Operations (TBO) being central to the SESAR and ICAO ATM concepts.

Impact of civil-military coordination

166 It is considered that effort to achieve a consistent high level of civil-military cooperation across the member states would enhance the ability to meet en-route flight efficiency targets.

167 The utilization of released airspace needs to be monitored to ensure that if the military allocates scarce public resources to improve performance of civil ANS, it is conducted in a way that delivers benefits in an effective and cost-efficient way. The PRB intends to consider this further with the military authorities and the Network Manager and will be further reviewed during RP3.

[30] Based on an unconstrained scenario, i.e. no route restrictions (e.g. RAD), no capacity shortfall, no constraints due to military activity and all conditional routes (CDRs) are permanently available.
[31] Performance Review Commission, 2017, Performance Review Report

9.4 Proposed target range

Horizontal en route flight efficiency of the last filed flight plan

168 The PRB proposes that the target range for horizontal efficiency of the last filed flight plan is 3.70% to 3.90% for RP3. Given the overall complexity of European airspace the PRB would not recommend to impose more stringent targets on this indicator.

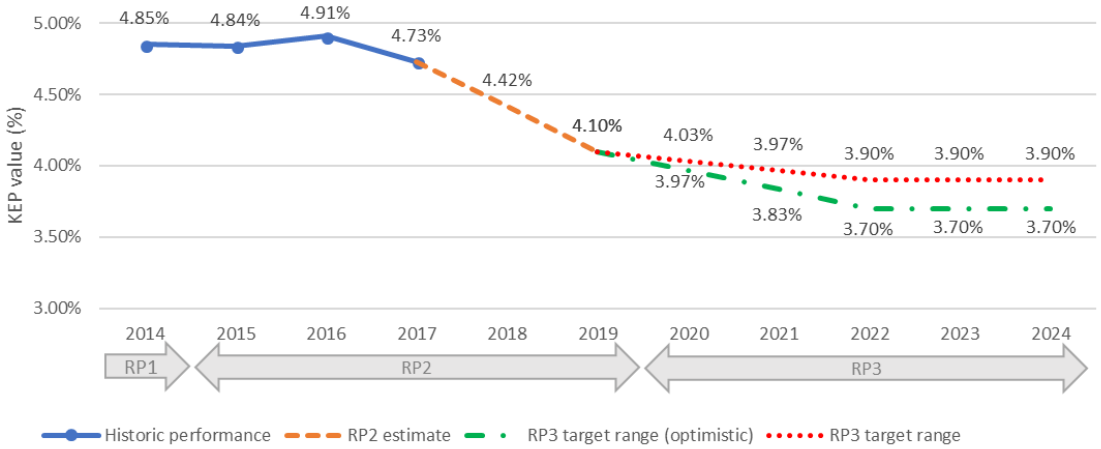


Figure 19: Proposed target range for the planned route indicator

Horizontal en route flight efficiency of the flown route

169 The PRB proposes that the target range for the horizontal efficiency of the actual trajectory RP3 is 2.20% to 2.40% for RP3.

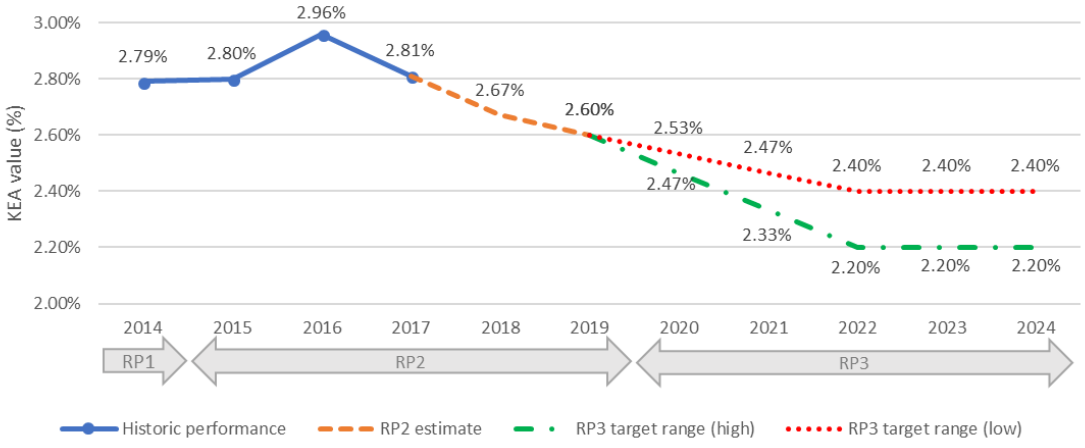


Figure 20: Proposed target range for the actual flown route indicator

170 The summary of the proposed targets in the Environment KPA is provided in Table 3.

The average horizontal flight efficiency of the last filed flight plan (KEP)		
Value in 2017	RP2 target value (2019)	Range (2024)
4.73%	4.10%	3.70% - 3.90%

Average horizontal flight efficiency of the actual trajectory (KEA)		
Value in 2017	RP2 target value (2019)	Range (2024)
2.81%	2.60%	2.20% - 2.40%

Table 9:Proposed target ranges for the Environment KPA

171 The PRB concludes that although the developments in route structure and availability are likely to bring improvement in the environmental indicators over the course of the RP3, further environmental benefits are expected to come from improvements in aircraft design and performance and engine efficiency. The PRB considers adapting a more holistic approach to assessing the environmental performance and setting the targets for the RP4.

10. Evidence for the Capacity KPA

10.1 Description of Capacity KPIs

172 The capacity KPI is defined as the average en route Air Traffic Flow Management (ATFM) delay per flight measured in minutes. The en route ATFM delay is the delay calculated by the central unit of ATFM as defined in Regulation (EU) No 255/2010 (European Commission (EC), 2010) and expressed as the difference between the estimated take-off time requested by the aircraft operator in the last filed flight plan and the calculated take-off time allocated by the central unit of ATFM.

173 The indicator includes all IFR flights within European airspace and all ATFM delay causes, excluding exceptional events[32]; it is calculated for the whole calendar year, and for each year of the reference period.

10.2 Historic performance of the Capacity KPA

Overview

174 Figure 21 shows the average en-route ATFM delay for the SES RP2 area between 2008 and 2017 and the evolution of IFR flights and the EU wide RP2 target. It shows that the EU-wide target of an average delay of 0.5 minutes per flight has never been achieved. It was almost reached in 2013 (0.55 min/flight). Since then, the number of flights increased by 10% and total en-route ATFM delays by 89%.

[32] According to Regulation (EU) No 390/2013 [1], 'exceptional event' means circumstances under which ATM capacity is abnormally reduced so that the level of ATFM delays is abnormally high as a result of: a planned limitation induced through operational or technical change, major adverse weather circumstances, the unavailability of large airspace parts either through natural or political reasons, or industrial action and the activation of the European Aviation Crisis Coordination Cell (EACCC) by the Network Manager as a result of one or more of these causes.

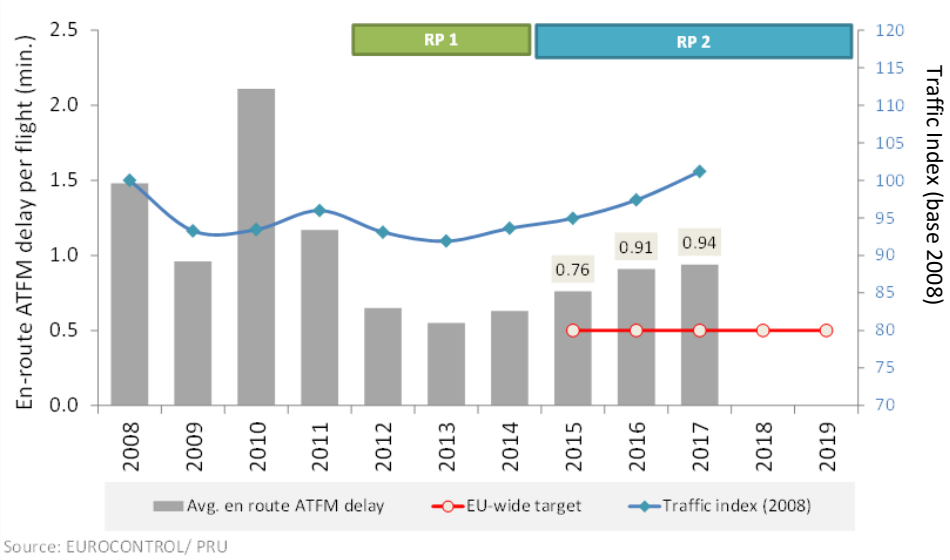


Figure 21: Average ATFM en route delay (RP2 area)

Causes of delay

175 Delay causes are allocated according to the criteria developed by the Network Manager including post operations adjustment mechanisms.

176 Figure 22 shows the EU-wide average ATFM en route delay by delay category. Capacity constraints are the main contributor to ATFM delay, followed by weather and staffing issues reported by ANSPs (Flow Management Positions).

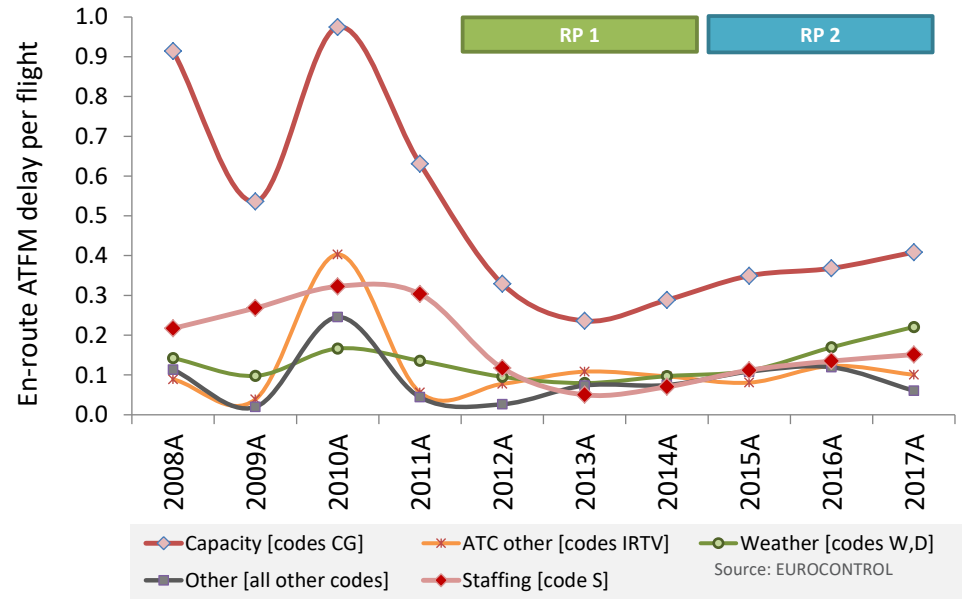


Figure 22: Average ATFM en route delay (min) by attributed delay category (RP2 area)

177 ATC staffing attributed delays are an indication that insufficient staff are available to open enough sectors to provide the required capacity. A significant amount of ATC staffing delays occurred in the core area during periods of peak traffic demand - with a high cost impact on airspace users.

178 **ATC Capacity** delays occur when traffic demand is higher than the declared sector capacity. However, analysis in PRR 2017 (EUROCONTROL Performance Review Commission, March 2018) shows a high proportion of delays attributed to ATC capacity when sectors[33] were in fact collapsed (defined by appropriate sector configuration[34]), due to internal constraints such as insufficient availability of qualified ATC staff. Therefore, attribution of delays to staffing or ATC capacity causes is often blurred.

179 ANSPs' capacity plans are updated at least on a yearly basis and compiled in successive editions of the Network Operations Plan (NOP). The latest NOP (EUROCONTROL, Network Manager, April 2018) indicates that the current capacity plans are insufficient to meet the capacity target set for RP2 for the next five years. This results in high additional costs to airspace users as indicated in the section below on Cost of delay. Capacity issues are in fact concentrated in two FABs and a small numbers of ACCs (see section below on the Average en route ATFM delay by Functional Airspace Block).

180 **Weather-related delays:** The RP2 EU-wide target included an allowance to account for weather delays and other events. During the consultation on target ranges, historical evidence was provided to show the 'typical' impact of adverse weather, between 0.10 and 0.16 minutes per flight.

181 The following figure presents the weather attributed ATFM delay on a monthly level in last five years. There is an overall increase of weather influences on ATFM delay and the majority of weather related delay occurs in the summer period.

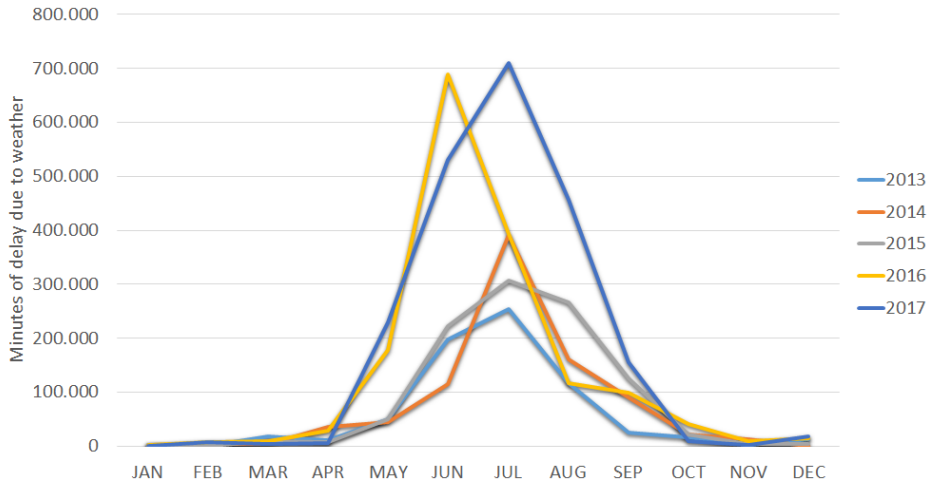


Figure 23: Total en route delay due to weather (Codes W, D)

182 Historical analysis has demonstrated that weather delay is not uniform and that the majority is generated in certain parts of Europe. As presented in the figure below, in 2017, four Member States accounted for 75% of the total weather delay, and eight Member States accounted for 95% of the total.

[33] A defined airspace volume for which an associated controller (or controllers) has ATC responsibility.
[34] Air traffic service (ATS) unit sector configuration means the four dimensional description of an ATS unit airspace sector, or group of sectors, which may be operated on a permanent or temporary basis

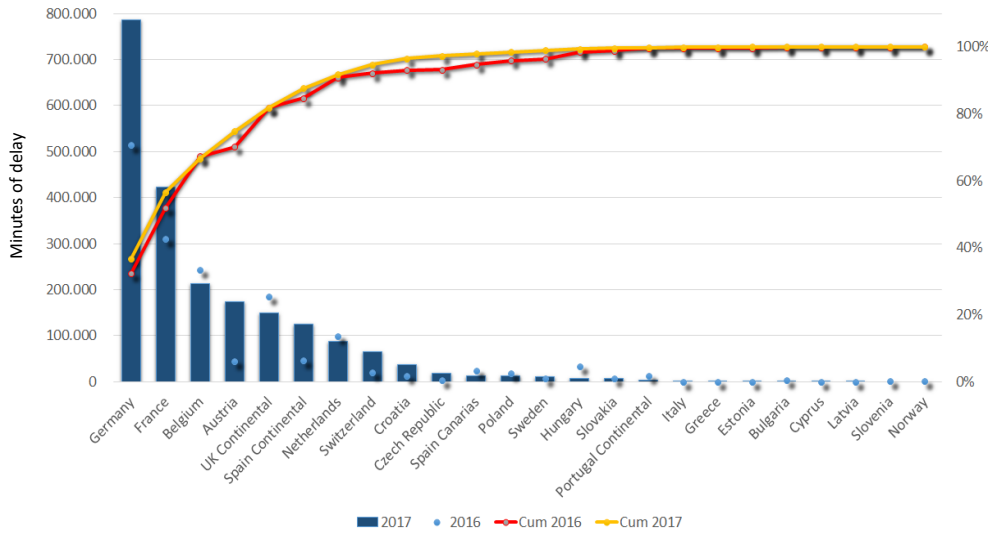


Figure 24: Distribution of weather delays between States in 2017

183 The proportion of weather attributed delays increased year on year during RP2 (see Table 10).

	Reference Period 1			Reference Period 2		
	2012	2013	2014	2015	2016	2017
Total en route ATFM delay	0.63	0.54	0.61	0.76	0.91	0.94
En-route ATFM delay attributed to weather	0.09	0.08	0.09	0.11	0.17	0.22
% of weather attributed en route delay	14%	15%	15%	15%	18%	23%

Table 10: Weather attributed delays (SES area)

184 Caution is warranted when interpreting the increase in weather-related delays: The Charging Regulation (EU) No 391/2013 (Article 15 (1) g) allows Members States to exclude weather attributed delay from the local target and incentive schemes.

185 The PRB observes that a very significant proportion of weather attributed delays (up to 90% in certain sector groups) occurred when sectors were collapsed, possibly due to staffing issues (EUROCONTROL Performance Review Commission, March 2018). This raises a question why such delay was attributed to weather rather than staffing.

186 **Network disruptions (including industrial action):** The PRB acknowledges networks disruptions have caused significant delays across the network, representing a share of between 10% and 20% of the total en route ATFM delay (taking into account RP1 and first three years of RP2).

187 For RP2, the PRB proposed an allowance for network disruption between 0.05 and 0.25 minutes per flight for RP2 (2015-2019). During RP1 and RP2 the value remained within the proposed range (see Table 11).[35]

[35] Network Manager, 2017, Reporting Assumptions and Descriptions

ATC disruptions (Codes I,T)	Reference Period 1			Reference Period 2		
	2012	2013	2014	2015	2016	2017
Total en route ATFM delay	0.63	0.54	0.61	0.76	0.91	0.94
En-route ATFM delay attributed to Disruptions (ATC) (Codes I,T)	0.08	0.11	0.09	0.08	0.12	0.10
% of disruptions (ATC) attributed en route delay (Codes I,T)	12%	20%	15%	11%	13%	10%

Table 11: Delays attributed to Newtok Disruptions (SES area)

Cost of delay

188 The cost of delay is used in target setting to establish the link between the cost of providing capacity and the costs incurred through a lack of capacity, i.e. delays. Insufficient capacity results in additional cost to airspace users: the cost of delay (including lower aircraft and crew productivity, missed connections, passenger compensation).

189 A report on the unit cost of delay was published by the University of Westminster in 2004 and updated in 2015. The latest version 4.1 (University of Westminster, December 2015) estimates the average cost of one minute of ATFM delay at €100. These costs to airlines mainly arise from crew costs, passenger compensation and the value of passenger loyalty[36].

190 The PRB estimates the excess delay resulted in additional costs of €1 060 to airspace users in the first three years of RP2.

	Reference Period 2		
	2015	2016	2017
Total en route ATFM delay above target (million minutes)	2.4	3.9	4.3
Estimated additional cost of delay above target (€)	€240M	€390M	€430M

Table 12: Estimated en-route ATFM delay costs to airspace users (additional costs compared to on-target peformance - SES area)

Average en route ATFM delay by Functional Airspace Block

191 The PRB has taken into account local information in the EU-wide target setting process, by assessing the average en route ATFM per flight at FAB level and comparing it to the reference values in 2017.

192 Figure 25 provides an overview of the FAB performance compared to the capacity target in 2017.

193 With the exception of FABEC and SW FAB, all FABs performed better than the target for 2017 set in their performance plan.

[36] This estimate includes direct costs, the network effect (i.e. the costs of reactionary delays that are generated by primary delays) and the cost of lost passengers to an airline. (These costs represent an estimate of the value an airline places on passenger loyalty in order to avoid the loss of future earnings). The cost of time lost by passengers is partly reflected here."

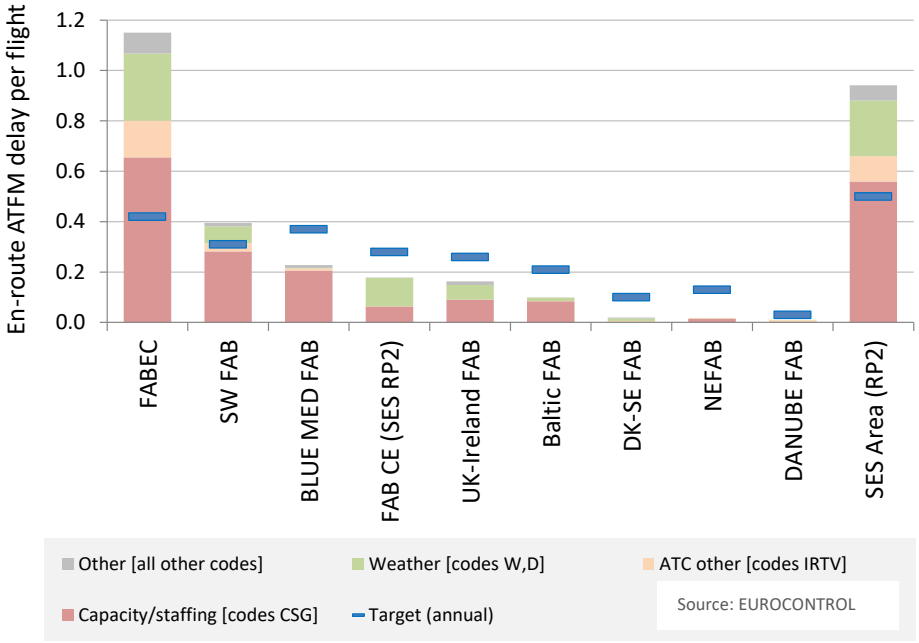


Figure 25: Average ATFM en route delay by FAB vs target in 2017

194 A limited number of ACCs cause most of the delay[37]. The most constraining ACCs in 2017 were Karlsruhe, Maastricht, Marseille, Brest, Bordeaux, Nicosia and Barcelona, which together accounted for almost 70% of en route delays in the SES RP2 area in 2017.

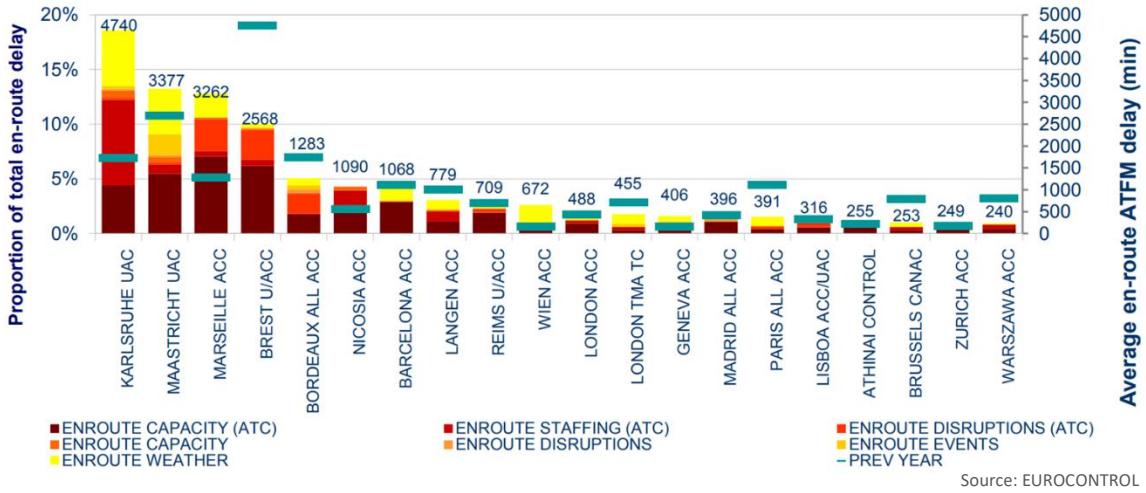


Figure 26: En route delay for the most constrained Area Control Centres in 2017

10.3 *Target setting for RP3 for the Capacity KPA*

System wide cost optimum capacity

195 This system wide economic optimum for capacity, calculated by the NM, is based on the trade-off between the cost of providing additional en route capacity and the cost of en route ATFM delay.

[37] Performance Review Commission, 2018, Performance Review Report.
Network Manager, 2018, Network Operation Report

196 Data and methodology: The simulation has been developed and refined in cooperation with their users over the past 15 years and are commonly accepted at European level. The capacity assessment and planning process is described in more detail in a dedicated publication.[38]

197 The model used for the NM simulation assumes a positive elasticity between capacity and cost. However, the marginal costs of capacity can vary significantly at different times and places due to differences in investments cycles and the efficiency of capacity provision.

198 Rationale and assumptions: In Europe, airspace users bear both the cost of route charges associated with the provision of en route capacity and the cost of ATFM delays due to insufficient en route capacity. A capacity shortfall has a strongly non-linear impact on delays.

199 The underlying rationale for the calculation of a system wide economic optimum is to minimise the total costs to airspace users. The "optimum capacity level" corresponds to the level of capacity at which airspace users incur the lowest total costs (cost of service provision plus the cost of delay). If there is spare capacity or if additional effective capacity can be generated by better matching rosters with demand, the marginal costs are relatively low. However, if new major investments are required (new system, etc.) the marginal cost of capacity will increase significantly.

200 The following parameters influence the level of the system-wide modelled cost optimum capacity:

- Available level of capacity: The current capacity baseline computed by NM is determined for each ACC. For the simulation, the capacity baseline of 2016 or 2017 (whichever one was higher) has been used.
- Traffic evolution: The predicted traffic demand is based on the latest STATFOR traffic forecast which is distributed over the route network. For the simulation, the high growth scenario of the latest STATFOR traffic forecast published in February 2018 and the shortest route scenario has been used.
- Cost of en route capacity : The system-wide modelled cost optimum depends on the unit cost of capacity. The higher the cost of capacity, the higher the system-wide modelled cost optimum delays, as it would cost more to invest in capacity. The underlying capacity costs in the model are based on 2017 data from the CRCO.

  The cost of capacity increases as a function of capacity, which can be characterised at the margin by a given cost elasticity factor[39]. In order to account for differences in marginal costs of capacity and to evaluate the sensitivity of the economic optimum to the aggregate cost elasticity, the following three cost elasticity factors were used for the simulations:

  - Cost elasticity factor of 0.5

[38] Capacity assessment and planning guidance document, EUROCONTROL. Edition 2.8. April 2013
[39] The costs of providing en route capacity are regional parameters which vary according to the cost of living, equipment, working arrangements, etc. If a 10% increase in capacity will cost an additional 5% in costs then the elasticity equals 0.5 or 50%.

  - Cost elasticity factor of 0.3
  - Cost elasticity factor of 0.1

- **Cost of en route ATFM delay:** The system-wide modelled cost optimum depends on the cost of delays. The relationship between capacity provision and delays is of a non-linear nature. For the simulation, en route ATFM delays need to be expressed in monetary terms in order to be able to balance them with the costs for providing additional capacity. The higher the cost of delays, the lower the system-wide modelled cost optimum delays, as it would cost more to have higher levels of delays.

  The cost of delay is frequently used in cost benefit analysis of air traffic management projects which are expected to increase capacity and, as a consequence, reduce the level of delay in the system.

- In order to evaluate the sensitivity of the economic optimum towards delay costs, the following assumptions were used in the simulations:
  - €40 per minute
  - €85 per minute
  - €120 per minute

201 Based on the established capacity baseline, the predicted demand level and the respective cost of capacity and delay, the economic analysis balances the cost of capacity provision and the cost of delay to determine the optimum capacity and optimum delay level (from a total cost point of view) for each ACC. For the estimation of the system-wide optimum, the economic optimisation process continues until a system-wide economic optimum is calculated.

202 **Simulation results:** Table 4 shows the results from NM's simulated scenarios. The simulations only consider capacity related delay and the optimum delay levels shown in the table therefore do not include, for instance, weather related ATFM delays.

203 Depending on the values assumed for elasticity and cost of one minute of delay, the simulation suggests a system-wide optimum en route delay level between 0.08 to 0.16 minute per flight for capacity related ATFM delays. This is far below the 0.5 minutes per flight target for RP2, which includes an allowance for weather and network disruptions.

		Cost elasticity of en route capacity		
		50% variable	30% variable	10% variable
Cost of ATFM delay	40 € / min.	0.16	0.12	0.08
	85 € / min.	0.11	0.09	0.08
	120 € / min.	0.10	0.08	0.08

Table 13: System-wide en route delay optimum (en route ATFM delay per flight)

Capacity planning and delay forecast

204 In addition to calculating the system wide cost optimum capacity, the Network Manager has forecasted the expected performance of the European en-route ATM network for the period 2018-2024. The results indicate the ability of the current capacity plans to meet the required level of performance.

205 **Data and methodology used** by the Network Manager is based on the EUROCONTROL capacity planning process.[40]

206 The outlook is based on the latest capacity plans agreed with all ANSPs during the period November 2017 – January 2018 and published in the latest NOP 2018-2019 to 2020.[41]

207 The traffic evolution is based on the STATFOR February 2018 traffic forecast, base scenario., with different routing scenarios taken into account.

208 Weather delay and network disruptions were accounted for with an allowance of 0.15 minutes per flight and 0.10 minutes per flight, respectively.

209 **Simulation results**: Table 14 shows the en route ATFM delay forecast between 2018 and 2022 based on ANSP's current capacity improvement plans and the assumptions listed above.

210 Although SES performance targets for Capacity have applied since 2014, as in previous years, the ANSPs' capacity plans published in the latest edition of the NOP are inconsistent with the capacity profiles that would be required to meet the FAB reference values and EU-wide target for en route capacity during RP2.

211 This target will likely be missed by a large margin until the end of RP2 as presented in Table 14. This generates additional costs to users, as shown in Table 2.

[40] EUROCONTROL, 2013, Capacity assessment and planning guidance document., Edition 2.8.
[41] EUROCONTROL, April 2018, European Network Operations Plan 2018-2019/22

Year	En route ATFM delay target full year (min/flt)	En route ATFM delay forecast full year (min/flt)
2018	0.5 min/flt	1.05
2019	0.5 min/flt	1.01
2020		0.97
2021		0.82
2022		0.74

Table 14: EU wide en route delay forecast based on NOP 2018

212 According to the latest Network Operations Plan delays are likely to remain above the target at some ACCs in Europe for some years, in most cases, due to inflexible use of staff, shortage of qualified controllers in some areas and unresolved staff management issues, combined with planned reductions in capacity during the training and implementation of major ATM system upgrades and/or airspace structure reorganisations.

213 Capacity issues are not systemic, but delay is forecasted to become problematic in the following 11 ACCs unless they take remedial action.

- Cyprus - Nicosia ACC
- Czech Republic – Prague ACC
- Eurocontrol – Maastricht UAC
- France - Bordeaux ACC
- France - Brest ACC
- France - Reims ACC
- France – Marseille ACC
- Germany – Karlsruhe ACC
- Portugal – Lisbon ACC
- Spain - Barcelona ACC
- Spain - Palma ACC

214 As it takes time and resources to increase capacity (optimised rostering, new airspace design, ATCO recruitment and training, new investment), actions and possibly investments are required to address the issues.

215 Going forward, capacity plans for those ACCs would need to be revised significantly if the same Capacity target was to apply in RP3 as in RP2.

10.4 Target ranges proposed

216 The PRB proposes the following EU-wide capacity target ranges for 2024:

- Upper bound: 0.24 minutes per flight
- Lower bound: 0.50 minutes per flight

	Low bound	High bound
System wide optimum	0.08	0.16
Severe weather	0.08	0.22
Network disruptions	0.08	0.12
Total	**0.24**	**0.50**

Table 15: Proposed target ranges for the Capacity KPI (ATFM delay in minutes per flight)

217 The PRB is taking stakeholders views into account when determining the Capacity KPI target ranges, especially with the current level of ATFM delay performance on Union wide level. The PRB invites comments from stakeholders on the option to increase the intermediate values for the early years of RP3, under the condition that ANSPs use this tolerance to drastically improve capacity provision to better match capacity to demand.

11. *Evidence for Cost efficiency KPA*

218 The evidence available for establishing the RP3 EU-wide targets for cost-efficiency is presented at Union-wide level. Union-wide averages may mask considerable variations between situations in the individual Charging Zones.

219 The historical analysis is based on the RP1 and RP2 en route reporting tables, including revised cost-efficiency targets of Malta, Bulgaria and Poland covering years 2017-2019. The forward-looking analysis is based on the submissions provided by the Member States in late April and early May 2018.

11.1 *Performance for the Cost Efficiency Key Performance Indicator during RP1 and RP2*

a) Assessment of RP 1 and RP 2 performance

220 During RP1, actual traffic was lower than expected (- 4.9% total service units). As a response, States and ANSPs reduced their cost (-5.0% compared to the determined costs of the adopted performance plans) to adapt to the lower traffic.

221 The developments during RP1 have resulted in average en-route actual unit cost of 56.33 €$_{2009}$ at Union-wide level for the period, marginally lower than the average determined unit rate aggregated from the performance plans of 56.40 €$_{2009}$ (-0.1%).

222 During RP2, actual traffic was higher than planned. Actual total service units were 2.0% higher in 2015 and 4.4% higher in 2016, compared to the forecasts in the adopted performance plans. This increase continued in 2017, where actual total service units were 8.0% higher than planned in the adopted performance plans. The adopted EU-wide targets for RP2 used the STATFOR low forecast from September 2013, which has contributed to the gap between the traffic in the performance plans and actual traffic demand.

223 ANSPs lowered their cost during RP2 despite the increased traffic. Compared to the adopted performance plans, *actual determined unit cost* at Union-wide level was significantly lower than the aggregated determined unit cost according to the national performance plans in both 2015 and 2016 (by -4.5% and -6.4%, respectively). The actual results were also below the Union-wide targets in both years (i.e. 6.7% lower in 2015 and 8.2% lower in 2016). This suggests that RP2 was not sufficiently ambitious.

224 *Actual en-route* costs in €$_{2009}$ were 2.5% lower in 2015 and 2.2% lower in 2016 compared to the determined costs of the adopted performance plans, contributing to the economic surpluses of ANSPs with respect to cost sharing (see Table 16 below).

225 A number of states selected the low traffic forecast for RP2 when defining their performance plans. This contributed to the observed discrepancies between the actual

and planned Determined Unit Cost values during RP1 and RP2. This choice impacted the traffic and cost risk sharing results and raises the question whether the starting point for defining the determined cost for RP2 was too high, making it easier for Member States to achieve the targets.

Data as per EC Decision on Union-wide targets for RP2	2015P	2016P	2017P	2018P	2019P
Real en-route costs (EUR2009)	6 147 905 000	6 055 686 000	5 904 294 000	5 756 687 000	5 612 769 000
Total en-route service units	108 541 000	110 196 000	111 436 000	112 884 000	114 305 000
DUC - Real en-route unit costs per service units (EUR2009)	**56.64**	**54.95**	**52.98**	**51.00**	**49.10**

Data from RP2 FAB performance plans	2015P	2016P	2017P	2018P	2019P
Real en-route costs (EUR2009)	6 235 113 277	6 195 878 072	6 164 525 008	6 110 343 143	6 018 185 578
Total en-route service units	112 687 532	115 027 116	117 494 197	120 642 948	122 962 099
DUC - Real en-route unit costs per service units (EUR2009)	**55.33**	**53.86**	**52.47**	**50.65**	**48.94**

Actual data from November 2017 reporting tables	2015A	2016A	2017A	2018A	2019A
Real en-route costs (EUR2009)	6 079 182 146	6 060 071 682			
Total en-route service units	114 994 014	120 135 471			
AUC - Real en-route unit costs per service units (EUR2009)	**52.87**	**50.44**			

Difference between actuals and EC Decision on Union-wide targets		2015	2016	2017	2018	2019
Difference in real en-route costs	(in EUR2009)	- 68 722 854	4 385 682			
	(in %)	-1.1%	0.1%			
Total en-route service units	(in value)	6 453 014	9 939 471			
	(in %)	5.9%	9.0%			
Real en-route unit costs per service units	**(in EUR2009)**	**- 3.8**	**- 4.5**			
	(in %)	**-6.7%**	**-8.2%**			

Difference between actuals and RP1 national performance plans		2015	2016	2017	2018	2019
Difference in real en-route costs	(in EUR2009)	- 155 931 130	- 135 806 390			
	(in %)	-2.5%	-2.2%			
Total en-route service units	(in value)	2 306 482	5 108 355			
	(in %)	2.0%	4.4%			
Real en-route unit costs per service units	**(in EUR2009)**	**- 2.5**	**- 3.4**			
	(in %)	**-4.5%**	**-6.4%**			

Source: EUROCONTROL

Table 16: Actual cost during RP 2 were farther below the Union-wide targets than below the national performance plans.

b) EU-wide actual service units, en route costs and unit cost during RP 2

226 The actual en route unit costs have decreased since 2012, driven by increasing traffic. According to the latest baseline STATFOR forecast (February 2018 issue), the number of total service units is expected to continue to increase by over 4% on average per year until the end of RP2. This means that Actual Unit Costs have decreased to 50.44€$_{2009}$ in 2016 and are expected to decrease further as traffic continues to increase.

Actual data	2009	2010	2011	2012	2013	2014	2015	2016
Real en-route costs (EUR2009)	6 302 059 643	6 117 433 826	6 023 434 500	6 121 684 913	6 020 379 322	6 017 964 074	6 079 182 146	6 060 071 682
% YoY		*-2.9%*	*-1.5%*	*1.6%*	*-1.7%*	*0.0%*	*1.0%*	*-0.3%*
Total en-route service units	99 364 769	101 937 437	106 678 327	105 180 397	106 866 247	111 594 616	114 994 014	120 135 471
% YoY		*2.6%*	*4.7%*	*-1.4%*	*1.6%*	*4.4%*	*3.0%*	*4.5%*
AUC (EUR2009)	**63.42**	**60.01**	**56.46**	**58.20**	**56.34**	**53.93**	**52.87**	**50.44**
% YoY		***-5.4%***	***-5.9%***	***3.1%***	***-3.2%***	***-4.3%***	***-2.0%***	***-4.6%***

Table 17: Actual en-route unit costs will continue to decrease during RP2

Source: EUROCONTROL

227 Actual costs have remained relatively stable since 2009 (in €$_{2009}$). They decreased in 2010 and 2011 resulting from cost-containment measures ANSPs took responding to the pressures from the 2009 economic crisis. The decrease in 2011 also reflects a one-off

reduction in EUROCONTROL costs (-55M€). In a few Member States certain costs increased in 2012 and 2015 due to higher staff costs, inter alia pension costs.[42]

228 Overall, during the seven-year period from 2009 to 2016, the actual real en-route unit costs have decreased by 20.5%, as costs decreased by 3.8% over the period, while the number of total service units has increased by 20.9%. [43]

c) *The effects of the traffic risk sharing mechanism during RP 2*

229 The increase of traffic in RP2 has, and will, generate significant revenues for the States/ANSPs which they have to share with the airspace users two years later. In addition, the revenue will increase the economic surpluses of the ANSPs. Table 18 below shows that higher traffic than planned in 2015-2017 generated 641.1 M€ additional revenues to be reimbursed to users in 2017-2019. It also indicates an estimate of the additional revenues that ANSPs will have to return to users due to higher traffic than planned in 2018 and 2019, if the latest STATFOR February 2018 baseline scenario would materialise. It will amount to 1'034.4 M€ in the first two years of RP3. It also shows the amounts to be charged to airspace users in respect of lower traffic than planned. Under the current regulatory framework, these amounts can be charged two years later or beyond, at the States' choice.

In MEUR (at 2017 average exchange rate)	2015 A	2016 A	2017 A	2015-2017A	*2018 F*	*2019 F*	*2018-2019F*
Number of charging zones with higher traffic than planned in the PP	21	22	27		*28*	*27*	
Additional revenues due to higher traffic than planned in the PP	145.1	321.8	581.9	1 048.8	672.5	790.5	1 463.0
Amounts kept by the ANSPs	68.4	140.2	199.1	407.7	208.7	219.9	428.6
Amounts to be returned to users in N+2	**76.7**	**181.6**	**382.8**	**641.1**	**463.8**	**570.6**	**1 034.4**
In % of the determined costs	1.1%	2.6%	5.4%	3.0%	*6.5%*	*8.0%*	*7.3%*
Number of charging zones with lower traffic than planned in the PP	9	8	3		*2*	*3*	
Loss of revenues due to lower traffic than planned in the PP	- 66.7	- 66.6	- 45.4	- 178.7	- 47.2	- 52.8	- 100.0
Amounts borne by the ANSPs	- 33.0	- 30.0	- 19.7	- 82.8	- 19.5	- 20.8	- 40.3
Amounts to be charged to users in N+2 or beyond	**- 33.7**	**- 36.5**	**- 25.6**	**- 95.9**	**- 27.7**	**- 32.0**	**- 59.6**
In % of the determined costs	-0.5%	-0.5%	-0.4%	-0.5%	*-0.4%*	*-0.4%*	*-0.4%*

Source: EUROCONTROL

Table 18: Amounts to be charged/returned to users due to the difference between planned and actual traffic in RP2

d) *Itemized cost for the provision of en-route services during RP2*

230 En-route actual costs (in €$_{2009}$) have remained nearly unchanged since 2009 (-3.8% over the seven-year period between 2009 and 2016). The large majority of them are incurred by the ANSPs (88% in 2016).

231 Figure 28 below presents the evolution of the actual en-route costs (in actual EUR) for the main cost items of an ANSP. They are based on an index 100 in 2009, as well as the share of the costs per entity for 2016. The exceptional costs (representing -0.2% of the actual costs) and the deduction of costs incurred for services provided to exempted VFR flights (representing -0.3% of the actual costs) are excluded from the figure due to their negligible impact on the trend.

232 Staff costs account for the largest part of en-route costs (around 60%). Staff costs in 2016 are at a similar level as in 2009 (-0.2% lower). Year on year variations reflect the sensitivity

[42] (see also d) below).
[43] Details on the trend at EU-wide level per entity and per nature of costs are presented in item d)

of the staff costs to changes in pension costs. Increases are noted in 2012 and 2015, which correspond to the first years of the reference periods and reflect inter alia increases in pension costs in a few Member States. The issue of pension costs could become more important in the future and should be carefully considered when setting the RP3 targets. The upcoming PRC pension study that will become available in the autumn could be useful during the discussions that will take place in view of the adoption of the RP3 EU-wide targets.

233 The staff costs can be split into two components: ATCO in operation and other staff costs. A clear division for the en-route costs is available from the last two ATM Cost Effectiveness (ACE) Benchmarking Report data, i.e. 2015 and 2016.

234 **Investment costs** represent around 18% of the real en-route actual total costs (12% for depreciation and 6% for the cost of capital).

235 **Depreciation costs** have remained stable over the seven-year period.

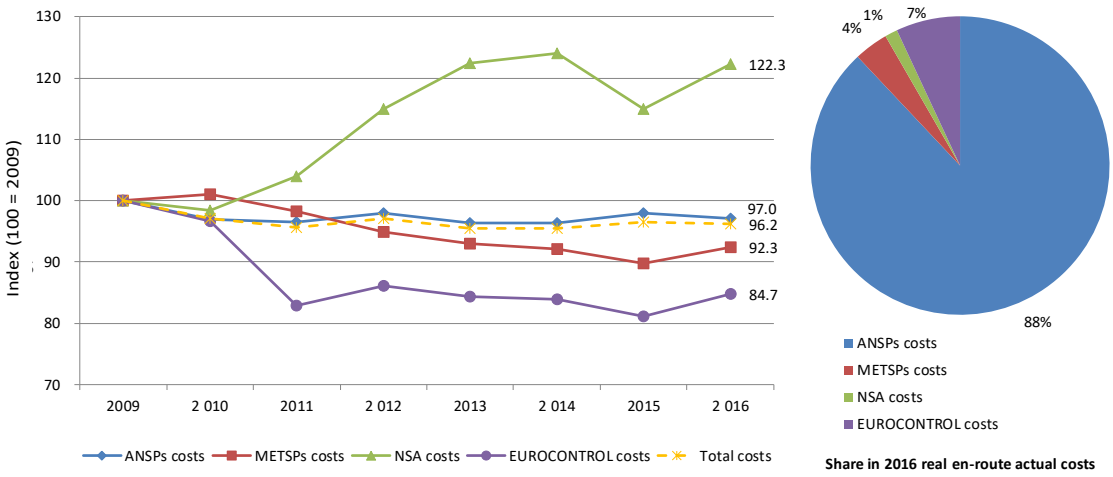
236 The actual **cost of capital** has slightly increased between 2009 and 2016 (+2.9% or +0.4% per year on average). Year on year changes reflect mainly the variations in the net book value of the asset base occurring in the amounts recorded as adjustments and as net current assets, whereas the net book value of fixed assets has continued to decrease year on year. This steady decrease in the net book value of fixed assets could be a sign of underinvestment in equipment, which could be detrimental to current and future quality of service.

237 The **EUROCONTROL costs** as recorded in the actual costs of the States (accounting for 7% of the total costs in 2016) have remained stable overall between 2012 and 2016, after a significant decrease in 2011 due to a one-off effect related to new accounting standards (IFRS - International Financial Reporting Standards).

238 The cost for **meterological services** (METSPs costs) account for 4% and have decreased overall over the period 2009 until 2016 by 7.7%. The MET costs provided by separate entities from the ANSPs and recorded here as METSPs account for around 80% of the total MET costs for the en-route activity, the remaining 20% of MET costs are provided by the ANSPs and recorded in the ANSPs costs.

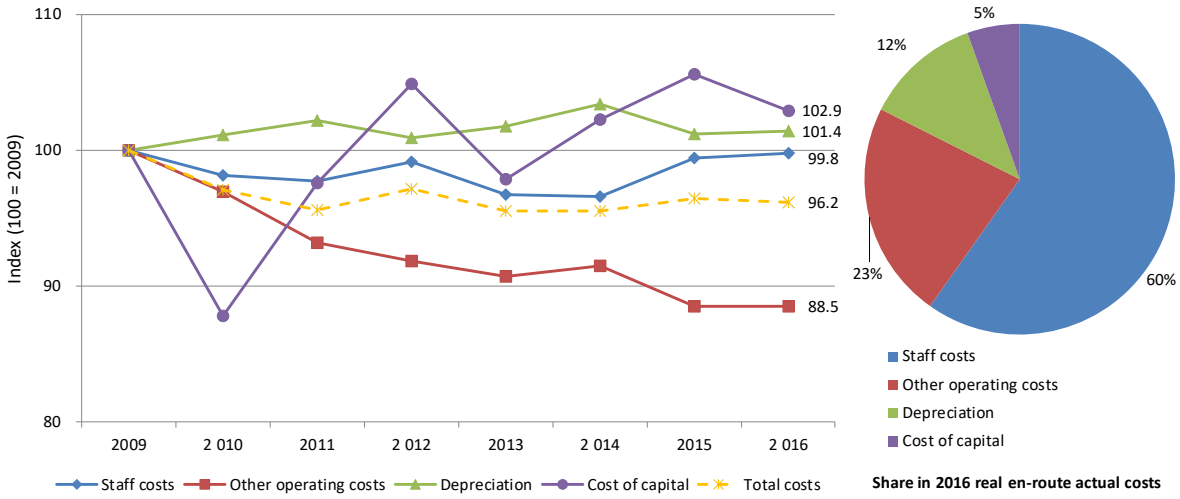
239 The cost for **National Supervisory Authorities** (NSA) account for around 1% of the total en-route costs. They have increased significantly (22.3%) over the seven-year period. The dip observed in 2015 is due to the reimbursement of the German NSA cost-sharing surplus in 2012 and 2013 to users.

240 The analysis shows that actual unit costs (in $€_{2009}$) were stable during the period, both in terms of the share of each entity and in terms of the breakdown of cost nature. Within the staff cost, there was an important shift: ATCO cost increased and other staff cost decreased (see paragraph 9 – Part 1).



Source: EUROCONTROL

Figure 27: Real en-route costs trends (index 2009=100) and shares per entity



Source: EUROCONTROL

Figure 28: Real en-route costs trends (index 2009=100) and shares per cost nature. Cost for ATCOs increased and other staff cost decreased.

e) Differences between determined and actual en-route costs at Union-wide level in RP2 up to and including 2016

241 During RP 2, actual en-route costs were lower than planned by 2.3% for the two first years of RP2 (-291.7 M€$_{2009}$). This gap has reduced from -155.9 M€$_{2009}$ in 2015 to -135.8 M€$_{2009}$ in 2016 (see also Table 16).

242 In RP1, actual en-route costs were lower for each entity type, the ANSPs being the main contributors to this difference (-283.0 M€$_{2009}$). For RP2, this situation occurs in the context of significantly higher actual traffic than the forecast presented in the performance plans (see also see Table 16).

243 As far as costs by nature are concerned, all cost items were also lower than planned (except for the exceptional costs and the deduction of costs for exempted VFR flights, as explained above).

244 Actual en-route **staff costs** are -1.0% (-71.1 M€$_{2009}$) lower than planned. The difference observed in 2016 is small (-15.5 M€$_{2009}$ or -0.4%) and reduced compared to the difference observed for 2015 (-55.6 M€$_{2009}$ or -1.5%).

245 The largest part of the total difference between planned and actual costs is attributed to **other operating costs** (-155.5 M€$_{2009}$ or -5.3%), with similar situations in both first years of RP2 (-75.6 M€$_{2009}$ or -5.2% for 2015 and -79.9 M€$_{2009}$ or -5.5% for 2016).

246 Actual en-route **depreciation** costs are -4.9% lower than planned or -75.2 M€$_{2009}$ for the two-year period. The net book value of fixed assets is also lower than planned (-4.4%).

247 The actual en-route cost of capital is only -0.5% lower than planned for the two first years of RP2, mainly due to the fact that the actual net current assets are significantly higher than planned.

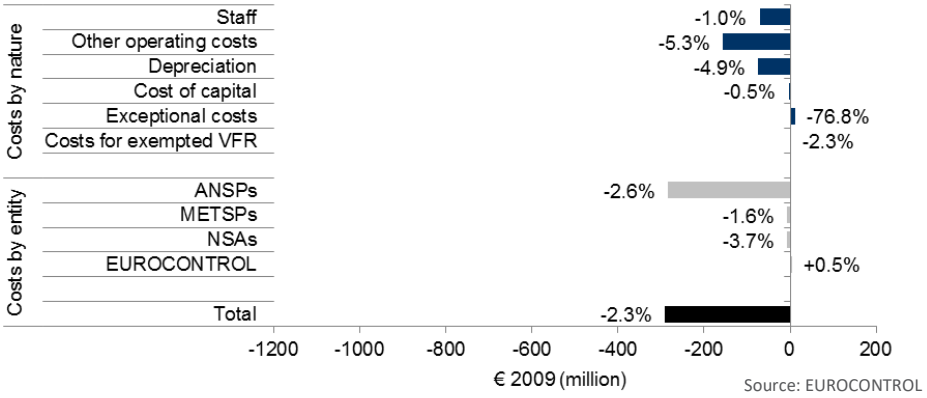


Figure 29: Actual real en-route costs compared to plan – first two year of RP2 (2015-2016)

f) Capital expenditure levels

248 The actual capital expenditure (Capex) for systems and equipment dropped significantly, i.e. by almost 200 M€$_{2015}$ between 2009 and 2010 as a result of the sharp traffic decline in 2009. This actual capex reduced again quite substantially between 2013 and 2014. The planned capex for systems and equipment for 2016 and onwards, as submitted by the Member States in 2014, is almost 1.5 times higher than the actual value of 2015. The jump between 2015 and 2016 gives the impression that the ANSPs tended to delay investment planned in the RP1 to RP2.

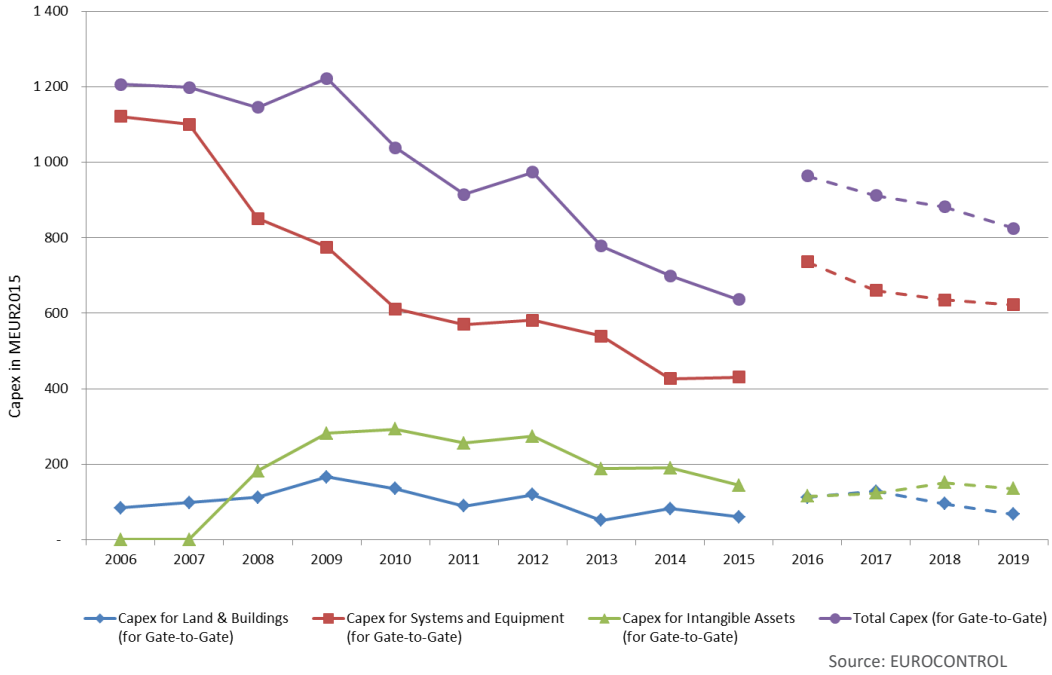


Figure 30: EU-Wide ANSP Gate-to-Gate Capital Expenditure Trends

g) Concept of economic surplus

249 The concept of "estimated economic surplus" is part of the current SES charging scheme. Such surpluses can reach considerable amounts. The "estimated economic surplus" is different from the net accounting profit disclosed by the ANSPs in their financial statements. The "estimated economic surplus" looks at the surplus generated by the en-route activities performed in a particular year and in respect of the charging zones concerned. The net accounting profit includes revenues and costs relating to other activities which are not financed through route charges, as well as revenues and costs pertaining to other years of activity, and is therefore not comparable with the notion of economic surplus. As a consequence, the "overall economic surplus" expressed as a percentage of the en-route revenues is not directly comparable to the profit margin that would be calculated from ANSPs' financial statements.

250 The cost of capital from the adopted performance plans includes an element of "economic surplus" consisting of a "reasonable return on assets"[44], the return on equity (RoE) embedded in the determined cost of capital.

251 The financial incentives of the SES Performance Scheme which are implemented through the SES Charging Scheme impact the charges which ANSPs bill to users and the actual revenues of ANSPs and hence also their actual "economic surplus". The "overall estimated surplus" is calculated from two elements:

- the surplus embedded in the cost of capital; and
- the net gain/loss arising from the en-route activity. This comprises the net gain/loss from the costs-sharing mechanism (i.e. the difference between the actual

[44] Regulation (EU) No. 550/2004, Article 15.3 (d).

and determined costs to which the following items are added: the inflation adjustment, the cost exempt from cost-sharin the loss/gain arising from the traffic risk-sharing mechanism and any gain/loss for capacity and environment incentive mechanisms.

252 The "estimated economic surplus" is a useful tool to monitor the financial strength of the ANSPs, so as to identify when corrective measures are needed to maintain their financial strength. It is also important to take account of the economic surplus generated in previous reference periods when setting the targets for the next reference period.

h) "Overall economic surplus" for the main ANSPs in the SES area in the en-route activity over RP1

253 During RP1, the economic surplus developed as follows:

- For RP1 en route activity, the economic surplus amounted to 436.5 M€$_{2009}$. The result indicates that in RP1, at Union-wide level, ANSPs were able to reduce their actual costs to the lower traffic (see also Table 16). They retained the cost savings amounting to 814.9 M€$_{2009}$. This amount was higher than the loss of revenue they incurred as a result of the traffic-risk sharing mechanism (amounting to -406.6 M€$_{2009}$). In addition, the ANSPs generated a net gain with the incentive schemes for capacity and environment (28.1 M€$_{2009}$).
- This net gain in RP1 plus the surplus in the cost of capital enabled ANSPs, at Union-wide level, to increase their aggregated surplus to reach 1'179.7 M€$_{2009}$ for RP1 (representing 7.6% of the revenues for the period) compared to an estimated planned surplus of 673.6 M€$_{2009}$ (or 4.2% of the planned revenue for the period).

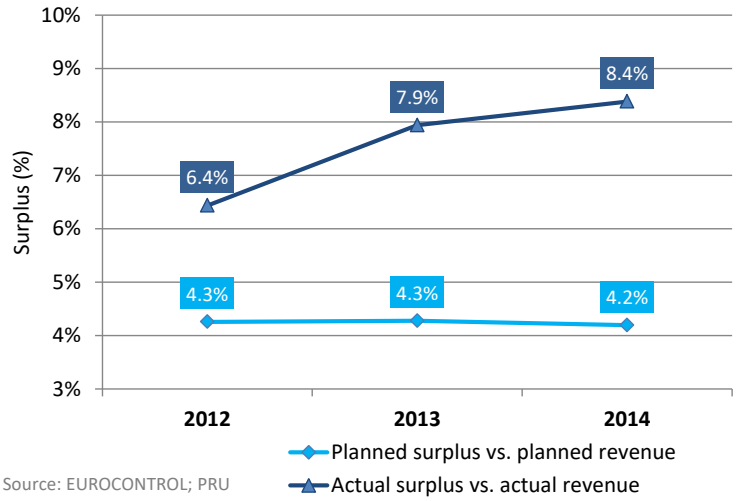
Estimated planned economic surplus (RP1 performance plans)	2012P	2013P	2014P	RP1 overall
Estimated surplus embedded in the cost of capital ('000EUR2009)	**223 650**	**227 419**	**222 517**	**673 586**
Estimated surplus in percent of en-route revenue/costs	**4.3%**	**4.3%**	**4.2%**	**4.2%**

Estimated actual economic surplus (RP1 reporting tables)	2012A	2013A	2014A	RP1 overall
Estimated surplus embedded in the cost of capital ('000EUR2009)	245 580	246 369	251 273	743 222
Estimated net gain/loss on en-route activity ('000EUR2009)	87 832	165 039	183 593	436 464
Overall estimated surplus ('000 EUR2009)	**333 412**	**411 408**	**434 866**	**1 179 686**
Estimated surplus in percent of en-route revenue/costs	**6.4%**	**7.9%**	**8.4%**	**7.6%**

Components of estimated net gain/loss on en-route activity	2012A	2013A	2014A	RP1 overall
Gain(+)/loss(-) in respect of cost-sharing ('000EUR2009)	201 938	304 900	308 092	814 930
Gain(+)/loss(-) in respect of traffic risk-sharing ('000EUR2009)	- 127 377	- 144 017	- 135 171	- 406 564
Gain(+)/loss(-) in respect of incentive scheme ('000EUR2009)	13 271	4 156	10 672	28 099
Estimated net gain(+)/loss(-) on en-route activity ('000EUR2009)	**87 832**	**165 039**	**183 593**	**436 464**

Source: EUROCONTROL

Table 19: RP1 estimated overall economic surplus for the 28 main ANSPs (2012-2014



Source: EUROCONTROL; PRU

Figure 31: RP1 estimated overall economic surplus vs. revenues for en-route

i) "Overall economic surplus" for the main ANSPs in the SES area in the en-route activity over RP2, up to and including 2016

254 During the first two years of RP2, the economic surplus developed as follows:

- For RP2 en route activity, the economic surplus of ANSPs continued to grow. It amounted to 445.0 M€$_{2009}$ (Union-wide level) in total for the first two years of RP2. This indicates that, at Union-wide level, ANSPs reduced their actual costs compared to their plans, whilst managing higher traffic than planned (see Table 16). The difference in costs that they retain (302.9 M€$_{2009}$), is added to the additional revenue generated by the traffic-risk sharing mechanism due to higher traffic than planned (129.2 M€$_{2009}$). In addition, the ANSPs reported an aggregated net gain with the incentive schemes for capacity and environment (12.9 M€$_{2009}$).
- This net gain generated by the financial incentives applied in the two first years of RP2 plus the surplus in the cost of capital enabled the main ANSPs, at Union-wide level, to increase their aggregated surplus to 964.4 M€$_{2009}$ (representing 9.0% of the revenues for the two-year period) compared to an estimated planned surplus of 491.3 M€$_{2009}$ (or 4.7% of the planned revenue for the period).

Estimated planned economic surplus (RP2 performance plans)	2015P	2016P	2017P	2018P	2019P	2 years of RP2
Estimated surplus embedded in the cost of capital ('000EUR2009)	**244 534**	**246 767**	**258 799**	**257 453**	**238 131**	**491 300**
Estimated surplus in percent of en-route revenue/costs	**4.6%**	**4.7%**	**4.9%**	**5.0%**	**4.7%**	**4.7%**

Estimated actual economic surplus (RP2 reporting tables)	2015A	2016A	2017A	2018A	2019A	2 years of RP2
Estimated surplus embedded in the cost of capital ('000EUR2009)	260 890	258 494				519 384
Estimated net gain/loss on en-route activity ('000EUR2009)	206 561	238 470				445 031
Overall estimated surplus ('000 EUR2009)	**467 451**	**496 963**				**964 415**
Estimated surplus in percent of en-route revenue/costs	**8.7%**	**9.3%**				**9.0%**

Components of estimated net gain/loss on en-route activity	2015A	2016A	2017A	2018A	2019A	2 years of RP2
Gain(+)/loss(-) in respect of cost-sharing ('000EUR2009)	165 186	137 698				302 884
Gain(+)/loss(-) in respect of traffic risk-sharing ('000EUR2009)	31 689	97 558				129 247
Gain(+)/loss(-) in respect of incentive scheme ('000EUR2009)	9 686	3 215				12 901
Estimated net gain(+)/loss(-) on en-route activity ('000EUR2009)	**206 561**	**238 470**				**445 031**

Source: EUROCONTROL

Table 20: RP2 estimated overall economic surplus for the 29 main ANSPs (2015-2019)

255 For the remaining three years of RP2, the planned surplus embedded in the cost of capital amounts to 754.4 M€$_{2009}$, representing 4.9% of the planned revenue for the three-year period. In view of the actual 2017 traffic and the latest traffic forecast for 2018 and 2019, it is expected that net gains will – like in RP 1 - lead to significantly higher overall surpluses than planned.

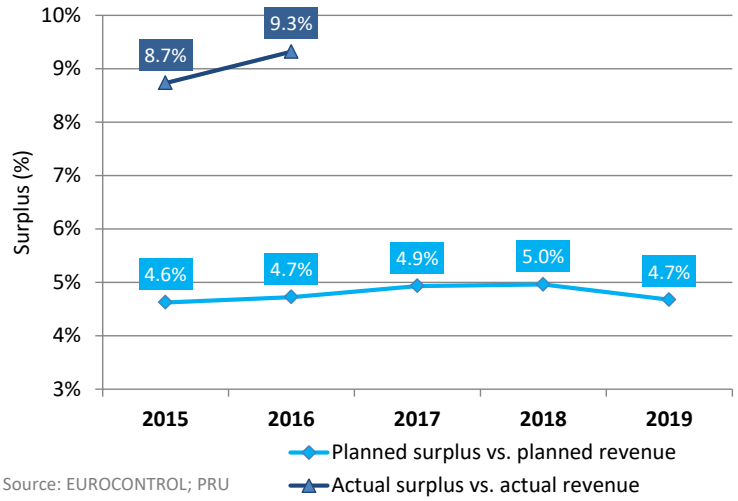


Figure 32: RP2 estimated overall economic surplus vs. revenues for en-route

11.2 Academic study supporting target setting for cost efficiency

a) Mandate of the study

256 Commission Implementing Decision (EU) 2016/2296 requires the PRB to ensure that its methodology reflects the latest scientific standards. Therefore, the PRB commissioned an academic study to assess the potential for cost reduction in the provision of air navigation services to complement the existing data and analysis. This analysis has been used to support the development of the target ranges for RP3.

257 The mandate of the study was the following: "to provide a report and a model to the PRB with meaningful and scientifically robust EU-wide targets on cost efficiency."

258 In May 2018, the PRB received the study from the Academic Group (Annex 2).

b) Methodology of the study

259 The Academic Group based its analysis on economic benchmarking to identify the potential for cost reduction of air navigation services in Europe. The performance of air navigation service providers was compared to their peers. In order to identify potential cost reductions, two different analyses were performed. The first method considered is the data envelopment analysis (DEA) method while the second method is the stochastic frontier analysis (SFA). The aim of the economic benchmarking is to compare the different air navigation service providers on the costs related to their operation. The data for the study was provided by EUROCONTROL.

260 Conducting the benchmarking, the Academic Group considered the following factors:

- ANSP output involves the 'safe separation of flights'. The Network Manager estimates the total IFR flight hours controlled according to the entry and exit times of an aircraft through the specific airspace.
- The terminal output is measured in IFR flight movements.
- Variables in general refer to the environment in which the ANSP must work but over which the management has little to no control.
- To capture the workload provided by ANSPs, the complexity of the flight paths being handled was considered. The Academic Group used the complexity defined in the EUROCONTROL ATM Cost Effective Benchmarking reports (traffic density, potential interactions between climbing, cruising and descending aircraft, flow structure, traffic mix).[45]

261 The analysis showed that the maximum number of sectors was a key variable, with costs increasing with the maximum number of sectors required.

262 Variability also creates substantial additional costs. This suggests that ANSPs handling the same number of controlled hours as another but with a substantial peak in demand over a month or more will require more resources than an ANSP with more constant yet equivalent demand over the year.

263 Complexity impacts the costs of an ANSP in two different ways. First, complexity increases workload above the hours controlled, i.e. creates more work than estimated directly. On the other hand, the management of ANSPs with higher complexity appear to generate more efficient operations.

264 The academic group has analyzed en-route and terminal activities separately. En-route provision has remained a monopolistic service provided by a single ANSP in each Member State, whereas there is certain competition to provide terminal services in Sweden, Germany, the UK and Spain.

c) Conclusions of the Academic Group

265 The suggested savings are based on the potential cost reductions for the three years from 2014 to 2016, and are computed as follows, combining the potential savings obtained by the two models applied by the Academic Group.

266 Terminal charges: Almost no cost reductions have been achieved in terminal air traffic control provision within the performance scheme. The results suggest that there is a potential of approximately 40% reduction in the cost of terminal provision, given the current market organization. The estimated annual, system total, potential savings for terminal provision vary from 290 M€ (minimum potential) equivalent to around 18% of the 2016 terminal provision costs to 515 M€ (maximum potential) equivalent to 33% savings.

267 En-route charges: The results suggest that there is the potential to reduce the costs for en-route service provision of approximately 25%-30%, saving up to an estimated maximum of 1 700 M€ (maximum potential) in 2016. The study identified differences

[45] Performance Review Commission, 2017, ATM Cost Effectiveness Benchmarking Report with 2016-2020 outlook

across ANSPs and concluded that local cost efficiency targets should be considered for RP3, rather than a one-size-fits-all approach.

d) Additional remarks of the Academic Group to its conclusions

268 The Academic Group noted large heterogeneity in the data received from Member States suggesting accounting practices should be further harmonised to define the cost categories and to agree criteria for how to distinguish between en-route and terminal activities.

11.3 Forecast data submitted by Members States

a) Data submitted by states

269 According to the current Charging Regulation (EU) 391/2013, States shall submit their forecast costs and traffic figures 19 months before RP3 (i.e. 1 June 2018) in order to facilitate the establishment by the Commission of Union-wide performance targets. Based on the experience in RP2 and following requests by the States, the European Commission and PRB requested for the data to be submitted by 30th April 2018.

270 The following analysis is based on the States' forecasts that were submitted by 17th May 2018. At that stage, 25 out of the 30 charging zones (RP2 SES area) had submitted their data, accounting for 90.4% of the actual real en-route costs and 88.1% of the actual Total Service Units in 2016. The data from Belgium/Luxembourg, Croatia, Hungary, Austria and Ireland was not provided.

271 States strongly caveat their preliminary forecasts and indicate that the final forecasts for RP3 may vary significantly. In some instances, the data provided was lacking key elements to enable a complete consolidation at system level.[46.]

272 In the following text:

- Section b): focuses on the results of the aggregation of the en-route data provided for the 25 charging zones.
- Section c): provides an extrapolation of these data at EU-wide level for all (30) charging zones forming the RP2 SES area and summarises the key points to be considered for RP3 target setting.

b) Trends of the preliminary RP3 forecasts provided for the 25 en-route charging zones for en-route costs, service units and unit costs over 2016 until 2024

273 This section presents the trend in the forecast real en-route unit costs since 2016 (last year for which actual cost data is available at the time of writing this report) and until the end of RP3. The data is aggregated in €$_{2009}$ for the 24 States having provided their data (25 charging zones).

[46] To develop the analysis assumptions were made to enable the data provided to be used to inform the target setting process. These assumptions are defined in Annex 1.

274 The aggregated data for the 24 States is provided in Table 21 below, while Figure 33 shows the evolution of the forecast real en-route costs, Total Service Units and Determined en-route Unit Cost (DUC) based on an index 100 in 2016.

275 Traffic forecast:

- For RP 3, states presented a forecast traffic growth in terms of Total Service Units which is below the STATFOR February 2018 baseline forecast (-2.0% lower than STATFOR baseline forecast by 2024). The majority of States have reported STATFOR baseline forecast (for 14 charging zones, in addition to France for which the baseline forecast was taken as an assumption[47]), two charging zones have reported the STATFOR low forecast and the remaining eight charging zones have chosen their own forecasts, which are in most cases lower than the STATFOR baseline forecast.
- For the remaining years of RP2 (2017-2019), states forecasted traffic growth showing a greater difference with the STATFOR February 2018 baseline scenario, because a number of States have reported the determined values from the performance plans which are based on a low scenario (as their initial plans for RP2) and have not revised these forecasts.

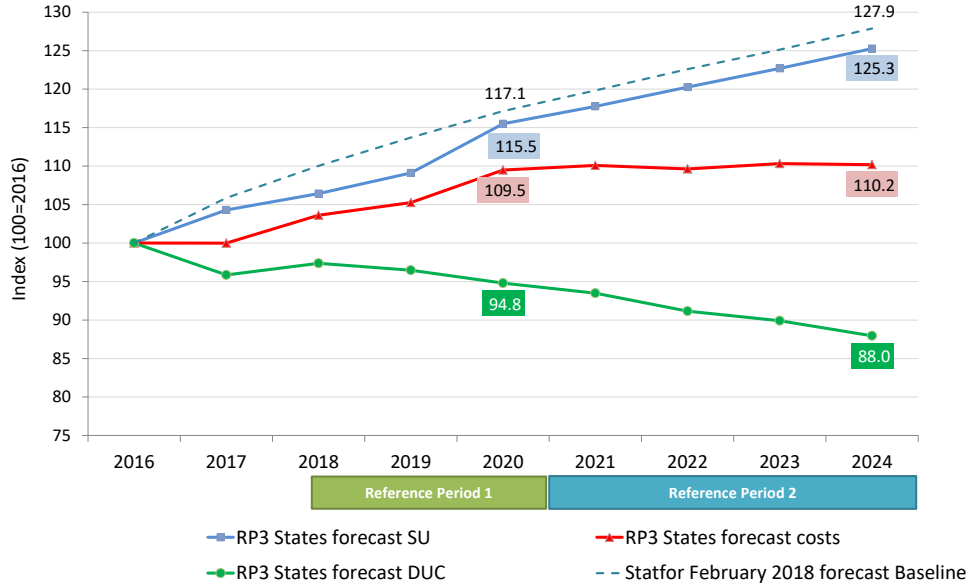
276 Cost forecast:

- Costs reported for the three remaining years of RP2 include a mix of determined and revised forecast data. This, and the limited qualitative information supporting the data for this period, raises questions on the validity of the forecast data covering years 2017 to 2020 and on the reliability of the increases in costs reported for this period.
- States forecast that real en-route costs will increase by +9.5% between 2016 and 2020 and will remain stable for the remainder of RP3 (+0.6% between 2020 and 2024), resulting in a 10.2% increase between 2016 and 2024.
- Total Service Units are forecast to increase by +25.3% (or +2.9% per year on average). Therefore, the Determined Unit Cost (DUC) based on the 24 States' inputs shows a decrease by -12.0% from 2016 to 2024 (or by -1.6% per year on average).
- Although some of the States' submissions provide information on SESAR deployment costs and benefits expected for RP3, it is not clear to what extent these have been reflected in the overall States' forecasts.

Aggregated RP3 forecasts	2016 A	2017 F	2018 F	2019 F	2020 F	2021 F	2022 F	2023 F	2024 F	2016-2024 overall	2016-2024 CAGR
Real en-route costs (EUR2009)	5 479 572 254	5 478 750 170	5 678 015 332	5 767 786 795	5 999 870 528	6 032 638 850	6 006 961 619	6 045 368 277	6 037 391 592	10.2%	1.2%
% YoY		*0.0%*	*3.6%*	*1.6%*	*4.0%*	*0.5%*	*-0.4%*	*0.6%*	*-0.1%*		
Total en-route service units	105 839 814	110 396 148	112 636 441	115 481 585	122 245 532	124 637 451	127 290 160	129 866 555	132 584 401	25.3%	2.9%
% YoY		*4.3%*	*2.0%*	*2.5%*	*5.9%*	*2.0%*	*2.1%*	*2.0%*	*2.1%*		
DUC (EUR2009)	**51.77**	**49.63**	**50.41**	**49.95**	**49.08**	**48.40**	**47.19**	**46.55**	**45.54**	**-12.0%**	**-1.6%**
% YoY		***-21.8%***	***-10.7%***	***-3.5%***	***-1.7%***	***-1.4%***	***-2.5%***	***-1.4%***	***-2.2%***		

Table 21: Forecast real en-route unit costs – 25 charging zones

[47] The submission from France did not disclose which traffic forecast was being assumed.



Source: EUROCONTROL; PRU

Figure 33: Forecast en-route cost-efficiency DUC trends 2016-2024 (index 2016=100) – 25 charging zones

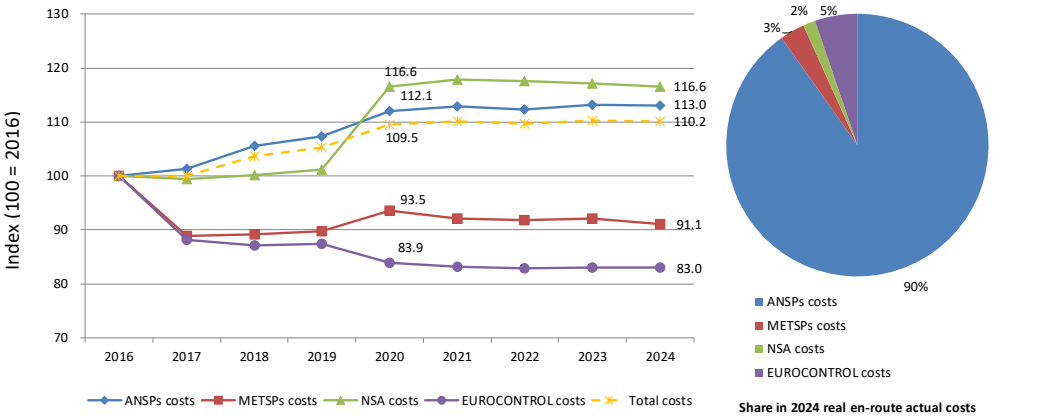
c) Forecast evolution of the total real en-route costs per entity type and cost nature 2016-2024

277 This section presents the structure of the forecast real en-route costs in €$_{2009}$ reported by the 24 States, per entity type and per cost nature, as well as their evolutions over the period 2016-2024.

278 Figure 34 below presents the evolution of the actual en-route costs per entity type based on an index 100 in 2016, as well as the shares of the costs in the total forecasted for 2024. Table 14 shows the differences in costs per entity type for 2016-2020, 2020-2024 and 2016-2024. They show that:

- ANSPs costs are forecast to remain stable overall within RP3 (+0.8% between 2020 and 2024), after an increase of +12.1% between 2016 and 2020. At aggregated level, the 2020 ANSPs costs' are higher by +581.7 M€$_{2009}$ compared to 2016 actual costs. ANSPs' costs increases that have the largest impact between 2016 and 2020 are:
  i. DFS (Germany): +106.2 M€$_{2009}$ (+15.1%), mainly driven by the end of the DFS Corporate Action (support from the German government) that was reducing costs during RP2 (-82.0 M€$_{2009}$ in 2016) and which is no longer available in RP3;
  ii. PANSA (Poland): +60.7 M€$_{2009}$ (+50.8%), mainly in staff and investment costs;
  iii. ROMATSA (Romania): +59.1 M€$_{2009}$ (+44.0%), mainly in staff costs;
  iv. NATS (United Kingdom): +56.4 M€$_{2009}$ (+10.1%) in operating costs;
  v. DSNA (France): +45.8 M€$_{2009}$ (+4.5%) mainly in staff costs and depreciation.
  vi. NAV (Portugal): +37.3 M€$_{2009}$ (+43.3%): principally in staff costs;
  vii. BULATSA (Bulgaria): +28.1 M€$_{2009}$ (+34.3%) mainly in staff costs and depreciation.

- The EUROCONTROL costs as recorded in the forecast of the States (accounting for 7% of the total costs in 2016 and 5% in the 2024 forecast) are also predicted to remain stable overall between 2020 and 2024 (-1.1% over the period), after a significant decrease of -16.1% between 2016 and 2020 mainly due to the decision of the German Ministry of Transport to finance the German contribution to Part I of the EUROCONTROL budget through the federal budget from 2017 onwards.
- The cost of the Meteorological Service Providers (METSPs) (accounting for 4% in 2016 and 3% in the 2024 forecast), show a planned decrease of 2.6% within RP3, after a decrease of -6.5% between 2016 and 2020, mainly as a result of a significant decrease in Germany in 2017.
- The cost for the National Supervisor Authorities (NSA) (around 1.5% of the total en-route costs) show a significant increase over the period 2016-2020 (+16.6% over the four-year period) and are foreseen to remain stable within RP3 (+0.1% over the four-year period between 2020 and 2024).



Source: EUROCONTROL

Figure 34: Forecast real en-route costs trends (index 2016=100) and shares per entity – 25 charging zones

Entity type	2016-2020		2020-2024		2016-2024	
	In MEUR2009	In %	In MEUR2009	In %	In MEUR2009	In %
ANSPs	581.7	12.1%	45.9	0.8%	627.6	13.0%
METSPs	-13.1	-6.5%	-5.0	-2.6%	-18.1	-8.9%
NSAs	13.0	16.6%	0.0	0.1%	13.1	16.6%
EUROCONTROL	-61.4	-16.1%	-3.4	-1.1%	-64.8	-17.0%
Total	**520.3**	**9.5%**	**37.5**	**0.6%**	**557.8**	**10.2%**

Source: EUROCONTROL

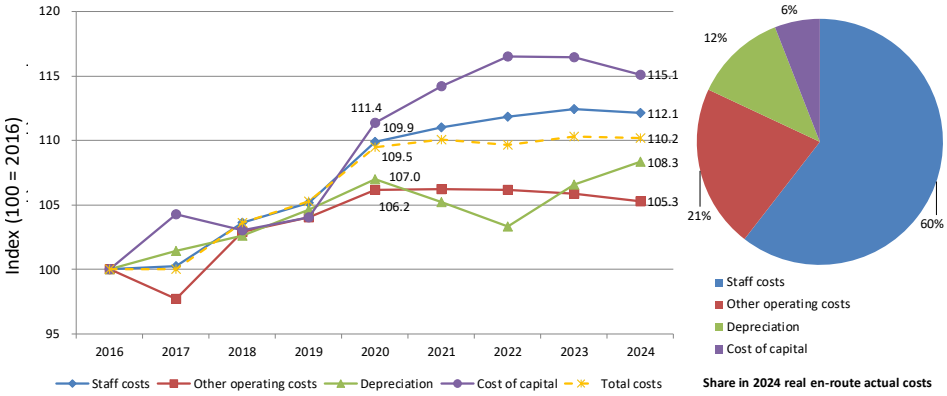
Table 22: Differences in real en-route costs per entity type – 25 charging zones

d) Forecasted cost for RP3 by item

63 The forecast data submitted by Member States indicate the following developments to be expected during RP 3 (Figure 35 and Table 23):

- **Staff costs** account for the largest part of real en-route costs (60% in the 2024 forecast). The forecast staff costs at the beginning of RP3 (2020) are +9.9% higher than the actual 2016 staff costs (a difference of +323.7 M€$_{2009}$). Within RP3, they are forecast to increase by 2.1% (between 2020 and 2024).

- Other operating costs are the second largest component (accounting for 21% in the 2024 forecast). In 2020, they are forecast to be 6.2% higher than the actuals in 2016 (+76.7 M€$_{2009}$). The forecasts present a slight decrease by 0.8% between 2020 and 2024. The dip in 2017 is due a decrease in the EUROCONTROL costs included in the German cost-base.
- Investment costs represent around 18% of the en-route actual total costs (12% for depreciation and 6% for the cost of capital).
- Depreciation costs for 2020 are 7.0% higher than the 2016 actuals (47.5 M€$_{2009}$). Within RP3, they are foreseen to increase by 1.2%. The decreases observed in 2021 and 2022 are driven by the values within the United Kingdom's submission.
- Cost of capital for 2020 is 11.4% higher than the 2016 actual. Within RP3, it is foreseen to increase by 3.3%, mainly as a result of forecast increases in the asset bases of the ANSPs in France, Poland and Bulgaria. It should be noted that rate of Return on Equity (RoE) reported for the main ANSPs are generally lower than in RP2, except for six ANSPs. The main increases in forecast RoE are observed in PANSA (to 11.5%) and ENAV (to 9.0%).
- Exceptional items include a mix of positive and negative amounts. Their significant increase between 2016 and 2020 is mainly due to the DFS Corporate Action applicable in RP2 and not in RP3 and recorded as negative exceptional item in RP2. In this respect, it should be pointed out that, in a number of cases, RP2 determined and actual costs are presented net of subsidies, whereas the SES regulations foresee that these would not be reflected in the cost-bases but should be deducted as other revenue for the calculation of the unit rate charged to airspace users. This should be corrected for RP3 and the impact of such correction on the historical data should be assessed in view of setting the EU-wide and local targets for RP3. These subsidies include both Union assistance programmes and national public funding.
- The deduction of costs for services provided to exempted VFR flights have not been reported for four of the charging zones which historically deduct these costs from their cost-bases. The deductions for these four charging zones represented 2.7 M€$_{2009}$ in 2016. Hence the annual aggregated forecast costs should be lower than reported by an amount of similar magnitude.



Source: EUROCONTROL

Figure 35: Forecast real en-route costs trends (index 2016=100) and shares per cost nature – 25 charging zones

Cost nature	2016-2020		2020-2024		2016-2024	
	In MEUR2009	In %	In MEUR2009	In %	In MEUR2009	In %
Staff	323.7	9.9%	74.4	2.1%	398.1	12.1%
Other operating	76.7	6.2%	-11.1	-0.8%	65.7	5.3%
Depreciation	47.5	7.0%	9.1	1.2%	56.6	8.3%
Cost of capital	35.7	11.4%	11.7	3.3%	47.4	15.1%
Exceptional items	33.9		-47.2		-13.3	
Deduction for VFR	2.8	-16.2%	0.6	-4.4%	3.4	-19.8%
Total	**520.2**	**9.5%**	**-6.2**	**-0.1%**	**557.8**	**10.2%**

Source: EUROCONTROL

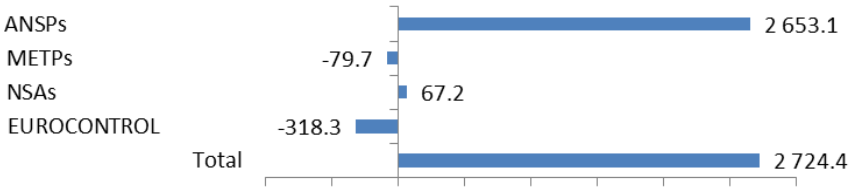
Table 23: Differences in real en-route costs per cost nature – 25 charging zones

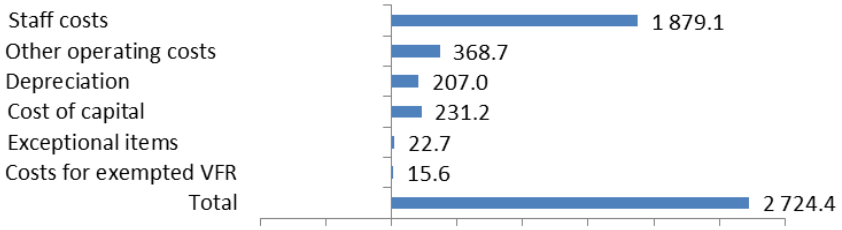
e) RP3 additional costs compared to 2016 actuals

279 This section looks at the cumulated additional en-route costs forecast by the States for RP3 compared to 2016, so as to identify the main drivers for the forecasted increases in costs in RP3. It presents the results by entity type, by cost nature and by charging zone.

280 The cumulated additional en-route costs forecast by the States for RP3 compared to the 2016 actual costs represent 2 724.4 M€$_{2009}$ if RP3 is five years.

281 Figure 36 below shows that this increase is almost entirely attributable to the ANSPs and primarily in staff costs.



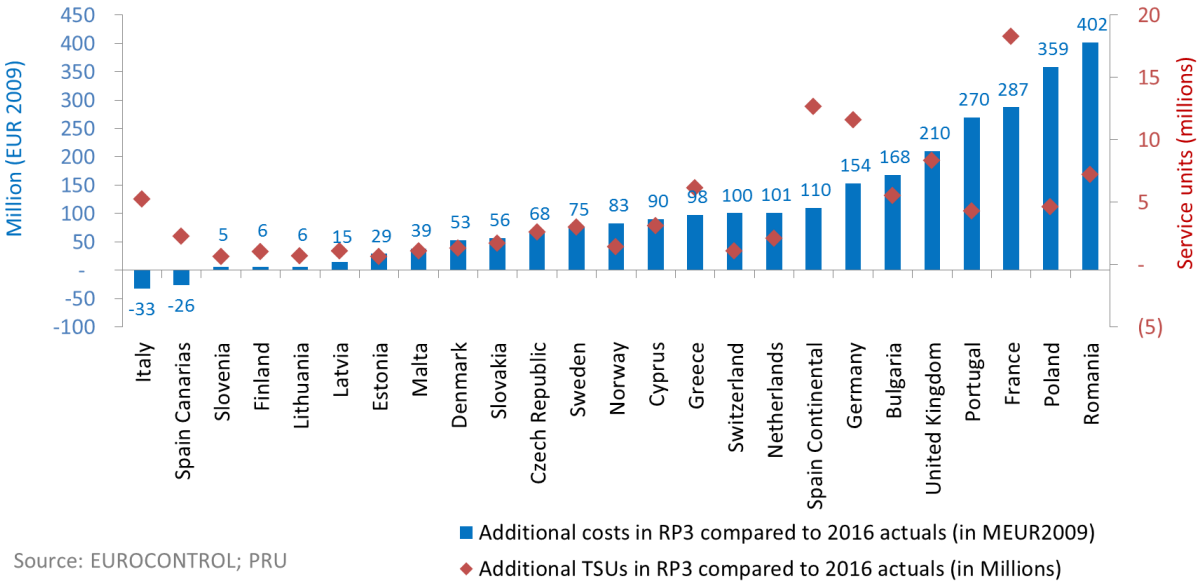


Source: EUROCONTROL

Figure 36: Cumulated additional en-route costs for RP3 vs. 2016 actuals by entity type and cost nature – 25 ch.zones

282 Figure 37 and Table 24 below show the results per en-route charging zone and show that:

- The charging zones which forecast the largest amounts of cumulated additional costs in RP3 compared to the actual data of 2016 are Romania, Poland, France, Portugal, the United Kingdom, Bulgaria and Germany. For France, Germany and the United Kingdom, these additional costs correspond to a large number of additional service units compared to 2016 and will lead to a decrease in the forecast RP3 Determined Unit Costs compared to the actual unit cost for 2016. For Romania, Poland, Portugal and Bulgaria, the opposite is true and the additional costs will lead to an increase in the forecast RP3 Determined Unit Costs compared to the actual unit cost 2016.
- Two charging zones forecast lower costs in RP3 than in 2016: Italy and Spain Canarias. For Spain, RP3 presents additional costs for the two Spanish charging zones combined.



Source: EUROCONTROL; PRU

Figure 37: Cumulated additional en-route costs for RP3 vs. 2016 actuals by charging zone – 25 charging zones

En-route charging zone	2020				2021				2022				2023				2024			
	Add. real en-route costs		Add.en-route TSUs		Add. real en-route costs		Add.en-route TSUs		Add. real en-route costs		Add.en-route TSUs		Add. real en-route costs		Add.en-route TSUs		Add. real en-route costs		Add.en-route TSUs	
	MEUR2009	in%	States forecast	STATFOR base	MEUR2009	in%	States forecast	STATFOR base	MEUR2009	in%	States forecast	STATFOR base	MEUR2009	in%	States forecast	STATFOR base	MEUR2009	in%	States forecast	STATFOR base
Romania	59.1	41.1%	23.0%	23.0%	69.3	48.2%	27.6%	27.6%	80.0	55.7%	32.4%	32.4%	90.9	63.2%	37.0%	37.0%	102.8	71.5%	41.9%	41.9%
Poland	62.8	46.2%	16.2%	16.2%	66.3	48.8%	19.4%	19.4%	73.1	53.8%	22.5%	22.5%	77.8	57.2%	25.1%	25.1%	78.6	57.8%	27.7%	27.7%
France	44.0	3.8%	14.2%	14.2%	54.2	4.7%	16.4%	16.4%	52.9	4.6%	18.5%	18.5%	62.3	5.4%	20.4%	20.4%	74.0	6.4%	22.3%	22.3%
Portugal	38.2	37.1%	19.8%	19.8%	50.2	48.7%	22.2%	22.2%	54.3	52.7%	24.5%	24.5%	60.5	58.8%	26.6%	26.6%	66.2	64.3%	29.0%	29.0%
United Kingdom	58.5	9.1%	11.4%	15.9%	39.8	6.2%	12.7%	17.8%	42.0	6.5%	15.2%	19.7%	44.0	6.8%	17.5%	21.6%	25.3	3.9%	19.7%	23.7%
Bulgaria	29.6	34.0%	23.5%	23.4%	30.9	35.5%	26.8%	26.8%	33.8	38.8%	30.2%	30.2%	36.8	42.3%	33.6%	33.5%	36.5	41.9%	37.2%	37.2%
Germany	55.0	6.2%	14.0%	15.8%	55.7	6.3%	15.6%	18.0%	17.3	2.0%	17.4%	20.5%	14.3	1.6%	18.6%	22.4%	11.3	1.3%	20.0%	24.6%
Spain Continental	26.1	4.8%	31.0%	37.0%	28.3	5.2%	35.7%	44.5%	20.7	3.8%	40.5%	52.0%	18.5	3.4%	45.3%	59.8%	16.6	3.0%	50.3%	68.2%
Netherlands	16.0	9.4%	11.0%	11.0%	17.6	10.3%	12.0%	12.0%	20.7	12.1%	13.5%	13.5%	22.8	13.4%	14.8%	14.8%	23.9	14.0%	16.3%	16.3%
Switzerland	18.4	19.1%	12.2%	16.4%	19.0	19.7%	13.1%	18.2%	19.4	20.2%	14.2%	20.1%	21.3	22.1%	15.1%	21.7%	22.5	23.4%	16.2%	23.6%
Greece	26.0	19.5%	21.9%	28.5%	22.6	16.9%	23.9%	32.7%	19.8	14.8%	26.2%	37.0%	16.5	12.4%	28.4%	41.4%	12.5	9.4%	30.9%	46.1%
Cyprus	13.9	29.7%	19.1%	22.1%	16.4	35.0%	25.5%	27.4%	18.8	40.0%	32.1%	32.8%	19.8	42.2%	38.9%	38.4%	21.2	45.2%	45.9%	44.3%
Norway	9.7	10.3%	8.7%	8.7%	15.6	16.7%	9.8%	9.8%	17.6	18.8%	11.3%	11.3%	21.4	22.8%	12.9%	13.0%	18.6	19.8%	14.8%	14.8%
Sweden	15.3	8.2%	13.7%	13.7%	13.1	7.0%	15.6%	15.6%	12.5	6.7%	17.6%	17.5%	16.7	8.9%	19.3%	19.3%	17.1	9.1%	21.1%	21.1%
Czech Republic	11.0	10.4%	10.9%	16.7%	14.1	13.4%	12.7%	20.8%	12.8	12.1%	15.2%	24.8%	15.4	14.6%	23.6%	28.2%	14.8	14.0%	32.6%	31.8%
Slovakia	8.2	15.1%	20.4%	20.4%	11.0	20.4%	24.8%	24.8%	11.8	21.7%	29.5%	29.5%	12.0	22.2%	34.1%	34.0%	13.3	24.6%	38.8%	38.8%
Denmark	9.0	10.4%	12.1%	12.1%	9.8	11.4%	14.1%	14.1%	11.0	12.8%	16.4%	16.4%	11.4	13.2%	18.6%	18.6%	12.0	13.9%	20.8%	20.8%
Malta	7.9	48.8%	13.9%	13.8%	7.7	47.9%	18.5%	18.6%	7.6	46.9%	23.6%	23.6%	7.6	47.3%	28.9%	28.8%	7.7	47.7%	34.6%	34.6%
Estonia	5.1	27.4%	9.6%	16.0%	5.5	29.6%	11.9%	18.4%	5.5	29.4%	14.6%	21.4%	6.1	32.7%	17.1%	24.2%	6.7	36.0%	19.8%	27.2%
Latvia	2.6	13.2%	23.1%	23.1%	2.6	13.0%	24.8%	24.9%	2.9	14.6%	27.1%	27.1%	3.5	17.5%	29.1%	29.2%	3.6	18.2%	31.3%	31.3%
Lithuania	1.3	6.2%	22.5%	18.5%	1.4	6.6%	24.2%	20.2%	1.4	6.8%	26.5%	22.4%	1.3	6.1%	28.5%	24.3%	1.1	5.2%	30.7%	26.4%
Finland	0.3	0.7%	23.2%	23.1%	1.2	3.0%	25.0%	25.1%	1.1	2.6%	27.3%	27.3%	1.6	3.9%	29.2%	29.3%	2.0	4.9%	31.4%	31.4%
Slovenia	1.1	3.5%	19.7%	19.7%	1.4	4.8%	22.5%	22.4%	1.2	4.0%	25.3%	25.3%	0.7	2.4%	28.0%	28.0%	0.9	2.9%	30.8%	31.0%
Spain Canarias	-6.1	-6.9%	20.2%	20.2%	-5.3	-6.0%	23.2%	23.2%	-5.3	-6.0%	26.1%	26.1%	-4.9	-5.6%	28.6%	28.6%	-4.8	-5.4%	31.2%	31.2%
Italy	7.5	1.3%	10.3%	13.5%	4.6	0.8%	11.3%	15.8%	-5.5	-0.9%	12.6%	18.2%	-12.6	-2.2%	13.9%	20.4%	-26.6	-4.6%	15.2%	22.9%
Total 25 charging zones	**520.3**	**9.5%**	**15.5%**	**17.1%**	**553.1**	**10.1%**	**17.8%**	**19.8%**	**527.4**	**9.6%**	**20.3%**	**22.6%**	**565.8**	**10.3%**	**22.7%**	**25.1%**	**557.8**	**10.2%**	**25.3%**	**27.9%**

Source: EUROCONTROL

Table 24: Additional en-route costs for RP3 vs. 2016 actuals per year and by charging zone – 25 charging zones

f) Extrapolation of the forecast en route costs, service units and unit costs over 2016-2024 at Union-wide level

283 This section extrapolates the trends at EU-wide level in the forecast en-route unit costs since 2016 until the end of RP3. The data has been computed from the information reported for the 24 States having provided the data (25 charging zones) and complemented with the following assumptions to replace the missing data for the five charging zones:

- Total real en-route costs are based on the same year on year increase from 2016 as for the total real en-route costs of the reporting States in €$_{2009}$;
- Total en-route service units are based on STATFOR February 2018 baseline forecast.

284 The resulting consolidated data at EU-wide level is presented in Table 25 and the results at charging zone level are shown in Table 26. Figure 38 shows the evolution of the forecast real en-route costs, total service units and Determined en-route Unit Cost (DUC) based on an index 100 in 2016.

285 These results indicate that overall from 2016 to 2024, the forecast Determined Unit Cost (DUC) based on the extrapolation of the States' inputs shows a decrease by 12.2% (or by -1.6% per year on average). This can be attributed to an increase in costs of 10.2% over the period (or +1.2% per year on average), while the number of Total Service Units is forecast to increase by 25.5% (or +2.9% per year on average).

Aggregated RP3 forecasts	2016 A	2017 F	2018 F	2019 F	2020 F	2021 F	2022 F	2023 F	2024 F	2016-2024 overall	2016-2024 CAGR
Real en-route costs (EUR2009)	6 060 071 682	6 059 162 509	6 279 537 587	6 378 819 332	6 635 489 743	6 671 729 503	6 643 332 056	6 685 807 471	6 676 985 744	10.2%	1.2%
% YoY		*0.0%*	*3.6%*	*1.6%*	*4.0%*	*0.5%*	*-0.4%*	*0.6%*	*-0.1%*		
Total en-route service units	120 135 471	125 201 232	128 051 128	131 426 441	138 696 558	141 519 294	144 614 720	147 611 648	150 782 533	25.5%	2.9%
% YoY		*4.2%*	*2.3%*	*2.6%*	*5.5%*	*2.0%*	*2.2%*	*2.1%*	*2.1%*		
DUC (EUR2009)	**50.44**	**48.40**	**49.04**	**48.54**	**47.84**	**47.14**	**45.94**	**45.29**	**44.28**	**-12.2%**	**-1.6%**
% YoY		***-23.7%***	***-13.1%***	***-3.8%***	***-1.4%***	***-1.5%***	***-2.6%***	***-1.4%***	***-2.2%***		

Table 25: Forecast RP3 real en-route unit costs (RP2 States and RP2 formula)

		AUC	Forecast DUC					CAGR costs		CAGR TSUs		CAGR AUC/DUC	
En-route charging zone	Notes	2016	2020	2021	2022	2023	2024	2016-2020	2020-2024	2016-2020	2020-2024	2016-2020	2020-2024
Belgium-Luxembourg	1&2	58.87	56.34	55.70	54.51	54.06	53.17	2.3%	0.2%	3.4%	1.6%	-1.1%	-1.4%
Germany		65.36	60.89	60.10	56.77	55.99	55.15	1.5%	-1.2%	3.3%	1.3%	-1.8%	-2.4%
Estonia		22.34	25.97	25.87	25.23	25.32	25.36	6.2%	1.6%	2.3%	2.2%	3.8%	-0.6%
Finland		52.84	43.19	43.55	42.61	42.51	42.16	0.2%	1.0%	5.4%	1.6%	-4.9%	-0.6%
United Kingdom	4	59.10	57.85	55.68	54.67	53.74	51.32	2.2%	-1.2%	2.7%	1.8%	-0.5%	-3.0%
Netherlands		55.03	54.26	54.19	54.38	54.32	53.94	2.3%	1.0%	2.6%	1.2%	-0.4%	-0.1%
Ireland	1&2	23.80	24.38	23.91	23.25	22.87	22.29	2.3%	0.2%	1.7%	2.4%	0.6%	-2.2%
Denmark		53.08	52.29	51.83	51.43	50.68	50.03	2.5%	0.8%	2.9%	1.9%	-0.4%	-1.1%
Norway		37.62	38.17	39.97	40.14	40.91	39.25	2.5%	2.1%	2.1%	1.4%	0.4%	0.7%
Poland		32.57	40.98	40.60	40.88	40.94	40.25	10.0%	1.9%	3.8%	2.4%	5.9%	-0.4%
Sweden		54.95	52.29	50.89	49.88	50.18	49.53	2.0%	0.2%	3.3%	1.6%	-1.2%	-1.3%
Latvia		25.05	23.04	22.67	22.58	22.80	22.56	3.1%	1.1%	5.3%	1.6%	-2.1%	-0.5%
Lithuania		40.71	35.28	34.92	34.36	33.61	32.77	1.5%	-0.2%	5.2%	1.6%	-3.5%	-1.8%
Spain Canarias		59.55	44.92	44.14	42.99	42.10	41.07	-1.8%	0.4%	5.4%	2.7%	-6.8%	-2.2%
Bulgaria		25.50	28.69	27.53	26.80	26.13	24.81	7.6%	1.4%	4.5%	5.2%	3.0%	-3.6%
Cyprus		30.42	30.12	30.26	30.32	29.77	29.40	6.7%	2.9%	7.0%	3.5%	-0.2%	-0.6%
Croatia	1&2	45.26	43.52	42.48	41.06	40.19	38.99	2.3%	0.2%	3.3%	2.9%	-1.0%	-2.7%
Spain Continental		55.84	48.67	47.67	45.96	44.90	43.84	1.2%	-0.4%	4.7%	2.2%	-3.4%	-2.6%
France	2	57.90	52.62	52.08	51.09	50.71	50.38	0.9%	0.6%	3.4%	1.7%	-2.4%	-1.1%
Greece		28.53	27.97	26.93	25.96	24.97	23.84	4.6%	-2.2%	5.1%	1.8%	-0.5%	-3.9%
Hungary	1&2	30.06	26.22	25.38	24.31	23.59	22.70	2.3%	0.2%	5.8%	3.8%	-3.4%	-3.5%
Italy		70.07	64.31	63.46	61.66	60.21	58.06	0.3%	-1.5%	2.5%	1.1%	-2.1%	-2.5%
Slovenia		59.79	51.71	51.18	49.64	47.83	47.01	0.9%	-0.2%	4.6%	2.3%	-3.6%	-2.4%
Czech Republic		38.60	38.43	38.80	37.55	35.81	33.21	2.5%	0.8%	2.6%	4.6%	-0.1%	-3.6%
Malta		17.85	23.33	22.28	21.22	20.40	19.59	10.4%	-0.2%	3.3%	4.3%	6.9%	-4.3%
Austria	1&2	58.98	54.19	53.44	52.16	51.59	50.55	2.3%	0.2%	4.5%	1.9%	-2.1%	-1.7%
Portugal Continental		29.35	33.58	35.71	36.00	36.80	37.38	8.2%	4.6%	4.6%	1.9%	3.4%	2.7%
Romania		32.36	37.12	37.58	38.06	38.55	39.11	9.0%	5.0%	5.3%	3.6%	3.5%	1.3%
Switzerland		64.43	68.39	68.20	67.79	68.34	68.39	4.5%	0.9%	2.9%	0.9%	1.5%	0.0%
Slovakia	3	47.56	45.48	45.89	44.70	43.34	42.68	3.6%	2.0%	4.7%	3.6%	-1.1%	-1.6%
Total/weighted average		**50.44**	**47.84**	**47.14**	**45.94**	**45.29**	**44.28**	**2.3%**	**0.2%**	**3.7%**	**2.1%**	**-1.3%**	**-1.9%**

Assumptions for missing data

1 Year on year increase from 2016 as for the total of the reporting States in EUR2009
2 STATFOR February 2018 Baseline forecast
3 Estimates made for NSA, EUROCONTROL and METSPs costs
4 Estimates made for EUROCONTROL costs

Source: EUROCONTROL

Table 26: Forecast RP3 real en-route unit costs (RP2 States and RP2 formula)

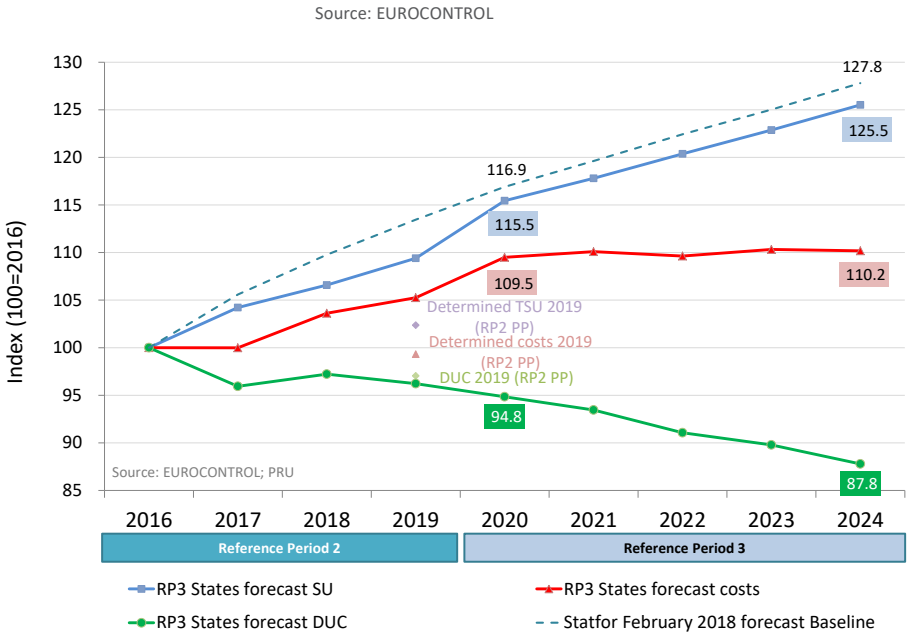


Figure 38: Forecast RP3 real en-route unit costs (RP2 States and RP2 formula)

11.4 STATFOR traffic projections for target setting in RP3

286 The cost efficiency target ranges for RP3 take into account the latest STATFOR traffic forecasts planned for the period 2018-2024, published in February 2018.

287 The STATFOR forecast of September 2013 that was used for RP2 EU wide en-route targets forecasted an average annual traffic service unit growth of 3.6% (high case), 2.6% (base case) and 1.2% (low case) over RP2. The latest STATFOR forecast for 2018 and 2019, together with actual traffic figures for 2015, 2016 and 2017 show an average annual growth of 4.6% (high case), 4.1% (base case) and 3.6% (low case). All three cases are likely to reach or surpass the traffic growth of the high case forecast presented in the September 2013 forecast. Therefore, it is not surprising that the actual traffic level is considerably higher than the planned traffic of the EU wide targets for RP2.

288 The PRB recognises that the base case is most likely outcome within the seven-year forecast by STATFOR. For RP3, the PRB will only consider the base case forecast when determining the target ranges.

11.5 The issue of the starting and end point for setting target ranges

289 Defining the starting point is crucial for setting cost efficiency targets. The PRB noted that for RP2, the starting point eliminated the cost efficiency gains achieved during RP1 (Figure 4).

290 Setting the starting point for RP3 targets in 2019 requires assumptions for the 2019 value(s) as the actual financial data for the year will only be available in June 2020 after the beginning of RP3.

a) Starting point for en-route determined unit costs

291 The PRB identified a number of different starting point values that could be used for the RP3 EU wide en-route cost efficiency target ranges. All values are expressed in €$_{2009}$.

i. The EU wide target adopted by the EC for 2019 (49.10€$_{2009}$).

ii. The aggregation of the local en-route cost efficiency targets provided for the year 2019 in the revised Performance Plans (48.94€$_{2009}$ by 2019).

iii. The forward looking en-route total cost forecast by Member States for 2019, as reflected in Table 25 (48.54€$_{2009}$).

iv. The total en-route cost for 2019 based on 2016 actual total en route cost (6 060 M€$_{2009}$), increased in line with observed growth relating to forecasted demand (as proposed by the academic study, Annex 2), reaching 6 515 M€$_{2009}$ divided by the latest February STATFOR en-route SU (base case) traffic forecast [136.4Million SUs] (47.79€$_{2009}$).

v. The total actual en-route cost for 2016 [6 060 M€$_{2009}$] divided by the latest February STATFOR en-route SU (base case) traffic forecast [136.4 million SUs] (44.44€$_{2009}$).

vi. The total actual en-route cost for 2016 [6 060 M€$_{2009}$] divided by the latest February STATFOR en-route SU (low case) traffic forecast [133.1 million SUs] (45.50€$_{2009}$).

vii. The planned total determined en-route cost for 2019 [6 018 M€$_{2009}$] divided by the latest February STATFOR en-route SU (base case) traffic forecast [136.4 million SUs] (44.13€$_{2009}$).

viii. The planned total determined en-route cost for 2019 [6 018 M€$_{2009}$] divided by the latest February STATFOR en-route SU (low case) traffic forecast [133.1 million SUs] (45.19€$_{2009}$).

292 The PRB recommends that the starting point should be based on costs increasing in line with the STATFOR baseline traffic to 6 514 M€$_{2009}$ in 2019. The result is an average union-wide Determined Unit Cost value of 47.79€$_{2009}$ as the starting point of RP3 taking into account the actual 2016 average Union-wide Determined Unit Cost of 50.44€$_{2009}$.

293 The proposed starting point is a balanced option, taking into account current levels of performance and adequate level of ambition and is lower than the aggregated Member States' forward-looking estimates for 2019 (48.54€$_{2009}$).

b) Setting the level of ambition for cost efficiency targets in RP3

294 The PRB defines five future scenarios taking into account different levels of ambition for setting the target ranges for the en-route cost efficiency Key Performance Indicators:

i. Baseline or no action: ANSPs are assumed to take no action to reduce total en-route cost, with costs increasing by 20% from around 6060 M€$_{2009}$ in 2016 to 7272 M€$_{2009}$ in 2024.

ii. 40% Gap closing: ANSPs are assumed to reduce the total en-route cost compared to the baseline scenario to 6 487 M€$_{2009}$ in 2024. This achieves 40% of

the potential cost reduction identified by the academic study. The remaining reduction should then be reached during RP4[48].

iii. Cost reduction to 2016 level: ANSPs are assumed to reduce their en-route service provision costs from the starting point of 6 514 M€$_{2009}$ at the end of RP2 to 6 060 M€$_{2009}$ in 2024. This would achieve 62% of the potential reduction identified by the academic study.

iv. 75% Gap closing: ANSPs are assumed to reduce the total en-route cost to 5 800 M€$_{2009}$ in 2024. This would achieve 75% of the potential cost reduction identified by the academic study. The remaining reduction should then be achieved in the middle of RP4[48].

v. 100% Gap closing: ANSPs are assumed to reduce the total en-route costs to 5 308 M€$_{2009}$.

295 PRB proposes the three middle scenarios as feasible options to define the target ranges for RP3.

c) The end-point for the target ranges for RP3

296 Setting the end points for RP3 is equally important for defining the cost efficiency targets. Connecting the starting point to the end points determines the targeted reduction in determined unit cost. Assessing the possible options depends on the level of ambition: An ambitious reduction triggers a lower end point. The PRB has assessed the levels of ambition presented in the following paragraph.

- Option 1: The total Union-wide en-route determined cost of the year 2024 as obtained from the 40% Gap Closing scenario by the traffic service unit of the latest STATFOR Base case scenario projection of the year 2024. The resulting determined unit cost is 42.25€$_{2009}$.
- Option 2: The total Union-wide en-route determined cost of the year 2024 as obtained from the Cost reduction to 2016 level scenario by the traffic service unit of the latest STATFOR Base case scenario projection of the year 2024. This resulting determined unit cost is 39.47€$_{2009}$.
- Option 3: The total Union-wide en-route determined cost of the year 2024 as obtained from the 75% Gap Closing scenario by the traffic service unit of the latest STATFOR Base case scenario projection of the year 2024. This resulting determined unit cost is 37.77€$_{2009}$.

[48] Assuming that a Reference Period is 5-years long

11.6 *Proposed targets for the cost efficiency KPA for RP3*

297 The PRB proposes the target ranges in Table 6.

	40% Gap Closing	Total Cost 2016 Constant	75% Gap Cosing
En route total DC % p.a.	-0.1%	-1.4%	-2.2%
En route SU growth p.. (STATFOR base case)	+2.4%		
En route DUC % p.a.	-2.3%	-3.5%	-4.2%
End points DUC (€$_{2009}$)	42.25	39.47	37.77

Table 27: Summary of the proposed RP3 (2019-2024) target ranges and scenarios (starting point in 2019 = 47.79€$_{2009}$)

11.7 *Summary of key points for setting target ranges for RP3*

298 The target ranges proposed by the PRB are supported by the following key points of evidence:

- Performance over RP2 and RP1 shows that ANSPs have been able to reduce costs in light of traffic increases and to set aside considerable sums of money both during RP1 and RP2. The increase in the "overall economic surplus" of the main ANSPs is a clear indication that further cost-efficiency improvements can be achieved in RP3.
- The academic study supports the view that further cost savings are achievable in RP3. The conclusions of the study are consistent with the previous estimations of the potential for cost reduction during the preparation for RP2.
- The quality of service provided by a number of ANSPs is currently inadequate. The leve of delay is too high and airspace users (and the travelling public) are bearing the associated costs. The targets for the cost efficiency for RP3 must support improving the situation. The proposed starting point and target ranges reflect a balanced position, allowing investment to achieve the required quality of service and providing improved value for money for airspace users.
- Forecasts predict that during RP3 traffic will continue to grow. This will require ANSPs to increase capacity in order to meet demand without producing more delays. Submissions by Member States confirm the need to invest in the short term to meet capacity constraints. The PRB agrees and has taken this into account when setting the target ranges.

12. *References*

1. European Court of Auditors, 2017, Single European Sky: a changed culture but not a single sky
2. Decker et al. 2013, Better Economic Regulation of Infrastructure: Country-based review

3. European Commission, 2015, An Aviation Strategy for Europe, page 6
4. Eurostat, 2017, GDP annual accounts, (based on the Euro 28)
5. Performance Review Body, 2013, RP2 EU-Wide Target Ranges for Stakeholder Consultation
6. Network Manager, 2018, Network Operations Plan
7. Performance Review Commission, 2017, Performance Review Report
8. EUROCONTROL, 2013, Capacity assessment and planning guidance document., Edition 2.8.
9. EUROCONTROL, April 2018, European Network Operations Plan 2018-2019/22
10. Performance Review Commission, 2017, ATM Cost Effectiveness Benchmarking Report with 2016-2020 outlook

13. Acronym List

Acronym	Full
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
ASMA	Arrival Sequencing and Metering Area
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
CDR	Conditional Route
DUC	Determined Cost Unit
EASA	European Aviation Safety Agency
EC	European Commission
EoSM	Effectiveness of Safety Management
ERNIP	European Route Network Improvement Plan
FAB	Functional Airspace Block
FRA	Free Route Airspace
FUA	Flexible Use of Airspace
KEA	Key performance Environment indicator based on Actual trajectory
KEP	Key performance Environment indicator based on last filed flight Plan
NOP	Network Operations Plan
NSA	National Supervisory Authority
PRR	Performance Review Commission
RAT	Risk Analysis Tool
RP1	1st Reference Period (2012-2014)
RP2	2nd Reference Period (2015-2019)
RP3	3rd Reference Period
SDM	SESAR Deployment Manager
SJU	SESAR Joint Undertaking
SKPI	Safety Key Performance Indicator
SoE	CANSO Standard of Excellence
SU	Service Unit
SWIM	System Wide Information Management
TBO	Trajectory Based Operation