PRB | Performance review body of the single european sky

PRB Monitoring Report 2019

Annex I – Union-wide detailed analysis for experts

The 2019 monitoring consists of five reports:

- PRB Monitoring Report 2019
- **Annex I – Union-wide detailed analysis for experts**
- Annex II – Member States' detailed analysis for experts
- Annex III – Safety Report
- Annex IV – CAPEX Report

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1 Introduction and Context

1.1 About this document

1 The PRB Monitoring Report 2019 provides analysis of the performance achieved by Member States of the Single European Sky (SES), covering the fifth year (2019) of the second Reference Period (RP2), which runs for five years from 2015 to 2019.

2 In 2019, the PRB Monitoring Report is supported by four Annexes to provide detailed analysis of performance:

- PRB Monitoring Report 2019
- **Annex I – Union-wide detailed Analysis for Experts**
- Annex II – Member States' detailed Analysis for Experts
- Annex III – Safety Report
- Annex IV – CAPEX Report (this document).

3 This document is Annex I – Union-wide Detailed Analysis for Experts and is a collaboration between the Performance Review Unit (PRU) of Eurocontrol, the European Union Aviation Safety Agency (EASA) and the Performance Review Body (PRB).

4 The data used in the report was submitted by the Member States and Eurocontrol or is in the public domain. It is published on the ESSKY website or on the performance dashboard hosted by Eurocontrol.[1] The dashboard provides reports and data on the performance of all air navigation service providers (ANSPs) belonging to the SES. It can be accessed at http://www.eurocontrol.int/prudata/dashboard.

5 The analysis for 2019 refers to performance in the airspace shown in Figure 1, which is the geographical scope of the Union-wide targets for RP2. The geographical scope covers the airspace controlled by the Member States, which are part of the Single European Sky area since the start of RP2 (28 EU Member States and the airspace controlled by Norway and Switzerland in the International Civil Aviation Organization (ICAO) EUR region, as well as the Canaries Flight Information Region (FIR) (Spain), Bodø FIR (Norway) and NOTA/SOTA (UK-IRE). It corresponds to the nine functional airspace blocks (FABs) shown in Figure 1.

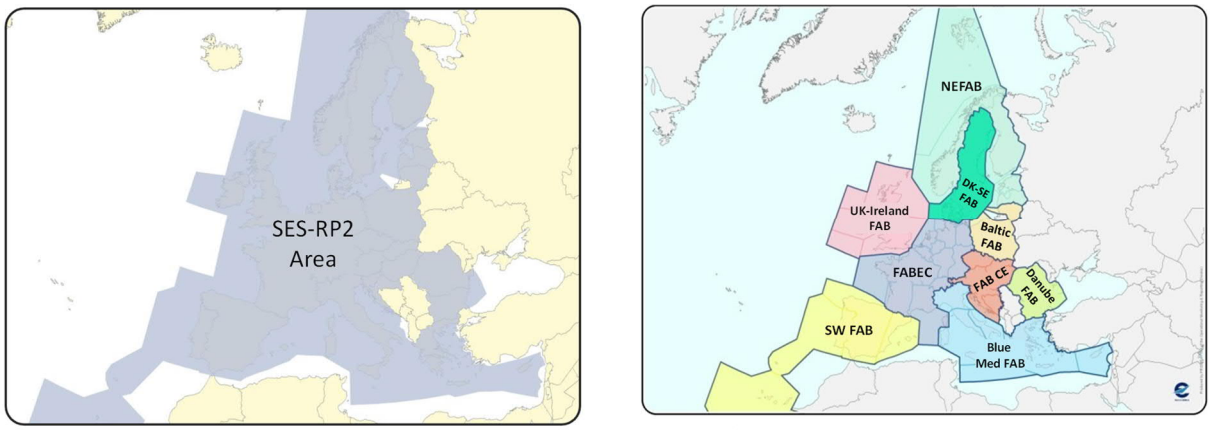


Figure 1 – RP2 Geographical scope (left) and Functional Airspace Blocks (right).

6 According to the legal framework applicable for RP2[2], monitoring covers four Key Performance Areas (KPAs), namely safety, environment, capacity and cost-efficiency. The performance indicators

[1] ESSKY is the European Commission's portal for data submission by Member States.
[2] Commission Implementing Regulation (EU) No 390/2013, Commission Implementing Regulation (EU) No 391/2013.

with Union-wide and/or local targets are referred to as the Key Performance Indicators (KPIs), while those established for monitoring purposes are referred to as Performance Indicators (PIs). The KPIs and PIs are shown in blue in Table 1.

(= KPI and Targets Setting Applies = Monitoring)	Union-wide	FAB	Local
Safety KPIs (blue) & PIs			
Effectiveness of Safety Management (EoSM)	%	%	🔍
Application of severity classification scheme (RAT methodology)	%	%	🔍
Just Culture (JC)		%	🔍
Application of automatic data recording		🔍	🔍
Level of occurrence reporting		🔍	🔍
Separation Minima Infringements (SMI)		🔍	🔍
Runway Incursions (RI)		🔍	🔍
ATM-Specific Occurrences (ATM-S)		🔍	🔍
Airspace Infringements (AI)		🔍	🔍
Environment KPIs (blue) & PIs			
Average horizontal en route flight efficiency (actual trajectory)	%	%	
Average horizontal en route flight efficiency (flight plan trajectory)	%		
Effectiveness of booking procedures for FUA	🔍		🔍
Rate of planning of conditional routes (CDRs)	🔍		🔍
Effective use of conditional routes (CDRs)	🔍		🔍
Additional time in taxi-out phase			🔍
Additional time in terminal airspace (ASMA)			🔍
Capacity KPIs (blue) & PIs			
Average minutes of en route ATFM delay attributable to ANS	%	%	
Average minutes of arrival ATFM delay attributable to terminal ANS	🔍		%
Adherence to ATFM slots			🔍
Average minutes of ATC pre-departure delay.			🔍
Cost-efficiency KPIs (blue) & PIs			
Average Determined Unit Cost (DUC) for en route ANS	%		%
Average Determined Unit Cost (DUC) for terminal ANS			%
Costs of EUROCONTROL	🔍		

Table 1 – RP2 performance indicators.

1.2 The SES performance scheme

7 The legal basis for monitoring the performance of the air traffic management in the SES area during RP2 is defined in Article 11 of Regulation (EC) No 549/2004 (the Framework Regulation).

8 In addition, the main elements of the performance scheme are set out in Articles 12, 14, 15 and 16 of Regulation (EC) No 550/2004 (the Service Provision Regulation), Implementing Regulation (EU) No 391/2013 (the Charging Scheme Regulation) and Implementing Regulation (EU) No 390/2013 (the Performance Scheme Regulation).

9 The performance monitoring process assesses whether Member States implement their performance plans and meet the binding targets. The targets for Member States are set under the SES

performance scheme at Union-wide and/or at local (national, FAB or charging zone) levels. Local targets for each KPI, and for each year of RP2, were defined by the National Supervisory Authority (NSA) in the performance plan of each FAB at the start of the reference period. The performance plans may also include additional performance indicators and associated targets set by the NSA.

10 The European Commission published the Union-wide targets and alert thresholds for RP2 in 2014 (Commission Implementing Decision (2014/132/EU) of 11 March 2014).

11 In 2016, Malta, Poland and Bulgaria requested the Commission to revise their RP2 en route cost-efficiency targets for the years 2018 to 2019. The monitoring for these three Member States considers the amended performance plans (Commission Implementing Decision (EU) 2017/2376 of 15 December 2017).

12 In 2017, Romania, Portugal and Denmark submitted a request to the European Commission to revise their RP2 en route cost-efficiency targets for the years 2018 and 2019. Denmark subsequently withdrew the request. Romania and Portugal revised their performance plans, the data thus refers to the revised performance plans (Commission Implementing Decision (EU) 2018/1782 of 15 November 2018 as amended by Commission Implementing Decision (EU) 2018/2021 of 17 December 2018).

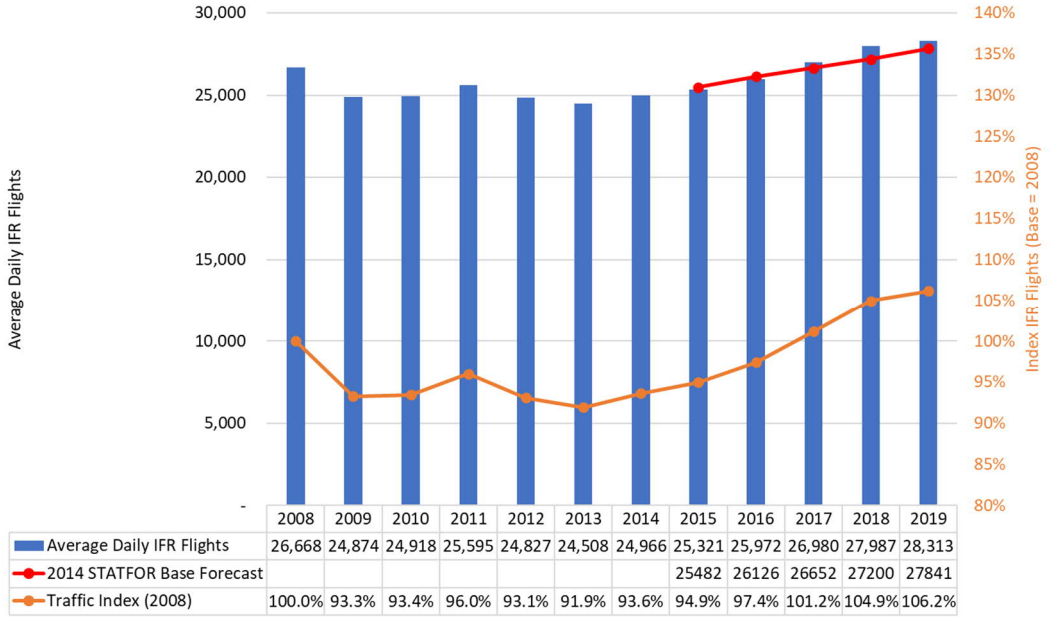
13 The NSAs provide an annual report on their monitoring of the performance plans. The Commission may issue decisions on the inconsistency of performance achievement in relation to performance targets through various legal instruments upon the review, monitoring and benchmarking of these reports.

1.3 Air traffic and service units 2008-2019

14 Instrument Flight Rules (IFR) traffic increased for the sixth year in a row in 2019 (+1.2% compared to 2018), as shown in Figure 2.

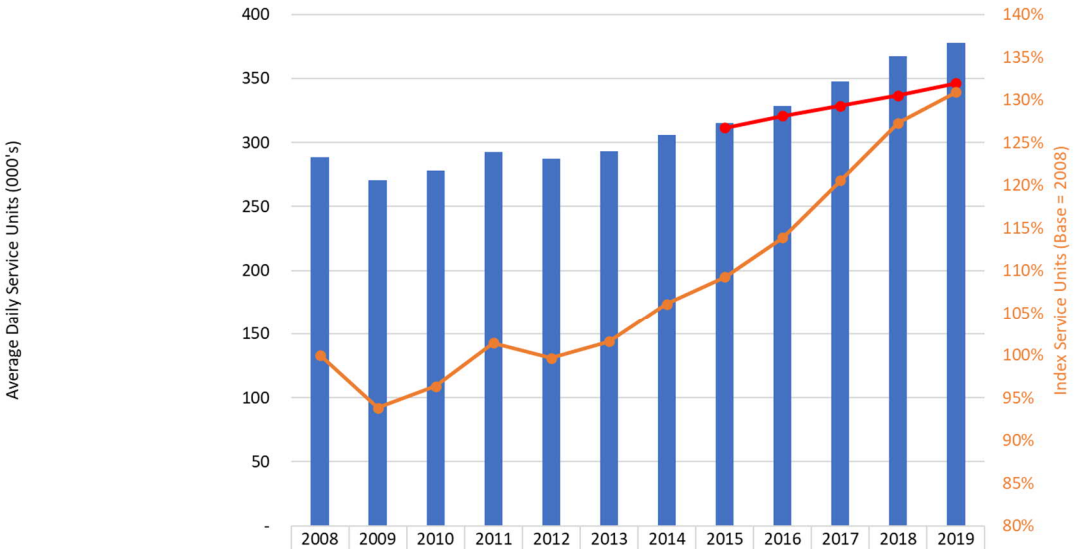
15 The Union-wide average masks variations in terms of traffic growth between FABs. Baltic FAB had the highest growth in 2019 (+5.0%), followed by BLUE MED FAB (+3.8%), FAB Central Europe (+3.6%), South West FAB (2.4%), Danube FAB (+1.4%), FAB Europe Central (+1.0%), North East FAB (+0.4%) and UK-Ireland (+0.9%). Denmark-Sweden FAB saw a decline in traffic (-1.3%).

16 Average daily en route service units (TSUs) in the SES RP2 area continued to grow faster than flights in 2019 (+2.8% vs. 2018, +30.9% vs. 2008) as shown in Figure 2 and Figure 3.



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Average Daily IFR Flights	26,668	24,874	24,918	25,595	24,827	24,508	24,966	25,321	25,972	26,980	27,987	28,313
2014 STATFOR Base Forecast								25482	26126	26652	27200	27841
Traffic Index (2008)	100.0%	93.3%	93.4%	96.0%	93.1%	91.9%	93.6%	94.9%	97.4%	101.2%	104.9%	106.2%

Figure 2 – Traffic 2008-2019 (SES RP2 area).



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Average Daily Service Units	288.4	270.6	277.8	292.5	287.4	293.0	305.9	315.1	328.4	347.7	367.2	377.5
2014 STATFOR Base Forecast								311.7	320.8	328.8	336.8	346.3
Traffic Index (2008)	100.0%	93.8%	96.3%	101.4%	99.6%	101.6%	106.1%	109.2%	113.9%	120.6%	127.3%	130.9%

Figure 3 – En route service units 2008-2019 (SES RP2 area).

2 Union-wide performance in 2019

17 The Union-wide performances in 2019 against the targets for the key performance areas of safety, environment, capacity, and cost-efficiency are shown in Table 2 and Table 3.

SAFETY KPI (UNION-WIDE)		2019						
		EU TARGET LEVEL	ACHIEVED LEVELS					Actual vs target
			A	B	C	D	E	
Effectiveness of Safety Management (EoSM)								
Member States (all objectives) – (# Member States on a minimum level) (of 30 MS)		C	-	14	16	-	-	✗
ANSP – Safety Culture (# ANSPs on a minimum level) (of 31 ANSPs)		C	-	-	4	23	7	✓
ANSP – Other Objectives (# ANSPs on a minimum level) (of 31 ANSPs)		D	-	-	3	28	-	✗
Application of risk analysis tool (RAT)								
Ground Score (ANSP level)	Safety Minima Infringements	100%	100%					✓
	Runway Incursions	100%	99%					✗
	ATM-S	100%	97%					✗
Overall Score (State level)	Safety Minima Infringements	80%	97%					✓
	Runway Incursions	80%	85%					✓
	ATM-S	100%	97%					✗

Table 2 – Actual performance at Union-level (2019): Safety KPA.

KPI (UNION-WIDE)	2019		
	EU TARGET	PERFORMANCE	Actual vs target
ENVIRONMENT[3]			
KEP (horizontal en route flight efficiency – planned route)	4.10%	4.68%	✖
KEA (horizontal en route flight efficiency – flown route)	2.60%	2.95%	✖
CAPACITY			
Average en route air traffic flow management (ATFM) delay per flight (minutes)	0.5	1.66	✖
COST-EFFICIENCY			
Average Union-wide determined unit cost for en route air navigation services (real terms €$_{2009}$)	49.10	44.61	✓

Table 3 – Actual performance at Union-wide level (2019).

18 For each KPA, the data shows that:

Safety: Union-wide, just over half of the Member States reached or exceeded the 2019 target for the Effectiveness of Safety Management (EoSM). All air navigation service providers reached or exceeded the 2019 target in safety culture and almost all reached the target for the other Management Objectives (MOs). The overall application of the risk analysis tool (RAT) improved and was above or close to the targets 2019. Application of the RAT by ANSPs to runway incursions (ground) trailed most behind the target in 2018 but improved in 2019 to become close to the target, increasing from 81% to 99%. Application of the RAT by ANSPs to separation minima infringement (SMI) reached the target in 2019.

Environment: Member States missed the Union-wide targets for environmental performance in 2019. Performance of the planned routes improved slightly compared to 2018, with a 0.03 percentage point decrease from 4.71% to 4.68%. However, performance of the actual routes worsened by 0.12 percentage points from 2.83% to 2.95%.

Capacity: Member States again missed the Union-wide targets of 0.5 minutes per flight by far in 2019 with a performance of 1.66 minutes per flight. The average en route air traffic flow management (ATFM) delay per flight slightly decreased from 1.83 minutes in 2018.

Cost-efficiency: Member States achieved the cost-efficiency targets in 2019. At Union-wide level, the actual en route unit cost (44.61€$_{2009}$) was -10% lower than the en route Union-wide target (49.10€$_{2009}$) and -8.9% lower than the aggregated performance plans determined unit cost (48.61€$_{2009}$). The actual (overall) en route costs were +1.4% (+86.2M€$_{2009}$) higher than the determined (overall) costs (6,059.1 M€$_{2009}$). Traffic in terms of service units in 2019 was much higher than planned (+10.5%). As far as terminal cost-efficiency is concerned, the results for 2019 show a similar picture to the en route Union-wide results: Union-wide actual terminal unit costs (152.89€$_{2009}$) were -2.1% lower than planned. This results from the combination of higher than

[3] According to the regulatory framework, Member States need to reach the targets for KEA and KEP in 2019 only. Nevertheless, indicative target values have been provided for the intermediate years.

planned terminal navigation service units (TNSUs), due to higher traffic (+8.8%) and higher than planned terminal costs (+6.5%, or +68.7 M€$_{2009}$).

3 Local level performance in 2019

19 This section shows the local performance in 2019 against the targets (and reference values where appropriate) for the key performance areas of safety, environment, capacity, and cost-efficiency.

20 **Safety**: Table 4 shows the minimum EoSM level attained by each FAB (both Member States and their ANSPs), which is essentially the minimum EoSM level achieved by Member States that belong to the FAB. UK-Ireland was the only FAB where all Member States achieved the minimum EoSM level, whilst others remained one level below the target. All ANSPs achieved the target level for safety culture, while ANSPs of five FABs (Danube, Denmark-Sweden, FAB CE, South West FAB and UK-Ireland) exceeded the targets. The ANSPs of three FABs (Blue Med FAB, Denmark-Sweden FAB and NEFAB) did not all achieve the minimum level of EoSM for the other Management Objectives.

EoSM minimum level for FABs	Minimum EoSM level for a State		Minimum EoSM level for ANSPs (Safety Culture)		Minimum EoSM level for ANSPs (other MOs)	
BALTIC FAB	B	✗	C	✓	D	✓
BLUE MED FAB	B	✗	C	✓	C	✗
DANUBE FAB	B	✗	D	✓	D	✓
DK-SE FAB	B	✗	D	✓	C	✗
FAB CE	B	✗	D	✓	D	✓
FABEC	B	✗	C	✓	D	✓
NEFAB	B	✗	C	✓	C	✗
SW FAB	B	✗	D	✓	D	✓
UK-Ireland FAB	C	✓	D	✓	D	✓

Table 4 – Actual performance at FAB level (2019) – Safety KPA.

21 **Environment**: Table 5 shows that no FAB met the horizontal en route flight efficiency[4] target for 2019. However, the data shows that DK-SE FAB and SW FAB missed the target by a small margin, while the performance of other FABs is further away from their target.

2019	FAB	Reference Value	Actual Performance	Actual vs. target
KEA (horizontal en route flight efficiency – flown route)	BALTIC	1.36%	1.85%	✗
	BLUE MED	2.45%	3.01%	✗
	DANUBE	1.37%	2.52%	✗
	DK-SE	1.19%	1.25%	✗
	FAB CE	1.81%	2.13%	✗
	FABEC	2.96%	3.32%	✗
	NEFAB	1.22%	1.66%	✗
	SW FAB	3.28%	3.29%	✗
	UK-IRE	2.99%	3.65%	✗

Table 5 – FAB level view of environment KPA (2019).

[4] The horizontal en route flight efficiency is excess distance flown as a percentage of the great circle distance.

22 **Capacity**: Table 6 shows that four FABs (Baltic, DK-SE, NEFAB and UK-Ireland) achieved their FAB-level targets in 2019.

2019	FAB	Ref. Value	PP Target	Actual Performance	Actual vs. target
En route ATFM delay Avg. en route air traffic flow management (ATFM) delay per flight (minutes)	BALTIC	0.22	0.22	0.10	✓
	BLUE MED	0.18	0.24	0.32	✗
	DANUBE	0.06	0.04	0.08	✗
	DK-SE	0.09	0.09	0.07	✓
	FAB CE	0.29	0.27	1.57	✗
	FABEC	0.43	0.43	1.68	✗
	NEFAB	0.13	0.13	0.00	✓
	SW FAB	0.30	0.30	0.53	✗
	UK-IRE	0.26	0.26	0.21	✓

Table 6 – FAB level view of capacity KPA (2019).

23 Further detail of the performance at local level is provided in Table 7, which shows the performance at State level within each FAB for the environment and capacity targets indicated in their performance plans. At a local level, arrival delay is also targeted in accordance with the Performance and Charging Regulation.

24 En route capacity targets did not have to be set at a State level but at FAB level. Nonetheless, some FABs allocated national targets in the FAB performance plans. Those that did not allocate targets, have a "N/A" indicated in the table below. Luxembourg meanwhile has its upper airspace controlled by MUAC and, therefore, did not have explicit targets. Table 7 shows where Member States achieved their national targets.

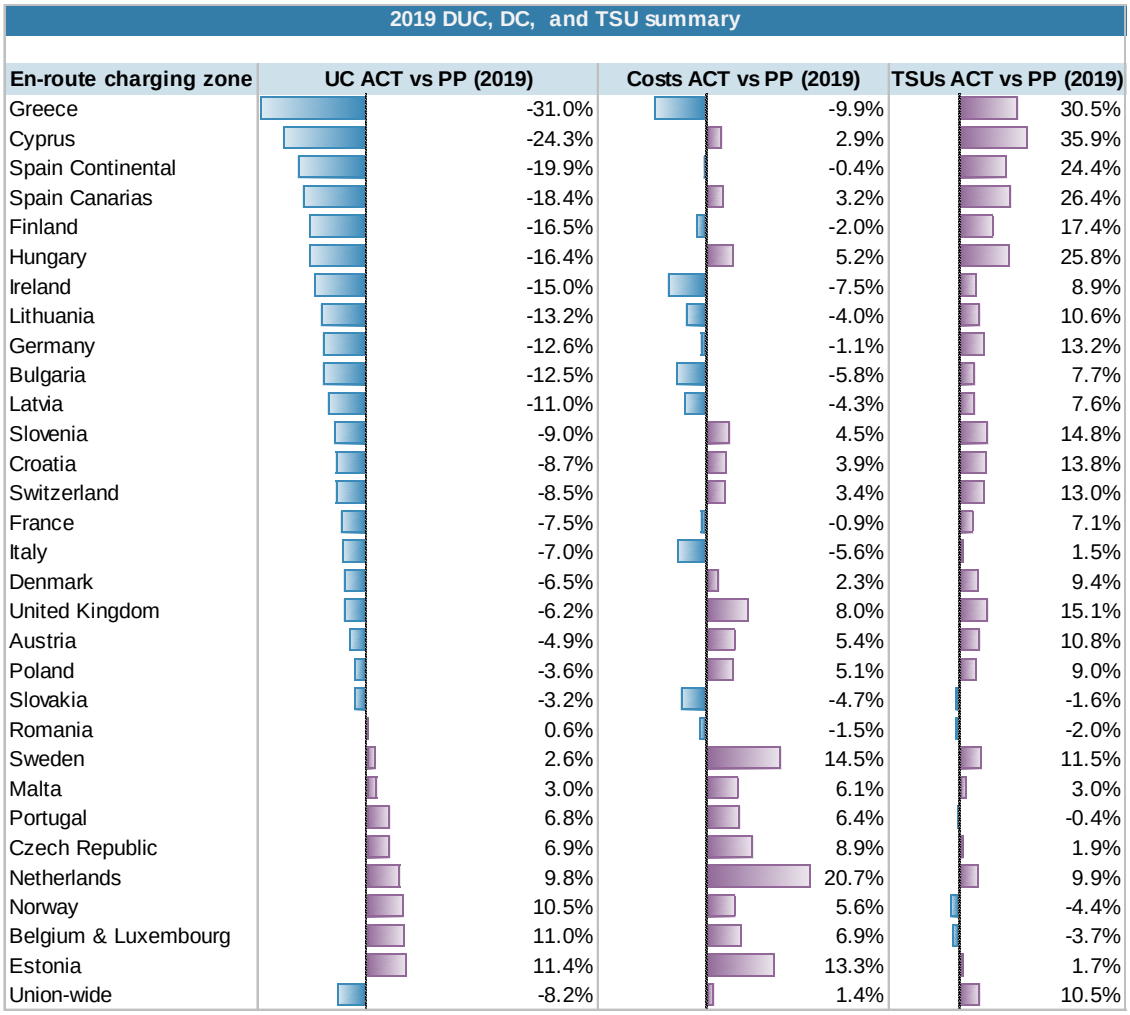
FAB	State	KEA	En route delay			Arrival delay		
		Actual	Target	Actual		Target	Actual	
BALTIC FAB	Lithuania	2.03%	0.04	0.00	✓	0.00	0.00	✓
	Poland	1.82%	0.23	0.12	✓	0.04	0.39	✗
BLUE MED FAB	Cyprus	4.33%	1.50	1.18	✓	N/A	0.52	
	Greece	2.33%	0.60	0.42	✓	0.10	3.57	✗
	Italy	3.21%	0.11	0.02	✓	0.41	0.29	✓
	Malta	1.83%	0.02	0.00	✓	0.10	0.00	✓
DANUBE FAB	Bulgaria	2.70%	0.06	0.00	✓	0.00	0.02	✗
	Romania	2.36%	0.00	0.11	✗	0.00	0.01	✗
DK-SE FAB	Denmark	1.17%	N/A	0.00		0.11	0.07	✓
	Sweden	1.28%	N/A	0.10		0.35	0.32	✓
FAB CE FAB	Austria	2.33%	0.19	1.12	✗	1.27	0.71	✓
	Croatia	1.66%	0.21	0.75	✗	0.05	0.00	✓
	Czech Rep.	2.59%	0.10	0.21	✗	0.40	0.16	✓
	Hungary	1.68%	0.04	1.62	✗	0.05	0.03	✓
	Slovakia	2.55%	0.11	0.07	✓	0.00	0.00	✓
	Slovenia	1.81%	0.23	0.00	✓	0.00	0.00	✓
FABEC	Belgium	3.87%	N/A	0.61		N/A	0.62	
	France	3.38%	0.39	1.32	✗	0.60	0.42	✓
	Germany	2.97%	N/A	1.49		0.65	0.39	✓

	Luxembourg	N/A	N/A	N/A		0.43	1.00	✗
	Netherlands	3.23%	N/A	0.10		2.00	3.88	✗
	Switzerland	4.57%	0.23	0.15	✓	2.11	1.61	✓
NEFAB	Estonia	1.44%	0.12	0.00	✓	0.00	0.00	✓
	Finland	1.03%	0.08	0.00	✓	0.14	0.37	✗
	Latvia	1.35%	0.04	0.01	✓	0.04	0.00	✓
	Norway	2.07%	0.08	0.00	✓	0.60	0.18	✓
SW FAB	Portugal	1.97%	0.14	0.25	✗	0.60	2.76	✗
	Spain	3.67%	0.27	0.47	✗	0.80	1.02	✗
UK-IRE FAB	Ireland	1.23%	0.14	0.01	✓	0.22	0.14	✓
	UK	4.08%	0.23	0.21	✓	0.78	1.25	✗

Table 7 – State-level view of environment and capacity KPA (2019).

25 **Cost-efficiency**: The performance and charging scheme has been designed to ensure that the cost-efficiency targets are directly used in the calculation of en route and terminal unit rates together with adjustments related to the various features of the scheme (such as inflation, traffic risk, cost risk, incentives, etc.). Figure 4 (for en route) and Figure 5 (for terminal) identify whether the actual unit cost is lower or higher than the determined unit cost (DUC) set in the performance plan, as well as the drivers for this evolution in terms of costs and traffic. The data shows that nine charging zones offered actual unit costs higher than planned and 17 terminal charging zones offered actual unit rates higher than planned.

26 NSAs have not reported any corrective measures per se in respect of cost-efficiency, but in some cases, Member States report the drivers behind a deviation and actions to improve cost-efficiency at local level. Details of these can be found in the charging zone view for each SES State (Annex II).



2019 DUC, DC, and TSU summary			
En-route charging zone	**UC ACT vs PP (2019)**	**Costs ACT vs PP (2019)**	**TSUs ACT vs PP (2019)**
Greece	-31.0%	-9.9%	30.5%
Cyprus	-24.3%	2.9%	35.9%
Spain Continental	-19.9%	-0.4%	24.4%
Spain Canarias	-18.4%	3.2%	26.4%
Finland	-16.5%	-2.0%	17.4%
Hungary	-16.4%	5.2%	25.8%
Ireland	-15.0%	-7.5%	8.9%
Lithuania	-13.2%	-4.0%	10.6%
Germany	-12.6%	-1.1%	13.2%
Bulgaria	-12.5%	-5.8%	7.7%
Latvia	-11.0%	-4.3%	7.6%
Slovenia	-9.0%	4.5%	14.8%
Croatia	-8.7%	3.9%	13.8%
Switzerland	-8.5%	3.4%	13.0%
France	-7.5%	-0.9%	7.1%
Italy	-7.0%	-5.6%	1.5%
Denmark	-6.5%	2.3%	9.4%
United Kingdom	-6.2%	8.0%	15.1%
Austria	-4.9%	5.4%	10.8%
Poland	-3.6%	5.1%	9.0%
Slovakia	-3.2%	-4.7%	-1.6%
Romania	0.6%	-1.5%	-2.0%
Sweden	2.6%	14.5%	11.5%
Malta	3.0%	6.1%	3.0%
Portugal	6.8%	6.4%	-0.4%
Czech Republic	6.9%	8.9%	1.9%
Netherlands	9.8%	20.7%	9.9%
Norway	10.5%	5.6%	-4.4%
Belgium & Luxembourg	11.0%	6.9%	-3.7%
Estonia	11.4%	13.3%	1.7%
Union-wide	-8.2%	1.4%	10.5%

Figure 4 – Actual vs determined en route unit costs 2019.

2019 DUC, DC and TNSU summary

Terminal charging zone	UC ACT vs PP (2019)	Costs ACT vs PP (2019)	TNSUs ACT vs PP (2019)
Latvia	-36.5%	-17.2%	30.4%
Greece	-36.4%	2.0%	60.3%
Hungary	-29.0%	-8.0%	29.7%
Lithuania	-27.0%	-9.1%	24.6%
Malta	-22.0%	-9.0%	16.6%
Cyprus	-21.5%	1.6%	29.5%
Ireland	-21.0%	-5.5%	19.6%
Italy - Zone 2	-18.8%	-11.1%	9.4%
Poland - Zone 1	-16.3%	10.8%	32.4%
Italy - Zone 1	-16.2%	-18.6%	-2.8%
Spain	-10.9%	12.2%	25.9%
Belgium Brussels	-10.7%	-0.1%	11.9%
Romania	-10.3%	-10.8%	-0.6%
Bulgaria	-10.1%	23.21%	37.1%
Luxembourg	-8.9%	4.1%	14.2%
Belgium Liege	-4.9%	26.1%	32.6%
Switzerland	-4.6%	-0.4%	4.3%
Denmark	-1.3%	9.3%	10.8%
Finland	-0.1%	15.3%	15.4%
France - Zone 2	0.7%	4.6%	3.8%
Norway	2.0%	-10.4%	-12.1%
Austria	2.2%	6.4%	4.1%
France - Zone 1	2.8%	1.2%	-1.6%
Croatia	4.6%	18.0%	12.8%
Poland - Zone 2	5.6%	17.7%	11.4%
Portugal	6.0%	9.8%	3.6%
Czech Republic	7.7%	6.3%	-1.3%
Belgium Charleroi	9.3%	-4.8%	-12.9%
Netherlands	9.9%	24.8%	13.6%
Slovakia	10.7%	16.0%	4.8%
Sweden	12.2%	9.9%	-2.0%
Estonia	13.4%	20.9%	6.7%
Belgium Antwerpen	17.5%	9.5%	-6.8%
Germany	18.6%	27.1%	7.2%
Slovenia	20.9%	18.7%	-1.8%
Belgium Oostende-Brugge	35.3%	-3.0%	-28.3%
Union-wide	-2.1%	6.5%	8.8%

Figure 5 – Actual vs determined terminal unit costs in 2019.

4 Safety

4.1 Presentation of the safety PIs, KPIs and targets

27 In RP2, there are two Union-wide targets for the following safety KPIs (SKPIs):

- SKPI 1: The Effectiveness of Safety Management (EoSM);
- SKPI 2: The application of the severity classification based on the Risk Analysis Tool (RAT) methodology.

28 The EoSM SKPI is assessed at two levels: at a State level, i.e. the capability of authorities to manage the State Safety Programme (SSP) whenever it is in place, and at a service provision level, the service providers' capability to manage an effective Safety Management System (SMS).

29 The application of the severity classification based on the RAT methodology SKPI aims at measuring to what extent the Risk Analysis Tool has been applied to assign severity levels to reported ATM incidents by ANSPs and the Member States.

30 In addition to the Union-wide targets, a third SKPI sets targets for the level of Just Culture at FAB level. This SKPI measures the level of presence and corresponding level of absence of Just Culture at State and at ANSP level (FAB target). The main objective of this SKPI is to identify possible obstacles and impediments to the application of a Just Culture at State and ANSP level.

31 The Performance and Charging Regulations also enforce three safety performance indicators (SPIs) for monitoring purposes. These are as follows:

- SPI 1: The application by the ANSPs of automated safety data recording systems where available, which should include, as a minimum monitoring of SMI and runway incursions (this PI aims at measuring if ANSPs use these tools in a Just Culture environment to improve the information and analysis by the organisations' SMS);
- SPI 2: The reporting by the Member States and ANSPs on the level of occurrence reporting, on an annual basis, aiming at measuring the level of reporting and addressing the issue of improvement of reporting culture;
- SPI 3: The number of, as a minimum, SMIs, runway incursions, airspace infringements, and ATM-specific occurrences at all air traffic services units.

32 The targets associated with the Union-wide SKPIs are shown in Table 8 and Table 9. Occurrences may occur on the ground or whilst aircraft are airborne and hence these are monitored separately.

LEVEL OF EFFECTIVENESS OF SAFETY MANAGEMENT (EOSM)		TARGET
State level	Union-wide target	C
ANSP level	Union-wide target for Safety Culture Management Objective (MO)	C
	Union-wide target for all other MOs also related to safety	D

Table 8 – RP2 targets for EoSM; for RP2, there is only one target for the end of the period to assess the EoSM.

		2015	2016	2017	2018	2019
Ground Score (ANSP level)						
Union-wide targets	Safety Minima Infringements			≥80%		100%
	Runway Incursions			≥80%		100%
	ATM-Specific			≥80%		100%
Overall Score (State level)						
Union-wide targets	Safety Minima Infringements			≥80%	≥80%	≥80%
	Runway Incursions			≥80%	≥80%	≥80%
	ATM-Specific			≥80%		100%

Table 9 – RP2 targets for application of the severity classification based on the RAT methodology.

4.2 Accidents and serious incidents

33 The data presented in this section relates to accidents and serious incidents, either:

- ANS-related: the ANS system may not have contributed to a given occurrence, but it may have a role in preventing similar occurrences in the future;
- ANS contribution: at least one ANS factor was in the causal chain of events leading to an occurrence, or at least one ANS factor potentially increased the level of risk, or it played a role in the occurrence encountered by the aircraft.

34 The PRB monitors the application of the RAT to severity classification and does not monitor accidents directly. These are monitored by EASA.

35 Figure 6 shows the number of accidents and serious incidents between 2009 and 2019 that are related to the provision of ANS within the SES area, alongside a rate calculated using the number of flight hours performed within the SES.

36 During the period monitored (2009-2019), ANS-related accidents and serious incidents showed a decreasing rate from 2010 to 2017, reaching a minimum in 2017. Despite the absolute number of accidents rising in 2019 to become the second highest in the period, safety levels seemed to stabilise at the level seen in 2018.

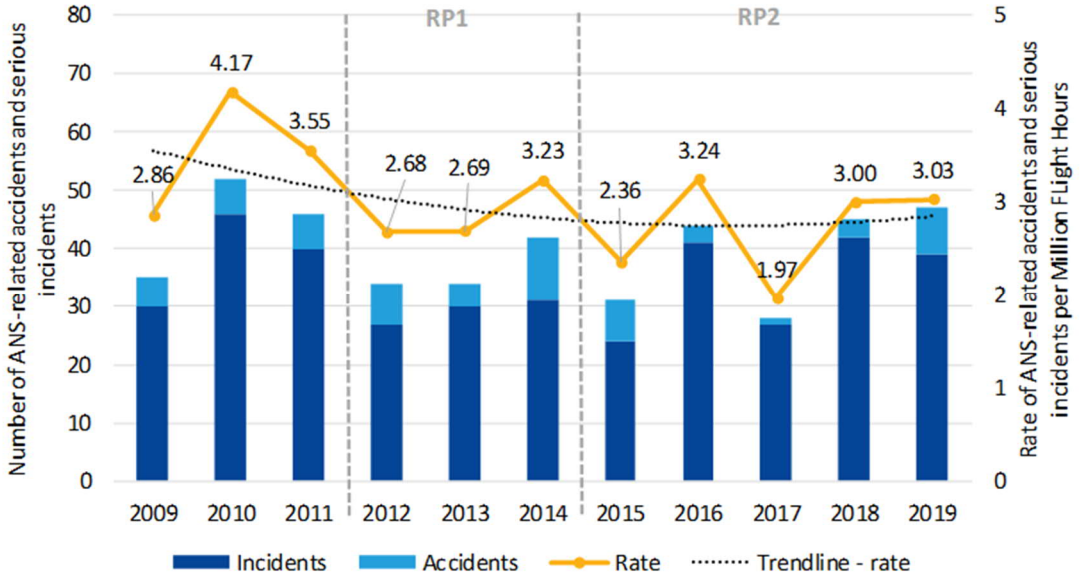


Figure 6 – ANS-related accidents and serious incidents (2009-2019).

37 Figure 7 shows accidents and serious incidents with ANS contribution identified by Member States in their investigations. The rate of accidents and serious incidents per million flight hours since 2010 with ANS contribution, while fluctuating, shows a clear downward trend, reaching the lowest level in 2019. Only one accident and serious incident in 2018 had an ANS contribution. In 2019, there were no accidents with ANS contribution and the absolute number of accidents and incidents with any ANS contribution was the lowest seen over the period between 2009-2019.

38 While some caution should be taken as the number of observations are small, the numbers suggests that ANSPs are managing major risks related to their service and continue to improve.

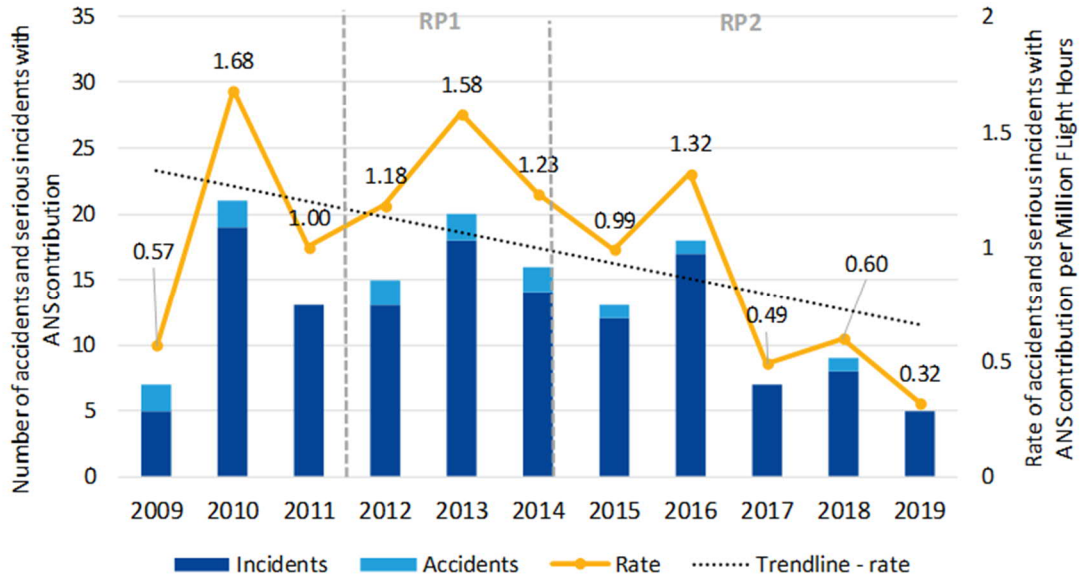


Figure 7 – ANS contribution accidents and serious incidents (2009-2019).

4.3 Effectiveness of Safety Management

39 All 30 Member States and 31 ANSPs, including Maastricht Upper Area Control Centre (MUAC), filled in the questionnaires used for the measurement of the EoSM SKPI in accordance with Acceptable Means of Compliance for the Implementation and Measurement of safety KPIs (EASA Decision No 2011/017/R, amended by EASA Decision No 2014/035/R and EASA Decision No 2015/028/R). EASA has verified the responses of all Member States while the responses of the ANSPs have been verified by the Member States' competent authorities.

40 Figure 8 shows the EoSM score(s) achieved (left axis) and the markers show the minimum EoSM level(s) achieved (right axis). The dashed red line represents the target level i.e. level C for 2019. The average score of the EoSM achieved by Member States in 2019 increased compared to 2018 from 66 to 68.5, a more modest year-on-year improvement compared to previous years. However, whilst the Union-wide score increased, performance at a local level varied between Member States. 23 Member States improved their scores relative to 2018, three remained at the same score, and four achieved lower scores than in 2018. Compared with 2018, five additional Member States reached the RP2 targets, while 14 Member States remained below targets in one or more component.

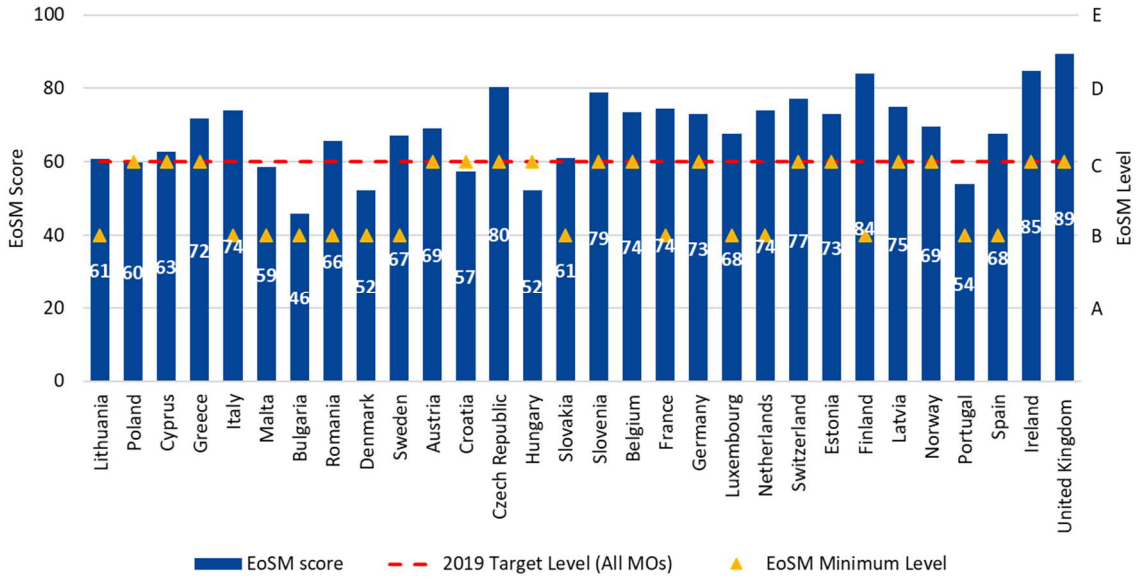


Figure 8 – 2019 Effectiveness of Safety Management for Member States (Source: EASA).

41 Figure 9 shows the number of Member States below the RP2 target level C in each Management Objective (MO) in 2018 and 2019. As it can be seen, most attention from Member States was required for the MO of Safety Policy and Objectives and Safety Culture, as eight and five Member States respectively did not achieve the target level C in 2019. Some improvements have been seen in both areas, in particular in Safety Culture, where a further seven Member States achieved the target level C.

42 Of the Member States not reaching the target, eight needed to improve one component (mostly Safety Culture), four needed to improve two components, one (Portugal) need to improve three components and one (Bulgaria) needed to improve four components. The EoSM scores achieved by these Member States are relatively high but they still miss the target suggesting small improvements will enable them to achieve the targets. This is typically caused by Member States having a low maturity for one area while having a maturity exceeding the target for other areas. Thus, there is not always a correlation between a high score and achieving the target maturity level.

43 Overall, the development for Member States in 2019 was as expected in the PRB Annual Monitoring Report 2018, i.e. that not all Member States would reach the target, except with an extraordinary effort. Since the SKPI is not retained for RP3, the sufficiency of the safety management and State safety oversight system applied by the State will be monitored by EASA. The baseline for Member States performance related to safety management will be Regulation (EU) 2017/373 and the associated Acceptable Means of Compliance and Guidance Material.

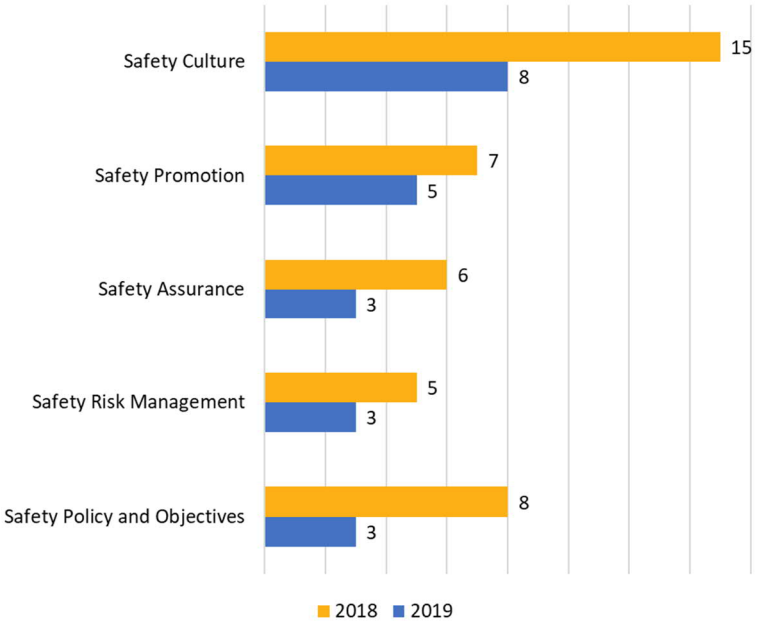


Figure 9 – EoSM: number of Member States not achieving target level C for each Management Objective in 2018 and 2019 (Source: EASA).

44 Figure 10 shows the EoSM scores achieved by ANSPs (left axis) and the markers show the minimum EoSM level(s) achieved (right axis) for safety culture and other MOs. The dashed red and blue lines represent the target levels for other MOs and safety culture i.e. level C and D respectively for 2019.

45 Overall, the development for ANSPs in 2019 was as expected in the PRB Monitoring Report 2018, i.e. that all but a few ANSPs could reach the RP2 targets. All ANSPs reached the target in Safety Culture and have done so since 2017. During 2019, eight more ANSPs reached the target level D for other MOs compared to 2018. Three ANSPs (CYATS of Cyprus, LFV of Sweden and LGS of Latvia) did not meet the RP2 target in other components.

46 During 2019, the ANSPs only marginally improved their average score on the EoSM from 84 in 2018 to 84.7 in 2019. The minimum effectiveness score by an individual ANSP in 2019 is 62, up from 59 in 2018.

47 Eight ANSPs (PANSA of Poland, NAVIAIR of Denmark, Croatia Control, ANA LUX of Luxembourg, LVNL of the Netherlands, MUAC, and Skyguide of Switzerland) improved so they achieved the RP2 target.

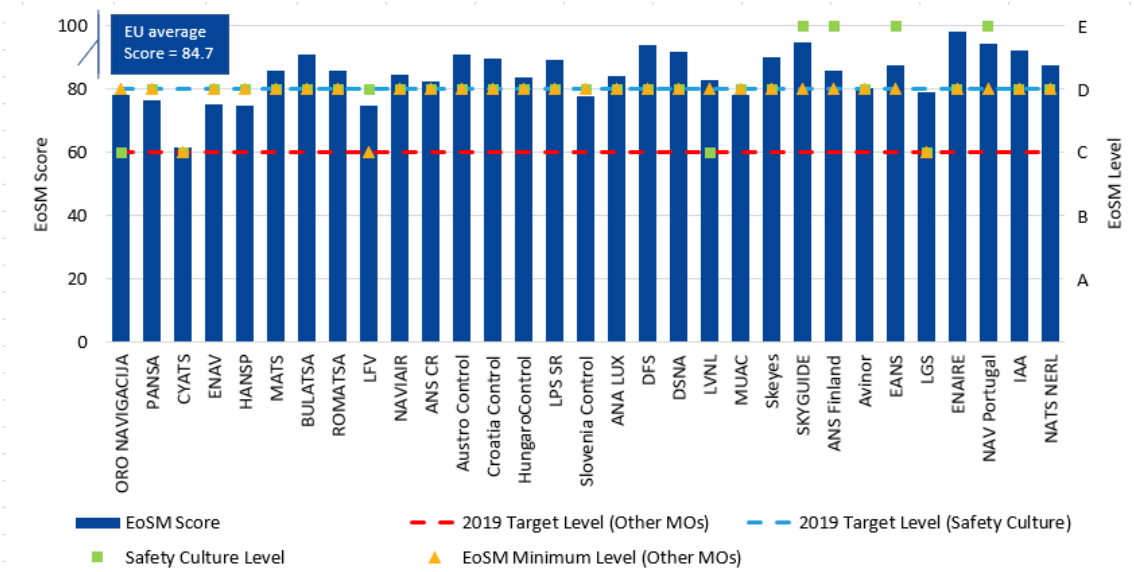


Figure 10 – 2019 EoSM for ANSPs (Source: EASA).

48 Figure 11 shows the number of ANSPs below the targets in each of EoSM components in 2018 and 2019. Between 2018 and 2019, the most improvements were seen for safety promotion and safety policy and objectives.

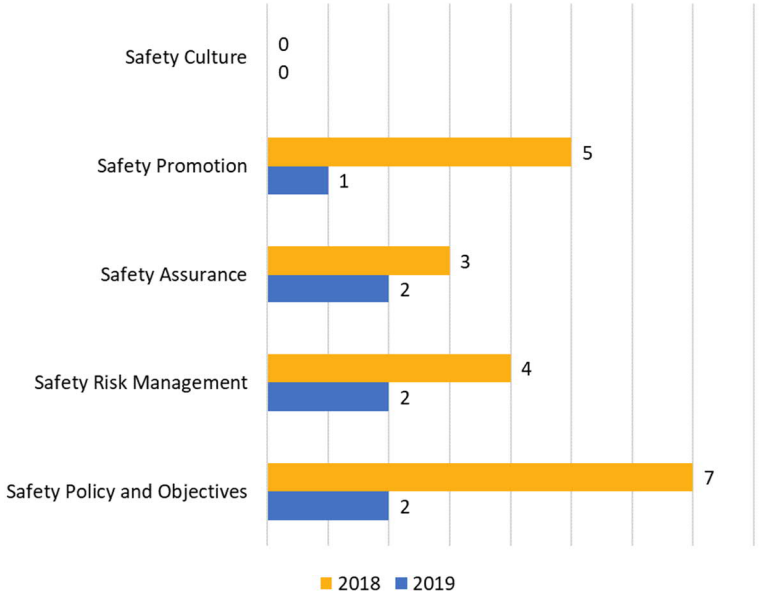


Figure 11 – EoSM: number of ANSPs below target level in 2018 and 2019 for each EoSM component (Source: EASA).

49 Of the three ANSPs missing the target, LGS is below target for one sub-component under Safety Policy and Objectives, LFV is below target for five sub-components in Safety Risk Management and Safety Assurance and CYATS below target for 14 sub-components affecting all four components, except Safety Culture.

4.4 Application of Risk Assessment Tool methodology

50 In accordance with Commission Implementing Regulation (EU) No 390/2013, Member States are required to report the proportion of separation minima infringements (SMIs), runway incursions

(RIs) and ATM specific occurrences (ATM-S), for which the severity classification was assessed using the RAT methodology. The Annual Summary Template (AST) reporting mechanism is still used as the main vehicle for reporting the application of severity classification using the RAT methodology.

51 During RP2, several changes have been introduced to the monitoring of the application of the RAT methodology for deriving the severity for the reported occurrences: The RAT methodology is only mandatory for deriving the severity of A, B and C reported SMIs and RIs and AA, A, B and C severity for ATM-Specific and Commission Implementing Regulation (EU) No 390/2013 (hence, including the use of the RAT methodology) is not be applicable at airports and traffic units with less than 70,000 IFR movements per year.

52 Table 10 shows the achieved percentage of RAT application per category per Member States in 2019. The data shows that 23 Member States achieved the target in 2019 for all categories, which is an improvement compared with 2018 on all categories, most notably on runway incursions (ground). One Member State did not provide data for 2019. Member States not achieving the targets need to improve the level of reporting in one or two categories. Those that achieved the targets have the cells highlighted green while red indicated underperformance compared to the targets.

FAB	STATE	SMI (Ground)	SMI (Overall)	RI (Ground)	RI (Overall)	ATM-S (Overall)
	TARGET	100%	80%	100%	80%	100%
BALTIC FAB	Lithuania	100%	100%	N/A	N/A	100%
	Poland	100%	0%	100%	0%	100%
BLUE MED FAB	Cyprus	100%	0%	N/A	N/A	100%
	Greece	100%	100%	N/A	100%	100%
	Italy	100%	100%	100%	100%	100%
	Malta	N/A	N/A	N/A	N/A	100%
DANUBE FAB	Bulgaria	100%	100%	100%	100%	100%
	Romania	100%	100%	N/A	N/A	100%
DK-SE FAB	Denmark	No data	No data	No data	No data	No data
	Sweden	100%	100%	100%	100%	100%
FAB CE	Austria	100%	100%	100%	100%	100%
	Czech Republic	100%	100%	100%	100%	100%
	Hungary	100%	100%	100%	100%	100%
	Slovakia	100%	100%	100%	100%	100%
	Slovenia	N/A	100%	N/A	N/A	100%
	Croatia	100%	100%	100%	100%	100%
FABEC	Belgium	100%	100%	100%	100%	100%
	France	100%	100%	100%	100%	97%
	Germany	100%	97%	100%	93%	97%
	Luxembourg	100%	100%	N/A	N/A	100%
	Netherlands	N/A	100%	100%	100%	100%
	Switzerland	100%	100%	100%	100%	100%
NEFAB	Estonia	100%	100%	N/A	N/A	100%
	Finland	100%	100%	100%	100%	100%
	Latvia	100%	100%	100%	100%	100%
	Norway	100%	100%	100%	100%	100%

FAB	STATE	SMI (Ground)	SMI (Overall)	RI (Ground)	RI (Overall)	ATM-S (Overall)
SW FAB	Portugal	100%	100%	100%	100%	100%
	Spain	100%	93%	100%	57%	76%
UK-Ireland FAB	Ireland	100%	100%	100%	100%	100%
	United Kingdom	100%	100%	67%	80%	100%

Table 10 – 2019 Application of the RAT per Member States per category (Source: EASA).

4.5 Just Culture

53 For RP2, Member States and their ANSPs were to report on the level of presence and corresponding level of absence of Just Culture. FABs were expected to set local Just Culture targets at FAB level – in accordance with Regulation (EU) 390/2013. EASA and the PRB assess the progress based on the responses given to a self-assessment questionnaire for both Member States and ANSPs. The questionnaire is divided into three main areas: policy and its implementation, legal & judiciary, and occurrence reporting and investigation. The questions were to be answered by "yes" or "no", and Member States and ANSPs were again encouraged to provide additional information and justification to their responses.

54 The aim of the assessment is to identify the status of those aspects, which indicate the presence (or corresponding absence) of a Just Culture environment in a given State or ANSP. The responses should be interpreted carefully aiming to identify arising issues over the reference period rather than direct interpretation of negative responses as lack of Just Culture.

55 FABs were also requested to report via the FAB Monitoring Reports on common FAB approaches for improvement in certain Just Culture areas, providing details on possible areas of improvement at both State and ANSP level. FABs have established a common approach as follows:

- Common approach for both regulatory authority and ANSPs: BLUE MED FAB, FAB CE, FABEC and UK-Ireland FAB;
- Common approach only for ANSPs: Danube FAB, DK-SE FAB and NEFAB;
- No common approach: Baltic FAB.

56 Figure 12 shows the replies given by Member States on their questionnaire and presents the number of affirmative replies in each of the three main areas (high number of affirmative replies indicate the level of the implementation of Just Culture). The aim of the assessment is to identify the status of those aspects which indicate the presence (or corresponding absence) of a Just Culture environment in a given Member State or ANSP.

57 Member States performed best in the area of occurrences with 23 Member States reaching the maximum number of affirmative replies. Nine Member States reached the maximum within policy and its implementation, however the remaining Member States are close to the maximum. Member States are lagging with implementation of a Just Culture in the area of legal/judiciary, where only five Member States reached the maximum, which could be explained by that fact that changes in legal systems to support a Just Culture may be difficult and time consuming to implement. Between 2018 and 2019, only Luxembourg improved their level of Just Culture related to policy and its implementation. Hungary and Germany are considered as outliers with low numbers of affirmative replies in all three areas. The United Kingdom did not provide any data.

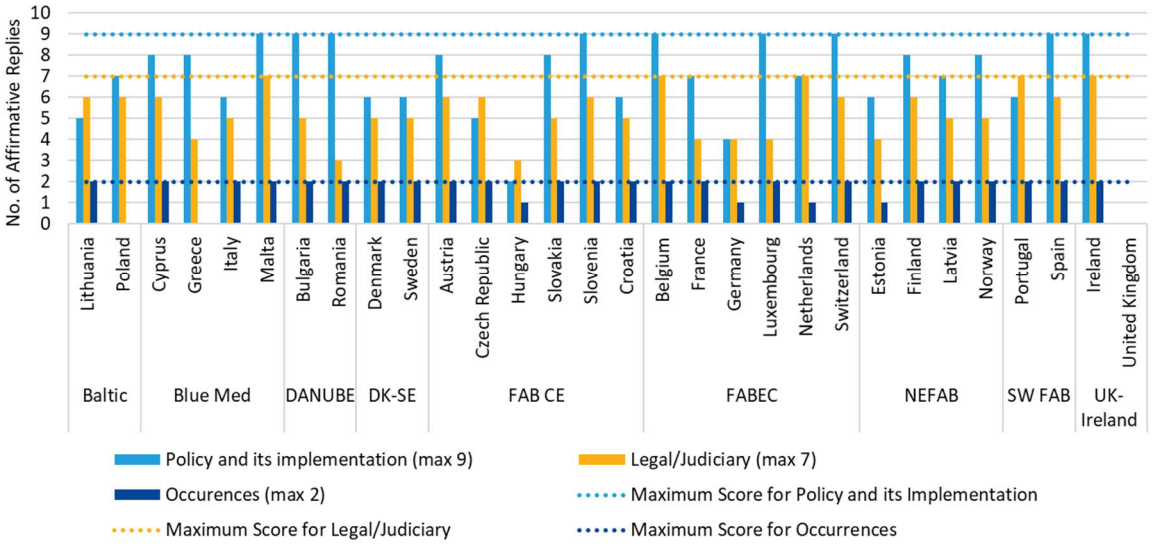


Figure 12 – Just Culture: Member States' number of affirmative answers per component.

58 Figure 13 shows the number of affirmative replies by ANSPs in each of the three main areas.

59 Between 2018 and 2019, improvements were seen for ANSPs in FABEC (ANA LUX, Skeyes, DSNA, LVNL and MUAC) and Baltic FAB (Oro Navigacija).

60 ANSPs performed best in the area of policy and its implementation with 17 ANSP reaching the maximum number of affirmative replies. Eight ANSPs reached the maximum in the area of occurrence and only five ANSPs reached the maximum in the area of legal and judiciary.

61 NATS did not provide any data.

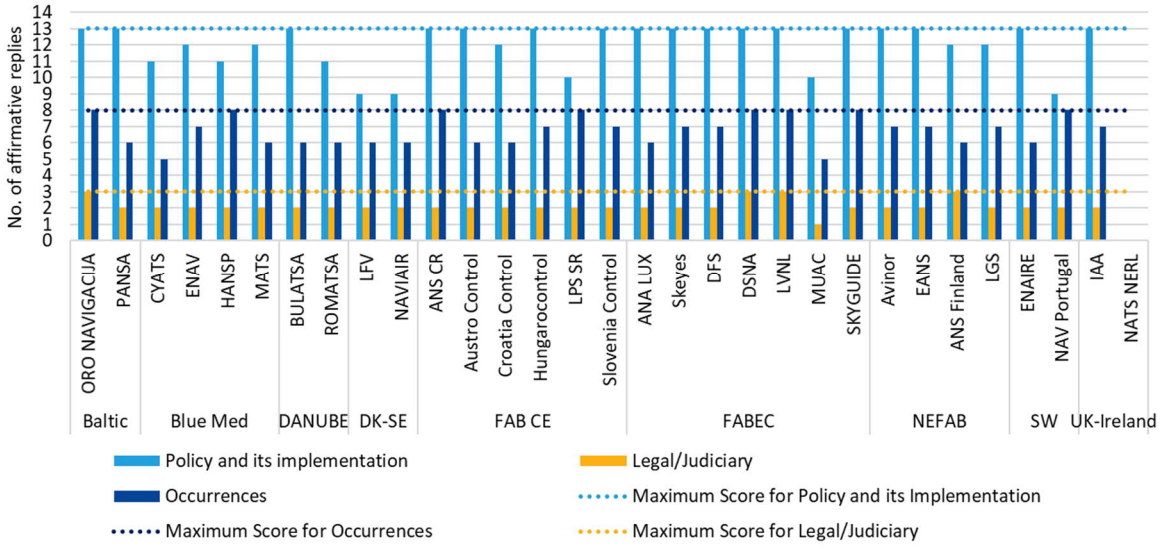


Figure 13 – 2019 Just Culture: ANSP's number of affirmative answers per component.

4.6 Other safety-relevant areas

4.6.1 Cyber-security

62 From a safety perspective, major disruption of ATS services, potentially affecting several ANSPs and network functions simultaneously, due to cyber-security threats is significant. As digitalisation

and virtualisation of the ATM functional systems increase, so does the risk that a disruption of services due to criminal actions will have a wider effect than today.

63 The effectiveness of cyber-security management will become equally important as the effectiveness of safety management systems to ensure aviation safety. Cyber-security requires a higher degree of a cooperative approach since the weakest point, both within an ANSP and within the European air traffic management network, will determine the overall effectiveness of the protection provided. Sharing information on attempts to penetrate security mechanisms will be essential to effectively defer attacks and limit the consequences.

64 As a key element to retaining a high level of aviation safety, the PRB is monitoring the safety regulatory developments related to cyber-security as well as other initiatives taken by the industry, including a maturity assessment principle developed by Eurocontrol and standards development by European Organisation for Civil Aviation Equipment (EUROCAE). The purpose hereof, is that the PRB monitor those area, which are of importance for the safety performance of the organisations monitored by the PRB.[5]

65 As an important step, EASA published a proposal for provisions for the management of information security risks covering all aviation domains, which complements the current EU regulatory framework.[6,7] The proposal will create a "horizontal" information security rule applicable to all aviation domains and introduce cross references to this "horizontal" rule in the existing implementing rules i.e. Implementing Regulation (EU) 2017/373 to the information security rules. The rules will include detailed requirements in two annexes: Annex I "Part-AISS.AR – Authority Requirements" and Annex II "Part-AISS.OR – Organisation Requirements".

66 The information security rule would apply to organisations involved in the design, implementation and maintenance of ANS/ATM systems and constituents, and to essential requirements related to such systems through implementing or delegated acts. The PRB considers this to be essential considering the expected increase in the digitalisation and virtualisation of the ATM functional systems.

67 The authority for the proposed rule would be the same as the one responsible for the current EASA safety approval (or declaration) of the organisation, i.e. in ANS/ATM the National Supervisory Authorities, with the option for the NSA to delegate its tasks to a qualified entity. Whilst NSAs can delegate the tasks, assigning additional and complicated oversight responsibilities will give additional burden on the NSAs, which, as illustrated in section 4.3, are already behind in ensuring compliance with existing regulations.

68 The PRB considers that its monitoring of safety performance need to be extended to also cover the maturity of the cyber-security management of the organisation within the remit of the PRB performance monitoring and will liaise with EASA to explore options to provide a basis for such monitoring.

4.6.2 Unmanned Aerial Vehicles (UAV)

69 In the PRB Monitoring Report 2018, the PRB noted the concern that increasing use of UAVs in more complex and beyond line of site operations provide several challenges:

[5] EASA, Notice of Proposed Amendment 2019-07, Management of information security risks, RMT.0720, dated 27th May 2019.

[7] E.g. complements Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union (the NIS Directive).

- The disruption from UAVs being operated unauthorised close to infrastructure causing disruption of traffic;
- The use of data driven digital systems, devised to providing fully automated services to feed highly automated aircraft operations;
- How to safely integrate UAVs and monitor that acceptable level of safety is achieved.

70 The PRB continues to monitor the development of the regulatory system and consider how UAV operations could/should be integrated into the safety performance monitoring. The PRB recognises the progress made on strengthening the regulatory basis for safe operation of UAVs and will continue to liaise with EASA to ensure that safety performance monitoring will fully encompass UAV operations and, as also noted for cyber-security, that the NSAs will have the capabilities to oversee and enforce compliance in these areas as well.

5 Environment

5.1 Presentation of the environment PIs, KPIs and targets

71 The Commission Implementing Regulation (EU) No 390/2013 defines two KPIs for horizontal en route flight efficiency at Union-wide level:

- **KEA:** The average horizontal en route flight efficiency of the actual trajectory (flown route); and
- **KEP**: The average horizontal en route flight efficiency of the last filed flight plan trajectory (planned route).

72 For local target setting and performance monitoring, only the KEA is defined as a KPI for horizontal flight efficiency at FAB level.

73 The Regulation defines additional Performance Indicators related to the booking procedures for flexible use airspace (FUA) and the planning and use of conditional routes (CDRs) which are monitored at Union-wide and national level.

74 The Regulation further defines additional PIs related to the operational performance at and around airports, to be monitored at both European and local levels (i.e. national level with a breakdown at airport level). From this group, the following PIs are monitored at local level:

- Additional time in the taxi-out phase;
- Additional time in the terminal airspace.

75 Table 1 lists all environment KPIs and PIs and is extracted from the overview of all KPIs used in RP2.

5.2 Horizontal en route flight efficiency

76 Table 11 lists the planned route (KEP) and flown route (KEA) results for the SES RP2 area and Figure 14 shows the monthly Union-wide evolution.

77 At Union-wide level, KEP performance slightly improved in 2019 by 0.03 percentage points, while KEA performance deteriorated by 0.12 percentage points. The target for 2019 in the SES area was missed by 0.58 percentage points for KEP and by 0.35 percentage points for KEA.

78 The data shows that the summer months saw a higher peak in KEA than in 2017 and 2018, which contributed to the underperformance.

79 Table 12 provides the performance of the FABs and the Network Manager (NM – SES area) as measured by the KEA indicator and the targets. Where the actual performance achieved the target, the cell is highlighted green and where it was not achieved, the cell is highlighted red.

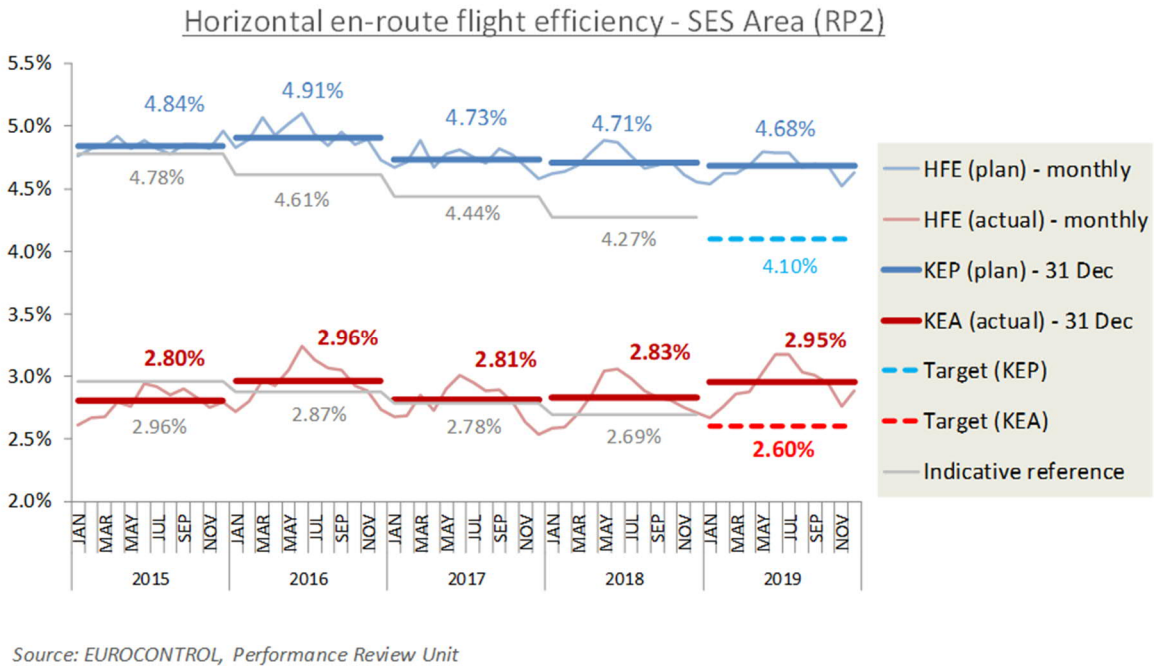
80 None of the nine FABs achieved the targets in 2019 and only SW FAB improved its environmental performance in 2019. This is in contrasts with 2018 when only SW FAB achieved the FAB level targets.

81 SW FAB met their targets between 2015 and 2018 but did not achieve the target in 2019 (by 0.01 percentage point).

82 However, in terms of improvement, between 2012 and 2019, all FABs improved their performance with the most improvement occurring in SW FAB, UK-Ireland FAB and FABEC, whilst the least improvements were achieved by DK-SE, NEFAB and BALTIC FAB.

AREA	INDICATOR		2015	2016	2017	2018	2019
SES RP2	KEP	Target	4.78%	4.61%	4.44%	4.27%	4.10%
		Actual	4.84%	4.91%	4.73%	4.71%	4.68%
	KEA	Target	2.96%	2.87%	2.78%	2.69%	2.60%
		Actual	2.80%	2.96%	2.81%	2.83%	2.95%

Table 11 – KEP & KEA performance at Union-wide level.



Source: EUROCONTROL, Performance Review Unit

Figure 14 – Evolution of horizontal en route flight efficiency (HFE) indicators.

FAB	2012	IMPROVEMENT 2012-2019		2015	2016	2017	2018	2019
BALTIC	1.61%	0.25%	Target	1.50%	1.47%	1.44%	1.40%	1.36%
			Actual	1.60%	1.68%	1.63%	1.72%	1.85%
BLUE MED	3.02%	0.57%	Target	2.78%	2.70%	2.62%	2.54%	2.45%
			Actual	2.80%	3.17%	2.82%	2.91%	3.01%
DANUBE	1.69%	0.32%	Target	1.55%	1.50%	1.46%	1.41%	1.37%
			Actual	1.26%	1.60%	1.62%	1.82%	2.52%
DK-SE	1.20%	0.01%	Target	1.20%	1.20%	1.20%	1.20%	1.19%
			Actual	1.18%	1.20%	1.18%	1.21%	1.25%
FAB CE	2.13%	0.32%	Target	1.99%	1.94%	1.90%	1.85%	1.81%
			Actual	1.91%	1.97%	1.91%	1.95%	2.13%
FABEC	3.56%	0.60%	Target	3.30%	3.22%	3.14%	3.05%	2.96%
			Actual	3.34%	3.40%	3.23%	3.25%	3.32%
NEFAB	1.44%	0.22%	Target	1.35%	1.32%	1.29%	1.26%	1.22%
			Actual	1.40%	1.72%	1.58%	1.31%	1.66%
SW FAB	4.27%	0.99%	Target	3.85%	3.71%	3.57%	3.43%	3.28%
			Actual	3.39%	3.49%	3.25%	3.36%	3.29%
UK-IRE	3.64%	0.65%	Target	3.36%	3.27%	3.18%	3.09%	2.99%
			Actual	3.47%	3.85%	3.70%	3.63%	3.65%
SES area			Target	2.96%	2.87%	2.78%	2.69%	2.60%
			Actual	2.80%	2.96%	2.81%	2.83%	2.95%

Table 12 – KEA (flown trajectory): performance by FAB.

5.3 Additional time in taxi-out phase and terminal airspace (ASMA)

5.3.1 Airport operator data flow

83 The transition from RP1 to RP2 resulted in an increase in the number of airports subject to the Commission Implementing Regulation (EU) 390/2013 from 77 to 174 in 2016, including the alignment of airports subject to the Performance and Charging Regulations.

84 This poses a data quality assurance problem:

- There are several airports subject to RP1 that have not established full compliance with the reporting requirements under RP1;
- Lack of integration of additional airports subject to the RP2 performance and charging regulations. Consequently, the operational data flow for performance monitoring at airports is not yet fully implemented.

85 To cope with the number of airports and ensure quality of the reporting, technical processes and organisational measures have been established and are maintained by the Performance Review Unit (PRU). The PRU is in contact with the identified reporting entities to establish the data flow and ensure compliance with the associated data specification. In case of major non-compliance or non-responsiveness by the identified reporting entity, the PRU liaises with the respective authorities.

86 While the reporting situation is steadily improving, for some of the airports included to the RP2 performance plans, the level of knowledge about the allocation and the resulting reporting requirements is low. Work is ongoing to iteratively to establish and implement the regular data reporting for these airports and respective results will be available in the following years. However, from a performance monitoring point of view, the airports that do report cover most of the departing or arriving IFR movements and, therefore, a good Union-wide understanding is possible.

87 The status of the implementation of the airport operator data flow[8] can be derived from Table 13 of the 174 regulated airports. For the calculation of additional arrival sequencing and metering area (ASMA) time, the share is 40.2% (70 airports) reporting whilst for additional taxi out time it is 39.7% (69 airports).

88 Additional taxi-out time measures the extra time spent taxiing out above the average taxi-out time measured during a normal operations at the airport, while ASMA measures the additional time spent in terminal airspace beyond the average time spent in it during normal operations.

89 Members States are encouraged to establish the data flow to help the industry to assess whether the high-level goals of the Single European Sky are being achieved.

5.3.2 Terminal environmental performance

90 Given the incomplete status of the airport data collection, it was not possible to calculate at Union-wide level the indicator for the average additional time in the taxi-out phase and terminal airspace.

91 At national level, results are only published if all airports are considered valid, i.e. 100% in compliance with the Eurocontrol specifications.[9] In 2019, this was the case for 15 Member States for additional taxi-out time and 15 for ASMA additional time. The national average will be strongly driven by the achieved performance at the major airport(s) in any given State.

92 In 2019, as in 2017 and 2018, the highest additional taxi-out times were observed at London Heathrow airport (8.97 minutes per departure), followed by London Gatwick (8.94 min), Rome Fiumicino (7.87 min), and Dublin (7.10 min).

93 The highest average additional times in the terminal airspace (ASMA) in 2019 were observed at London Luton (14.65 minutes per arrival), followed by Gran Canaria (14.61 min), Paris Charles de Gaulle (14.60 min) and London Stansted (14.16 min).

94 Table 13 provides an overview of additional taxi-out and ASMA time at national level in 2019. More information at airport level is available in the local level view part (Annex II) of the PRB Annual Monitoring Report 2019 or on the dashboard at http://www.eurocontrol.int/prudata/dashboard.

FAB	STATE	# OF AIRPORTS	ADDITIONAL TAXI-OUT TIME			ADDITIONAL ASMA TIME		
			MIN PER DEPARTURE	VALID AIRPORTS	% VALID	MIN PER ARRIVAL	VALID AIRPORTS	VALID DATA (%)
BALTIC	Lithuania	4		1	25%		1	25%
	Poland	15		1	6.7%		1	6.7%

[8] Operational ANS performance data at airport level is published (i.e. airports with valid data) if the data provider successfully established the compliance with the airport operator data flow and not more than two months of data are missing per year.
[9] Eurocontrol Specification for Operational ANS Performance Monitoring - Airport Operator Data Flow, January 2019.

FAB	State	# of air-ports	Additional taxi-out time			Additional ASMA time		
			Min per de-parture	Valid airports	% valid	Min per arrival	Valid air-ports	Valid data (%)
BLUE MED	Cyprus	2		0	0.0%		0	0.0%
	Greece	1	2.61	1	100%	1.30	1	100%
	Italy	5	5.04	5	100%	1.97	5	100%
	Malta	1	1.79	1	100%	0.76	1	100%
DAN-UBE	Bulgaria	1	1.64	1	100%	0.31	1	100%
	Romania	2		1	50.0%		1	50.0%
DK-SE	Denmark	1	2.59	1	100%	1.07	1	100%
	Sweden	1	2.05	1	100%	1.15	1	100%
FAB CE	Austria	6		1	16.7%		1	16.7%
	Croatia	1	1.06	1	100%	0.66	1	100%
	Czech Rep.	4		1	25.0%		1	25.0%
	Hungary	1	1.63	1	100%	0.85	1	100%
	Slovakia	1	0.84	1	100%	0.11	1	100%
	Slovenia	3		1	33.3%		1	33.3%
FABEC	Belgium	5		2	40.0%		2	40.0%
	France	60		5	8.3%		6	10.0%
	Germany	16	2.76	16	100%	1.57	16	100%
	Luxembourg	1	2.34	1	100%	0.50	1	100%
	Netherlands	4		1	25.0%		1	25.0%
	Switzerland	2	3.36	2	100%	2.45	2	100%
NEFAB	Estonia	2		1	50.0%		1	50.0%
	Finland	1	3.04	1	100%	1.19	1	100%
	Latvia	3		1	33.3%		1	33.3%
	Norway	4		1	25.0%		3	75.0%
SW FAB	Portugal	10		3	30.0%		3	30.0%
	Spain	5	3.41	5	100%	1.59	5	100%
UK-IRE	Ireland	3		2	66.7%		2	66.7%
	UK	9	5.91	9	100%	3.45	9	100%
Union-wide		**174**		**69**	**39.7%**		**70**	**40.2%**

Table 13 – Additional taxi-out time & additional ASMA time: (2019) national level.

5.4 Effective use of Conditional Routes

95 A conditional route (CDR) is defined as non-permanent ATS route or portion thereof which can be planned and used under specified conditions.[10]

96 Utilisation of conditional routes is measured with the Rate of Aircraft Interested (RAI) and Rate of Aircraft using CDRs (RAU) measurements. The first indicator, RAI, shows the proportion of flights that could potentially use available CDRs, the second one indicates the actual usage of CDRs.

97 In a free route airspace (FRA) environment, RAI represents the ratio between the number of aircraft filing flight plans to take advantage of an unallocated reserved/restricted airspace to the potential users of that airspace, i.e. where the unallocated reserved/restricted airspace lies amongst the direct route between origin and destination.

98 The NM noted that changes to the methodology for calculating the Rate of Interest and Rate of Usage indicators mean that data before 2017 cannot be directly compared with that from 2017 onwards.[11]

99 The evolution of the RAI and RAU indicators during RP2 is shown in Figure 15. It shows that CDRs remain relevant for a high proportion of flights (high RAI). The higher the RAI value, the more efficient the flight planning process is, meaning that the airspace opportunities from the flight planning point of view are better used. A value of 100% means that all the flights which could have flight planned on a CDR (or through a reservable/segregable airspace) for their shortest route from the aerodrome of departure to the aerodrome of arrival have indeed flight planned using the available opportunity.

100 ANSPs and airspace users can work together to improve the KEP performance by ensuring the availability of CDRs for flight planning purposes and to ensure the flight planning tools take advantage of them.

101 In 2019, the RAU of CDR1 and CDR2 increased, which reversed a general trend of reduced year-on-year usage between 2015 and 2018. It is not clear why the RAU declined between 2015 and 2018 given that the RAI was high, however, one possible reason could be that the airspace availability was dynamic and by the time airspace users needed to use the airspace, it was no longer available.

[10] There are two types of CDRs reported on:
- CDR1 - Permanently Plannable CDR routes are available for flight planning during times published in the relevant national Aeronautical Information Publication (AIP);
- CDR2 - Non-Permanently Plannable CDR routes may be available for flight planning. Flights may only be planned on a CDR2 in accordance with conditions published daily in the Conditional Route Availability Message.

[11] Changes were made by the NM "to align it with the methodology in place for free route airspace".

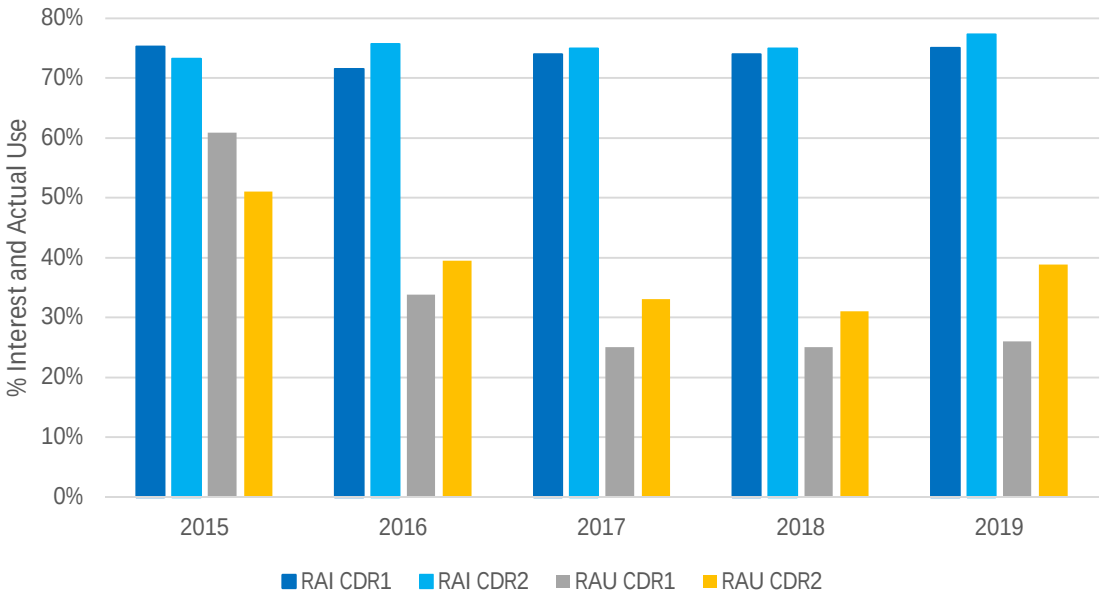


Figure 15 – Evolution of RAI and RAU indicators during the RP2 period (based on data provided by the NM).

5.5 Civil-military dimension

102 Civil-military cooperation, coordination and interoperability are fundamental to delivering a Single European Sky. Supportive co-existence is essential for regional connectivity, stability and growing economies. Member States must adopt a balanced approach to accommodate both civil and military airspace demands while ensuring a safe and efficient operational environment since it is acknowledged that the civil-military relationship has the potential to impact all KPAs of the performance and charging scheme.

103 As a safeguard to national sovereignty prerogatives, the SES Regulation does not directly cover military operations and training as referred to in Article 1(2) of the SES Framework Regulation. This provision is repeated throughout the whole regulatory package, although most of the regulations require that the civil-military aspects be considered as necessary as to support safe and performing ANS provision and ATM functions.

104 However, Member states and the Network Manager were required to include in the performance plans a description of the civil-military dimension of the plan describing the performance of FUA application in order to increase capacity with due regard to military mission effectiveness, and, if deemed appropriate, relevant performance indicators and targets in consistency with other indicators and targets of the performance plan.

105 For RP2, it was therefore assumed that the civil-military dimension should be 'measurable' via assessment of effectiveness of the FUA concept as applied by both the Member states and the Network Manager. Having evaluated all the RP2 performance plans, it has been identified that neither local PIs nor targets related to civil-military dimension have been established by Member States.

106 A review of civil-military coordination and cooperation arrangements performed by Eurocontrol in 2016 and other studies such as the ongoing use of reservable and segregable airspace being by the airspace taskforce in FAB CE identified:[12]

[12] Eurocontrol, Review of civil military coordination and cooperation arrangements, 2016.

- Lack of impact assessments for restricted or segregated airspaces and the effect they have on general air traffic in terms of available ATC capacity and route options;
- Absence of clear national/regional strategic objectives;
- Haphazard data flows throughout the ASM process (availability of the right information to the relevant parties at the right time);
- Differences in the use of airspace flexible structures and application of FUA restrictions buffer zones;
- Non-harmonized time reporting as regards actual use of reserved/segregated airspace (actual airspace use times may differ from activation and release times).

107 In 2015, the Civil-Military Interface Standing Committee developed the Civil-Military ATM Performance Framework document. The document defines several other PIs that could be used by Members States and by the military to assess an impact of ATM system on military mission effectiveness. The indicators have been implemented into the PRISMIL system. In 2019, there were approximately 60% of Member States using the PRISMIL service.

5.5.1 Application of the Flexible Use of Airspace

108 Annex V paragraph 1.1(j) of the Commission Implementing Regulation (EU) 390/2013 requires NSAs to provide information on how the FUA concept is applied by the national/FAB authorities to provide the optimum benefit for both civil and military airspace users.

109 Paragraph 1.2 of the same Regulation requires NSAs to submit their yearly survey on the application of the FUA concept.

110 The FAB monitoring template requested FABs and Member States to provide information on how the Member States review their application of FUA to ensure they are providing the optimum benefit for airspace users.

111 Again, as for the years before, the absence of information from Member States about how they review the effectiveness of applying the FUA concept to provide the optimum benefit for both civil and military airspace users prevented the PRB from monitoring the quantitative benefit for airspace users.

112 The reporting by the Member States on this subject is inconsistent and varied and the annual review processes on the application of FUA by the Member States appears to be absent in general.

113 However, good developments described by Member States include the implementation of LARA (a NM tool to help facilitate airspace management between ANSPs) in Lithuania and the UK in 2019, the involvement of the Spanish Air Force to develop and implement a harmonisation plan, sharing of radar data between civil-military ANSPs in Poland and more Member States implemented advanced FUA (A-FUA) concepts, such as variable profile areas and geometric areas.

114 The PRB recommends NSAs to enforce the regulatory requirements to enable effective monitoring but also to highlight to service providers the importance of FUA to deliver optimum results.

5.5.2 Reservation and usage of segregated or reserved airspace

115 Annex II, which reports on the local level view for each State, presents information on effective booking procedures.

116 The value for the indicator showing the actual use of reserved/segregated airspace compared to the amount of time it was booked, ranges from 100% to 20%. In total, five Member States did not provide any information (Portugal, Ireland, Italy, Luxembourg, Estonia and Malta).

117 Stakeholders (civil and military ANSPs) have not described how this indicator impacts ANS performance. In addition, no information was provided on operational steps taken to influence the local indicator.

118 Only 19 Member States provided data on the release of unneeded area reservations three hours prior to activation. This data shows that the share of restricted/segregated airspace that was not required and was released with at least three hours' notice ranges from <1% to 13%.

119 Figure 16 shows that four Member States accounted for more than half of the sum of number of hours allocated for area reservations and that less than 15 Member States accounted for 90% of the sum of number of hours allocated for area reservations.

120 Concerted effort by these Member States will bring the most benefit in ensuring airspace management is as efficient as possible to minimise the impact on civil air traffic.

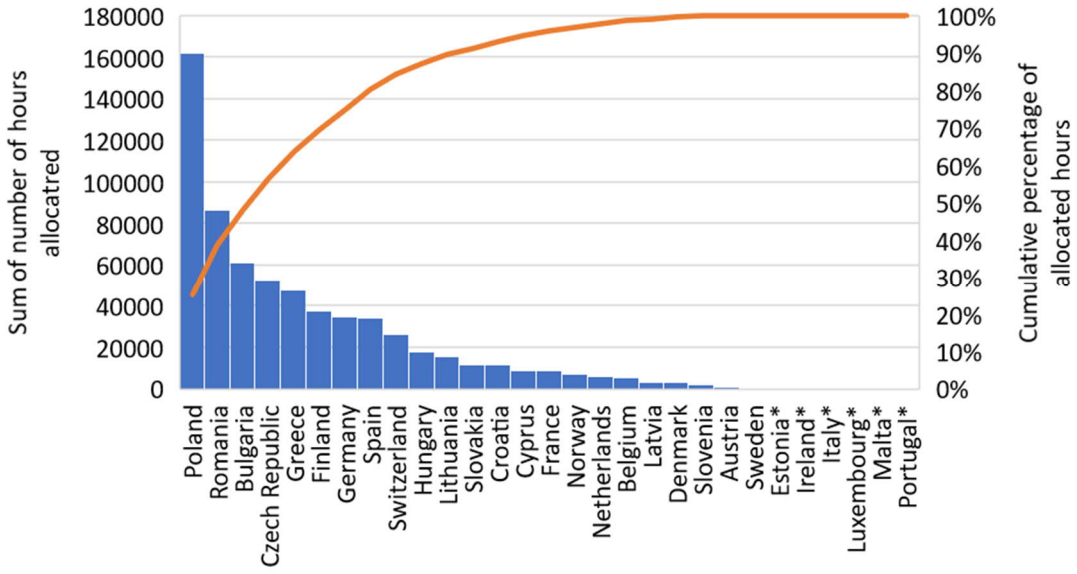


Figure 16 – Sum of number of hours allocated for area reservation in 2019 and the cumulative percentage*.

121 Article 3(c) of the Flexible Use of Airspace Regulation (Commission Regulation (EC) No 2150/2005) states that the airspace reservation for exclusive or specific use of categories of users shall be of a temporary nature, applied only during limited periods based on actual use and released as soon as the activity having caused its establishment ceases.

122 Since it is mandatory to cancel airspace reservations as soon as the activity causing its establishment ceases, military (and civil) stakeholders are obliged to notify airspace users about the release of the airspace to free up capacity and provide more route options.

123 Instead of monitoring a cancellation of airspace reservations up to three hours after the requirement or use has ceased, the PRB believes it would be more effective to monitor the civil-military coordination process within the State to ensure that the legal obligations under the FUA Regulation are being fulfilled.

* Portugal, Ireland, Italy, Luxembourg, Estonia and Malta did not provide any information.

5.5.3 Impact of military activities on airspace users

124 In the capacity KPA there is a category of delay causes related directly to airspace management (ASM). Although not all ASM causes could be attributed to military.

125 The overall annual impact of military activities on EU performance is minimal. In terms of en route ATFM delays, 2.2 – 2.5% of the total 2019 delays were attributable to ASM. However, the data represented by Figure 17 and Figure 18 shows that Germany, Cyprus, France, the United Kingdom, Croatia, Belgium and Spain caused most of the airspace management delays, which peaked in the summer months.

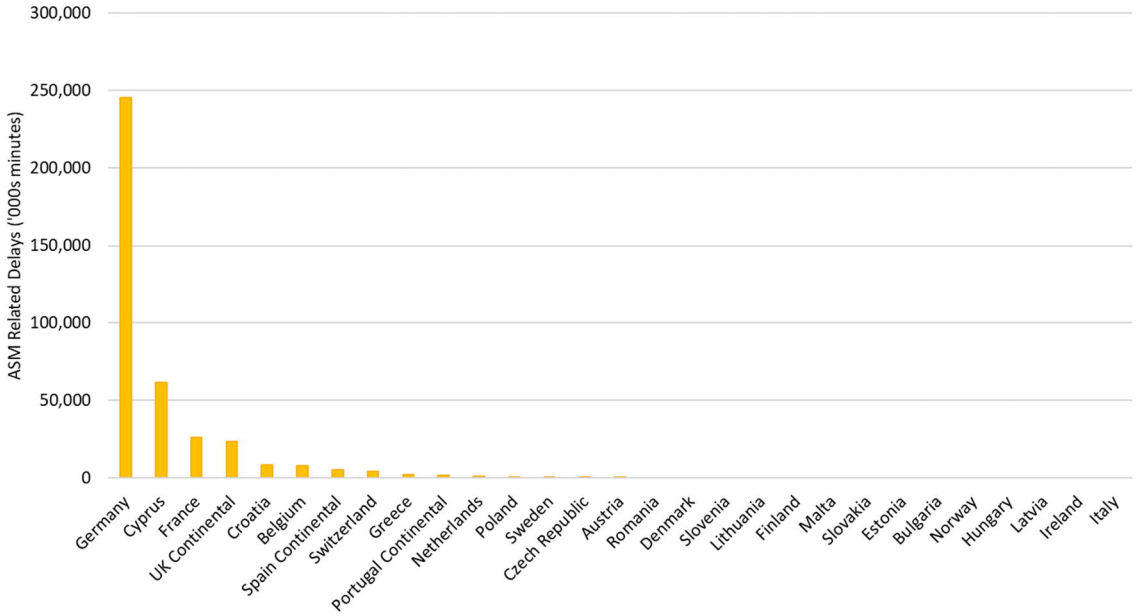


Figure 17 – Distribution of ASM related delays in 2019 amongst Member States showing that a handful of countries generated most of the delays.

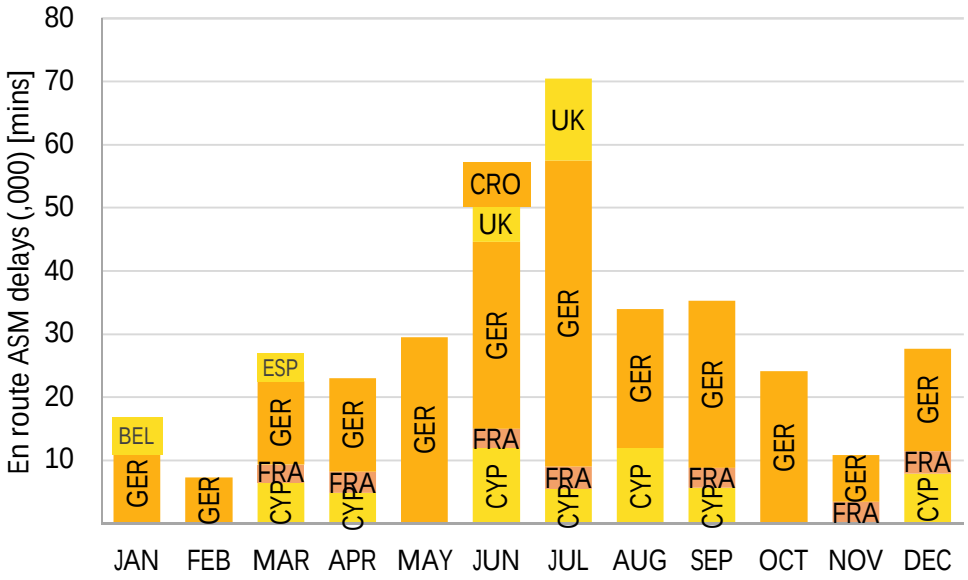


Figure 18 – Distribution of ASM related delays across the months of 2019 and broken down by contributing Member States. The data shows that the summer period resulted in increased ASM delays, particularly from FABEC Member States.

126 Both findings presented above demonstrate the significance of the impact of the civil-military dimension despite the low values at the EU level. It is important to assess the impact of ASM and FUA in the right air traffic context based on common denominators which could be either a State view or possibly a group-of-states' view (e.g. States along the common air traffic axis or FABs).

127 The main en route areas impacted by military activities in 2019 included Karlsruhe, Maastricht, Bremen, Langen, Nicosia, Reims, Madrid, Bordeaux, Zagreb and London.

128 Although the en route environment is primarily affected by military activities the impact on certain airports was clearly identified during 2019. The most affected airport by military activities was Lisbon. During May and June 2019, the military activities in the vicinity of airports generated 10,330 and 30,582 minutes of ATFM delay, respectively. Airspace management delay, due to military activity in the vicinity of Lisbon airport, was the reason for 47.4% of airport capacity related delay. The list of major impacts on airport operations is provided in Table 14.

Month	Impact	Activity	Location	Impact [minutes]
APR	Airport	Capacity issues in conjunction with military exercises	Lisbon airport	2280
APR	Airport	Capacity issues in conjunction with military activity	Lisbon airport	1141
MAY	Airport	Military air display	Sofia airport	1029
MAY	Airport	Military parade	Warsaw/Chopin airport	1217
MAY	Airport	Rehearsals for military air parade	Sevilla airport	1059
MAY	Airport	Military activity in the vicinity of airport	Lisbon airport	10330
JUN	Airport	Military exercises in the vicinity of the airport	Lisbon airport	1858
JUN	Airport	Military activities in the vicinity of airport	Lisbon airport	30582
JUL	Airport	Military activity in the vicinity of the airport.	Lisbon airport	1443
AUG	Airport	Military Parade / Air Show	Katowice airport	Not provided
OCT	Airport	Military parade / Air show	Madrid/Barajas airport	1593
NOV	Airport	Military activity in the vicinity of airport	Lisbon airport	417
NOV	Airport	Military Air Show	Iraklion airport	Not provided
DEC	Airport	Military activities in the vicinity of airport	Lisbon airport	457

Table 14 – Major military activities impacting airport operations.

5.5.4 RP2 civil-military projects and measures

129 The NOP 2019-2024 provides a list of project and activities planned for 2019 in support of civil-military cooperation and military requirements. The PRB assessed the status of each and found that most projects were successfully implemented as shown in Table 15.

Planned projects in support of civil military cooperation		
	Project	Status
UK	Project Lightning (EGD323 re-design to meet military requirements)	Achieved
Cyprus	Improved Civil-Military cooperation in the South-East part of the FIR	Achieved
Denmark	Optimizing the use of FRA when military areas are active at Copenhagen ACC	Achieved
MUAC	Military to Civil Cross training of ATCOs	First ATCOs endorsed.
Greece	Improved civil/military coordination at Athens ACC	Achieved
Greece	Improved civil/military coordination at Macedonia ACC	Achieved
Hungary	2019 Deployment of LARA tool to military units to support Advanced FUA	Achieved
Sweden	Optimizing the use of FRA when military areas are active at Malmo ACC	Achieved
Sweden	Optimizing the use of FRA when military areas are active at Stockholm ACC	Achieved
Turkey	Improved civil/military coordination at ANKARA/ISTANBUL ACC	Achieved
Belgium	Reassessment of sector capacities following CAPAN to fit military needs.	Achieved
Germany	Bremen ACC, 2 military positions	Achieved
Germany	Langen ACC, 2 military positions	Achieved
Denmark	FRA usage optimisation when military areas are active	Achieved

Table 15 – Planned projects in support of civil-military cooperation.

6 Capacity

6.1 Presentation of the capacity PIs, KPIs and targets

130 The KPI used for Union-wide en route capacity is the average minutes of en route air traffic flow management (ATFM) delay per flight attributable to ANS.

131 As far as local target setting is concerned, the Commission Implementing Regulation (EU) 317/2019 defines two KPIs, namely:

- Average minutes of en route ATFM delay per flight at FAB level, with a breakdown monitored for reasons of transparency at the most appropriate level;
- Average minutes of arrival ATFM delay per flight attributable to terminal and airport ANS and caused by landing restrictions at the destination airport. In this case, it is at national level, with a breakdown at airport level for monitoring purposes.

132 The Regulation also defines performance indicators related to the operational performance of ANS at and around airports, monitored at both Union-wide and local levels (i.e. national level with a breakdown at airport level):

- Adherence to ATFM slots;
- Average minutes of ATC pre-departure delay.

133 The European Commission accepted the revised capacity en route targets for BLUE MED FAB in Commission Decision C(2019) 3502 of 15 May 2019. In accordance with Article 16 of the Regulation, the revised en route capacity targets apply retroactively as from the first day of the reference period.

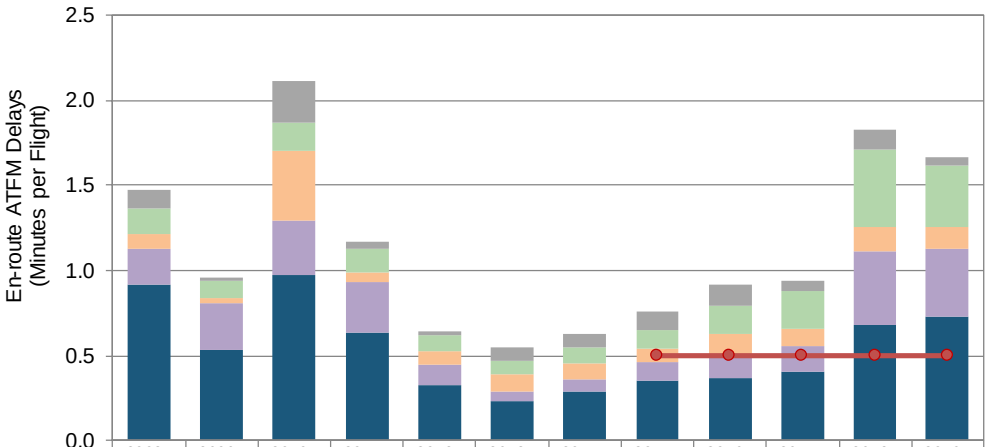
6.2 En route ATFM delays: Union-wide

134 Figure 19 shows the average en route ATFM delay by cause for the SES RP2 area, between 2008 and 2018, according to the delay-cause attribution provided by the NM. The Union-wide average en route ATFM delay target for RP2 is 0.5 minute per flight (SES RP2 area, all delay reasons, all years during RP2).

135 The Union-wide en route capacity target was not met by far in 2019, even though it was the first year in which en route capacity performance slightly improved compared to the previous year. The average en route ATFM delay in 2019 was 1.67 minutes per flight and therefore 9%, or 1.17 minutes, higher than the target value.

136 The additional cost to airspace users associated with this excess delay beyond the target is estimated at 1,209M€ (1.17 minutes per flight x 10.33M flights x 100€).[13] During the five years of RP2, this is 3,618M€ of additional cost (i.e. in addition to the cost of delay associated with the Union-wide delay targets) of delay borne by airspace users.

[13] Standard Inputs for Eurocontrol Cost Benefit Analyses - Edition 8.



	2008A	2009A	2010A	2011A	2012A	2013A	2014A	2015A	2016A	2017A	2018A	2019A
Other [all other codes]	0.11	0.02	0.25	0.04	0.03	0.07	0.07	0.11	0.12	0.06	0.11	0.05
Weather [W,D]	0.14	0.10	0.17	0.14	0.10	0.08	0.10	0.11	0.17	0.22	0.46	0.35
ATC disruptions [I,T]	0.09	0.04	0.40	0.06	0.08	0.11	0.10	0.08	0.12	0.10	0.14	0.13
ATC Staffing [S]	0.22	0.27	0.32	0.30	0.12	0.05	0.07	0.11	0.13	0.15	0.43	0.40
ATC Capacity [C]	0.91	0.54	0.97	0.63	0.33	0.24	0.29	0.35	0.37	0.41	0.68	0.73
EU-wide target								0.50	0.50	0.50	0.50	0.50
Total	1.48	0.96	2.11	1.17	0.65	0.55	0.63	0.76	0.91	0.94	1.83	1.67

Figure 19 – En route ATFM delay with delay codes between 2008 and 2019.

137 The improvement in en route capacity performance compared to 2018 was mainly driven by fewer disruptions and less weather impact, combined with the efforts of the NM and core area ANSPs in the implementation of the enhanced Network Manager/ANSPs network measures for Summer 2019 (eNM/S19 measures).

138 ATC capacity and ATC staffing remained the main causes of delays, with a proportion of 67.7% of total delays. The absolute value and share of ATC capacity code both increased, highlighting that the underlying structural issues have not been resolved by many ANSPs. These factors are fully under the control of ANSPs, yet there were no substantial improvements over the course of RP2 at the Union-wide level, which indicates underlying management problems of ANSPs.

139 Even though the performance of the Union-wide network improved, local performances show a mixed picture. While performance improved in most of the core area (especially in Maastricht UAC, Reims ACC and Brest ACC), Austria and Hungary emerged as new en route ATFM delay hot spots, recording twice and four times as high en route ATFM delays than in the previous year, respectively. This was partly due to a significant increase in traffic and the lack of capacity to cope with it, as well as the impact of convective weather during the summer months. More information on capacity performance on the local level is provided in section 6.3.

140 While the number of flights affected by en route ATFM delay increased from 1,006,685 in 2018 to 1,051,269 by more than 4% in 2019, the number of flights with more than 15 minutes of en route ATFM delay decreased from 437,070 in 2018 to 390,661 in 2019 by more than 10%. This resulted in better predictability of the network as aircraft were in the air closer to their planned times, presumably accompanied by a better passenger experience as well. Still, more than 10% of the flights are affected by en route ATFM delay, and 3.8% of the flights had more than 15 minutes of en route ATFM delay. This increase in predictability, however, does not translate immediately into an increase in the efficiency of the network. Such improvements in predictability should also be accompanied by improvements in the overall delay performance as well, on a longer term.

141 The Network Manager – together with the most affected ANSPs – implemented a series of measures between April and November in 2019 in order to reduce complexity and traffic loads in the most constrained ACCs. The eNM/S19 measures were aimed to re-route traffic and/or level-

cap flights, in order to reduce delays. As a result of the measures, traffic declined in Karlsruhe (-3%) and Maastricht (-1%) UACs, Bremen ACC (-3%) and remained stable in Langen ACC. The implemented measures had no positive impact on the traffic levels or complexity of Marseille ACC[14].

142 The NM has conducted an analysis against a 'no-measures' scenario, which suggests that some 24 million minutes of en route ATFM delay was avoided by implementing the eNM/S19 measures.[15] In addition to the eNM/S19 measures, the Network Manager Operations Centre (NMOC) helped to avoid an additional 2.2 million minutes of en route ATFM delay, through direct actions in the NMOC and by proposing alternative routes (RRPs), which were followed by airspace users. The PRB believes that it is of crucial importance to fully understand the impact mechanisms behind these measures and how they affected the ANSPs and will conduct further analysis to explore the full potential of such measures.

143 As a result of this, and despite the considerable improvement observed in 2019, it remains questionable whether such ambitious Union-wide capacity targets can be reached without significantly more commitment from ANSPs to implement structural reforms.

144 Table 16 shows the evolution of en route ATFM delay over RP2. Despite the improvement observed in 2019, the overall trend in RP2 still resulted in more than twice as much en route ATFM delays than in 2015.

	2015	2016	2017	2018	2019
Union-wide target	0.5	0.5	0.5	0.5	0.5
Actual performance	0.76	0.91	0.94	1.83	1.67
Difference	+0.26	+0.41	+0.44	+1.33	+1.17
Performance vs target	✘	✘	✘	✘	✘

Table 16 – En route ATFM delay performance at Union-wide level.

6.3 En route ATFM delays: local level (FAB)

145 The local (FAB) targets for en route capacity are as adopted in the relevant FAB performance plans. Each FAB was provided with a reference value (that would ensure consistency with the Union-wide target), for each year of RP2, as published in the Network Operations Plan (NOP). Reference values, FAB targets and actual performance are shown in Table 17.

146 In 2019, four of the nine FABs achieved their en route capacity targets. Two out of these (BALTIC and UK-Ireland FAB) experienced traffic growth between the STATFOR base and high forecast scenarios, while DK-SE and NEFAB experienced traffic growth between the low and baseline forecast scenarios. All four FABs contributed positively to network performance, by achieving a better performance than their respective reference values.

[14] Source: Network Manager Annual Network Operations Report 2019, https://www.eurocontrol.int/publication/annual-network-operations-report-2019.
[15] Source: Network Manager Annual Network Operations Report 2019, https://www.eurocontrol.int/publication/annual-network-operations-report-2019.

FAB	Reference Value	FAB Target	Actual Performance	Performance vs target
BALTIC	0.22	0.22	0.1	✓
BLUE MED	0.18	0.24	0.32	✗
DANUBE	0.06	0.04	0.08	✗
DK-SE	0.09	0.09	0.07	✓
FAB CE	0.29	0.27	1.57	✗
FABEC	0.43	0.43	1.68	✗
NEFAB	0.13	0.13	0.00	✓
SW	0.30	0.30	0.53	✗
UK-IRE	0.26	0.26	0.21	✓

Table 17 – En route ATFM delay performance by FAB (2019).

147 The FABs that did not achieve their targets in 2019 were BLUE MED, DANUBE, FAB CE, FABEC, and SW-FAB. FAB CE and FABEC have the highest difference between the actual performance and the target values (+1.3 and +1.25 minutes per flight respectively) and these two FABs show the highest deviation from the targets when expressed as a percentage of the target as well (481% and 290% respectively).

148 Table 18 shows actual traffic levels for each individual year compared to the STATFOR traffic forecast scenarios for the same year (for IFR movements). This is based on the STATFOR seven-year forecast from 2014 February, which was the latest available forecast at the time of developing the performance for RP2.

FAB	2015	2016	2017	2018	2019
BALTIC	Below low traffic scenario	Between low and baseline		Between baseline and high	
BLUE MED	Between baseline and high	Between low and baseline	Between baseline and high		
DANUBE	Above high traffic scenario				
DK-SE	Below low traffic scenario		Between low and baseline		
FAB CE	Above high traffic scenario	Between baseline and high			
FABEC	Between baseline and high traffic scenario				
NEFAB	Below low traffic scenario			Between low and baseline	

SW FAB	Above high traffic scenario		
UK-IRE	Between base-line and high	Above high traffic scenario	Between base-line and high

Table 18 – Comparison of actual traffic with STATFOR.

149 Four FABs (DANUBE, FAB CE, SW FAB, and UK-IRE) have registered traffic above the high scenario for at least one year of RP2, three out of which had traffic growth above the high forecast in at least three consecutive years.

150 In total, six of the FABs (BLUE MED and FABEC in addition to the aforementioned four) encountered higher growth of traffic than expected (between baseline and high scenarios or above high scenario). Out of these six FABs, only BLUE MED registered a year in which traffic was between the low and baseline forecast. Figure 20 provides an overview of the STATFOR low, base, and high scenarios and actual traffic volumes for all FABs.

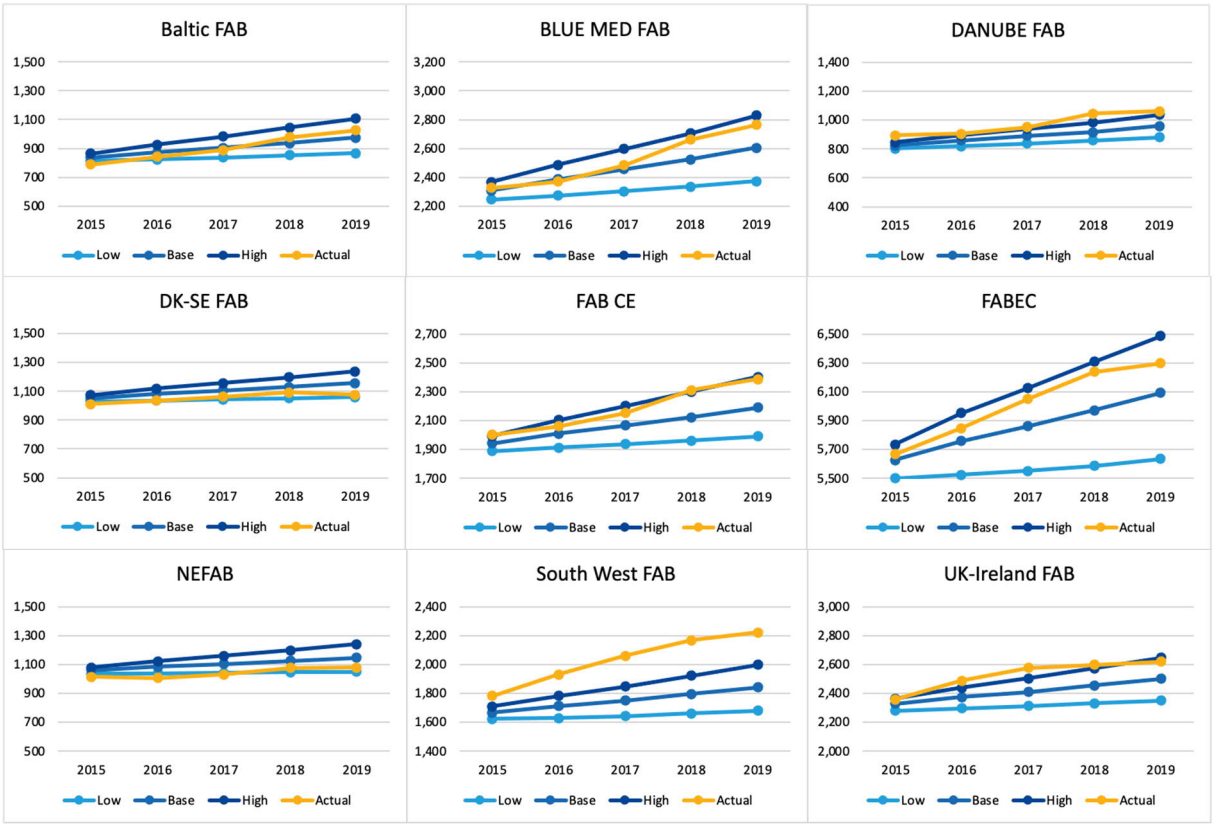


Figure 20 – Comparison of the forecast scenarios (STATFOR 2014 February) and actual traffic volumes in FABs which have registered higher-than-expected traffic volumes over RP2 (Source: STATFOR and SES Performance Dashboard).

151 The difference between the actual number of IFR movements and the STATFOR base forecast values in 2019 is summarised in Table 19.

FAB	IFR MOVEMENTS ('000s)	STATFOR BASE ('000s)	DIFFERENCE ('000)	DIFFERENCE %
BLUE MED	2,763	2,606	157	6.03%
DANUBE	1,060	960	100	10.45%
FAB CE	2,386	2,190	196	8.97%
FABEC	6,298	6,093	205	3.36%
SW	2,221	1,841	380	20.64%
UK-IRE	2,618	2,500	118	4.74%

Table 19 – Comparison of actual IFR movements and the STATFOR 2014 February base forecast values in 2019 in the six FABs which experienced higher-than-expected traffic volumes in RP2. (Source: STATFOR and SES Performance Dashboard).

152 SW FAB registered the largest difference both in absolute terms and in percentages (380,00 flights and 20.64%). In FAB CE, the difference is significant both in terms of absolute values and percentages (196,000 flights and 8.97%). In DANUBE FAB, the difference is less in absolute values, than for the other FABs, however when calculated as percentages, Danube FAB registered the second highest difference in 2019, with 10.45%. For BLUE MED FAB, UK-Ireland FAB, and FABEC the absolute figures are significant, but when calculated as percentages, they translate into 6.03%, 4.74% and 3.36% respectively.

153 FABs in the northern area of the SES had traffic levels below the low forecast scenario in the first half of RP2 and between the low and baseline scenarios in the second half.

154 BALTIC FAB did not fit in either of the above categories, traffic levels transitioning from below the low forecast to between baseline and high over the course of RP2 driven by the increase in GDP and travel demand and partly also due to the evolution of geopolitical circumstances along the Eastern border of the SES area.

155 As a result of all these tendencies, traffic demand proved to be significantly higher than expected especially in the South-Eastern, South-Western parts of the SES, whereas in the Northern parts of the SES area demand was weaker than initially expected in 2014.

156 Table 20 shows an overview of the en route capacity performance of FABs over RP2. FABs, which had mostly lower than expected traffic volumes over RP2 managed to reach their targets in most years. On the other hand, FABs (all other than DK-SE and NEFAB) with higher than expected traffic levels have failed to achieve their targets, especially in 2018 and 2019. This highlights the lack of flexibility of ANSPs, and the insufficiency of management efforts to adapt to changes in traffic levels.

FAB	2015	2016	2017	2018	2019
BALTIC	✓	✗	✓	✓	✓
BLUE MED	✗	✓	✗	✗	✗
DANUBE	✓	✓	✓	✗	✗
DK-SE	✓	✓	✓	✓	✓
FAB CE	✓	✓	✓	✗	✗
FABEC	✗	✗	✗	✗	✗
NEFAB	✓	✓	✓	✓	✓
SW FAB	✗	✗	✗	✗	✗
UK-IRE	✓	✗	✓	✗	✓

Table 20 – Achievement of en route capacity target during RP2 by FAB.

6.4 En route capacity incentive schemes

157 The annual monitoring reports received from each FAB contained information on the results of the incentive schemes applied upon the en route ATFM delay per flight and arrival ATFM delay per flight during 2019.

158 During 2019, nine ANSPs achieved performance levels, which resulted in an aggregated additional receipt in the form of a bonus from airspace users of more than 9.9M€ (Oro Navigacija, PANSA, ENAV, Bulatsa, EANS, ANS Finland, LGS Avinor, IAA) for achieving a capacity performance that was better than the target. The ANSPs subject to bonuses altogether achieved a performance, which resulted in 499,513 minutes less en route ATFM delay than their targeted values. This translates into an average 19.8€ bonus per minute of avoided delay.

159 Eight ANSPs achieved performance levels that resulted in aggregated financial penalties equivalent to 9.8M€ (ROMATSA, Austro Control, Croatia Control, ANS CR, HungaroControl, DFS, DSNA and Skeyes) for achieving a capacity performance that was below the target. The ANSPs subject to penalties altogether achieved a performance, which resulted in 8,720,660 minutes more en route ATFM delay than their targeted values. This translates into an average 1.1€ of penalty per minute of excess delay.

160 Although the financial values of bonuses and penalties were almost the same in 2019, there is a huge difference in terms of avoided and additional delays. A minute of avoided delay was worth 18 times more on average than an additional minute of delay. The asymmetry of these values, and the fact that an additional minute of delay costs 100€ for airlines, highlights the shortcomings of the incentive schemes in general and their weakness in driving ANSPs towards better performance, as it does not provide the necessary financial incentive for ANSPs to avoid generating additional delay.

161 Ten ANSPs achieved capacity performance levels within a dead-band of neither penalty nor bonus (Naviair, LFV, LPS SR, Slovenia Control, LVNL, Eurocontrol (MUAC), skyguide, Nav Portugal, ENAIRE and NATS).

162 Two ANSPs were not subject to an incentive scheme (MATS and HANSA).

163 DCAC Cyprus reported that they had changed the incentive scheme in accordance with an agreement between Cyprus and the European Commission in December 2018. Notwithstanding the reported agreement, Cyprus advised that even though the target was missed, the State will not apply any financial penalty for 2019 en route capacity performance. Cyprus justified not applying the financial penalty by taking into account the efforts and corrective measures made by the ANSP to improve its capacity performance while traffic was continuously growing.

164 It is noted that despite the BLUE MED FAB report advising that the BLUE MED en route capacity targets were significantly revised for the remainder of RP2, the local incentive targets for Italy were not changed.

6.5 Arrival ATFM delay – national target setting and actual performance

165 Arrival ATFM delays are regulations that are attributable to terminal/airport air navigation services and caused by landing restrictions at the destination airport. Table 21 summarises the evolution of arrival ATFM delay over the course of RP2.

166 In 2019, the Union-wide average for arrival ATFM delay (all delay causes) continued to increase from 0.78 minutes per arrival in 2018 to 0.86 minutes in 2019, which was the highest year-on-year increase in RP2.

167 The increase in average airport arrival ATFM delay in 2019 was due to an decrease in the use of aerodrome capacity related delay codes (ATC and non-ATC related), as well as an increase in disruptions (ATC and non-ATC related). Weather related delays decreased compared to 2018.

AIRPORT ARRIVAL ATFM DELAY PER ARRIVAL	2015	2016	2017	2018	2019
Actual performance	**0.64**	**0.67**	**0.74**	**0.78**	**0.86**
# of airports	173	174	174	174	174

Table 21 – Airport arrival ATFM delay: Union-wide level.

168 Most Member States established a national target on arrival ATFM delay in their RP2 performance plans. Table 22 shows the performance observed in 2019 (all delay-causes) in terms of achieving the national targets and associated breakdowns. Cases for which no national target (all causes) has been established, or where the actual observed performance exceeds the established target are highlighted. Reasons for not meeting the target are also summarised, wherever such explanation was provided by the NSAs through the monitoring templates.

169 A number of SES Member States have augmented the national target on arrival ATFM delay with a respective 'CRSTMP target'.[16] The latter is an instrument for the application of the incentive scheme and regulated under the Performance and Charging Scheme regulation.

[16] ATFM delay to which a flight is subjected is defined to have as cause the most penalizing ATFM regulation. Causes related to air traffic service provision and/or special activities comprise: C – ATC Capacity, R – ATC Routing, S – ATC Staffing, T – Equipment (ATC), M – military activity, and P – special event. Under the Regulation (EU) 2019/317, Member States may exclude specific delay causes for the application of the respective incentive scheme.

FAB	State	Airport arrival ATFM delay per arrival (2019)			
		National Target	Actual (all causes)	Target achieved	Reasons for performance
BALTIC	Lithuania	0.00	0.00	✓	
	Poland	0.04	0.39	✗	Delays at Warsaw due to works on runways and weather, associated with increase in traffic.
BLUE MED	Cyprus	none	0.52		No national target specified
	Greece	0.10	2.94	✗	
	Italy	0.41	0.29	✓	
	Malta	0.10	0.00	✓	
DANUBE	Bulgaria	0.00	0.02	✗	
	Romania	0.00	0.01	✗	Minor airport capacity-related delays at Bucharest/ Otopeni
DK-SE	Denmark	0.11	0.07	✓	
	Sweden	0.35	0.32	✓	
FAB CE	Austria	1.27	0.71	✓	
	Croatia	0.05	0.00	✓	
	Czech Rep.	0.40	0.16	✓	
	Hungary	0.05	0.03	✓	
	Slovakia	0.00	0.00	✓	
	Slovenia	0.00	0.00	✓	
FABEC	Belgium	none	0.62		No national target specified
	France	0.60	0.42	✓	
	Germany	0.65	0.39	✓	
	Luxembourg	0.43	1.00	✗	Restrictions related to the surveillance chain upgrade project, now finished.
	Netherlands	2.00	3.88	✗	Weather and capacity-related delays at Amsterdam. 95% of CRSTMP delays associated to the implementation of electronic flight strips.
	Switzerland	2.11	1.61	✓	
NEFAB	Estonia	0.00	0.00	✓	
	Finland	0.14	0.37	✗	Weather related delays (70%) and aerodrome capacity related delays associated with renovation works.
	Latvia	0.04	0.00	✓	
	Norway	0.60	0.18	✓	Weather related delays
SW FAB	Portugal	0.60	2.76	✗	Lack of aerodrome capacity due to infrastructure limitations, weather and airspace management issues in Lisbon and weather events in Porto.

FAB	STATE	AIRPORT ARRIVAL ATFM DELAY PER ARRIVAL (2019)			
		NATIONAL TARGET	ACTUAL (ALL CAUSES)	TARGET ACHIEVED	REASONS FOR PERFORMANCE
	Spain	0.80	1.02	✗	Weather-related delays and capacity issues at Barcelona, Madrid and Palma airports
UK-IRE	Ireland	0.22	0.14	✓	
	UK	0.78	1.25	✗	

Table 22 – Arrival ATFM delay: targets and observed performance (2019).

6.6 Incentive schemes on national target on arrival ATFM delay

170 As part of the RP2 performance plan assessment, compliance issues with respect to the establishment of a national target on arrival ATFM delay and a respective incentive scheme were identified by the PRB at the time. Member States commented on the identified issues, with a final decision by the Commission still pending. The general comments made in the previous Annual Monitoring Reports for the years 2015, 2016, 2017 and 2018 concerning the compliance of the individual incentive schemes still apply.

171 The lack of compliance resulted in a non-uniform application of national targets and in some instances only applied to a subset of airports or delay causes. In some cases, no target was set at the airport level.

6.7 Adherence to ATFM slots and pre-departure delay

172 Table 23 shows the ATFM slot adherence and the ATC pre-departure delay at national level in 2019.

173 As was the case in previous years of RP2, the reporting of average ATC pre-departure delay was limited due to ongoing data issues (lack of proper data provision through airport operator data flow implementation, data quality, etc.), particularly at smaller airports. At national level, results are only published if all airports are considered valid. As a result, the indicator could only be computed for ten of the 30 Member States in 2019 (the same as in 2018). Greece and Switzerland both had on average around one-minute of ATC pre-departure delays. For the other reported airports, the delay figures were not significant, albeit ATC pre-departure delay continued to deteriorate in 2019.

FAB	STATE	# AIR-PORTS	ATFM SLOT ADHERENCE	ATC PRE-DEPARTURE DELAY		
			% OF REGULATED FLIGHTS DE-PARTING WITHIN THE 15 MIN ATFM WINDOW	MIN PER DE-PARTURE	VALID AIRPORTS	VALID DATA (%)
BALTIC	Lithuania	4	95.3%		1	25%
	Poland	15	95.6%		1	6.7%
BLUE MED	Cyprus	2	86.1%		0	0%
	Greece	1	93.3%	0.97	1	100%
	Italy	5	94.5%		4	80%
	Malta	1	95.0%	0.24	1	100%
DANUBE	Bulgaria	1	98.3%	0.15	1	100%
	Romania	2	95.1%		1	50%
DK-SE	Denmark	1	98.6%	0.09	1	100%
	Sweden	1	97.9%	0.09	1	100%
FAB CE	Austria	6	97.4%		1	16.7%
	Croatia	1	94.7%	0.10	1	100%
	Czech Rep.	4	95.7%		1	25.0%
	Hungary	1	94.8%	0.30	1	100%
	Slovakia	1	98.4%		0	0.0%
	Slovenia	3	95.6%		1	33.3%
FABEC	Belgium	5	95.3%		2	40.0%
	France	60	88.4%		3	5.0%
	Germany	16	95.2%		10	62.5%
	Luxembourg	1	86.2%	0.01	1	100%
	Netherlands	4	97.2%		0	0.0%
	Switzerland	2	94.7%	1.13	2	100%
NEFAB	Estonia	2	97.6%		1	50.0%
	Finland	1	93.9%	0.39	1	100%
	Latvia	3	98.0%		1	33.3%
	Norway	4	99.0%		1	25.0%
SW FAB	Portugal	10	95.8%		3	30.0%
	Spain	5	95.7%		1	20%
UK-IRE	Ireland	3	96.2%		1	33.3%
	UK	9	95.0%		6	66.7%
Union-wide		174	94.5%		50	28.7%

Table 23 – ATFM slot adherence & ATC pre-departure delay (2019) local level.

174 In 2019, the level of ATFM slot adherence was above 95% in 21 of the 30 Member States, between 90% and 95% in six Member States and between 85% and 90% in the rest, showing a very good and continuously improving compliance at union level (94.5%).

6.8 Post-ops adjustments

175 In order to provide a better understanding of network constraints by identification of the right ATFM delay cause category, the Network Manager has introduced an improved post-operations

adjustment process, approved in May 2019, which allows operational stakeholders to notify national and European authorities of problems related to air traffic flow management delay measurement, classification and assignment. It also includes the option to reassign delay to a third party.

176 The main output of post-operations adjustment process is a separate performance dataset, which includes the approved changes. The dataset is available for performance scheme and local management reporting.

177 In 2019, the post-operations adjustments also had an additional layer, which comprised of the delay-reattributions associated with the eNM/S19 measures. Since these measures aimed at diverting traffic from the most congested or constrained areas, they sometimes resulted in en route ATFM delays at ACCs, which were not targeted by the measures. These delays would not have been realised had the traffic not been redirected by the measures, thus, these delays were re-attributed to the original ACCs, which benefited from the measures.

178 According to the 2019 post-ops performance adjustment performance dataset[17], en route ATFM delays were increased by around 46,000 minutes due to delay re-attribution between airports and en route environments. This value is negligible compared to the total minutes of en route ATFM delay in 2019 (17.2M minutes).

179 The delay re-attribution requests related to the eNM/S19 measures were reported separately in 2019. As a result of these adjustments, around 970,000 minutes of en route ATFM delay were re-attributed to DFS, DSNA and MUAC, from their neighbouring ANSPs.[18]

6.9 Capacity planning and ATCO management

180 The planning and realisation of capacity profiles is driven by several factors: the design of the airspace, the number of sectors, specificities of technical systems, rostering schemes, and, last but least, the number of available Air Traffic Control Officers (ATCOs).

181 While not directly driven by ATCO management in itself, the analysis of capacity profiles does indicate the extent, to which ANSPs were able to deliver their capacity improvement plans. Capacity profiles are given as IFR movements per hour. ANSPs report their planned profiles for all ACCs, while the NM calculates the actual values as well as the reference profiles (which would need to be realised by the ANSPs in order to meet their respective en route ATFM delay targets).

182 Table 24 shows the comparison of capacity profiles (expressed in IFR movements per hour) for the ACCs with the ten largest deviation from their average en route ATFM delay reference values. Marseille ACC, Karlsruhe UAC, Reims ACC, and Zagreb ACC have been able to deliver higher capacity profiles than the planned values, Barcelona ACC realised the planned profile, while Budapest ACC, Brussels ACC, Bremen ACC and Wien ACC have all realised profiles which were well under the planned values in 2019.

[17] https://www.eurocontrol.int/service/post-operations-performance-adjustment.

[18] A detailed table of all the post-ops adjustments is provided by Eurocontrol here: https://www.eurocontrol.int/publication/post-operations-adjustment-process-dataset.

ACC NAME	2019 CAPACITY PROFILES (IFR MOVEMENTS PER HOUR)			COMPARISON OF PROFILES	
	PLANNED	ACTUAL	REFERENCE	ACTUAL VS. PLANNED	ACTUAL VS. REFERENCE
Vienna ACC	202	181	239	-21	-58
Budapest ACC	203	170	214	-33	-44
Marseille ACC	222	247	297	25	-50
Karlsruhe UAC	279	299	399	20	-100
Nicosia ACC	72	71	79	-1	-8
Brussels ACC	140	118	143	-22	-25
Bremen ACC	149	128	151	-21	-23
Zagreb ACC	160	166	188	6	-22
Barcelona ACC	164	164	168	0	-4
Reims ACC	198	207	234	9	-27

Table 24 – Comparison of planned, actual, and reference capacity profiles of ACCs with top ten deviation from average en route ATFM delay reference values in 2019 (source: NM Annual Network Operations Report 2019 and Network Operations Plan 2019-2024 Edition 2.1).

183 All ACCs in the list had lower capacity profiles than their reference values in 2019. In Barcelona ACC, the deviation from the reference profile is only four movements per hour (less than 2.5%), which indicates, that delays are not driven primarily by structural capacity problems. For all other ACCs in the list, the deviation is significant (ranging from 10% in Nicosia ACC to 25% in Karlsruhe UAC), indicating that without capacity enhancement measures being implemented at large the delay situation cannot be improved.

7 Cost-efficiency

7.1 En route ANS cost-efficiency

7.1.1 Presentation of the en route Cost-efficiency PIs, KPIs and targets

184 Commission Implementing Decision 2014/132/EU of 11 March 2014 sets the Union-wide targets for the cost-efficiency KPA covering RP2 (i.e. the period 2015-2019). These targets, as shown in Table 25, are expressed in average determined unit cost (DUC) for en route air navigation services (ANS) and correspond to an average DUC decrease of -3.3% p.a. between 2014 (starting point based on the RP1 determined costs (DCs) for 2014 i.e. 58.09 €$_{2009}$) and 2019.

COST-EFFICIENCY UNION-WIDE TARGETS	2015	2016	2017	2018	2019
Real en route determined unit costs (in €$_{2009}$)	56.64	54.95	52.98	51.00	49.10

Table 25 – En route cost-efficiency targets for RP2 (EC Decision).

185 The aggregation of the individual national cost-efficiency targets for the 30 SES Member States that corresponds to 30 en route charging zones (CZ) (Belgium and Luxembourg share one CZ and Spain has two CZs) as shown in Table 26. DUC decreased by - 3.5% per year on average between 2014 (starting point based on the RP1 determined costs (DCs) for 2014, i.e. 58.09 €$_{2009}$) and 2019.

186 Table 26 also shows that the aggregation of the local cost-efficiency targets reported in the RP2 performance plans are lower than the Union-wide targets in 2015 (-2.3%), 2016 (-2.0%), 2017 (-1.0%), 2018 (-1.2%) and 2019 (-1.0%).

COST-EFFICIENCY DATA FROM PERFORMANCE PLANS	2015P	2016P	2017P	2018P	2019P
Real en route determined unit costs (in €$_{2009}$)	55.33	53.86	52.47	50.38	48.61
Difference between determined unit costs and Commission Decision on Union-wide targets	-2.3%	-2.0%	-1.0%	-1.2%	-1.0%

Table 26 – En route cost-efficiency targets for RP2 as per aggregation of adopted national targets (SES level).

187 In 2016, Malta, Poland and Bulgaria requested the European Commission to revise their RP2 en route cost-efficiency targets for the years 2018 to 2019. The figures for these three Member States show the amended performance plans (Commission Implementing Decision (EU) 2017/2376 of 15 December 2017). In 2017, Romania, Portugal and Denmark submitted a request to the European Commission to revise their RP2 en route cost-efficiency target DUC for the years 2018 to 2019. Denmark subsequently withdrew the request. This report includes the amended targets for Romania and Portugal as reflected in the revised performance plan (Commission Implementing Decision (EU) 2018/1782 of 15 November 2018 as amended by Commission Implementing Decision (EU) 2018/2021 of 17 December 2018).

188 In order to ensure consistency with Commission Implementing Decision 2014/132/EU setting Union-wide targets for RP2 as well as with the determined costs provided in the adopted performance plans and to allow consolidation at Union-wide level, the actual and determined costs in this PRB Monitoring Report 2019 are expressed in real terms (€$_{2009}$ prices).

189 The source of the data for all tables, figures and analysis, in this PRB Monitoring Report 2019, are the 2020 en route reporting tables summited by the Member States, except for the CAPEX data sourced from the NSA Monitoring report submitted by the FABs.

7.1.2 Actual 2019 en route costs vs costs in performance plans

190 At Union-wide level, actual 2019 en route costs were 6.15B€$_{2009}$, +86.2M€$_{2009}$ (i.e. +1.4%) higher than the determined costs provided in the RP2 performance plans (6.06B€$_{2009}$).

191 Figure 21 provides a breakdown of this variation for each entity considered in the en route charging zones (ECZs): the main air traffic service provider (ATSPs)[19], other ANSPs, the meteorological services for air navigation (MET service providers) and the NSAs/Eurocontrol).[20] The higher than planned en route costs in real terms are mainly driven by the main ATSPs (+2.1%, or +109.2M€$_{2009}$), while the costs for the MET service provider (-4.2%, or -8.5M€$_{2009}$) and the NSA/Eurocontrol (-3.4%, or -16.3M€$_{2009}$) are lower than planned.

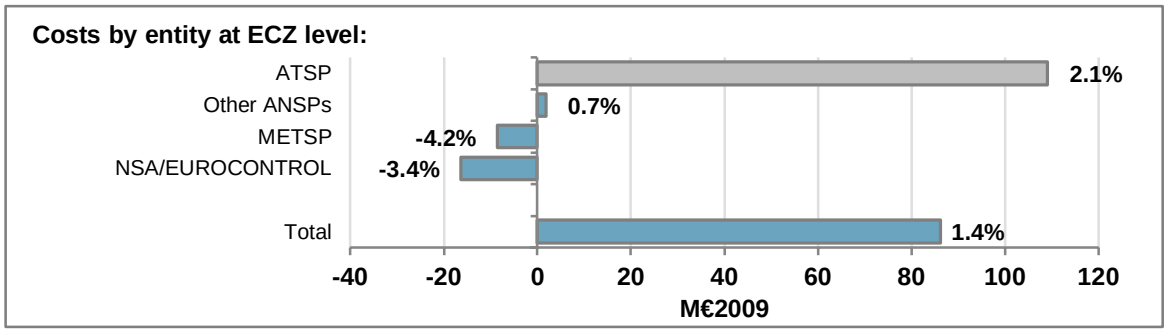


Figure 21 – 2019 actual en route costs compared to performance plans by entity (SES level).

192 The (main) en route Member States' ATSP is the most significant contributor to the Member States' en route costs, in 2019 they contributed 85% of the total en route costs at Union-wide level. The ATSPs are the only (or main) entities subject to the costs and traffic risk sharing mechanisms as foreseen by the Charging Regulation. Due to their relative size in the CZs in terms of costs, most of the deviation observed for the total en route ANS is due to the main ATSPs.

193 Figure 22 presents for each en route charging zone the variation between actual costs and determined costs in 2019. Actual costs were higher than planned for 18 charging zones, with three of these showing a significant deviation above +10%:

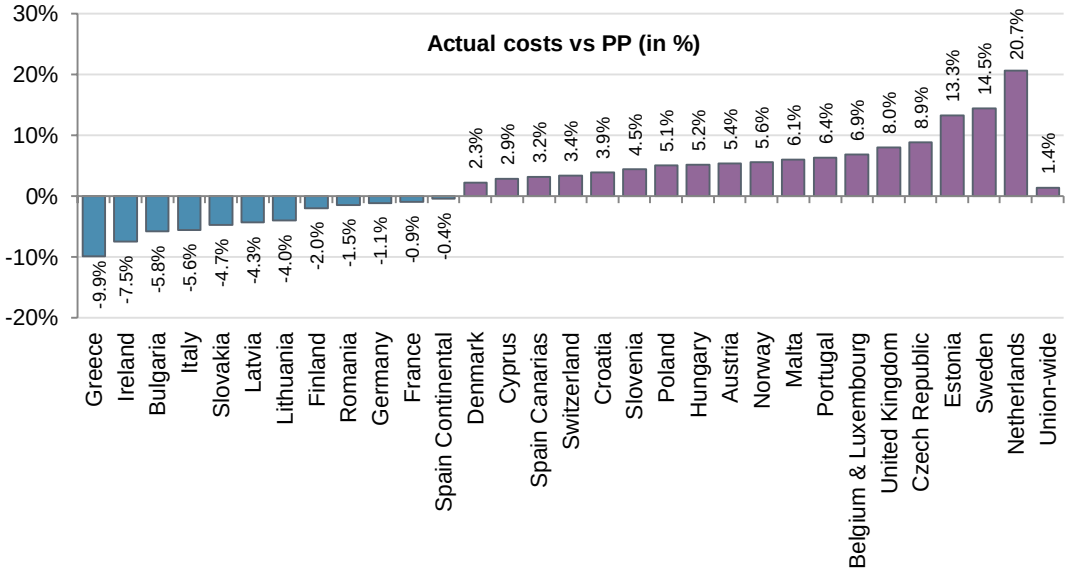
- The Netherlands has a much higher than planned en route costs in real terms (+20.7% or +35.0 M€$_{2009}$) mainly driven by higher actual costs for the main ATSP - LVNL (+25.8% or +30.6 M€$_{2009}$). According to the additional information to the June 2020 en route reporting tables, this results from a combination of:

[19] For the purposes of this analysis, the term ATSP is used instead of ANSP, in order to specify the fact than in this PRB 2019 Monitoring Report the costs MET services are air navigation services monitored apart.

[20] For the purposes of this analysis, the main ATSPs actual costs are aggregated from the June 2020 en route reporting tables produced at CZ level. For a few ATSPs, the analysis at Member State level is adjusted to take into account reporting issues or special circumstances. These adjustments are systematically explained in the local level view part (Annex II) of this PRB 2019 Annual Monitoring Report.

- higher staff costs (+12.2%, or +10.7M€$_{2009}$) "as a result of hiring additional staff, increased pension premiums and additions to staff provisions required by external accountant";
- much higher other operating costs (+94.6%, or +19.2M€$_{2009}$) "due to hiring of external staff for building up the extensive RP3 project portfolio". The NSA monitoring report 2019 also refers to "a number of one-off costs for LVNL due to accounting changes and legal issues";
- much higher depreciation costs (+30.3%, or +2.6M€$_{2009}$) "due to completion of some major investments such as the new training and contingency facilities also used to develop iCAS";
- much lower cost of capital (-69.4%, or -1.9M€$_{2009}$) "due the postponement of the implementation of some investments and lower interest rate".

- Sweden has a deviation of +14.5% or +23.2M€$_{2009}$. The higher than planned en route costs in real terms were mainly driven by higher actual costs for the main ATSP - LFV (+11.2%, or +14.4M€$_{2009}$) and for the other ANSPs (+78.6%, or +5.6M€$_{2009}$). The main driver for the higher actual costs for LFV was the higher than planned staff costs (+10.3%, or +9.3M€$_{2009}$). This is due to higher pension costs driven by a lower discount rate than assumed in the performance plan and changes in the internal accounting that impacted actual staff costs compared with the planned. The difference between the actual and planned pension costs is reported as costs exempted from cost-sharing.
- Estonia has a deviation of +13.3% or 2.7M€. The higher than planned en route costs in real terms are driven by EANS (the ATSP) (+15.2%, or +2.4M€$_{2009}$) due to higher staff costs (+9.0%, or +0.8M€$_{2009}$) "mainly due to the situation in labour market, high pressure to raise salaries".



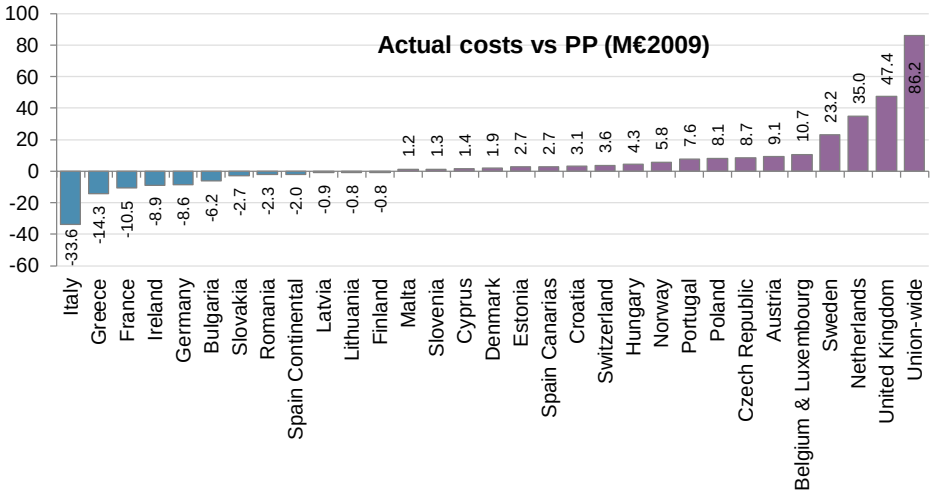


Figure 22 – 2019 actual en route costs compared to PPs by CZs (SES level).

194 Figure 23 shows that the actual en route costs for the main ATSPs are higher than planned in 2019 (+109.2€$_{2009}$). This results mainly from a combination of:

- Higher staff costs (+4.0% or +133.2M€$_{2009}$);
- Higher other operating costs (+1.6% or +14.0M€$_{2009}$);
- Lower depreciation costs (-4.8% or -33.80M€$_{2009}$);
- Lower costs of capital (-5.7% or -17.1M€$_{2009}$).

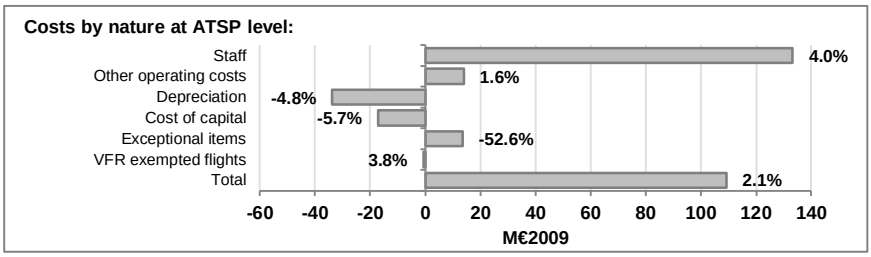


Figure 23 – 2019 actual ATSPs en route costs compared to performance plans by nature (SES level).

195 Figure 24 shows that in 2019 only four ATSPs (Bulgaria, Ireland, France and Italy) recorded lower actual staff costs than planned. A large proportion of the +133.2M€$_{2009}$ deviation between the actual and planned staff costs is due to NATS, the ATSPs of the United Kingdom, with +17.8% or 39.9M€$_{2009}$. As indicated in the additional information to the June 2020 en route reporting tables, mainly due to "higher levels of recruitment of ATCO trainees together with more staff/hours required for SESAR systems implementations and transition costs where dual running is still required".

196 Figure 24 shows that out of the 30 CZs, half of them have higher operating costs than planned. A large portion of the +14M€$_{2009}$ deviation between the actual and planned other operating costs is due to the ATSPs of three Member States:

- Skyguide (Switzerland) has much higher other operating costs (+137.2%, or +5.4M€$_{2009}$) due to “More purchase of services”. This is aligned with the strategy “buy instead of make” applied by skyguide since a few years and “Increase in allowance for bad debt”;
- LVNL (the Netherlands) has much higher other operating costs (+94.6%, or +19.2M€$_{2009}$). As indicated in the additional information to the June2020 en route reporting tables, mainly due to “hiring of external staff for building up the extensive RP3 project portfolio”.

The NSA monitoring report 2019 also refers to "a number of one-off costs for LVNL due to accounting changes and legal issues";

- Skeyes (Belgium), with much higher other operating costs (+88.2%, or +8.3M€$_{2009}$), explained by "an increase in costs for temporary reinforcement of staff, for project management and transformation".

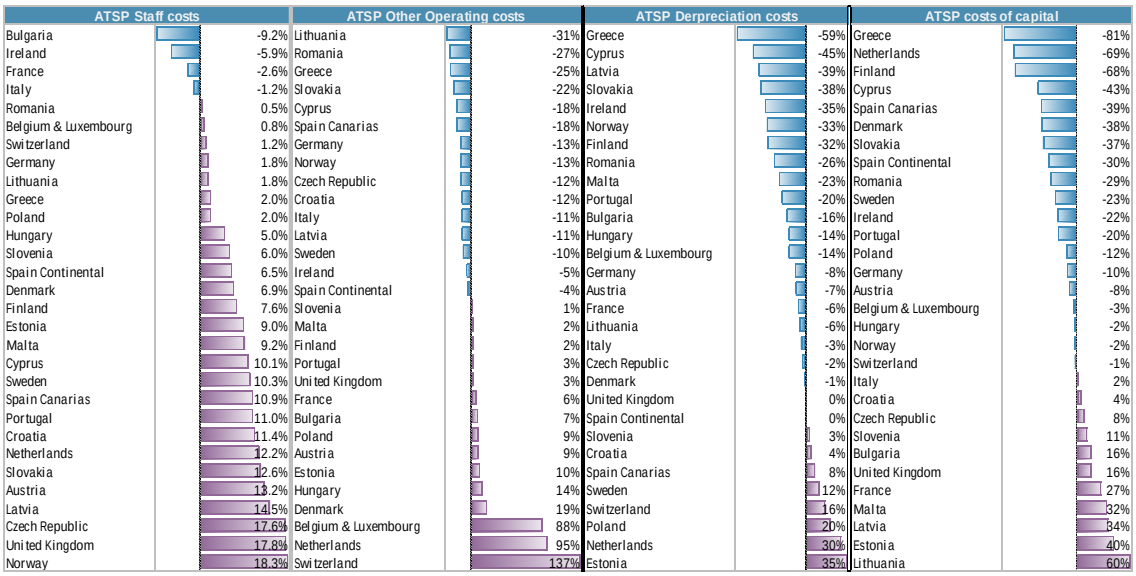


Figure 24 – 2019 actual main ATSPs en route costs compared to performance plans by nature.

197 Costs of capital are lower than planned (-5.7% or 17.10M€$_{2009}$). Reflecting a combination of several factors depending of each state, but in general terms, lower than planned total asset base and lower interest rates.

198 Depreciation costs are also lower than planned (-4.8% or -33.80M€$_{2009}$). This is mainly due to (1) the postponement or delays in capital expenditures (CAPEX), (2) delays in entry into service of the purchased equipment, and (3) in some cases the non-realisation of planned CAPEX. The postponement of capital expenditures (CAPEX) that was observed during the RP1 period could have been triggered to adjust to lower than expected traffic volumes (-4.9% TSUs over the whole RP1 period), but this should not be the case in RP2 where traffic is higher than planned (+7% TSUs over the whole RP2 period). Details on CAPEX are available in the Annex IV of this PRB Monitoring Report 2019.

199 Details of the main drivers underlying the deviation between actual and determined costs for each of these cost categories are available at charging zone level in the Annex II of this PRB Monitoring Report 2019.

7.1.3 Cost-sharing mechanism

200 The cost-sharing mechanism in the RP2 SES Regulations provides that the difference between the determined costs set in the adopted performance plans and the actual costs for the year shall be borne (in case of higher costs) or retained (in case of lower costs) by the Member States/ATSPs, except for the costs items exempted from this mechanism (listed in Figure 26).

201 At Union-wide level, actual 2019 en route costs for the main ATSPs are +109.2M€$_{2009}$ (i.e. +2.1%) higher than the determined costs provided in the RP2 performance plans. This difference between the DCs set in the adopted performance plans and the actual costs for the year is borne by the (main) ATSPs as shown in Figure 25 once excluding the costs exempted from the costs sharing

mechanisms, the net loss retained by the main ATSPs in respect of the costs-sharing amounts to -42M€$_{2009}$.

Cost sharing ('000 €2009)	2015	2016	2017	2018	2019
Determined costs for the main ATSPs (PP) - based on planned inflation	5 289 228	5 225 457	5 249 455	5 233 089	5 135 840
Actual costs for the main ATSPs	5 147 242	5 093 510	5 109 924	5 187 571	5 244 995
Difference in costs: gain (+)/Loss (-) retained/borne by the main ATSPs	141 986	131 946	139 530	45 518	-109 155
Amounts excluded from cost sharing to be recovered from (+) or reimbursed to (-) users	22 195	4 232	27 899	32 099	67 190
Gain (+)/Loss (-) to be retained by the main ATSPs in respect of cost sharing	**164 181**	**136 179**	**167 429**	**77 616**	**-41 965**

Figure 25 – Gain (+)/loss (-) to be retained by the ATSPs in respect of cost sharing. Negative values are shown in red.

202 The cost-sharing arrangements explained in paragraph 200 should not apply to the difference between determined costs and actual costs with regard to cost items for which the air navigation service provider, contracting State or qualified entities concerned have taken reasonable and identifiable steps to manage but which may be deemed to be outside their control as a result of: (1) unforeseen changes in national pensions law, pension accounting law or pension costs resulting from unforeseen financial market conditions, (2) significant changes in interest rates on loans, which finance costs arising from the provision of air navigation services, (3) unforeseen new cost items not covered in the performance plan, but required by law, (4) unforeseen changes in national taxation law, (5) unforeseen changes in costs or revenues stemming from international agreements.

203 The costs exempted from cost-sharing are considered in the calculation of the ATSP net gain for the 2019 en route activity, which is presented in Section 7.1.8. This monitoring report considers the Member States' submissions on costs exempted from cost-sharing, as reported in the June 2020 reporting tables for the purposes of en route charges. These amounts displayed in the in Figure 26 to be recovered from (+) or reimbursed to (-) airspace users, will be eligible for carry-over to the following reference period(s), if deemed eligible by the Commission.

En-route costs exempted from cost sharing						
Estimates ('000 €2009)		2015	2016	2017	2018	2019
by item	Pension	33 714	19 579	44 166	45 869	59 696
	Interest rates on loans	-2 173	-3 693	-5 060	-862	-1 232
	Taxation law	-9 717	-10 877	-11 724	-12 938	-13 839
	New cost item required by law	511	-8	1 012	2 121	23 005
	International agreements	-5 906	-5 607	-20 116	-29 933	-30 765
by entity	ATSP	22 195	4 232	27 899	32 099	67 190
	Other ANSP	0	2 157	2 643	2 514	3 520
	METSP	-11	-39	-46	-48	-35
	NSA/EUROCONTROL	-5 755	-6 957	-22 217	-30 307	-33 810
Total costs exempted from cost sharing		**16 429**	**-606**	**8 278**	**4 257**	**36 865**
To be recovered from (+) or reimbursed to (-) users if eligible after EC verification						

Figure 26 – En route costs exempted from cost-sharing (SES level). Negative values are shown in red.

204 Figure 26 above shows that the net amount of en route costs exempted from cost-sharing in 2019 is +36.9M€$_{2009}$ (to be recovered from the airspace users). The costs exempted from cost-sharing reported by main ATSPs amount to +67.2M€$_{2009}$ (to be recovered from airspace users). Costs exempted from cost-sharing reported by other ANSP (-3.5M€$_{2009}$) and the NSAs/Eurocontrol (-33.8M€$_{2009}$) are negative (indicating reimbursement to the users).

7.1.4 Actual 2019 total service units vs performance plans

205 In 2019, Union-wide actual total service units were +10.5% higher than planned in the adopted performance plans (i.e. slightly above the ±10% alert threshold at system level). In 2019, the IFR movements were 1.69% higher than the base forecast, indicating that the high difference in total service units may be due to the use of larger, heavier aircraft by the airspace users.

206 Service units have greatly exceeded the ±2% dead-band foreseen in the traffic risk sharing mechanism although this is just applicable at charging zone level. Additionally, the difference between

actual and planned service units increased each year (+2.0%, +4.4%, +8.0% +9.7% and +10.5% in 2015, 2016, 2017, 2018 and 2019 respectively).

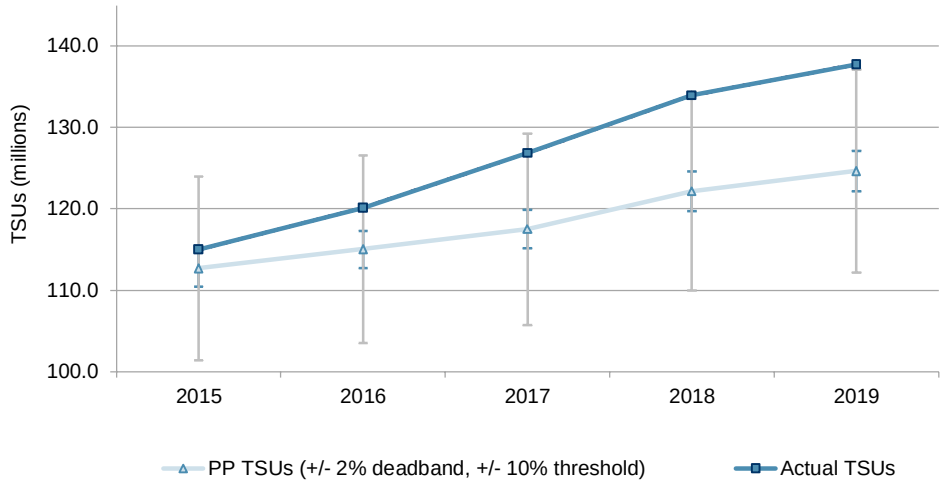


Figure 27 – En route traffic monitoring (actual 2015-2019 TSUs compared to performance plans, SES level).

7.1.5 Traffic risk sharing mechanism

207 The traffic risk sharing arrangements provided in Commission Implementing Regulation (EU) No 391/2013 foresee that ANSP's additional (or lost) revenue (in respect of determined cost) due to the difference between the actual and the planned TSUs is shared with airspace users as follows:

- If the difference in terminal service units falls within the dead-band of ±2%, the additional (or lost) revenue in respect of air traffic service provider determined costs is fully retained (or borne) by the ATSP concerned;
- If the difference in TSUs falls outside the threshold of ±10%, the additional (or lost) revenue in respect of ATSP DCs is fully reimbursed (or charged) to the airspace users;
- If the difference in TSUs falls between the dead-band of ±2% and the threshold of ±10%, the additional (or lost) revenue in respect of ATSP DCs is shared between the ATSPs (30%) and the airspace users (70%).

208 This mechanism is presented in Figure 28. It shows that revenues due to traffic variation between ±2% are fully borne by the ANSP whilst between ±2% and ±8% the ANSP can keep a maximum of 30% of additional revenue or bear at least 30% of the loss. Beyond the 10% limits all additional/lower revenue is fully recovered or reimbursed to airspace users.

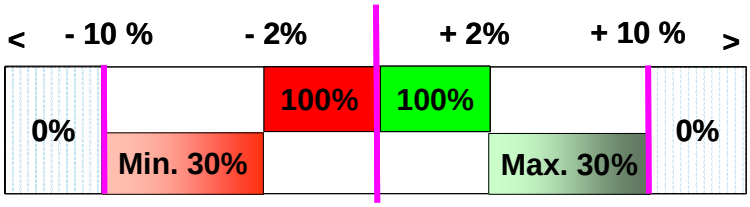


Figure 28 – Traffic risk sharing mechanism for the ATSPs.

209 The DCs of the other entities such as NSAs, Eurocontrol and MET service providers (which represent around 10% of the total DCs at Union-wide for 2019) are not subject to traffic risk sharing and are fully reimbursed (or charged) to the airspace users, irrespective of traffic evolution.

210 The additional revenues resulting from the application of the traffic risk sharing mechanism amounted to 663.4M€$_{2009}$ in 2019. This additional revenue arising from the deviation between actual and planned traffic are shared between Member States/ANSPs and airspace users according to the traffic risk sharing mechanism described above.

211 Figure 29 shows the proportion of revenues eligible and ineligible for the traffic risk sharing mechanism to be reimbursed to airspace users. In 2019, 73.8% of the additional revenues are distributed to airspace users, i.e. 60.0% relating to cost subject to traffic risk sharing (397.7M€$_{2009}$) and 13.8% relating to costs not subject to traffic risk sharing (91.6M€$_{2009}$). 26.2% of the additional revenues are retained by Member States/ATSPs (174.0M€$_{2009}$, of which 170.7M€$_{2009}$ for the main ATSPs and 3.4M€$_{2009}$ for the other ATSPs).

212 This situation is significantly different from the situation in RP1 when actual traffic was consistently lower than planned in the PPs.

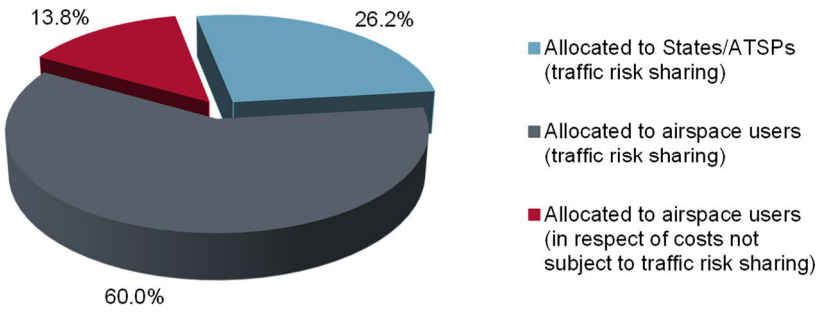


Figure 29 – Outcome of the 2019 traffic risk sharing mechanism.

7.1.6 Actual 2019 unit cost vs DUC in performance plans

213 In order to ensure consistency with the Commission Implementing Decision 2014/132/EU of 11 March 2014 setting Union-wide targets for RP2 as well as with the DCs provided in the adopted performance plans and to allow consolidation at Union-wide level, actual costs are expressed in real terms (€$_{2009}$ prices). Figure 30 shows actual and planned costs, when actuals are lower than the planned values the figures shows the difference in red.

214 The actual costs related to 2018 presented in this PRB Monitoring Report 2019 differs from the figures published in the PRB Monitoring Report 2018. This is because several Member States updated the actual costs exempted for cost sharing. This report considers the most recent values.

215 Figure 30 summarises the situation in 2019 and for the overall RP2 period. For 2019, it shows that the Union-wide actual en route unit cost (44.61€$_{2009}$) was -8.2% lower than planned in the 2019 RP2 PPs (48.61€$_{2009}$). This is because in 2019 actual en route costs were +1.4 % (+86.2M€$_{2009}$) higher than the DCs reported in the performance plans (6,059.1M€$_{2009}$), while the actual number of total service units (TSUs) was +10.5% higher than planned. In addition, the Union-wide actual en route unit cost (44.61€$_{2009}$) was -9.1% lower than the Union-wide target for 2018 (49.10€$_{2009}$) as defined by the Commission in 2014 (see Table 25).

216 The graph in the Figure 30 shows the en route determined costs, actual en route costs and, planned TSUs and actual TSUs indexed to 2015 while the bars show the actual and determined unit costs.

Actual unit cost vs. DUC in adopted Performance Plans							
SES States - Data from RP2 Performance Plans		**2015D**	**2016D**	**2017D**	**2018D**	**2019D**	**RP2 Planned**
En-route costs (EUR2009)		6 235 113 277	6 195 878 072	6 164 525 008	6 153 524 516	6 059 092 064	30 808 132 937
Total en-route Service Units		112 687 532	115 027 116	117 494 197	122 148 732	124 649 261	592 006 837
Real en-route unit costs per Service Unit (EUR2009)		**55.33**	**53.86**	**52.47**	**50.38**	**48.61**	**52.04**
SES States - Actual data from Reporting Tables		**2015A**	**2016A**	**2017A**	**2018A**	**2019A**	**RP2 Actual**
En-route costs (EUR2009)		6 079 269 388	6 060 523 324	6 002 852 359	6 077 800 962	6 145 242 571	30 365 688 603
Total en-route Service Units		114 994 014	120 135 471	126 856 192	133 959 583	137 752 174	633 697 433
Real en-route unit costs per Service Unit (EUR2009)		**52.87**	**50.45**	**47.32**	**45.37**	**44.61**	**47.92**
Difference between Actuals and Planned (Actuals vs. PP)		**2015**	**2016**	**2017**	**2018**	**2019**	**RP2**
Real en-route costs (EUR2009)	in value	-155 843 889	-135 354 748	-161 672 649	-75 723 553	86 150 507	-442 444 333
	in %	-2.5%	-2.2%	-2.6%	-1.2%	1.4%	-1.4%
Total en-route Service Units	in value	2 306 482	5 108 355	9 361 996	11 810 851	13 102 913	41 690 597
	in %	2.0%	4.4%	8.0%	9.7%	10.5%	7.0%
Real en-route unit costs per Service Unit (EUR2009)	**in value**	**-2.47**	**-3.42**	**-5.15**	**-5.01**	**-4.00**	**-4.12**
	in %	**-4.5%**	**-6.3%**	**-9.8%**	**-9.9%**	**-8.2%**	**-7.9%**

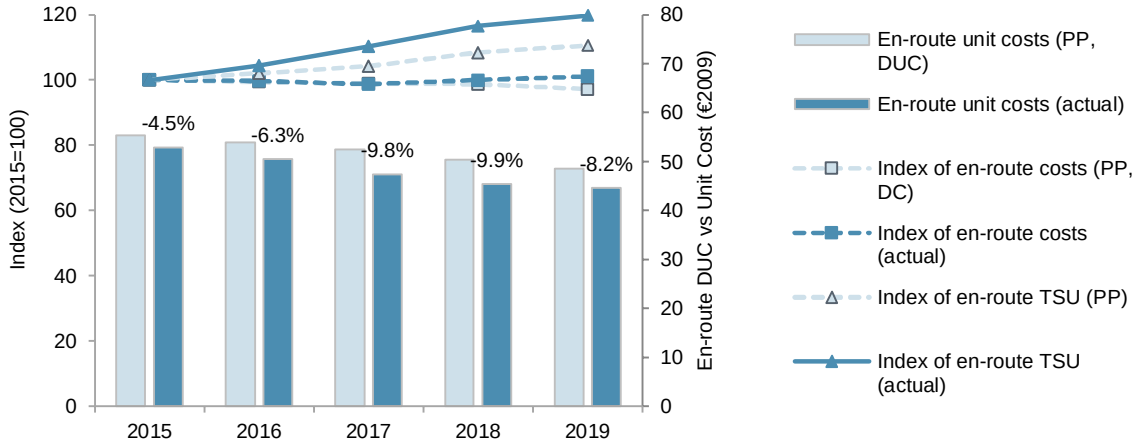
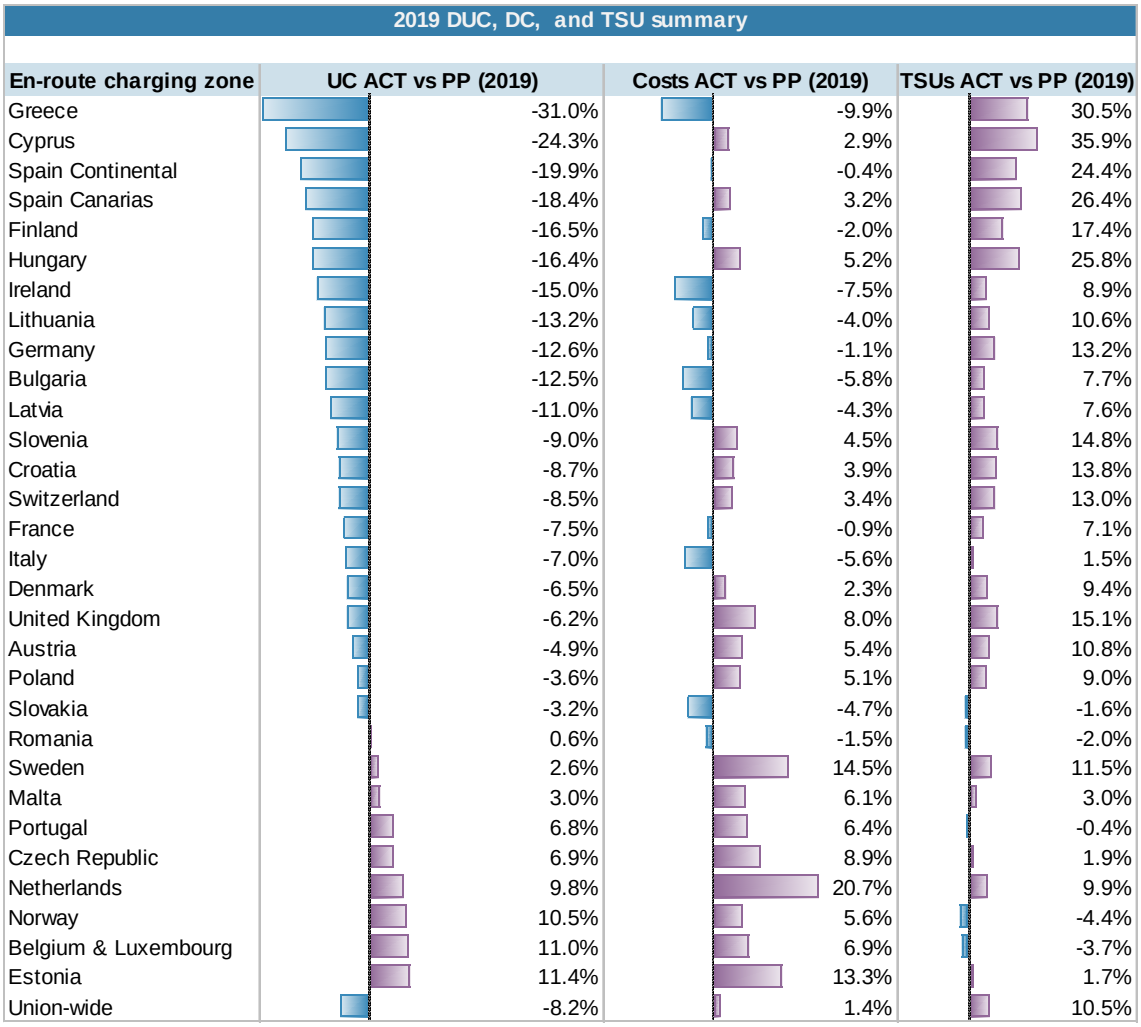


Figure 30 – En route unit cost (actual vs performance plans).

217 The overall average variation of en route unit cost observed at Union-wide level (-8.2%) masks different situations across the 30 en route CZs. In 2019, the actual en route unit cost was lower than planned for 21 CZs. For 10 of these CZs, this is due to the combination of lower actual costs with higher traffic volumes than expected. In contrast, the 2019 actual en route unit cost was higher than the DUC provided in the RP2 PPs for nine CZs. For Estonia (+11.4%), Belgium and Luxembourg (+11%) and Norway (+10.5%), actual unit costs are more than +10% higher than the DUC.

218 At Member State level, as shown in Figure 31, all CZs recorded actual service units above the -10% threshold, while 14 CZs experienced a traffic increase above the +10% threshold. From those 14, five were above +20%: Cyprus (+35.9%), Greece (+30.5%), Spain Canarias (+26.4%), Hungary (+25.8%) and Spain Continental (+24.4%).



En-route charging zone	UC ACT vs PP (2019)	Costs ACT vs PP (2019)	TSUs ACT vs PP (2019)
Greece	-31.0%	-9.9%	30.5%
Cyprus	-24.3%	2.9%	35.9%
Spain Continental	-19.9%	-0.4%	24.4%
Spain Canarias	-18.4%	3.2%	26.4%
Finland	-16.5%	-2.0%	17.4%
Hungary	-16.4%	5.2%	25.8%
Ireland	-15.0%	-7.5%	8.9%
Lithuania	-13.2%	-4.0%	10.6%
Germany	-12.6%	-1.1%	13.2%
Bulgaria	-12.5%	-5.8%	7.7%
Latvia	-11.0%	-4.3%	7.6%
Slovenia	-9.0%	4.5%	14.8%
Croatia	-8.7%	3.9%	13.8%
Switzerland	-8.5%	3.4%	13.0%
France	-7.5%	-0.9%	7.1%
Italy	-7.0%	-5.6%	1.5%
Denmark	-6.5%	2.3%	9.4%
United Kingdom	-6.2%	8.0%	15.1%
Austria	-4.9%	5.4%	10.8%
Poland	-3.6%	5.1%	9.0%
Slovakia	-3.2%	-4.7%	-1.6%
Romania	0.6%	-1.5%	-2.0%
Sweden	2.6%	14.5%	11.5%
Malta	3.0%	6.1%	3.0%
Portugal	6.8%	6.4%	-0.4%
Czech Republic	6.9%	8.9%	1.9%
Netherlands	9.8%	20.7%	9.9%
Norway	10.5%	5.6%	-4.4%
Belgium & Luxembourg	11.0%	6.9%	-3.7%
Estonia	11.4%	13.3%	1.7%
Union-wide	-8.2%	1.4%	10.5%

Figure 31 – 2019 actual unit cost vs performance plan by charging zone.

219 Figure 31 shows that actual service units was higher than planned for 25 CZs out of 30 and slightly lower for five Member States, with only two above -2%, Norway (-4.4%) and Belgium and Luxembourg (-3.7%). Ten CZs were able to offset the increase in costs by the increase in traffic. For example, although the actual costs were +8.0% above planned in the United Kingdom, traffic was +15.1% higher than planned, leading to an actual unit cost -6.1% lower than planned. More details on the deviation between the DUC and actual en route unit cost for 2019 at CZ level are available in the local level view (Annex II) part of the PRB Monitoring Report 2019.

7.1.7 ATSP overall economic surplus generated from the en route activity

220 The analysis of the overall economic surplus generated from the en route activity by an Air Traffic Service Provider (ATSP) can be broken down in two main elements:

- Net ATSP gain/loss from en route activity related to the traffic/cost risk sharing mechanisms;
- Estimated actual surplus embedded in the cost of capital (return on equity, RoE).

221 The estimated economic surplus is a useful tool to monitor the financial strength of the ATSPs. Detailed information on the methodology used to compute the estimated economic surplus is available in the Reader's Guide included in the accompanying local level view (Annex II) of the PRB Monitoring Report 2019.

222 The concept of estimated economic surplus is different from the net accounting profit disclosed by the ATSPs in their financial statements. The latter includes revenues and costs relating to the provision of terminal ANS and other activities (e.g. consultancy services), which are not financed through user charges, as well as revenues and costs pertaining to other years of activity. Therefore, it is not comparable with the notion of economic surplus, which only considers the excess revenue gained due to the risk sharing mechanisms rebates and cost of capital differences between determined and planned.

223 Consequently, it is important to stress that the estimated surplus, when expressed as a percentage of the revenues, can be associated to a "profit margin" generated by the ATSP with respect to the regulated activity of the year, but it is not comparable to the profit margin that would be calculated straight from ATSPs financial statements.

7.1.8 ATSP net gain for the 2019 en route activity

224 The (main) en route ATSP is the most significant contributor to a Member State's en route costs and is the main entity subject to the costs and traffic risk sharing mechanisms. The analysis of the net ATSP gain/loss focuses on the ATSP en route activity for 2019. The cash flow position and the liquidity balance at the end of the year were not considered in this analysis as both are impacted by the charging mechanism, whereby the eligible under-recoveries (for traffic, etc.) are to be recovered in year N+2 or later.

225 The net ATSP gain/loss on en route activity, results from the combination of the traffic risk sharing, the cost-sharing and the incentives on capacity and environment performance during the year. An overall RP2 analysis is presented in section 10.5.6 of this document.

226 The analysis of the main ATSPs in each Member State in 2019 shows that, at Union-wide level, a net gain of 129.2M€$_{2009}$ was generated on the en route activity (see Figure 32). This result is due to the combination of three distinct elements:

- Loss resulting from the cost-sharing mechanism of -42.0M€$_{2009}$, corresponding to (i) the difference between actual 2019 costs and the determined costs from the adopted performance plans for the (main) ATSPs (-109.2M€$_{2009}$), and (ii) reported amounts for costs exempt from cost-sharing (+67.2M€$_{2009}$). This is the unique year of RP2 where the actual costs are higher compared to the planned;
- Net gain resulting from the traffic risk sharing mechanism of +170.7M€$_{2009}$ for the (main) ATSPs. The net gain resulting from the traffic risk sharing mechanism was +31.7M€$_{2009}$ in 2015, +97.6M€$_{2009}$ in 2016, +154.6M€$_{2009}$ in 2017, +165.8M€$_{2009}$ in 2018 and +170.7M€$_{2009}$ in 2019 (i.e. a fivefold increase from 2015);
- Net moderate gain resulting from the financial incentive mechanism relating to capacity performance amounting to +0.5M€$_{2009}$.

Focus on the main ATSPs: Net ATSP gain/loss on en-route activity					
Cost sharing ('000 €2009)	**2015**	**2016**	**2017**	**2018**	**2019**
Determined costs for the main ATSPs (PP) - based on planned inflation	5 289 228	5 225 457	5 249 455	5 233 089	5 135 840
Actual costs for the main ATSPs	5 147 242	5 093 510	5 109 924	5 187 571	5 244 995
Difference in costs: gain (+)/Loss (-) retained/borne by the main ATSPs	141 986	131 946	139 530	45 518	-109 155
Amounts excluded from cost sharing to be recovered from (+) or reimbursed to (-) users	22 195	4 232	27 899	32 099	67 190
Gain (+)/Loss (-) to be retained by the main ATSPs in respect of cost sharing	**164 181**	**136 179**	**167 429**	**77 616**	**-41 965**
Traffic risk sharing ('000 €2009)	**2015**	**2016**	**2017**	**2018**	**2019**
Difference in total service units (actual vs PP) %	2.0%	4.4%	8.0%	9.7%	10.5%
Determined costs for the main ATSPs (PP) - based on actual inflation	5 319 561	5 314 633	5 316 694	5 269 263	5 184 965
Gain (+)/Loss (-) to be retained by the main ATSPs in respect of traffic risk sharing	**31 689**	**97 557.68**	**154 580.25**	**165 789**	**170 686**
Incentives ('000 €2009)	**2015**	**2016**	**2017**	**2018**	**2019**
Gain (+)/Loss (-) to be retained by the main ATSPs in respect of incentives (bonus/penalty)	**9 708**	**3 158**	**2 961**	**-7 074**	**471**
Net ATSP gain(+)/loss(-) on en-route activity ('000 €2009)	**205 578**	**236 895**	**324 970**	**236 331**	**129 192**

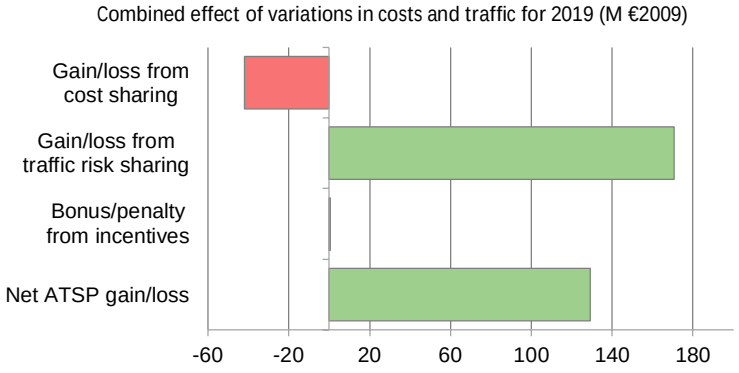


Figure 32 – Net gain/loss on the en route activity for the (main) ATSPs (SES level).

227 The gain, in respect of capacity and environment incentives (+0.47M€$_{2009}$ shown in Figure 32), reflects the fact that:

- For 12 en route main ATSPs, the actual capacity performance in 2019 remained within the dead band of the capacity incentive mechanism, therefore, no bonuses or penalties were applied to these CZs;
- For the majority of ATSPs eligible for a bonus or penalty, the amount of bonus or penalty in respect of capacity incentives is significantly lower than 1% of the en route revenues;
- Ten en route main ATSPs generated bonuses for a total amount of 9.0M€$_{2009}$;
- Eight en route main ATSPs reported penalties (-8.6M€$_{2009}$ in total).

228 Figure 33 shows the bonus/penalties for each ATSP operating in the 30 CZs. The bonuses that are above or equal to 1% of the en route revenues (based on the ATSP chargeable unit rate in 2019 times the actual TSUs) for four ANSPs are: ENAV 1.1%, ANS Finland 1.0%, Avinor 1.0% and IAA 1.0%. Regarding the penalties none of them are below or equal to -1% of the revenues. Austro Control and ANS CR are the highest, in relative terms with respect the revenues, with -0.6% for both.

229 The inclusion of these bonuses in the chargeable cost bases is being assessed by the Commission.

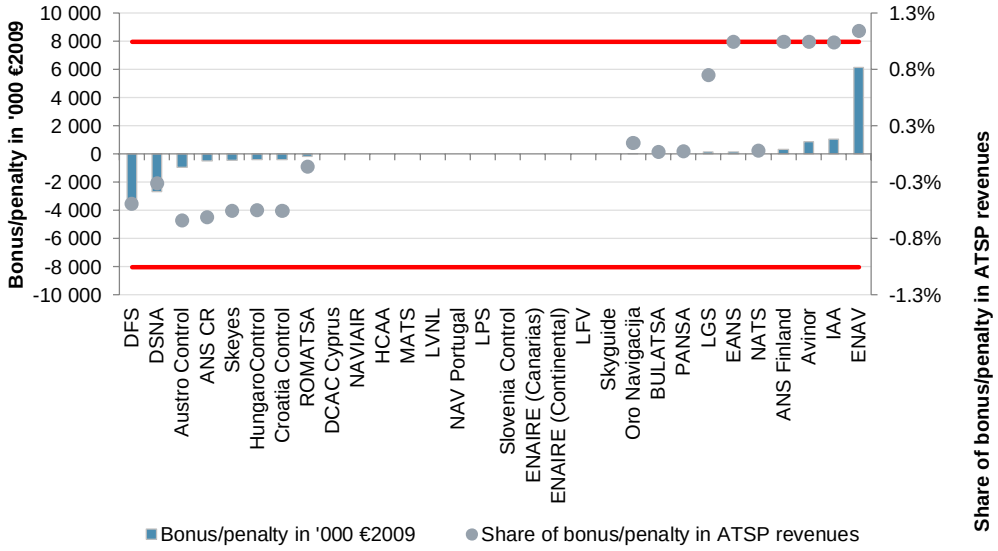


Figure 33 – En route gain (+)/loss(-) to be retained by the main ATSPs in respect of incentives.

7.1.9 Actual ATSP 2019 estimated surplus embedded in the cost of capital vs in performance plans

230 The estimated surplus embedded in the cost of capital represents the return on equity (RoE) that the main ATSPs (equity holders) expect to get back in return for investing in the provision of air navigation services. It is calculated as the multiplication of (i) the estimated proportion of financing through equity (in %), (ii) the RoE pre-tax rate (in %) and (iii) the total asset base.

231 Based on the information reported by the Member States, the actual estimated surplus embedded in the cost of capital for the en route activity in 2019 amounts to 272.2M€$_{2009}$ (see column 2019A in Figure 34). This figure is based on an actual asset base amounting to some 5,878M€$_{2009}$, of which 68.4% is financed through equity at an average (pre-tax) RoE rate of 6.8%.

232 The estimated en route surplus embedded in the determined cost of capital was projected at 236.8M€$_{2009}$ for the main ATSPs (see column 2019D in Figure 34). This figure is based on a planned asset base amounting to some 5,802M€$_{2009}$, of which 61.1% was financed through equity at an average (pre-tax) RoE rate of 6.7%.

233 The actual estimated surplus embedded in the cost of capital for the en route activity in 2019 (272.2M€$_{2009}$) is higher that the planned (236.8M€$_{2009}$). This is due to an actual total asset base higher than planned but mainly, due to an actual proportion finance by equity (68.4%) higher than planned (61.1%).

7.1.10 Actual ATSPs overall economic surplus vs performance plans

234 This analysis estimates the “overall economic surplus” as the actual surplus embedded in the cost of capital (return on equity) plus the net ATSP gain/loss on en route activity (see 7.1.8). The estimated actual surplus embedded in the cost of capital corresponds to the return on equity, which can be considered as a source of profit. For an ATSP, which is 100% financed through debt, the estimated surplus embedded in the cost of capital will be nil, while for an ATSP which 100% financed through equity, the entire cost of capital will be considered as the estimated surplus. An overall RP2 analysis is presented in section 10.5.6 of this document.

235 The actual estimated surplus for the en route activity in 2019 amounts to 401.4M€$_{2009}$ (see column 2019A in Figure 34). This figure comprises the actual surplus embedded in the cost of capital

(272.2M€2009) and the net gain/loss generated in respect of the en route activity in 2019 (129.2M€2009, see Figure 32).

236 The estimated surplus at Union-wide level amounts to 401.4M€2009, representing 7.5% of 2019 en route revenues, which is higher than planned in the performance plans (4.6%). This corresponds to an (weighted average) ex-post actual RoE of 10%, which is also higher than planned in the performance plans (7.2%).

237 The actual estimated surplus includes the amounts reported for costs exempted from cost-sharing for the main ATSPs (i.e. 67.2M€2009) in 2019 (as discussed in Section 7.1.3). These amounts to be recovered from (+) or reimbursed to (-) the airspace users will be eligible for carry-over to the following reference period(s), if allowed by the Commission. Should these costs be deemed not eligible by the Commission, the actual estimated surplus in 2019 would be lower (i.e. 334.2M€2009, compared to 401.4M€2009).

Focus on the main ATSPs: En-route ATSP estimated surplus *					
ATSP estimated surplus ('000 €2009) from RP2 Performance Plans	**2015D**	**2016D**	**2017D**	**2018D**	**2019D**
Total asset base	6 321 739	6 208 733	6 132 025	5 980 428	5 801 714
Estimated proportion of financing through equity (in %)	55.9%	57.2%	58.6%	59.6%	61.1%
Estimated proportion of financing through equity (in value)	3 534 295	3 551 321	3 595 444	3 564 812	3 544 181
Estimated proportion of financing through debt (in %)	44.1%	42.8%	41.4%	40.4%	38.9%
Estimated proportion of financing through debt (in value)	2 787 444	2 657 412	2 536 581	2 415 615	2 257 533
Cost of capital pre-tax (in value)	330 739	328 002	336 148	324 000	300 116
Average interest on debt (in %)	3.1%	3.1%	3.0%	2.8%	2.8%
Interest on debt (in value)	86 205	81 236	77 349	67 914	63 331
Determined RoE pre-tax rate (in %)	6.9%	6.9%	7.2%	7.2%	6.7%
Estimated surplus embedded in the cost of capital for en-route (in value)	244 534	246 767	258 799	256 087	236 785
Overall estimated surplus (+/-) for the en-route activity	**244 534**	**246 767**	**258 799**	**256 087**	**236 785**
Revenue/costs for the en-route activity	**5 289 228**	**5 225 457**	**5 249 455**	**5 233 089**	**5 135 840**
Estimated surplus (+/-) in percent of en-route revenues	**4.6%**	**4.7%**	**4.9%**	**4.9%**	**4.6%**
Estimated ex-ante RoE pre-tax rate (in %)	**6.9%**	**6.9%**	**7.2%**	**7.2%**	**6.7%**
ATSP estimated surplus ('000 €2009) based on actual data from Reporting Tables	**2015A**	**2016A**	**2017A**	**2018A**	**2019A**
Total asset base	6 356 267	6 338 468	6 077 412	5 796 665	5 877 908
Estimated proportion of financing through equity (in %)	58.5%	58.4%	63.3%	66.8%	68.4%
Estimated proportion of financing through equity (in value)	3 718 580	3 703 737	3 848 183	3 870 446	4 021 101
Estimated proportion of financing through debt (in %)	41.5%	41.6%	36.7%	33.2%	31.6%
Estimated proportion of financing through debt (in value)	2 637 687	2 634 731	2 229 229	1 926 219	1 856 807
Cost of capital pre-tax (in value)	333 180	325 105	316 958	327 518	283 013
Average interest on debt (in %)	2.7%	2.5%	1.8%	2.6%	0.6%
Interest on debt (in value)	72 290	66 744	40 360	49 171	10 844
Determined RoE pre-tax rate (in %)	7.0%	7.0%	7.2%	7.2%	6.8%
Estimated surplus embedded in the cost of capital for en-route (in value)	260 890	258 362	276 599	278 346	272 169
Net ATSP gain(+)/loss(-) on en-route activity	205 578	236 895	324 970	236 331	129 192
Overall estimated surplus (+/-) for the en-route activity	**466 468**	**495 257**	**601 569**	**514 678**	**401 361**
Revenue/costs for the en-route activity	**5 352 820**	**5 330 405**	**5 434 895**	**5 423 903**	**5 374 187**
Estimated surplus (+/-) in percent of en-route revenues	**8.7%**	**9.3%**	**11.1%**	**9.5%**	**7.5%**
Estimated ex-post RoE pre-tax rate (in %)	**12.5%**	**13.4%**	**15.6%**	**13.3%**	**10.0%**

Figure 34 – Estimated surplus for en route activity for the (main) ATSPs at Union-wide level.
The metric presented in the figure is computed using information provided by States/ANSPs in their reporting tables for the purposes of the cost-efficiency monitoring analysis. It is important to note that, mainly due to differences in scope, this metric may not reflect the financial situation of ANSPs as it is presented in their audited financial statements.

238 The overall estimated surplus at Union-wide level (401.4M€2009, or 10.0% of en route revenues) masks different situations amongst the main en route ATSPs. Figure 35 shows that in 2019, 17 ATSPs have increased their estimated surplus (as a proportion of revenues) compared to the amounts embedded in the determined cost of capital.

239 Figure 35 also shows that six main ATSPs (LVNL, Skeyes, EANS, Skyguide, Avinor and NAV Portugal) have incurred losses and show a negative actual estimated surplus on their en route activity in 2019. Finally, the figure shows that for ten ATSPs, the estimated surplus in 2019 represented more than 10% of their en route revenues and for one of them it exceeded 20%.[21]

[21] More details on the main ATSPs' economic surplus for each Member State are available in Annex II.

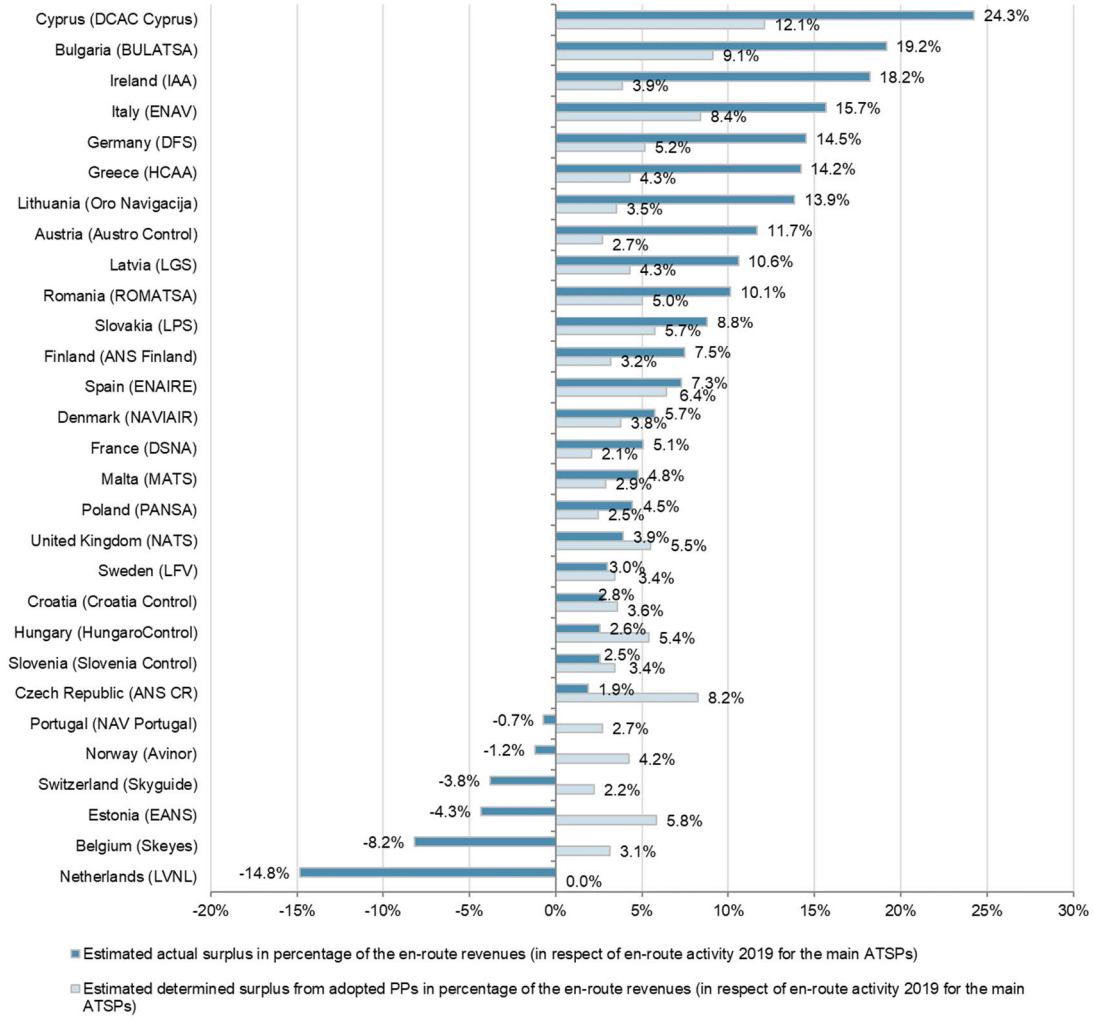


Figure 35 – Estimated surplus for the 2019 en route activity for the main ATSPs.

7.1.11 En route 2019 actual costs for airspace users

240 This section presents the actual en route cost for airspace users with respect to ANS activities in 2019 (also referred to as the "true cost for users"). The "true cost" for users is different from the cost charged during the year due to the adjustments foreseen in the SES Performance and Charging Regulations.

241 The "true costs" reflect the cost-efficiency performance from an airspace user's point of view. This section attempts to quantify the "true costs" in respect of ANS activities carried out in 2019 which comprise:

- The amounts that have been billed to users based on the 2019 determined costs and actual TSUs;
- Different adjustments relating to 2019 activities, which will be charged or reimbursed to users in in future years.

242 The calculation of the "true costs" for users does not include the impact of the risk associated with exchange rates linked to the billing of the chargeable unit rate. The unit rate charged to airspace users is established in national currency but billed in euros using the current exchange rate. In

case of exchange rate fluctuations, the actual costs paid by airspace users will be higher or lower than planned.

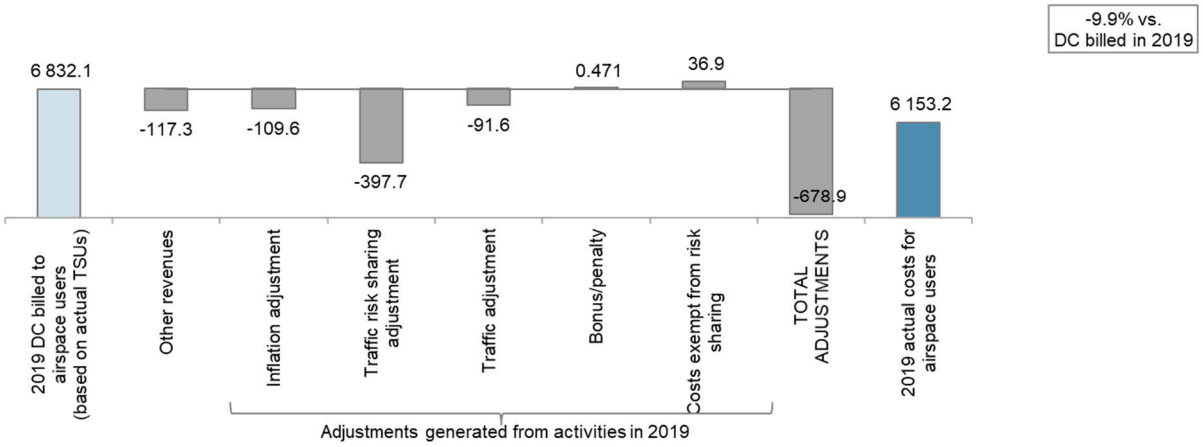


Figure 36 – Actual costs for users in respect of the 2019 en route activity (in M€$_{2009}$).

243 Figure 36 shows that the actual costs incurred by airspace users in respect of activities performed in 2019 (6,153.2M€$_{2009}$) were -9.9% (-678.9M€$_{2009}$) lower than the DCs billed based on actual TSUs (6,832.1M€$_{2009}$).

244 At Union-wide level, TSUs were +10.5% higher than planned. For 26 CZs, the difference between actual and planned TSUs fell outside the ±2% dead-band of the traffic risk sharing mechanism. The net effect of these deviations between actual and planned TSUs is a reimbursement to airspace users amounting to -397.7M€$_{2009}$ (to be reimbursed in N+2).

245 Since, at a Union-wide level, traffic was higher than planned, the traffic adjustments relating to costs not subject to traffic risk sharing also resulted in a forthcoming reimbursement (-91.6M€$_{2009}$) to airspace users.

246 Moreover, there is the deduction of -117.3M€$_{2009}$ of other revenues. Article 1 of the Commission Implementing Regulation (EU) No 391/2013 defines other revenues. In most en route charging zones either no other revenues or small amounts of other revenues were deducted from the determined costs. However, a few CZs have reported other revenues contributing to an impact at a Union-wide level. This is especially the case for:

- The United Kingdom (-36.3M€$_{2009}$);
- Spain Continental and Spain Canarias (-26.2M€$_{2009}$);
- Croatia (-8.1M€$_{2009}$);
- France (-17.5M€$_{2009}$).

247 For most CZs (Belgium and Luxembourg, Bulgaria, France, Norway, Poland and Romania being the only exceptions), the actual inflation index in 2019 was lower than planned in the performance plans. The overall net effect of inflation adjustments at CZ level is a forthcoming reimbursement (-109.6M€$_{2009}$) to airspace users.

248 At system level, the overall result of the incentive mechanisms amounts to a bonus of -0.5M€$_{2009}$ to be charged to airspace users, if deemed eligible after assessment by the Commission.

249 Finally, a net amount of +36.9M€$_{2009}$ has been reported as costs exempt from cost-sharing at Union-wide level which will be charged to airspace users. The +36.9M€$_{2009}$ amount differs from the +67.2M€$_{2009}$ of Figure 32, which was calculated for the main ATSPs and not at State level.

7.2 Terminal ANS cost-efficiency

7.2.1 Presentation of the terminal cost-efficiency PIs, KPIs and targets

250 Although there are no Union-wide cost-efficiency targets for terminal ANSs, terminal ANS cost-efficiency performance has been monitored in each year of RP2 according to the requirements of Article 18 of the Commission Implementing Regulation (EU) No 390/2013.

251 The terminal cost-efficiency KPI is the result of the ratio between the determined costs and the forecast terminal navigation service units (TNSUs) contained in the performance plans. Each Member State has adopted local cost-efficiency targets at terminal charging zone (TCZ) level for RP2 with the same risk sharing arrangements than for en route except that traffic risk sharing exemptions can apply for TCZs including airports with less than 225,000 movements.

252 A total of 38 TCZs have been reported (generally one per Member State, but two TCZs have been reported for Italy, France, Poland, the UK and five for Belgium) covering a total of 174 airports. The two TCZs reported by the UK have been excluded from the Union wide analysis for the following reasons:

- Information relating to UK TCZ B (nine airports) should be reported to the Commission on a confidential basis in accordance with the requirements related to market conditions;
- UK TCZ C (London Approach) is not directly comparable with other TCZs since the service provided is of a hybrid nature, making the transition between en route and terminal services for the five London Airports (which are also part of TCZ B).

253 The 2019 cost-efficiency monitoring analysis for UK TCZ C is available in the CZ view, Annex II of the PRB Annual Monitoring Report 2019.

254 Table 27 presents the aggregation of the terminal DUCs reported by the Member States (excluding UK) for all years of RP2.

COST-EFFICIENCY DATA FROM PERFORMANCE PLANS	2015D	2016D	2017D	2018D	2019D
Real terminal Determined Unit Costs (in €$_{2009}$)	180.83	174.35	165.78	160.14	156.19
Real terminal Actual Unit Costs (in €$_{2009}$)	171.59	165.58	157.89	153.09	152.89

Table 27 – Terminal DUCs for RP2 as per aggregation of performance plans (SES level).

255 In order to ensure consistency with the DCs provided in the adopted performance plans and to allow consolidation at Union-wide level, actual terminal costs are expressed in real terms (€$_{2009}$ prices). The source of the data for all tables, figures and analysis, in this section of the terminal PRB Monitoring Report 2019, are the terminal 2020 reporting tables summited by the Member States.

7.2.2 Actual 2019 en route terminal costs vs costs in performance plans

256 Overall terminal actual costs (1,128.7M€$_{2009}$) have been higher than the determined costs (1,059.0M€$_{2009}$). Figure 37 shows that at SES level actual terminal costs were lower than planned for the MET service providers (-10.5% or -4.5M€$_{2009}$). Differently, the NSA costs (+6.3% or +0.8M€$_{2009}$) and the terminal cost for the main ATSPs were higher (+7.2% or 72.3M€$_{2009}$). Due to their relative size in the CZs, most of the deviation observed for the total terminal ANS costs (+6.5% or +68.7M€$_{2009}$) was due to the main ATSPs.

257 Figure 37 also shows that the observed higher actual costs compared to the DCs for the main ATSPs mask different situations across the different costs categories in 2019. The main drivers of the deviation are the higher staff costs (+10.5% or +73.9M€$_{2009}$) and the higher operational costs (+16.8% or 28.1M€$_{2009}$), only partially compensated by lower depreciation costs (-12.3% or -15.5M€$_{2009}$) and lower cost of capital (-25.0% or -14.3M€$_{2009}$).

258 Details on the main drivers underlying the deviation between actual and determined costs for each of these costs categories are available at CZ local view, Annex II of this PRB Annual Monitoring Report 2019.

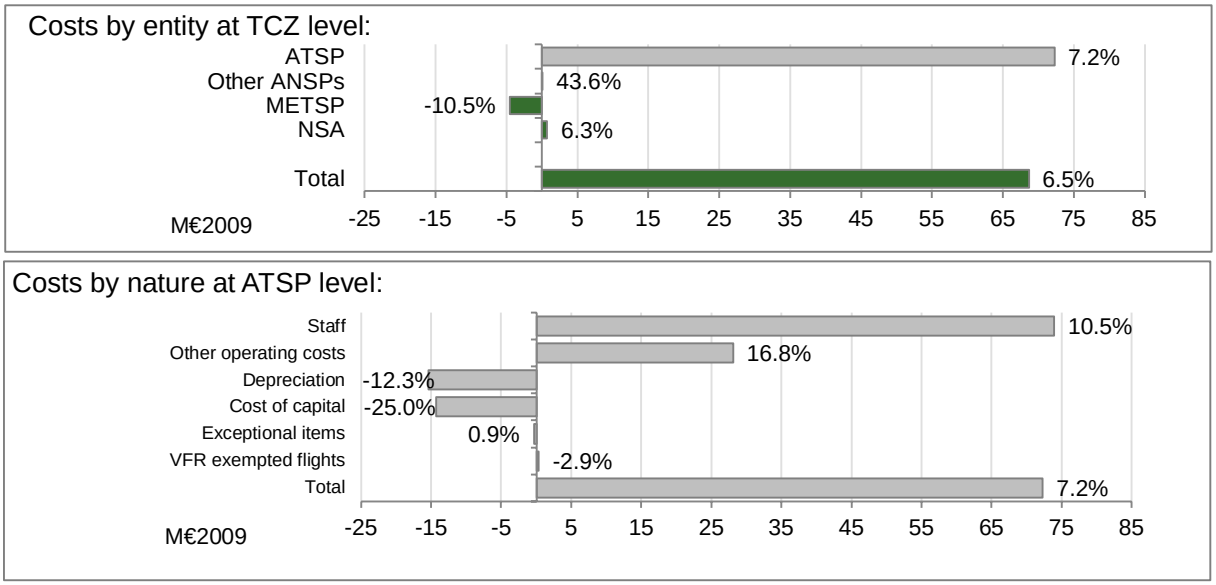


Figure 37 – 2019 actual terminal costs compared to performance plans (SES level).

259 Figure 38 presents the variation for each TCZ between actual costs and determined costs. Actual costs were higher than planned for 25 CZs. 12 of these Member States had an observed deviation above +10% and three of them above +24%: Germany (+27.1%), (Belgium Liege (+26.1) and the Netherlands (+24.8%). In absolute terms, most of the deviation observed is due to three TCZ, Germany (+41.5M€$_{2009}$), the Netherlands (+13.3M€$_{2009}$) and Spain (+10.1€$_{2009}$). The actual costs were lower than planned for 13 CZs. None of these CZs had an observed deviation below -10% and only three of them below -5%: Italy Zone 1 (-7.2%), Italy Zone 2 (-6.3%) and Norway (-5.1%).

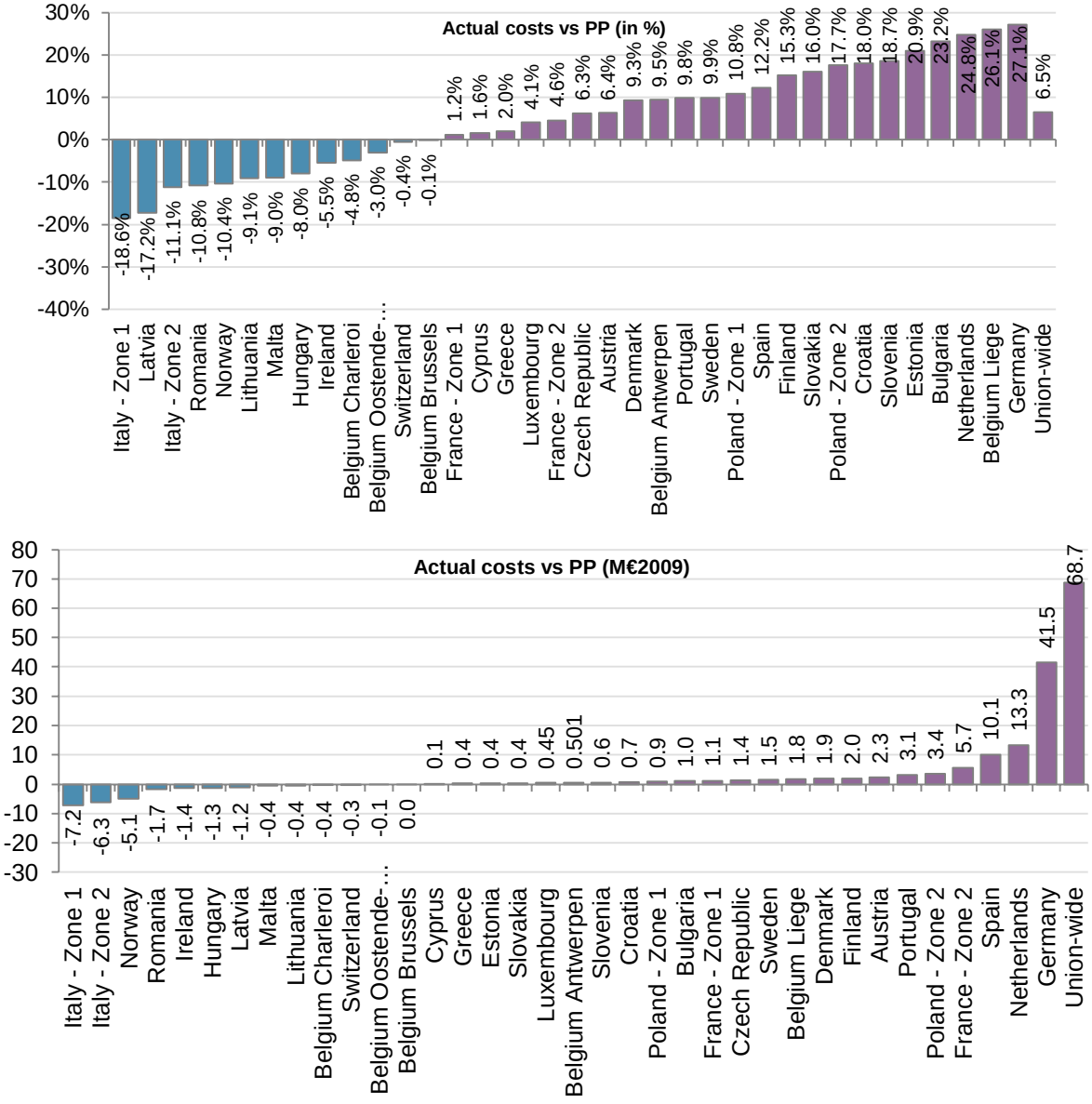


Figure 38 – 2019 actual terminal costs compared to performance plans (SES level).

7.2.3 Cost-sharing mechanism

260 The cost-sharing mechanism in the RP2 SES Regulations provides that the difference between the determined costs set in the adopted performance plans and the actual costs for the year shall be borne (in case of higher costs) or retained (in case of lower costs) by the Member States/ATSPs, except for the costs items exempted from this mechanism (listed in Figure 40).

261 At Union-wide level, actual 2019 terminal costs for the main ATSPs are +72.0M€$_{2009}$ (i.e. +7.2%) higher than the determined costs provided in the RP2 performance plans. This difference between the determined costs as in the adopted performance plans and the actual costs for the year is borne by the (main) ATSPs as showed in Figure 39 excluding the costs exempted from the cost-sharing mechanisms, the net loss retained by the main ATSPs in respect of the costs-sharing amounts to -60.4M€$_{2009}$.

Cost sharing ('000 €2009)	2015	2016	2017	2018	2019
Determined costs for the main ATSPs (PP) - based on planned inflation	1 034 271	1 018 655	985 233	983 098	979 223
Actual costs for the main ATSPs	1 008 139	1 017 908	1 013 219	1 028 585	1 051 255
Difference in costs: gain (+)/Loss (-) retained/borne by the main ATSPs	26 133	746	-27 986	-45 487	-72 032
Amounts excluded from cost sharing to be recovered from (+) or reimbursed to (-) users	-327	799	1 245	6 254	11 650
Gain (+)/Loss (-) to be retained by the main ATSPs in respect of cost sharing	**25 806**	**1 546**	**-26 741**	**-39 233**	**-60 382**

Figure 39 – Terminal gain (+)/loss (-) to be retained by the ATSPs in respect of cost-sharing.

262 The cost-sharing arrangements (explained in details in paragraph 263) should not apply to the difference between determined costs and actual costs with regard to cost items for which the ANSP, contracted State or qualified entities concerned have taken reasonable and identifiable steps to manage but which may be deemed to be outside their control as a result of: (1) unforeseen changes in national pension law, pension accounting law or pension costs resulting from unforeseen financial market conditions, (2) significant changes in interest rates on loans, which finance costs arising from the provision of air navigation services, (3) unforeseen new cost items not covered in the performance plan, but required by law, (4) unforeseen changes in national taxation law, (5) unforeseen changes in costs or revenues stemming from international agreements.

263 The costs exempted from cost-sharing are considered in the calculation of the ATSP net gain for the 2019 terminal activity, which is presented in Section 7.2.8. This Monitoring Report considers the Member States' submissions on costs exempted from cost-sharing, as reported in the June 2020 reporting tables for the purposes of terminal charges. These amounts displayed in the in Figure 40 to be recovered from (+) or reimbursed to (-) airspace users, will be eligible for carry-over to the following reference period(s), if deemed eligible by the Commission.

Focus on the main ATSPs: Net ATSP gain/loss on terminal activity					
Cost sharing ('000 €2009)	**2015**	**2016**	**2017**	**2018**	**2019**
Determined costs for the main ATSPs (PP) - based on planned inflation	1 034 271	1 018 655	985 233	983 098	979 223
Actual costs for the main ATSPs	1 008 139	1 017 908	1 013 219	1 028 585	1 051 255
Difference in costs: gain (+)/Loss (-) retained/borne by the main ATSPs	26 133	746	-27 986	-45 487	-72 032
Amounts excluded from cost sharing to be recovered from (+) or reimbursed to (-) users	-327	799	1 245	6 254	11 650
Gain (+)/Loss (-) to be retained by the main ATSPs in respect of cost sharing	**25 806**	**1 546**	**-26 741**	**-39 233**	**-60 382**
Traffic risk sharing ('000 €2009)	**2015**	**2016**	**2017**	**2018**	**2019**
Difference in total service units (actual vs PP) %, for the TCZs applying TRS	1.5%	4.0%	6.1%	7.0%	7.4%
Determined costs for the main ATSPs applying TRS (PP) - based on actual inflation	847 361	835 087	798 652	789 811	786 175
Gain (+)/Loss (-) to be retained by the main ATSPs in respect of traffic risk sharing	**6 488**	**7 071**	**10 964**	**14 625**	**15 859**
Incentives ('000 €2009)	**2015**	**2016**	**2017**	**2018**	**2019**
Gain (+)/Loss (-) to be retained by the main ATSPs in respect of incentives (bonus/penalty)	**1 072**	**1 816**	**1 464**	**1 809**	**1 611**
Net ATSP gain(+)/loss(-) on terminal activity ('000 €2009)	**33 366**	**10 432**	**-14 314**	**-22 800**	**-42 912**

Figure 40 – Terminal costs exempted from cost-sharing (SES level). Negative values are shown in red.

264 Figure 40 above shows that the net amount of terminal costs exempted from cost-sharing in 2019 reported by main ATSPs (+11.63M€$_{2009}$ to be recovered from airspace users), apart from some METSP costs exempted from cost-sharing (-0.02M€$_{2009}$).

7.2.4 Actual 2019 traffic vs TNSUs in performance plans

265 Figure 41 shows that the actual TNSUs are consistently above the forecasts used in the performance plans. This implies additional revenues for the Member States/ATSPs and amounts to be reimbursed to airspace users according to the traffic risk sharing adjustments.

266 The traffic has exceeded the ±2% dead-band foreseen in the traffic risk sharing mechanism although this is just applicable at charging zone level. The gap between actual and planned traffic has increased each year during RP2 (+2.2%, +4.6%, +7.2% +8.6% and +8.8% in 2015, 2016, 2017, 2018 and 2019 respectively).

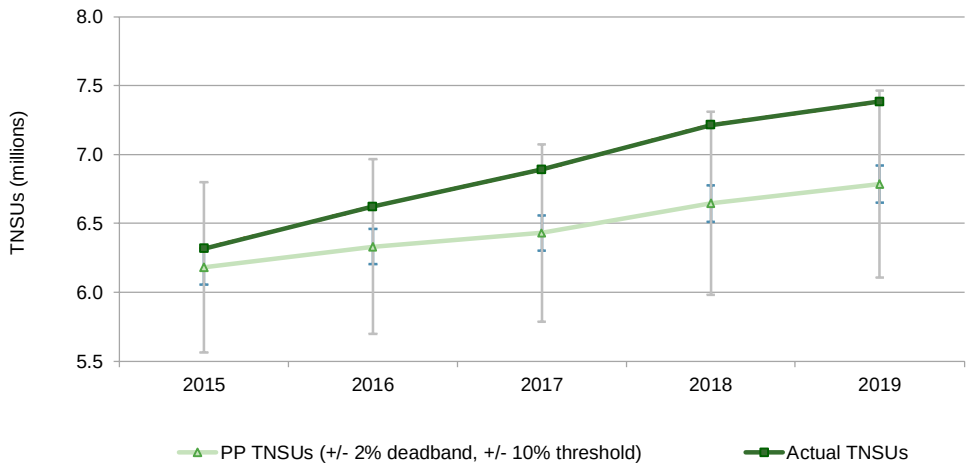


Figure 41 – Terminal traffic monitoring (SES level).

7.2.5 Traffic risk sharing mechanism

267 The same risk sharing arrangements as en route are applied for terminal, except that traffic risk sharing exemptions can apply for TCZs including airports with less than 225,000 movements. Traffic risk sharing applies to 18 TCZs out of the 36 included in this monitoring report.

268 The determined costs of the other entities such as NSAs and MET service providers are not subject to traffic risk sharing and are fully reimbursed (or charged) to the airspace users, irrespective of traffic evolution.

269 The additional revenues resulting from the application of the traffic risk sharing mechanism for terminal amounted to 89.9M€$_{2009}$ in 2019. This additional revenue arising from the deviation between actual and planned traffic are shared between Member States/ANSPs and airspace users according to the traffic risk sharing mechanism described in paragraph 208.

270 Figure 42 shows the proportion of revenues eligible and ineligible for the traffic risk sharing mechanism to be reimbursed to airspace users. In 2019, 82.3% of the additional revenues are distributed to airspace users, i.e. 39.8% relating to cost subject to traffic risk sharing (35.8M€$_{2009}$) and 42.5%% relating to costs not subject to traffic risk sharing (38.2M€$_{2009}$). 17.7% of the additional revenues are retained by Member States/ATSPs (15.9M€$_{2009}$).

271 This situation is significantly different from RP1, when actual traffic was consistently lower than planned in the performance plans.

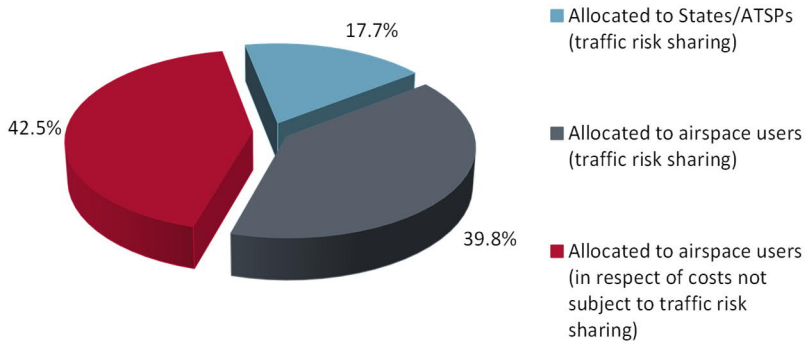


Figure 42 – Outcome of the 2019 terminal traffic risk sharing mechanism.

7.2.6 Actual 2019 terminal unit cost vs DUC in performance plans

272 Figure 43 summarises the situation in 2019 and for the overall RP2 period. In 2019, the Union-wide actual terminal unit cost (152.89€$_{2009}$) was -2.1% lower than planned in the RP2 performance plans (Figure 43). This variation results from the combination of higher than planned TNSUs (+8.8%) and higher than planned terminal costs (+6.5%, or +68.7M€$_{2009}$).

273 It is the third time in the overall RP1 and RP2, that the total terminal air navigation service actual costs were higher than planned, i.e. +2.1% or +21.9M€$_{2009}$ in 2017, +3.8% or +40.5M€$_{2009}$ in 2018 and +6.5% or +68.7M€$_{2009}$ in 2019.

Actual unit cost vs. DUC in adopted Performance Plans							
SES States - Data from RP2 Performance Plans		**2015D**	**2016D**	**2017D**	**2018D**	**2019D**	**RP2 Planned**
Terminal costs (EUR2009)		1 117 713 492	1 103 962 617	1 066 100 758	1 064 115 512	1 059 985 630	5 411 878 008
Total terminal Service Units		6 181 013	6 331 707	6 430 770	6 645 093	6 786 564	32 375 146
Real terminal unit costs per Service Unit (EUR2009)		**180.83**	**174.35**	**165.78**	**160.14**	**156.19**	**167.16**
SES States - Actual data from Reporting Tables		**2015A**	**2016A**	**2017A**	**2018A**	**2019A**	**RP2 Actual**
Terminal costs (EUR2009)		1 084 292 299	1 096 452 314	1 088 023 758	1 104 601 261	1 128 686 012	5 502 055 644
Total terminal Service Units		6 318 950	6 621 834	6 890 820	7 215 315	7 382 258	34 429 177
Real terminal unit costs per Service Unit (EUR2009)		**171.59**	**165.58**	**157.89**	**153.09**	**152.89**	**159.81**
Difference between Actuals and Planned (Actuals vs. PP)		**2015**	**2016**	**2017**	**2018**	**2019**	**RP2**
Real terminal costs (EUR2009)	in value	-33 421 193	-7 510 302	21 923 000	40 485 749	68 700 382	90 177 635
	in %	-3.0%	-0.7%	2.1%	3.8%	6.5%	1.7%
Total terminal Service Units	in value	137 937	290 127	460 050	570 222	595 695	2 054 031
	in %	2.2%	4.6%	7.2%	8.6%	8.8%	6.3%
Real terminal unit costs per Service Unit (EUR2	**in value**	**-9.24**	**-8.77**	**-7.89**	**-7.04**	**-3.30**	**-677.48**
	in %	**-5.1%**	**-5.0%**	**-4.8%**	**-4.4%**	**-2.1%**	**-80.9%**

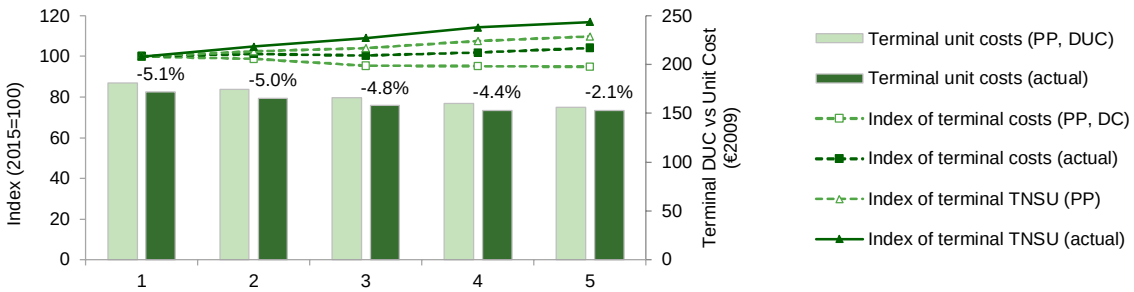


Figure 43 – Terminal costs, traffic and unit costs (actual vs performance plans, SES level).

274 The overall deviation of terminal unit costs observed at Union-wide level (-2.1%) masks different situations across the 36 TCZs as shown in Figure 40.

275 Actual terminal unit costs were lower than planned in 19 TCZs out of 36, in six cases with a combination of lower actual costs and higher traffic compared to RP2 performance plans. Among these 19 TCZs, seven managed to achieve reductions in the terminal actual unit costs of more than -20% and two more than -30%, Latvia (-36.5%) and Greece (-36.4%).

276 For 17 TCZs, actual unit costs were higher than planned, among these 17 TCZs seven were higher by +10% or more and three higher than +15%, Belgium Oostende-Brugge (+35.3%), Slovenia (20.9%) and (Germany (+11.6%). For Belgium Oostende-Brugge, the higher unit cost is due to significantly lower traffic compared to the forecast used in the performance plans (-28.3%), for the other two CZs, the higher unit cost is due to substantially higher actual costs than planned.

2019 DUC, DC and TNSU summary

Terminal charging zone	UC ACT vs PP (2019)	Costs ACT vs PP (2019)	TNSUs ACT vs PP (2019)
Latvia	-36.5%	-17.2%	30.4%
Greece	-36.4%	2.0%	60.3%
Hungary	-29.0%	-8.0%	29.7%
Lithuania	-27.0%	-9.1%	24.6%
Malta	-22.0%	-9.0%	16.6%
Cyprus	-21.5%	1.6%	29.5%
Ireland	-21.0%	-5.5%	19.6%
Italy - Zone 2	-18.8%	-11.1%	9.4%
Poland - Zone 1	-16.3%	10.8%	32.4%
Italy - Zone 1	-16.2%	-18.6%	-2.8%
Spain	-10.9%	12.2%	25.9%
Belgium Brussels	-10.7%	-0.1%	11.9%
Romania	-10.3%	-10.8%	-0.6%
Bulgaria	-10.1%	23.21%	37.1%
Luxembourg	-8.9%	4.1%	14.2%
Belgium Liege	-4.9%	26.1%	32.6%
Switzerland	-4.6%	-0.4%	4.3%
Denmark	-1.3%	9.3%	10.8%
Finland	-0.1%	15.3%	15.4%
France - Zone 2	0.7%	4.6%	3.8%
Norway	2.0%	-10.4%	-12.1%
Austria	2.2%	6.4%	4.1%
France - Zone 1	2.8%	1.2%	-1.6%
Croatia	4.6%	18.0%	12.8%
Poland - Zone 2	5.6%	17.7%	11.4%
Portugal	6.0%	9.8%	3.6%
Czech Republic	7.7%	6.3%	-1.3%
Belgium Charleroi	9.3%	-4.8%	-12.9%
Netherlands	9.9%	24.8%	13.6%
Slovakia	10.7%	16.0%	4.8%
Sweden	12.2%	9.9%	-2.0%
Estonia	13.4%	20.9%	6.7%
Belgium Antwerpen	17.5%	9.5%	-6.8%
Germany	18.6%	27.1%	7.2%
Slovenia	20.9%	18.7%	-1.8%
Belgium Oostende-Brugge	35.3%	-3.0%	-28.3%
Union-wide	-2.1%	6.5%	8.8%

277 Figure 44 – 2019 TANS actual costs vs performance plan at State level.

278 For ten TCZs, the actual number of TNSUs was lower than planned in the RP2, and three of them had traffic levels that fell below the -10% alert threshold: Belgium Oostende-Brugge (-26.1%), Belgium Charleroi (-12.9%) and Norway (-12.1%). The two mentioned Belgium TCZs were not subject

to Terminal Navigation Charges (TNC) since terminal ANS costs were 100% subsidised by the State or regional authorities in 2019.

279 For 18 TCZs, the actual TNSUs were more than 10% higher than planned in the RP2 performance plans, exceeding the alert threshold. Significant deviations above +30% were observed for Greece (+60.3%), Bulgaria (+37.1%), Belgium Liege (+32.6%), Poland - zone 1 (+32.4%) and Latvia (+30.4%). More details on the deviation between the actual unit cost for 2019 and the DUC at TCZ level are available in the local view Annex II of this PRB Monitoring Report 2019.

7.2.7 Overall economic surplus generated from terminal activity

280 Although 30 main ATSPs reported information relating to terminal ANS in 2019, the analysis presented hereafter focuses on 28 ATSPs to account for the specificities of some TCZs:

- Actual data for the ATSPs operating in UK TCZ B (mainly NERL) are not publicly available (should be reported to the European Commission on a confidential basis as terminal ANS are provided on a contractual basis);
- In Cyprus and at four Belgian regional TCZs, terminal ANS is 100% subsidised by the States/Regions;
- In Sweden, no capital-related costs (depreciation and cost of capital) are reported for the main ATSP (LFV) in the terminal reporting tables since these costs are fully borne by the airport operator (Swedavia) that owns the CNS infrastructure used by LFV to provide terminal ANS services. For monitoring purposes, the overall estimated terminal surplus for ATSPs (LFV and Swedavia) is considered;
- From 2017, France and Poland have two terminal CZ but one single ATSP each (DSNA and PANSA respectively) and Italy from 2015 (ENAV). Therefore, the ATSP surplus is calculated by considering both CZs of each State.

281 In the cases mentioned above, the notion of economic surplus is either not appropriate, or to be interpreted with caution. NERL, DCAC and Skeyes (except for its activity in Brussels TCZ) have therefore been excluded from the analysis presented below.

7.2.8 ATSP net gain for the 2018 terminal activity

282 In 2019, the main ATSPs collectively generated a net loss of -43.0M€$_{2009}$ on the terminal activity. This is a combination of three elements:

- Loss of -60.4M€$_{2009}$ arising from the cost-sharing mechanism;
- Gain of +15.9M€$_{2009}$ arising from the traffic risk sharing mechanism (applied in 18 out of 36 TCZs included in this analysis);
- Gain of +1.6M€$_{2009}$, corresponding to a bonus from the capacity incentive mechanism.

Focus on the main ATSPs: Net ATSP gain/loss on terminal activity					
Cost sharing ('000 €2009)	**2015**	**2016**	**2017**	**2018**	**2019**
Determined costs for the main ATSPs (PP) - based on planned inflation	1 034 271	1 018 655	985 233	983 098	979 223
Actual costs for the main ATSPs	1 008 139	1 017 908	1 013 219	1 028 585	1 051 255
Difference in costs: gain (+)/Loss (-) retained/borne by the main ATSPs	26 133	746	-27 986	-45 487	-72 032
Amounts excluded from cost sharing to be recovered from (+) or reimbursed to (-) users	-327	799	1 245	6 254	11 650
Gain (+)/Loss (-) to be retained by the main ATSPs in respect of cost sharing	**25 806**	**1 546**	**-26 741**	**-39 233**	**-60 382**
Traffic risk sharing ('000 €2009)	**2015**	**2016**	**2017**	**2018**	**2019**
Difference in total service units (actual vs PP) %, for the TCZs applying TRS	1.5%	4.0%	6.1%	7.0%	7.4%
Determined costs for the main ATSPs applying TRS (PP) - based on actual inflation	847 361	835 087	798 652	789 811	786 175
Gain (+)/Loss (-) to be retained by the main ATSPs in respect of traffic risk sharing	**6 488**	**7 071**	**10 964**	**14 625**	**15 859**
Incentives ('000 €2009)	**2015**	**2016**	**2017**	**2018**	**2019**
Gain (+)/Loss (-) to be retained by the main ATSPs in respect of incentives (bonus/penalty)	**1 072**	**1 816**	**1 464**	**1 809**	**1 611**
Net ATSP gain(+)/loss(-) on terminal activity ('000 €2009)	**33 366**	**10 432**	**-14 314**	**-22 800**	**-42 912**

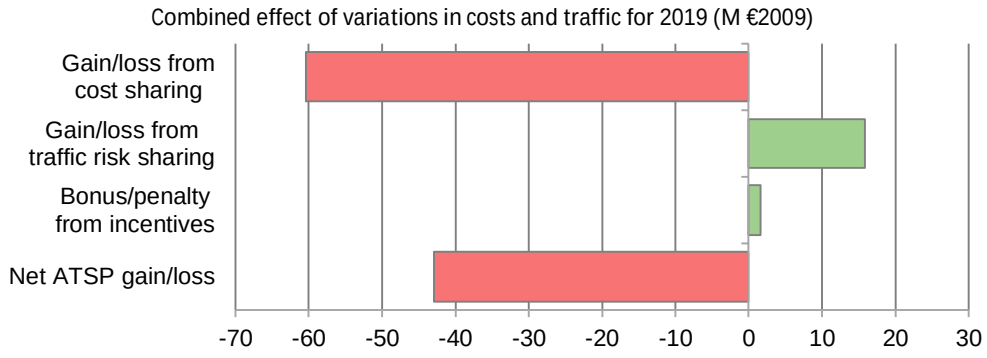


Figure 45 – Net gain/loss on the terminal activity for the (main) ATSPs (SES level).

283 The gain, in respect of capacity and environment incentives (+1.6M€$_{2009}$ shown in Figure 46), reflects the fact that six ATSPs (DFS, Avinor, ENAV, Skyguide, LGS and Oro Navigacija) reported a bonus for their operational performance in 2019 (for an overall amount of 2.0M€$_{2009)}$ and three (LVNL, ANS Finland and PANSA) reported a penalty (for an overall amount of 0.4M€$_{2009}$).

284 The inclusion of these bonuses in the chargeable cost base is still being assessed by the Commission.

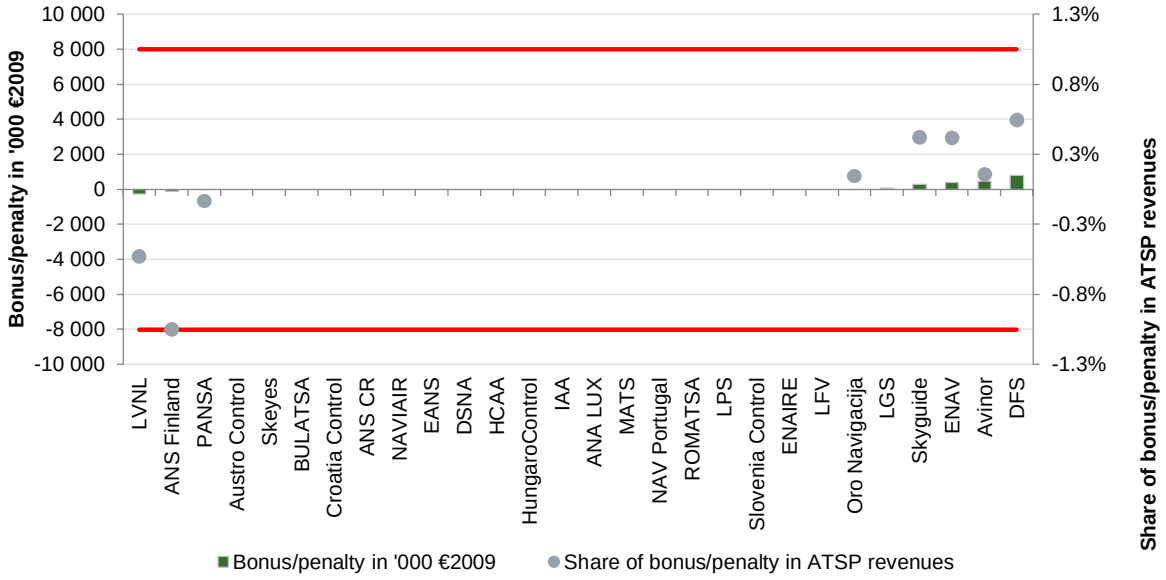


Figure 46 – Terminal gain (+)/loss(-) to be retained by the main ATSPs in respect of incentives.

7.2.9 Actual ATSP 2019 estimated surplus embedded in the cost of capital vs in performance plans

285 The estimated surplus embedded in the actual cost of capital for the terminal activity in 2019 amounts to 42.4M€$_{2009}$ (see column 2019A in Figure 47). This figure is based on an actual asset base amounting to some 1,041M€$_{2009}$, of which 63.5% is financed through equity at an average (pre-tax) RoE rate of 6.4%.

286 The estimated terminal surplus embedded in the determined cost of capital was projected at 41.4M€$_{2009}$ for the main ATSPs (see column 2019D in Figure 47). This figure is based on a planned asset base amounting to some 1,148M€$_{2009}$, of which 55.9% was financed through equity at an average (pre-tax) RoE rate of 6.4%.

287 The actual estimated surplus embedded in the cost of capital for the terminal activity in 2019 (42.4M€$_{2009}$) is slightly higher that the planned (41.4M€$_{2009}$). This is due to an actual total asset base lower than planned but an actual proportion finance by equity (63.5%) higher than planned (55.9%).

7.2.10 Actual ATSPs overall economic surplus vs in performance plans

288 Ex-post, the overall estimated surplus accounting for the net loss from the terminal activity mentioned above (-43.0M€$_{2009}$) and the surplus embedded in the actual cost of capital (42.4M€$_{2009}$) amounts to -0.47M€$_{2009}$. At Union-wide level, the resulting ex-post rate of return on equity (RoE) is -0.1%, which is lower than the 6.4% planned in the performance plans. Many TCZs are very small (for RP2, 123 out of 166 airports included in this report, were below the threshold of 70,000 air transport movements per year) and in many cases the asset base reported for the TCZ is also very small. The RoE expressed in terms of percentage should therefore be interpreted with caution since relatively high/low values do not necessarily reflect very large gains/losses in absolute values.

Focus on the main ATSPs: Terminal ATSP estimated surplus					
ATSP estimated surplus ('000 €2009) from RP2 Performance Plans	**2015D**	**2016D**	**2017D**	**2018D**	**2019D**
Total asset base	1 172 571	1 171 611	1 170 406	1 154 743	1 147 512
Estimated proportion of financing through equity (in %)	53.3%	55.0%	54.1%	54.6%	55.9%
Estimated proportion of financing through equity (in value)	624 906	644 393	633 596	630 725	641 759
Estimated proportion of financing through debt (in %)	46.7%	45.0%	45.9%	45.4%	44.1%
Estimated proportion of financing through debt (in value)	547 665	527 218	536 810	524 018	505 753
Cost of capital pre-tax (in value)	56 122	57 755	59 191	56 271	56 386
Average interest on debt (in %)	3.3%	3.3%	3.3%	3.0%	3.0%
Interest on debt (in value)	18 075	17 595	17 780	15 763	15 014
Determined RoE pre-tax rate (in %)	6.1%	6.2%	6.5%	6.4%	6.4%
Estimated surplus embedded in the cost of capital for terminal (in value)	38 048	40 160	41 411	40 507	41 372
Overall estimated surplus (+/-) for the terminal activity	**38 048**	**40 160**	**41 411**	**40 507**	**41 372**
Revenue/costs for the terminal activity	**1 034 509**	**1 018 966**	**985 601**	**983 524**	**979 704**
Estimated surplus (+/-) in percent of terminal revenues	**3.7%**	**3.9%**	**4.2%**	**4.1%**	**4.2%**
Estimated ex-ante RoE pre-tax rate (in %)	**6.1%**	**6.2%**	**6.5%**	**6.4%**	**6.4%**
ATSP estimated surplus ('000 €2009) based on actual data from Reporting Tables	**2015A**	**2016A**	**2017A**	**2018A**	**2019A**
Total asset base	1 113 589	1 155 116	1 138 473	1 043 103	1 041 144
Estimated proportion of financing through equity (in %)	56.7%	56.4%	59.1%	62.4%	63.5%
Estimated proportion of financing through equity (in value)	631 488	651 928	672 861	650 688	661 603
Estimated proportion of financing through debt (in %)	43.3%	43.6%	40.9%	37.6%	36.5%
Estimated proportion of financing through debt (in value)	482 101	503 187	465 613	392 415	379 541
Cost of capital pre-tax (in value)	53 253	56 027	54 238	54 680	42 347
Average interest on debt (in %)	2.8%	2.8%	2.0%	3.2%	0.0%
Interest on debt (in value)	13 502	13 904	9 269	12 533	-91
Determined RoE pre-tax rate (in %)	6.3%	6.5%	6.7%	6.5%	6.4%
Estimated surplus embedded in the cost of capital for terminal (in value)	39 751	42 123	44 969	42 147	42 438
Net ATSP gain(+)/loss(-) on terminal activity	33 366	10 432	-14 314	-22 800	-42 912
Overall estimated surplus (+/-) for the terminal activity	**73 118**	**52 556**	**30 655**	**19 347**	**-474**
Revenue/costs for the terminal activity	**1 041 505**	**1 028 341**	**998 905**	**1 005 785**	**1 008 344**
Estimated surplus (+/-) in percent of terminal revenues	**7.0%**	**5.1%**	**3.1%**	**1.9%**	**0.0%**
Estimated ex-post RoE pre-tax rate (in %)	**11.6%**	**8.1%**	**4.6%**	**3.0%**	**-0.1%**

Figure 47 – Estimated surplus for 2019 terminal ANS activity at Union-wide level (SES level).
The metric presented in the figure (Estimated surplus for en route activity) is computed using information provided by States/ANSPs in their Reporting Tables for the purposes of the cost-efficiency monitoring analysis. It is important to note that, mainly due to differences in scope, this metric may not reflect the financial situation of ANSPs as it is presented in their audited financial statements.

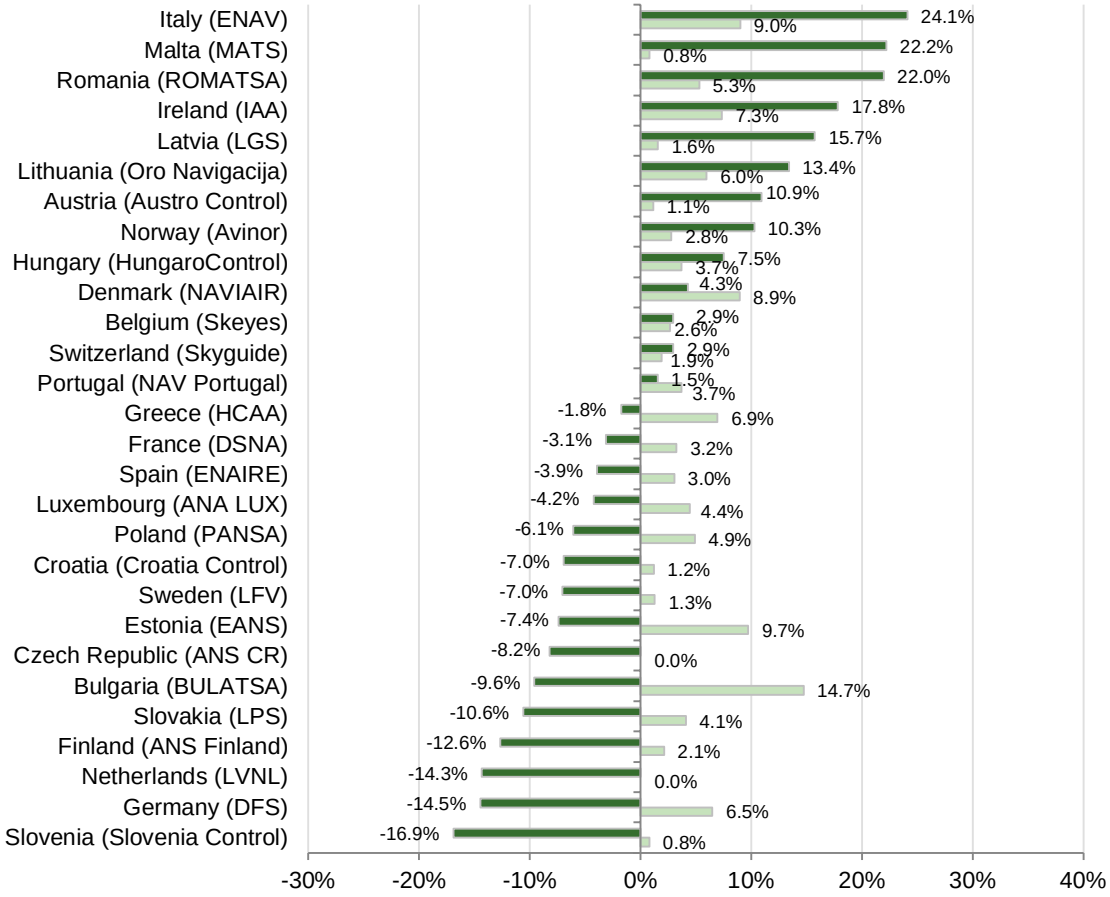


Figure 48 – Estimated surplus for the 2019 terminal activity at (main) ATSPs level.

289 Figure 60 shows that nine ATSPs had a higher actual estimated surplus than planned. This is particularly the case of the three ATSPs operating in Italy, Malta and Romania, where the overall estimated surplus exceeds 20% of ATSPs' revenues. On the other hand, Figure 60 also shows that 15 ATSPs incurred an estimated economic loss in respect of the 2019 terminal activity.

290 As opposed to the en route activity, many Member States recovered less than the determined economic surplus. More details on the main ATSPs economic surplus are available in the local view Annex II of this PRB Monitoring Report 2019.

7.2.11 Terminal 2019 actual costs for airspace users

291 This section analyses the actual terminal costs for airspace users in respect of ANS activities in 2019 (also referred to as the "true cost for users") in the same way as is done for en route ANS. Cyprus and the four Belgian regional TCZs, where the terminal ANS is 100% subsidised by the States/Regions have been excluded from this analysis.

292 Figure 49 shows that the actual costs incurred by airspace users in respect of activities performed in 2019 (962.2M€$_{2009}$) are -17.4% (-190.2M€$_{2009}$) lower than the determined costs billed based on actual TNSUs (1,152.4M€$_{2009}$).

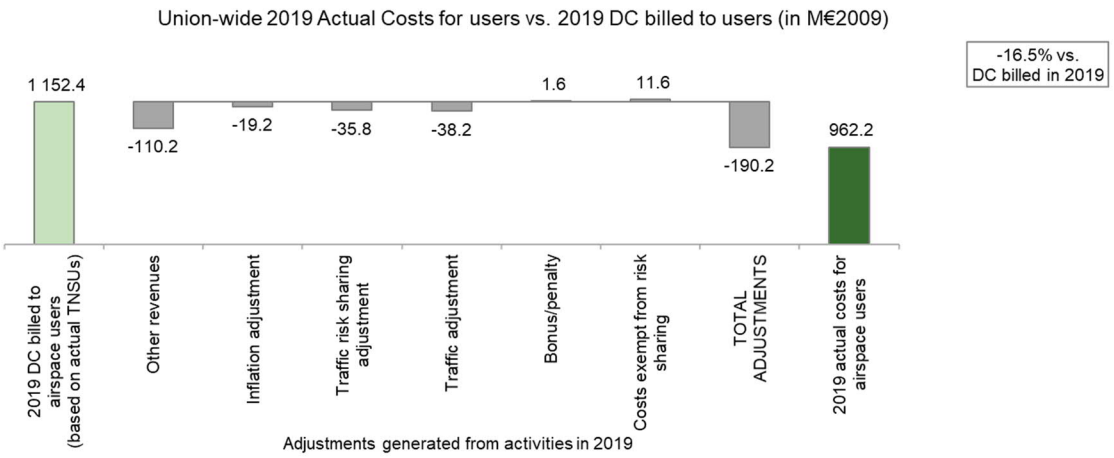


Figure 49 – Union-wide 2019 actual costs for users vs. 2019 DCs billed to users (in M€$_{2009}$).

293 The most important factor contributing to the observed difference is the deduction of -110.2M€$_{2009}$ of other revenues. In most TCZs, there are either no (or negligible), amounts of other revenues deducted from the determined costs. However, circumstances in a few TCZs have a large impact at Union-wide level. This is especially the case for:

- Spain (-58.8M€$_{2009}$) reflecting the fact that terminal ANS costs are partially financed by two elements: (1) revenues from agreements with the airport manager regarding aerodromes service provisions for all airports in the CZ and (2) ENAIRE commercial income (publications, and minor consulting activities);
- France (-23.9M€$_{2009}$) reflected reimbursements from the SESAR Joint Undertaking, revenues from commercial activities, and the co-financing of major programs by Commission grants (Connecting Europe Facility funds).

294 For the majority of Member States the actual inflation index in 2019 was lower than planned. The overall net effect of inflation adjustments at Member State level is a reimbursement (-19.2M€$_{2009}$) to airspace users.

295 Traffic risk sharing applies to 18 TCZs out of the 36 included in this Monitoring Report. In these TCZs, the net effect of differences between actual and planned TNSUs is a reimbursement (-35.8M€$_{2009}$) to airspace users. Since traffic was in general higher than planned, the traffic adjustments relating to costs not subject to traffic risk sharing is again a forthcoming reimbursement (-38.2M€$_{2009}$) to airspace users.

296 Six ATSPs (DFS, Avinor, ENAV, Skyguide, LGS and Oro Navigacija) reported a bonus for their operational performance in 2019 (totalling 2.0M€$_{2009}$) and three (LVNL, ANS Finland and PANSA) reported a penalty (totalling 0.4M€$_{2009}$) leading to a net amount of 1.6M€$_{2009}$.The inclusion of these bonuses in the chargeable cost bases will be assessed by the Commission.

297 Finally, +11.6M€$_{2009}$ costs exempt from cost-sharing were reported. These costs will be eligible for carry-over (charged to airspace users) to the following reference period(s), if deemed eligible by the European Commission.

7.3 Gate-to-gate ANS determined costs

298 Table 28 shows that actual gate-to-gate ANS costs[22] in 2019 were +2.2% higher than planned at Union-wide level in the adopted performance plans (7,273.9M€$_{2009}$ compared to 7,119.1M€$_{2009}$).

299 The actual proportion of en route in total ANS costs (85.1%) is in line with the proportion planned in the performance plans (84.5%). This indicates that, at system level, there is no noticeable reallocation of costs from en route to terminal ANS.

2019 Gate-to-gate ANS actual costs vs. PP							
SES States - Data from RP2 Performance Plans		**2015D**	**2016D**	**2017D**	**2018D**	**2019D**	**RP2 Planned**
Real en-route costs (determined costs 2015-2019) - (in EUR2009)		6 235 113 277	6 195 878 072	6 164 525 008	6 153 524 516	6 059 092 064	30 808 132 937
Real terminal ANS costs - (in EUR2009)		1 117 713 492	1 103 962 617	1 066 100 758	1 064 115 512	1 059 985 630	5 411 878 008
Real gate-to-gate ANS costs - (in EUR2009)		7 352 826 769	7 299 840 689	7 230 625 766	7 217 640 028	7 119 077 694	36 220 010 945
Share of en-route costs in gate-to-gate ANS costs		**84.8%**	**84.9%**	**85.3%**	**85.3%**	**85.1%**	**85.1%**
SES States - Actual data from Reporting Tables		**2015A**	**2016A**	**2017A**	**2018A**	**2019A**	**RP2 Actual**
Real en-route costs - (in EUR2009)		6 079 269 388	6 060 523 324	6 002 852 359	6 077 800 962	6 145 242 571	30 365 688 603
Real terminal ANS costs - (in EUR2009)		1 084 292 299	1 096 452 314	1 088 023 758	1 104 601 261	1 128 686 012	5 502 055 644
Real gate-to-gate ANS costs - (in EUR2009)		7 163 561 686	7 156 975 638	7 090 876 116	7 182 402 224	7 273 928 583	35 867 744 247
Share of en-route costs in gate-to-gate ANS costs		**84.9%**	**84.7%**	**84.7%**	**84.6%**	**84.5%**	**84.7%**
Difference between Actuals and Planned (Actuals vs. PP)		**2015**	**2016**	**2017**	**2018**	**2019**	**RP2**
Real gate-to-gate costs (EUR2009)	in value	-189 265 082	-142 865 051	-139 749 650	-35 237 804	154 850 889	-352 266 698
	in %	-2.6%	-2.0%	-1.9%	-0.5%	2.2%	-1.0%
En-route share	in p.p.	0.1 p.p.	-0.2 p.p.	-0.6 p.p.	-0.0 p.p.	-0.0 p.p.	-0.4 p.p.

Table 28 – 2019 gate-to-gate ANS actual costs vs. performance plans (SES level). Negative figures are highlighted in red and reflect lower than planned actual values.

8 Network Performance Plan

300 In accordance with Article 6 of Commission Implementing Regulation (EU) No 390/2013, the Network Manager should draw up a Network Performance Plan (NPP) containing performance targets for the NM covering all KPAs, which are to be consistent with the Union-wide performance targets.

8.1 Safety

301 The safety key performance indicators for the Network Manager as defined in the NPP cover:

- Minimum level of the Effectiveness of Safety Management (EoSM as for ANSP);
- Percentage of application of the severity classification based on the Risk Analysis Tool (RAT);
- Top five operational safety risks and priorities (Network operational safety risks).

302 The safety KPIs included in the NPP are shown in Table 29:

[22] UK TCZs were excluded from this analysis in order to ensure consistency with terminal section.

KEY PERFORMANCE INDICATORS	NM TARGET
The minimum level of the effectiveness of safety management (EoSM)	Improving its own SMS to reach at least level D in the Management Objectives (MOs), safety policy and objectives, safety risk management, safety assurance, safety promotion and at least level C in the MO safety culture.
The percentage of application of the severity classification based on the Risk Analysis Tool (RAT)	Applying the RAT methodology to all reported ATM specific occurrences with the categories AA (total inability to provide safe ATM services, B (partial inability to provide safe ATM services) and C (ability to provide safe but degraded ATM services). The target was to achieve a 100% application of the RAT in 2018.

Table 29 – Safety KPA and targets for RP2, Network Manager (Source: NPP).

303 Table 30 shows the maturity level achieved by the Network Manager over RP2. In 2018, the NM had eight questions giving a level C: two in safety policy and objectives, four in safety assurance and two in safety promotion.

304 In 2019, only one question remained at level C in safety assurance and achieved the NPP target for four out of five components.

EOSM MANAGEMENT OBJECTIVE	2015	2016	2017	2018	2019
Safety Culture	**C**	**C**	No response provided by the NM	**D**	**D**
Minimum level achieved for all other MOs	**B**	**B**		**C**	**C**
Safety Policy & Objectives	C	B		C	D
Safety Risk Management	C	C		D	D
Safety Assurance	B	B		C	C
Safety Promotion	B	B		C	D

Table 30 – Development of EoSM maturity level over RP2, Network Manager (Source: EASA).

305 The ANSP model is applied for the NM with certain reservations as some of the questions are not fully applicable to NM. The EASA AMC/GM was amended in 2015 to consider the network specific type of ATM specific occurrences within the scope of performance scheme and a group of ATM-specific occurrences exclusively applicable to the NM were introduced.

306 The NM reported that RAT methodology was applied 100% of AA/A, B or C ATM specific occurrences, thus achieving the 2019 target. These figures have not been verified by either EASA or Eurocontrol/DPS (Note: the NM does not report its occurrences to the Annual Safety Template (AST) mechanism).

307 The NM is actively managing the top five network operational safety risks.

8.2 Environment

308 In addition to the KEP and KEA indicators, which are KPIs, the NM has four PIs: the KEP and KEA indicators for the entire NM area (as opposed to the SES area).

309 The two horizontal flight efficiency PIs for the entire NM area are highly correlated to the two corresponding KPIs. They are defined for different areas and therefore do not necessarily follow the same evolution.

310 Regarding the KEP value defined for the entire NM area, similarly to the result achieved for the SES area, the target was missed (by 0.58 percentage points - 4.68% vs. 4.10%).

311 Regarding the KEA value defined for the entire NM area, similarly to the result achieved for the SES area, the target was not met (by 0.35 percentage points - 2.95% vs 2.60%).

312 The NM reports that they have proposed shorter routes that exceed the 5% objective of NM flight efficiency savings, but that low acceptance of these proposals has contributed to not achieving the objective.

313 The Network Manager's objective to improve the route extension due to airspace design (RTE-DES) by 0.57 percentage points between 2012 and 2019 was supported by more than 156 airspace improvement packages that were developed and implemented in the 12 months prior to summer 2019. This helped to ensure that the airspace design Performance Indicator achieving its objective (improvement of 0.72 percentage points between 2012 and 2019). The RTE-DES in 2012 was 2.96% and in 2019 it was 2.24%.

8.3 Capacity

314 Average en route ATFM delay in the SES RP2 area in 2019 was 1.67 minutes per flight (down from 1.83 minutes per flight in 2018), which means that the Union-wide capacity target of 0.5 minutes was not achieved.

315 In the NM Annual Report 2019, the NM provided an overview of capacity performance. The reduction in delay from 2018 was due to the positive effect of the Eurocontrol/NM Action Plan (eNM/S19) implementation and to the decrease in weather and disruption delays. The eNM/S19 measures were developed and implemented in close cooperation between NM and affected ANSPs, using the NM collaborative decision-making (CDM) process. There was less volatility in the network during the summer season.

316 The Network Management Board (NMB) endorsed the ATFM delay assignment/reattribution process for the eNM/S19 measures, through the post-operations performance adjustment process. Capacity and weather regulations in the areas receiving the rerouted or level-restricted traffic were analysed and the percentage of delay which occurred specifically due to the additional traffic, or complexity, was reattributed to the root-cause ANSPs: DFS, DSNA and Eurocontrol (MUAC). DFS received 490,000 minutes of reattributed delays, DSNA received 462,000 and MUAC received 150,000.

317 ATC capacity, and staffing issues in some ACCs created the main bottlenecks in the network. The NM Annual Report also provided details on capacity performance at individual ACCs: 14 ACCs had higher delays than forecasted in NOP 2019-2024.

318 57 ACCs recorded fewer delays than forecasted in NOP 2019-2024.

319 The Network Manager Annual Report 2019 highlights four area control centres with regards to 2019 performance.

- Karlsruhe and Marseille UACs had capacity shortage for the last two years;
- Vienna and Budapest ACCs struggled with recurrent staffing issues throughout the summer.

8.4 Cost-efficiency

320 The Network Management Board endorsed the NM 2019 (part IX) of the Budget at its 22nd meeting , after the Single Sky Committee gave its positive opinion during its 70th meeting on 25 October 2018. It was thereafter approved by the Eurocontrol Permanent Commission through the Provisional Council as part of the Eurocontrol budget.

321 The 2019 total actual Network Manager costs outturn is reported to amount to 181.6M€ (in nominal terms) which is -18.7% lower than planned (or -41.9M€) in the approved NPP (223,561K€). The Network performance plan cost-efficiency target has therefore been met in 2019 and for the fifth year in a row (Table 31).

	NPP FORECASTS RP2				
NM Cost forecast (nominal, '000€)	*2015 F*	*2016 F*	*2017 F*	*2018 F*	*2019 F*
Grand Total	*216 810*	*217 045*	*218 126*	*220 360*	*223 561*
	Monitoring RP2 Actual costs				
NM Cost actual (nominal, 000€)	**2015 A**	**2016 A**	**2017 A**	**2018 A**	2019 A
Grand Total	**213 908**	**206 600**	**197 627**	**183 796**	**181 664**
% deviation Actual vs. Forecast	-1.3%	-4.8%	-9.4%	-16.6%	-18.7%

Table 31 – Total NM RP2 costs forecast profile and actual costs.

322 The Network Manager reports on a range of measures during the execution of the budget in 2019 to stay within the approved cost base, including "Especially the delay in the implementation of the New-PENS leading to longer and more costly transition from the current PENS had to be addressed. The staff costs did not exceed the planned costs". The breakdown of total costs is detailed in Table 32.

				RP2 PLANNED COSTS PROFILE from NPP				
NM Costs (nominal, 000€)	**2012 A**	**2013 A**	***2014 E***	**2015**	**2016**	**2017**	**2018**	**2019**
1 1a Staff Remuneration	90 858	86 332	*87 848*	91883	93189	94725	96360	98927
1 2 Operating	48 748	50 57	*55 161*	45609	44693	43656	43873	43366
1 3 Depreciation	8 722	7 756	*4 296*	3587	3521	3996	4773	5158
1 4 Cost of capital	478	344	*283*	252	381	441	473	487
1 1a Staff Receipts	-962	-952	*-934*	-974	-1005	-1025	-1046	-1087
1 2 Other Receipts			*-1 136*	-1140	-1393	-1643	-1643	-1643
1 2 Sales of services UPP	-1 101	-3 415	*-1 624*	-913	-839	-842	-848	-848
1 2 Sales of services UPP Overhead	-330	-1 024	*-488*	-273	-252	-252	-254	-254
Indirect Costs	43 923	41 884	*43 656*	41767	41323	41045	40338	41064
Future (net) Costs Total	190 336	130 925	187 062	179798	179618	180101	182026	185170
Costs of the Past	39 181	37 361	*38 507*	37012	37427	38025	38334	38391
Grand Total	229 517	168 286	225 569	216810	217045	218126	220360	223561

	Monitoring RP2 Actual costs				
NM Costs (nominal, 000€)	**2015 A**	**2016 A**	**2017 A**	**2018 A**	2019 A
Staff Remuneration	**94 449**	**95 012**	**94 436**	**88 806**	**89 059**
Operating	**42 068**	**43 214**	**40 043**	**31 555**	**35 585**
Depreciation	**2 556**	**1 525**	**429**	**340**	**317**
Cost of capital	**84**	**32**	**28**	**5**	**3**
Staff Receipts	**-1 048**	**-1 117**	**-1 125**	*****	**-1 024**
Other Receipts	**0**	**-1 111**	**-2 711**	******	**-2 889**
Sales of services UPP	**-1 240**	**-1 659**	**-669**	******	**-431**
Sales of services UPP Overhead	**0**	**0**	**0**	******	**N/A**
Indirect Costs	**41 037**	**34 508**	**31 622**	**31 361**	**26 532**
Future (net) Costs Total	**177 906**	**170 404**	**162 052**	**152 067**	**147 151**
Costs of the Past	**36 002**	**36 196**	**35 575**	**31 728**	**34 513**
Grand Total	**213 908**	**206 600**	**197 627**	**183 796**	**181 664**

Table 32 – Breakdown of total NM RP2 cost forecasts and actual.

9 Alert thresholds

9.1 Presentation of the alert thresholds

323 Article 19 of the Commission Implementing Regulation (EU) No 390/2013 defines specific mechanisms to handle exceptional situations occurring in reference periods. These so-called alert mechanisms can be triggered in reference periods at both Union-wide level and local level when unforeseeable circumstances occur that are both insurmountable and beyond the control of the Member States, ANSPs and NM or when alert threshold(s) are reached at Union-wide level.

324 Two traffic alert thresholds, one at Union-wide level and one at local level, were defined in Commission Implementing Decision 2014/132/EU of 11 March 2014 setting the Union-wide performance targets and alert thresholds for RP2.

- Deviation over a calendar year by at least 10% of actual traffic expressed in en route service units compared to the Union-wide planned figure (114,305,000 in 2019) defined in the Annex of the aforementioned Commission Implementing Decision;
- Deviation over a calendar year by at least 10% of actual traffic expressed in service units compared with forecasts set out in the respective performance plans at local level.

9.2 Union-wide level

325 From the 2019 traffic data, the traffic alert threshold of ±10% was exceeded at Union-wide level. As shown on Figure 50, actual en route service units in 2019 were +20.5% higher than the planned 2019 value in Annex I of Commission Implementing Decision 2014/132/EU. This is mostly because Union-wide targets for RP2 have been based on the STATFOR low case scenario (September 2013).

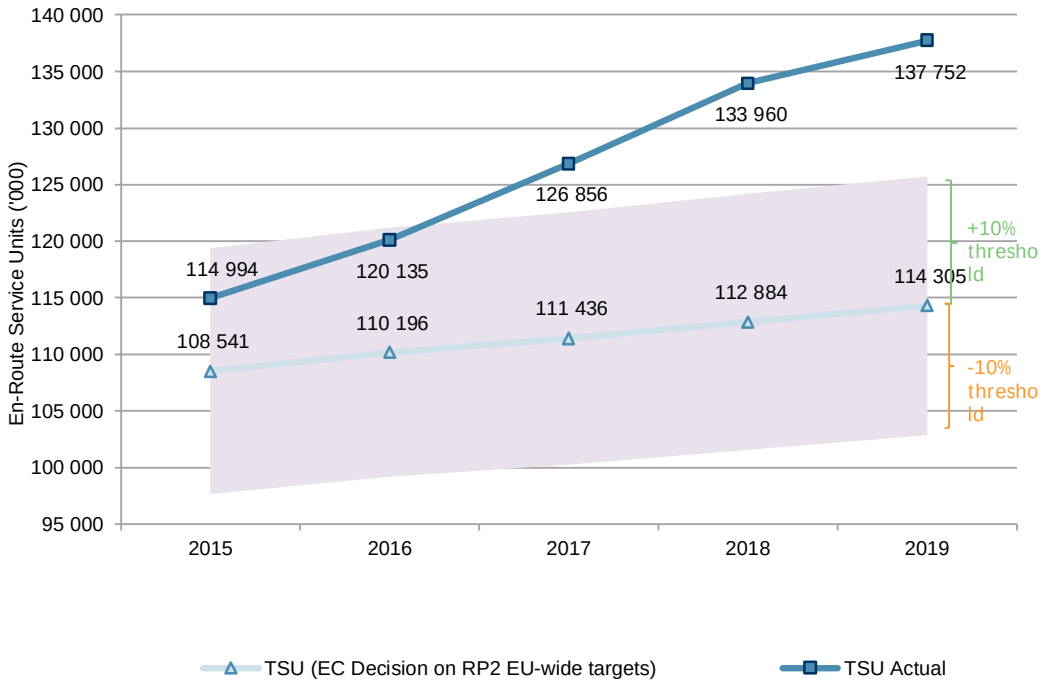


Figure 50 – En route service units at Union-wide level.

9.3 Local level

326 According to Article 19(3) of the Commission Implementing Regulation (EU) No 390/2013, Member States may decide to apply different alert thresholds at local level than the Union-wide level. In this case, they should describe and justify them in their performance plans. So far, no Member States decided to use a different alert threshold. Therefore, the same threshold (±10% compared to the traffic forecasts contained in each performance plan) applies to all the en route charging zones.Figure 51 presents the proportional difference between actual and planned en route service units for each charging zone in 2019. 14 charging zones experienced service unit increases above the +10% threshold: Cyprus (+35.9%), Greece (+30.5%), Spain Canarias (+26.4%), Hungary (+25.8%), Spain Continental (+24.4%), Finland (17.4%), the United Kingdom (+15.1%), Slovenia (+14.8%), Croatia (+13.8), Germany (+13.2), Switzerland (+13.0%), Sweden (+11.5%), Austria (+10.8%) and Lithuania (+10.6%). No Member States exceeded the -10% threshold.

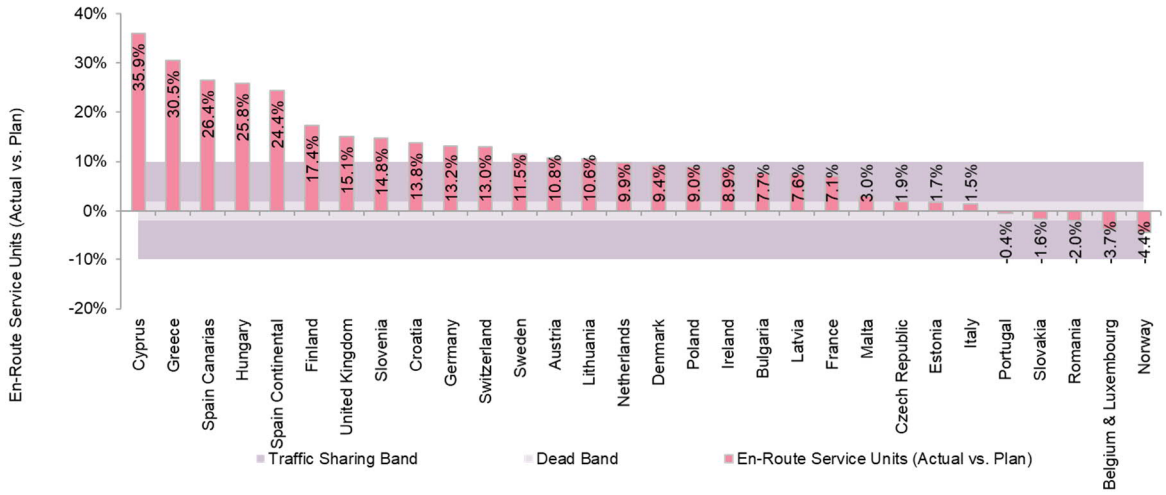


Figure 51 – 2019 En route actual service units versus performance plan by charging zone.

10 Monitoring of performance over RP2 (2015-2019)

10.1 Overview of the RP2 of the performance scheme

327 RP2 is the second reference period in the implementation of the SES performance and charging scheme following on from the shorter RP1, which ran from 2012 to 2014. Considering the tight implementation schedule, the complex nature of the ANS system, the absence of prior experience and the magnitude of change for all stakeholders, RP1 was considered as a transition and learning period with more ambitious targets and stricter rules applying from RP2 onwards.

328 Performance targets set for RP2 were "challenging but achievable" according to the 2013 PRB Target Setting Report. The final target setting considered a growth of 2.6% compound annual growth rate (CAGR) in service units between 2014 and 2019 (the baseline STATFOR 2013 September forecast) and 2.2% CAGR in IFR movements. At the end of RP2, it is apparent that these assumptions were accurate for the number of IFR movements but less so for the number of service units since the actual CAGR equated to 4.3% for service units and 2.6% for IFR movements.

329 In this context, the main performance outcomes over RP2 are:

- There were no fatal accidents with ANS contribution since 2010 in the SES area. However, the safety targets were not met at the Union-wide level;
- The KEA target was not achieved in any year of RP2 and performance was worse in 2019 than in 2015. KEP did improve relative to 2015 but did not achieve the targets;
- En route ATFM delay reached levels not seen since 2008 and the actual performance moved further away from the capacity target in each year of RP2 until 2019 when the eNM measures slightly improved the situation. This is despite that fact that IFR movements were aligned with the base forecast at a Union-wide level;
- For the whole RP2, the Union-wide actual en route unit cost (47.92€$_{2009}$) was -7.9% lower than planned in RP2 aggregated performance plans (52.04€$_{2009}$) and lower than the RP2 target (49.10€$_{2009}$). Higher than planned service units contributed to this achievement.

10.2 Safety KPA

10.2.1 Effectiveness of Safety Management

330 Table 33 shows the development of the average EoSM score and the EoSM minimum maturity level for Member States over RP2. The figure shows that some Member States (like Lithuania and Italy) have improved their EoSM score during RP2, but still did not manage to ensure that the minimum level of any question on a Management Objective reached the target. The figure also shows that despite a high EoSM score (like Italy and Finland), a low maturity question may cause a Member State not to reach the target while performing better than the target in most of the questions. Improvements during RP2 should therefore be seen as the combination of the development of the EoSM score and the minimum maturity level. From that perspective, most Member States have improved the maturity of their safety management over RP2.

331 In 2015, the first year of RP2, 29 out of 30 Member States were below the EoSM targets (only the UK achieved them). The average score was 56. Between 2015 and 2016, a small improvement was observed. While the average score improved from 2016 to 2017, the Member States reaching the target did not improve, with 25 Member States being still below target. As the average score improved, this was not sufficient for many Member States to raise their minimum level of maturity of the Management Objectives. Between 2017 and 2019, while seeing a modest increase in the

average score, another 11 Member States improved their minimum level of all Management Objective to reach the target level C.

332 In 2019, when RP2 ended, 14 Member States remained below the EoSM targets. Most Member States had to implement substantial improvements to their safety management practices during RP2. While the average score has improved, it was not sufficient to raise the minimum level of at least one EoSM component to the target maturity level. Nine Member States did not reach the target on one component, the rest have two, three or four components to improve.

DEVELOPMENT OF EOSM SCORES AND MINIMUM LEVEL FOR MEMBER STATES OVER RP2											
		2015		2016		2017		2018		2019	
		Score	Level	Score	Level	Score	Level	Score	Level	Score	Level
Baltic FAB	Lithuania	43	B	48	B	55	B	61	B	61	B
	Poland	56	B	54	B	54	A	59	C	60	C
Blue Med FAB	Cyprus	52	B	55	B	52	B	60	C	63	C
	Greece	66	B	71	C	73	C	74	C	72	C
	Italy	52	B	63	B	66	B	67	B	74	B
	Malta	50	A	52	B	52	B	72	B	59	B
DANUBE FAB	Bulgaria	48	B	40	B	47	B	40	B	46	B
	Romania	60	B	61	B	56	B	61	B	66	B
DK-SE FAB	Denmark	42	A	46	A	47	A	50	B	52	B
	Sweden	54	B	61	B	52	A	64	B	67	B
FAB CE	Austria	58	B	61	B	66	C	67	C	69	C
	Croatia	47	B	49	B	55	B	57	B	57	C
	Czech Republic	69	B	72	B	79	B	80	C	80	C
	Hungary	46	B	45	B	46	B	46	B	52	C
	Slovakia	56	B	60	B	60	B	61	B	61	B
	Slovenia	42	B	58	B	72	C	75	C	79	C
FABEC	Belgium	62	B	64	A	64	A	68	A	74	C
	France	64	B	71	B	72	B	72	B	74	B
	Germany	55	B	70	C	69	B	73	C	73	C
	Luxembourg	47	B	58	B	63	B	63	B	68	B
	Netherlands	59	B	64	B	70	B	74	B	74	B
	Switzerland	66	B	71	C	76	C	77	C	77	C
NEFAB	Estonia	46	B	53	B	57	B	56	B	73	C
	Finland	61	B	75	B	84	B	84	B	84	B
	Latvia	58	B	64	C	63	B	71	C	75	C
	Norway	52	B	56	B	60	B	68	B	69	C
SW FAB	Portugal	44	A	41	A	50	B	53	B	54	B
	Spain	56	B	59	B	62	B	64	B	68	B
UK-Ireland FAB	Ireland	79	B	79	B	86	B	86	C	85	C
	United Kingdom	81	C	86	C	88	C	88	C	89	C

Table 33 – Monitoring and assessment of NSA performance in the EoSM (KPI) over RP2 (Source: EASA), showing that substantial improvements were made and 15 Member States improved to achieve the RP2 targets.

333 Of the Member States failing to meet the target for RP2, their performances fall in three categories:

- Four Member States implemented modest improvements and one even saw their EoSM score reduced over RP2. They consequently did not reach the target;
- Three Member States implemented significant improvements and improved their EoSM score by more than 40%, but still did not reach the target on one EoSM component despite considerable effort;
- Six Member States did improve their performance, but not sufficiently to meet the target typically increasing their score by between +40% and +20%.

334 Some Member States that did not achieve the targets scored high in most areas but have one or two areas with a maturity level below the targets.[23] Two Member States were below in three and four areas (out of five).

335 The KPI for EoSM of Member States will be discontinued for RP3 and will no longer be monitored by the PRB. For RP3, Member States will be subject to the oversight by the European Union Aviation Safety Agency with respect to their compliance with requirements under Regulation (EU) 2017/373[24], which will give at least a comparable maturity level for safety management as the EoSM for Member States under RP2. The need for ANSPs to comply with Regulation (EU) 2017/373 will require them to achieve targets early in RP3 due to the consistency between the regulatory requirements and requirements under the EoSM.

336 Table 37 shows the development of the average EoSM score and the EoSM minimum maturity level for Member States over RP2. The table shows that for other MOs, the highest improvement was seen between 2018 and 2019 but this reflects the that ANSPs missing the target in 2018 only had to improve in one or two areas to reach the target, i.e. benefitted from a high starting level and the improvements implemented earlier in RP2. Thus, the eight ANSPs achieving the target in 2019, did only marginally improve their EoSM scores between 2018 and 2019.

337 In 2015, the first year of RP2, 21 ANSPs were below the EoSM targets and three ANSPs remained below target when RP2 ended in 2019. The rather modest increase in the average Union-wide ANSP EoSM score illustrates that many ANSPs started RP2 close to the targets and needed to improve a few areas to reach the targets.

338 At the beginning of RP2, only one ANSP (PANSA) was below the RP2 target of maturity level C in Safety Culture. With the improvement of PANSA's maturity in EoSM for Safety Culture in 2015 and 2016, all ANSPs achieved the target level C for Safety Culture in 2017.

339 For the ANSPs below the RP2 target, all except CYATS had a relatively high score in the first year of RP2 remained at the same level throughout. CYATS started lower and improved their score by 20% but remained below the target maturity level on all five MOs with many areas to improve to reach the target.

[23] For Member State detailed analysis, please refer to Annex III.
[24] Commission Implementing Regulation (EU) 2017/373 of 1 March 2017 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight.

DEVELOPMENT OF EOSM SCORES AND MINIMUM LEVEL FOR OTHER MOS FOR ANSPS OVER RP2										
		2015		2016		2017		2018		2019	
		Score	Level	Score	Level	Score	Level	Score	Level	Score	Level
Baltic FAB	ORO NAVIGACIJA	82	D	82	D	78	D	78	D	78	D
	PANSA	24	A	29	A	45	B	60	C	76	D
Blue Med FAB	CYATS	62	C	58	B	58	B	59	C	62	C
	ENAV	76	D	66	D	76	D	72	C	75	D
	HANSP	73	C	75	C	75	D	75	D	75	D
	MATS	82	D	83	D	85	D	84	D	86	D
DANUBE FAB	BULATSA	86	C	86	C	92	D	91	D	91	D
	ROMATSA	82	C	84	C	84	D	86	D	86	D
DK-SE FAB	LFV	74	C	77	C	79	C	77	C	75	C
	NAVIAIR	88	C	88	C	87	C	85	C	85	D
FAB CE	ANS CR	83	D	83	D	83	D	83	D	83	D
	Austro Control	90	C	91	D	91	D	91	D	91	D
	Croatia Control	77	C	82	C	85	C	87	C	90	D
	HungaroControl	78	D	77	D	79	D	77	D	84	D
	LPS SR	88	D	86	D	89	D	89	D	89	D
	Slovenia Control	74	C	70	C	76	C	77	D	78	D
FABEC	ANA LUX	71	B	74	C	79	C	81	C	84	D
	DFS	92	C	92	D	94	D	94	D	94	D
	DSNA	86	C	85	C	91	C	91	D	92	D
	LVNL	86	C	85	C	75	C	82	C	83	D
	MUAC	84	D	76	C	77	C	76	C	78	D
	Skeyes	76	C	78	C	82	D	86	D	90	D
	SKYGUIDE	84	C	87	C	92	D	93	C	95	D
NEFAB	ANS Finland	75	A	80	D	86	D	86	D	86	D
	Avinor	78	C	80	C	80	C	80	D	80	D
	EANS	82	D	85	D	87	D	88	D	88	D
	LGS	78	C	78	C	78	C	78	C	79	C
SW FAB	ENAIRE	87	D	92	D	93	D	93	D	98	D
	NAV Portugal	91	D	91	D	91	D	95	D	95	D
UK-Ireland FAB	IAA	84	C	92	D	89	D	92	D	92	D
	NATS NERL	86	C	87	D	88	D	87	D	87	D

Table 34 – Monitoring and assessment of ANSP performance in the EoSM KPI over RP2 (Source: EASA), showing that substantial improvements were made and 18 ANSPs improved to achieve the RP2 targets.

340 The most impressive improvements were shown by PANSA improving their score from 24 in 2015 to 76 in 2019. The score for five ANSPs declined during RP2, but still achieved the target. One ANSP was below the target on all management objectives, except for Safety Culture.

341 For RP3, further improvements will be required, across all MOs.

10.2.2 RAT performance improved and are above or close to targets

342 The application of the RAT methodology improved between 2018 and 2019 Union-wide for all types of occurrences. The application of RAT for runway incursion (ground) improved in 2019 as opposite to previous years but remained below the RP2 target. While the RAT application for RI

(ground) and air traffic management specific (ATM-S) ground are close to their targets and in practical terms achieve the target considering that some data for Member States/ANSPs are still not provided.

343 The number of ANSPs/NSAs achieving the 2019 target has increased. Figure 52 shows the application of RAT for all occurrences reported, for each occurrence type and year.

344 During RP2, all except runway incursions (ground) have improved, which fell to a lowest point in 2018, but regained most of the loss in 2019. ATM specific occurrences was the category with the largest improvements over RP2. While the RAT application for RIs (ground) and ATM specific (ground) did not reach the target of 100%, they are quite close to targets and further improvements to reach 100% will only be required for few ANSPs.

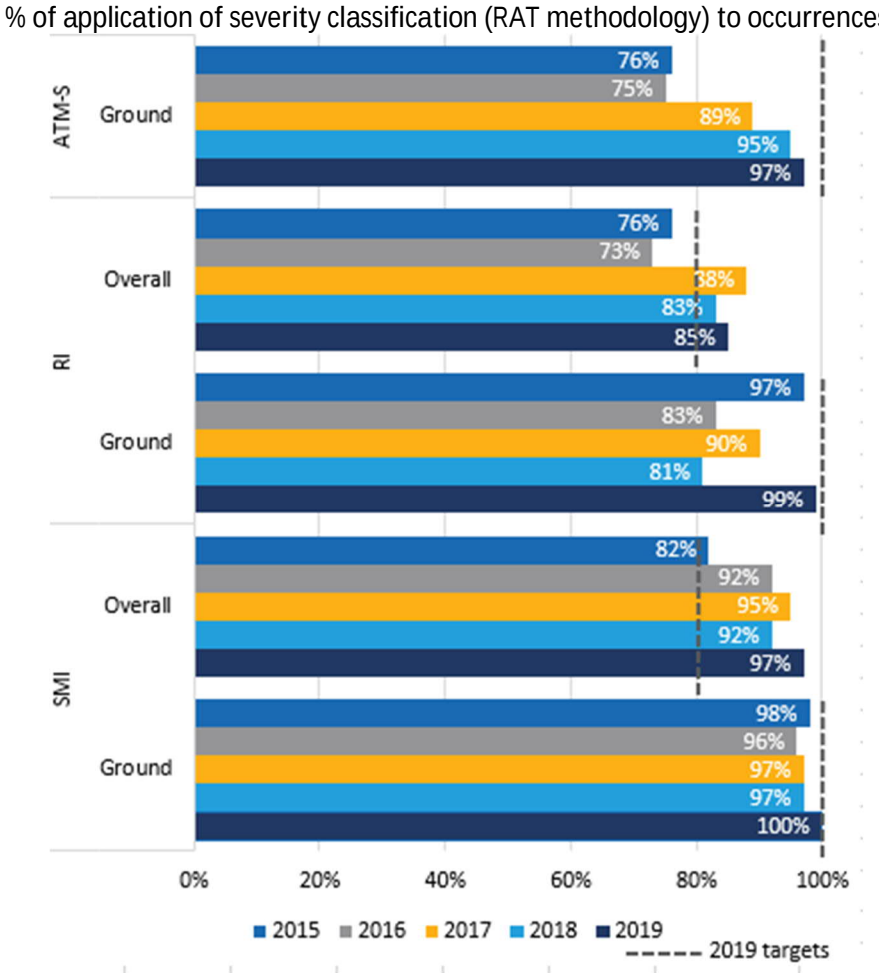


Figure 52 – Achieved levels of RAT application over RP2 for SMI (separation minima infringement), RI (runway incursions) and ATM-S (air traffic management - specific) occurrences (Source: EASA), showing that the application of RAT still needs improvement.

10.2.3 Just Culture

345 EASA and the PRB assessed the Just Culture progress of Member States and ANSPs based on the responses given to a self-assessment questionnaire that had 24 questions. The questions required affirmative or non-affirmative answers to the questions. The aim of the assessment is to identify the status of those aspects which indicate the presence (or corresponding absence) of a Just Culture environment in a given Member State or ANSP.

346 Figure 53 shows the number of 'yes' in the Member States responses to the self-assessment questionnaire and Figure 54 shows the number of 'yes' in the ANSPs responses.

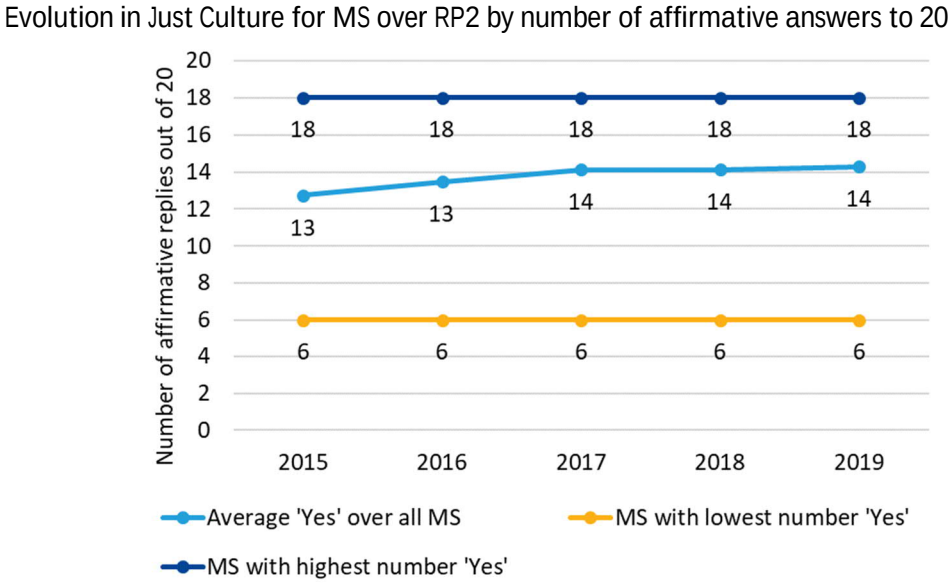


Figure 53 – Just Culture achieved by Member States in 2019 measured as the number of affirmative responses out of 20 questions.

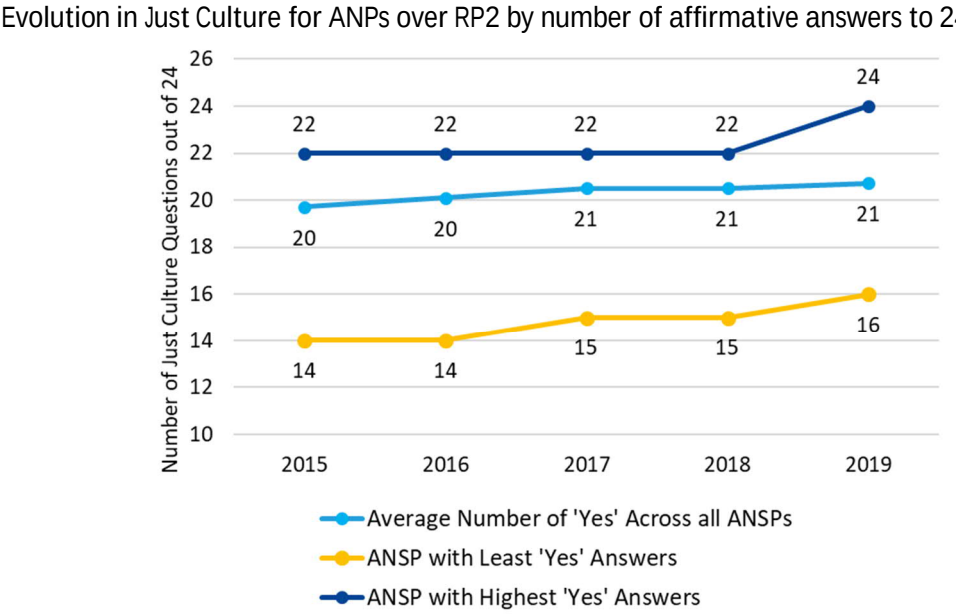


Figure 54 – Just Culture achieved by Member States in 2019 measured as the number of affirmative responses out of 24 questions.

347 Based on number of affirmative replies, Member States and ANSPs did not improve the level of Just Culture substantially over RP2. For both the average number of affirmative only increased by one over RP2. The ANSP with the lowest number of affirmative replies improved by two over RP2, while the Member States with the lowest number of affirmative replies did not improve.

348 FABs were also requested to report via the FAB Monitoring Reports on common FAB approaches for improvement in certain Just Culture areas, providing details on possible areas of improvement at both State and ANSP level. FABs established a common approach as follows:

- Common approach for both regulatory authority and ANSPs: Blue MED FAB, FAB Central Europe (FAB CE), FAB Europe Central (FABEC) and UK-Ireland FAB;
- Common approach only for ANSPs: Danube FAB, Denmark-Sweden FAB and NEFAB;
- No common approach: Baltic FAB.

349 The Just Culture KPI will be discontinued for RP3 and further implementation would be required, as today, to be based on ICAO provisions (Annex 13 and 19)[25] and Regulation (EU) No 376/2014[26].

10.2.4 Development of incidents and accidents at Union-wide level

350 Figure 6 and Figure 7 showed the development of accidents and serious incidents over the period between 2009 and 2019. Data available confirms that the positive development seen between 2009 and 2018 continued into 2019. This includes both where occurrences are related to air navigation services[27] and where such contribution has been identified.[28]

351 Table 35 shows the number of occurrences reported for runway incursions (RI), separation minima infringements (SMI), airspace infringements (AI) and air traffic management - specific over RP2 in absolute numbers. While number of SMIs remained at the same level over RP2, both the numbers of RIs and AIs increased. RIs saw a positive development between 2015 and 2017 with a 10% reduction but increased from 2017 to 2019 being around 40% higher than in 2015. AIs showed a steady increase in numbers over the whole RP2, but with a jump between 2018 and 2019 reaching also 40% above the number in 2015. ATM-S occurrences, dropped over 2016 and 2017 but increased again in 2018 and in 2019 to arrive to 7% higher than in 2015.

TYPE OF OCCURRENCE		2015	2016	2017	2018	2019	VARIATION 2015 TO 2019
Reported occurrences Union-wide	Separation Minima Infringements	2,290	2,231	2,284	2,294	2,287	↔ 0%
	Runway Incursion	1,024	1,099	940	1,075	1,435	↑ 34%
	Airspace Infringements	4,041	4,838	4,620	4,873	5,691	↑17 %
	ATM-Specific	15,111	14,089	14,664	15,576	16,192	↑4 %

Table 35 – Development in number of occurrences for SMI, RI, AI and ATM-S over RP2.

[25] ICAO Annex 13 — Aircraft Accident and Incident Investigation. ICAO Annex 19 – Safety Management.
[26] Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation, amending Regulation (EU) No 996/2010.
[27] ANS may not have contributed to a given occurrence, but it may have a role in preventing similar occurrences in the future.
[28] At least one ANS factor was in the causal chain of events leading to an occurrence, or at least one ANS factor potentially increased the level of risk, or it played a role in the occurrence encountered by the aircraft.

352 Part of the increase can be explained by two factors: Increase in traffic from 2015 to 2019 (increase from around 13.1 to 15.2 million flight hours), which with the same safety performance should give a higher number of reports in absolute numbers and an increase in the level of reporting caused by an improved reporting culture, which despite the safety performance is the same should give higher number of occurrences in absolute numbers. While the absolute numbers increased for RIs and AIs, this cannot be concluded to show a deteriorating safety performance. On the contrary the data seems to confirm the overall improvements in the Union-wide level of accident and incidents as described earlier.

353 Figure 55 shows the occurrence rates for RIs, SMIs, AIs and ATM-S for each year in RP2 for each Member State and the Union-wide average rate same year. The figure indicates the development of the rate for the Member States with the highest occurrence rate when RP2 started (in 2015) and when RP2 ended (in 2019).

354 The development in the Union-wide average seem to confirm that:

- Union-wide rate for RIs declined from 2015 to 2017 and increased from 2017 to 2019 but ended in 2019 in large on the same rate as seen in RP2;
- Union-wide rate for AIs remained stable over RP2 despite a 40% increase in the absolute number of reported incidents;
- Union-wide rate for SMIs and ATM-S remained as well stable over RP2;
- Figure 53 also shows the spread of rates around the Union-wide rate with a few outliers but with the gravity of the rates around the Union-wide average. In general, the outliers are not consistently the same Member States, even though for RIs and ATM-S the same Member State had the highest occurrence rate in three of the five years. For SMIs and AIs it seems to be different Member States being the outlier. Overall, the uneven distribution of the Member States rate around the average (the height of the boxes for each year) seems to be caused by the single highest outlier. If that Member State is removed, the top of the boxes only varies slightly from year to year. The Union-wide average remains despite the outliers reasonably stable supporting the indication that the safety performance over RP2 measured on number of occurrences has improved.

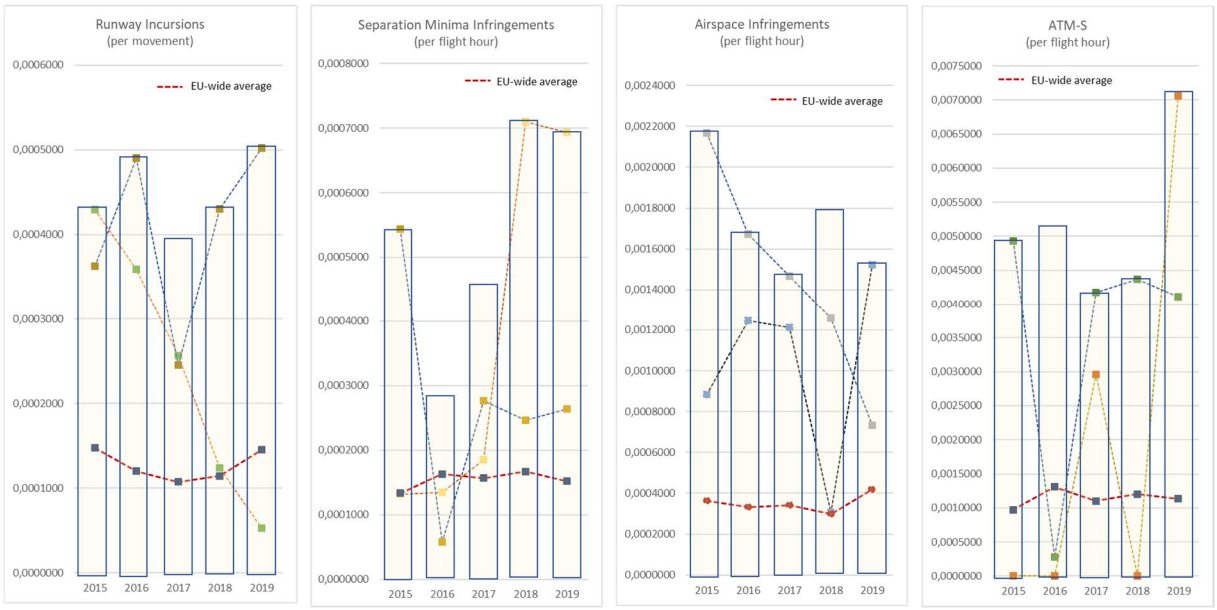


Figure 55 – Development in occurrence rates and Union-wide average rate over RP2 for RIs, SMIs, AIs and ATM-S.

10.3 Environment KPA

10.3.1 Horizontal flight efficiency

355 In 2014, the PRB consulted widely on setting an RP2 target for the planned en route flight efficiency in the range between 4.10% to 4.40% compared to the 2014 achieved performance of 4.90%. For the flown en route flight efficiency, the PRB consulted widely on setting an RP2 target for the actual en route flight efficiency in the range between 2.50% and 2.75% compared to the achieved actual en route flight efficiency of 2.79% in 2014.

356 Figure 56 shows the RP1, RP2 and RP3 targets on KEA and KEP, whilst also showing the KEA and KEP performances for RP1 and RP2. KEP has improved with a clear downward trend, while KEA has remained stable, although a noticeable but temporary improvement was achieved in 2017 and 2018.

357 The PRB Monitoring Reports of each year in RP2 emphasised that the lack of progress in KEA is due to more than the ANSP's performance. The design of the KEA metric means that the impact of weather, airspace user route choices and airline economics, i.e. the cost index, all impact the flown routes. However, the monitoring reports and data do show that ANSPs can improve by implementing free route airspace which will mitigate the impact of the ANSP on KEA.

358 However, even though free route airspace was implemented by many Member States before and during RP2, the KEA performance has not improved overall and this is part due to the fact the airspace management and restrictions can still impeded a true free route airspace, i.e. entry/exit point design, area reservation and excess demand compared to offered capacity.

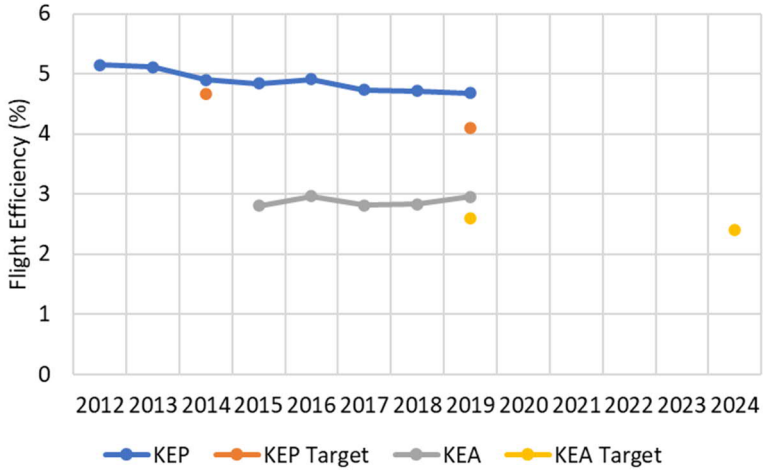


Figure 56 – Evolution of HFE during RP1 and RP2 and projection of RP3 targets.

10.3.2 Utilisation of Conditional Routes (CDRs)

359 Table 36 shows that the rate of uptake of CDRs has been relatively static over the period 2015 – 2019. This could be explained by several reasons:

- Civil-military authorities may not be making the CDRs available when there is actual demand;
- Aircraft operators may not know when CDRs are available, or may for business reasons simply prefer not to use them;

- CDR availability may not be coordinated across national regional boundaries making individual segments unusable despite being available.

360 Work continues among all stakeholders, including Network Manager, ANSPs, military authorities, aircraft operators and computer flight plan service providers to focus on each of the areas highlighted above.

YEAR	2015	2016	2017	2018	2019
Aircraft Planning on CDR 1	75%	72%	74%	74%	75%
Aircraft Planning on CDR 2	73%	76%	75%	75%	77%

Table 36 – CDR FPL Use by aircraft 2015-2019.

10.3.3 Reservation and usage of segregated or reserved airspace

361 Figure 57 shows that the evolution of the usage of pre-tactically booked airspace between 2015 and 2019.

362 The number of hours allocated for special use increased between 2015 and 2019, although, more and more of the airspace that was not required was released at three hours before area activation. However, the number of hours still reserved and unused was the highest in 2019 and more should be done to ensure the FUA concept is applied and unnecessary airspace reservations are cancelled.

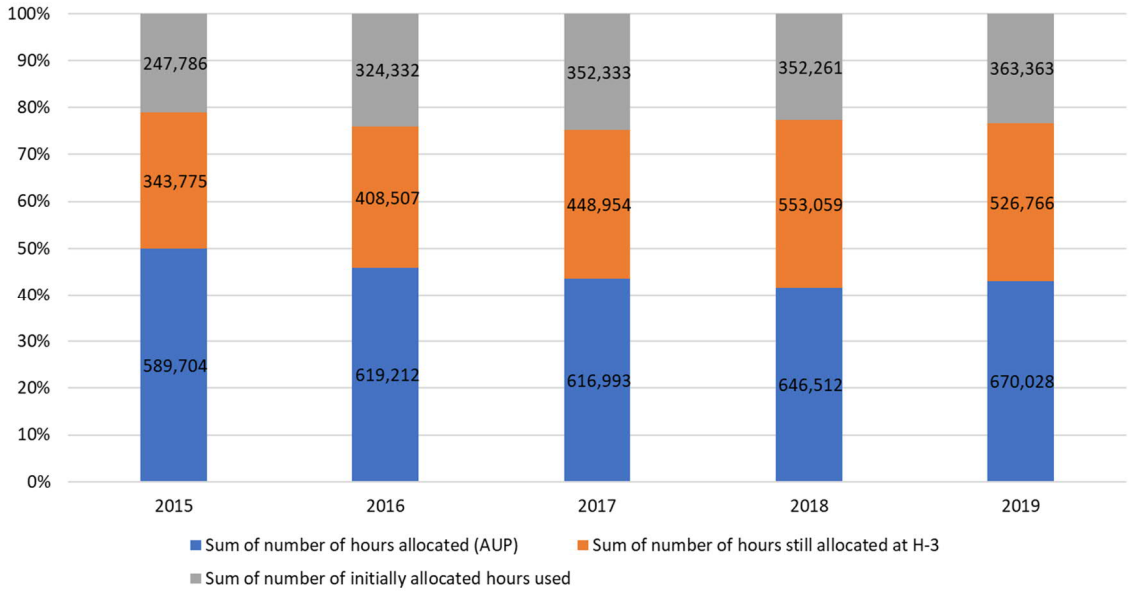


Figure 57 – Usage of pre-tactically booked airspace 2015-2019.

363 There is a huge variation across the Member States in the effective reservation and usage of pre-tactically booked airspace, which can be due to many factors including:

- Member States may be reporting on a different selection of areas;
- Member States may be monitoring the actual use of airspace more closely than previously;
- Member States may have revised national booking procedures to only book airspace when it is required;

- Member States may have decided that there is no capacity or flight efficiency issue and that they have no need improve airspace booking procedures.

10.3.4 Terminal performance

364 Figure 58 shows the additional taxi-out and holding times for the airports that report data. Out of 174 airports that are regulated and required to report data, 69 reported additional taxi-out data time and 70 reported additional holding time. Therefore, the figure should be interpreted with caution since many airports do not provide the data to determine Union-wide performance.

365 However, the data does show that additional taxi-out time increased over RP2, whilst additional holding times decreased. The data shows that performance was varied year-to-year with some improvements in additional taxi out time in 2017 and improvements in additional holding times in 2016 and 2018.

366 The terminal performance metrics are heavily influenced by those airports that manage the most traffic i.e. major airports such as Frankfurt and Heathrow. Small improvements at such major airports can lead to significant improvements in Union-wide performance.

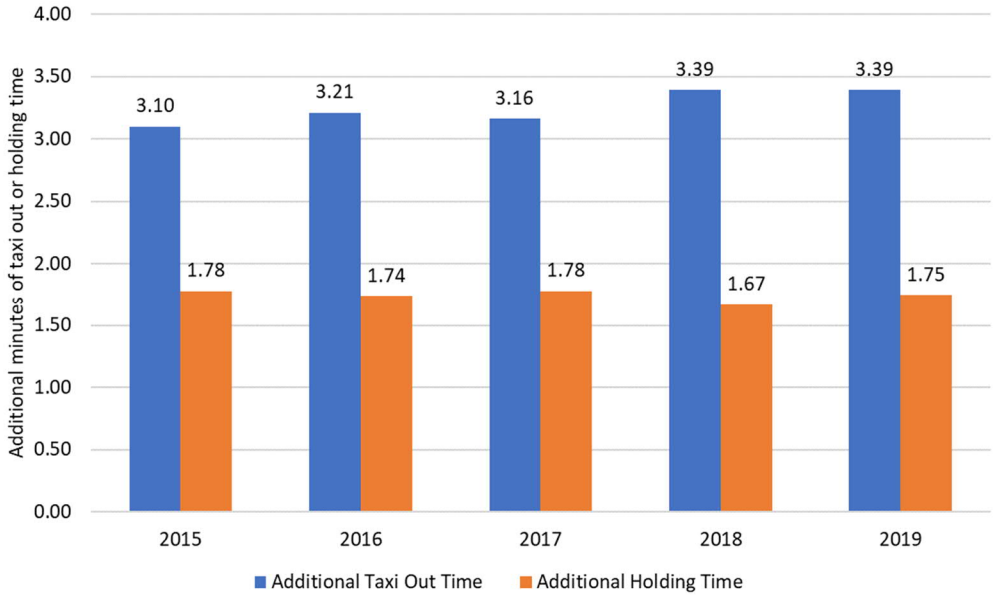


Figure 58 – Additional taxi-out and time spent in terminal airspace.

10.4 Capacity KPA

10.4.1 En route capacity overview

367 The Union-wide target for capacity has not been met in any of the years of RP2. Between 2015 and 2018, both total minutes of ATFM delay and the average ATFM delay per flight increased in every year. In 2019, a slight improvement was achieved, but the Union-wide target was not achieved by far.

368 Over the five years of RP2, traffic increased by 13%, which was mostly in line with the STATFOR 2014 February base forecast for the SES-RP2 area, whereas the total minutes of ATFM delay increased by 209%, resulting in an increase of 172% of average en route ATFM delay per flight, compared to 2014 values.

369 Figure 59 presents capacity performance and traffic growth on a wider time horizon. Following the volatile period of 2008-2010, and the improvements between 2011-2013, the delay situation steadily deteriorated until 2019 and almost matched the 2010 level again. During this same period, traffic levels on the Union-wide level kept growing steadily.

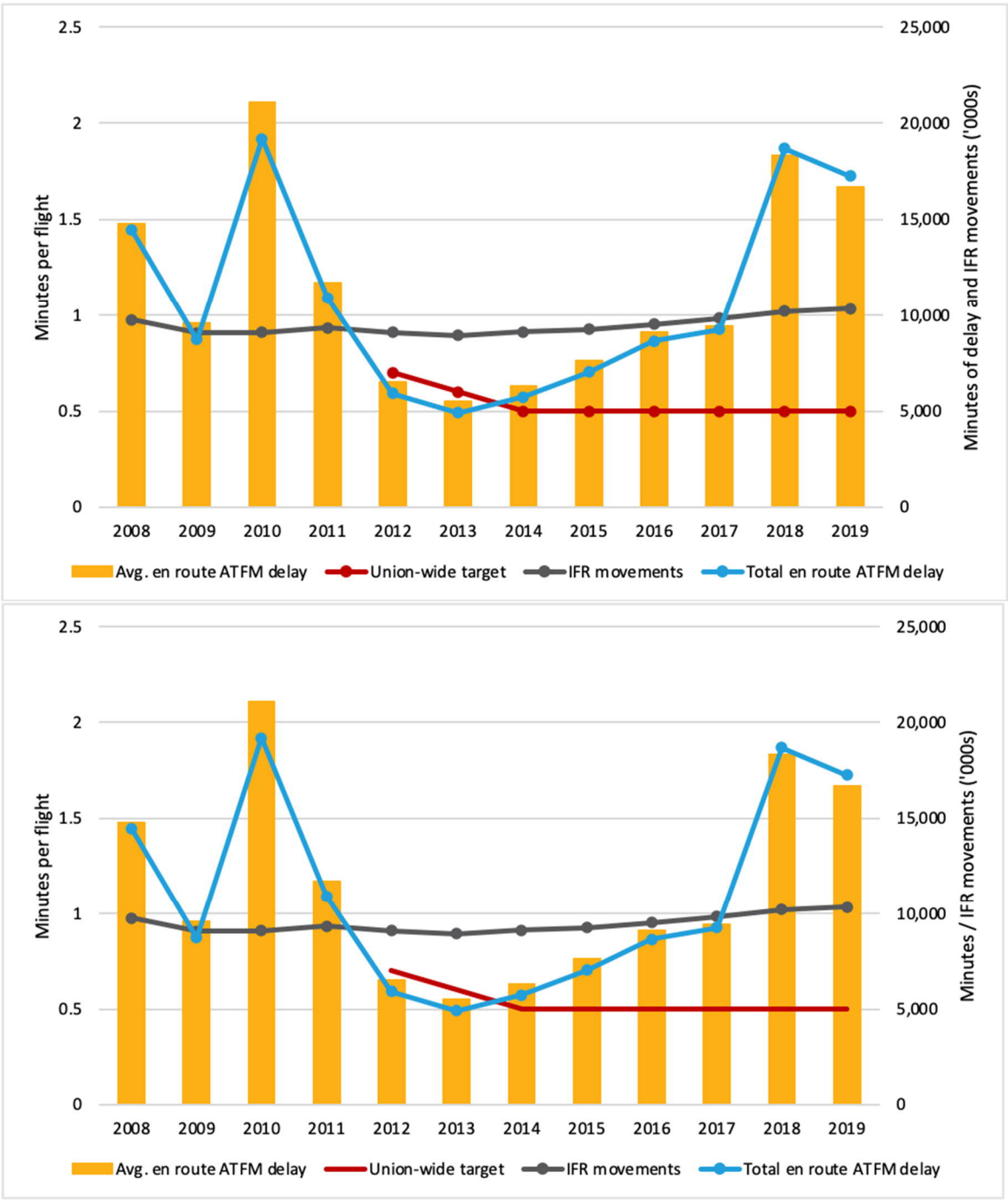


Figure 59 – Overview of capacity performance and the evolution of traffic since 2008 (Source: https://an-sperformance.eu).

370 Table 37 shows an overview of target setting and actual performance by FABs over RP2. The table also indicates the reference values for each FAB. Most of the FABs have adopted targets which were either in line or below their reference values, with the exception of FABEC for the years of

2015 and 2016, and BLUE MED for the years of 2018 and 2019.[29] Only two FABs (DK-SE and NE-FAB) out of nine were able to meet their respective en route capacity targets in every year of RP2. Baltic FAB only missed the target in 2016, meeting the targets in all other years.

371 UK-IRE FAB, DANUBE FAB, and FAB CE have met their respective targets in three out of the five years of RP2, the two latter FABs showing a deteriorating performance, missing the targets in 2018 and 2019.

372 BLUE MED FAB only managed to meet the target in 2016, whereas FABEC and SW FAB were unable to meet their targets in any years of RP2.

FAB		2015	2016	2017	2018	2019
BALTIC FAB	Ref. Value	0.21	0.21	0.21	0.22	0.22
	Target	0.21	0.21	0.21	0.22	0.22
	Actual	0.16	0.35	0.1	0.22	0.1
BLUE MED	Ref. Value	0.17	0.18	0.18	0.18	0.18
	Target	0.17	0.18	0.18	0.24	0.24
	Actual	0.64	0.13	0.23	0.35	0.32
DANUBE	Ref. Value	0.04	0.04	0.04	0.05	0.06
	Target	0.03	0.03	0.03	0.03	0.04
	Actual	0.03	0	0.01	0.08	0.08
DK-SE	Ref. Value	0.1	0.1	0.1	0.09	0.09
	Target	0.1	0.1	0.1	0.09	0.09
	Actual	0.01	0.05	0.02	0.04	0.07
FAB CE	Ref. Value	0.3	0.29	0.29	0.29	0.29
	Target	0.29	0.29	0.28	0.28	0.27
	Actual	0.21	0.08	0.18	0.82	1.57
FABEC	Ref. Value	0.43	0.42	0.42	0.42	0.43
	Target	0.48	0.49	0.42	0.42	0.43
	Actual	0.69	1.07	1.15	2.14	1.68
NEFAB	Ref. Value	0.12	0.12	0.13	0.13	0.13
	Target	0.12	0.12	0.13	0.13	0.13
	Actual	0.04	0.07	0.02	0.03	0
SW FAB	Ref. Value	0.3	0.31	0.31	0.3	0.3
	Target	0.3	0.31	0.31	0.3	0.3
	Actual	0.46	0.42	0.4	0.64	0.53
UK-IRE	Ref. Value	0.25	0.26	0.26	0.26	0.26
	Target	0.25	0.26	0.26	0.26	0.26
	Actual	0.08	0.3	0.16	0.28	0.21

Table 37 – Reference values, targets and actual en route ATFM delay per flight values of FABs 2015-2019.

373 As shown in Table 18 and Figure 20, six FABs have faced higher than expected traffic levels. For FAB CE and DANUBE FAB, there was a sudden unexpected increase in traffic between 2017 and 2019. For BLUE MED FAB and UK-Ireland FAB, traffic growth was somewhat volatile during RP2,

[29] Capacity targets for BLUE MED were adopted by Commission Implementing Decision (EU) 2019/3502/F1 on 15 May 2019. The target values submitted by BLUE MED in their original performance plan were higher than the respective reference values in each year of RP2.

resulting in traffic levels close to or higher than the STATFOR high scenario in some of the years. For FABEC, traffic growth was steady over the period, consistently staying between the base and high scenarios, whereas for SW FAB, traffic levels consistently stayed above the STATFOR high forecast scenario.

374 When comparing en route capacity performance with the traffic growth situation, different cases may be identified:

- ANSPs facing an unexpected and significant increase in traffic incurred dramatically more delays, than previously (e.g.: Austro Control, HungaroControl from FAB CE, ROMATSA from DANUBE FAB). Reasons behind such cases might be the inability to react to the changed circumstances (either because the lack of flexibility or due to management decisions), and/or the loss of resilience due to the sudden increase in demand. Under such circumstances the effects of adverse weather may also be dramatic (as was the case for Austro Control in 2019).
- ANSPs facing volatile, but relatively high traffic levels through RP2 achieved an inconsistent capacity performance, meeting their targets in some years, but without any visible tendency (e.g. HCAA, DCAC from BLUE MED FAB, NERL from UK-Ireland FAB). Such cases may be driven by the lack of a capacity buffer (either because of inappropriate planning, or by management decision), which could absorb the volatility of traffic, and/or longstanding structural problems may be hindering the ANSP in improving its performance (which is one of the key drivers behind the performance of Cyprus).
- ANSPs facing steady traffic growth, resulting in traffic levels either close to or even above the STATFOR high forecast in all years of RP2, missing their targets in RP2 (e.g. DFS, DSNA from FABEC and Spain from SW FAB). Reasons behind these cases may be longstanding structural problems, which are hindering the improvement of capacity performance, difficulties in implementing new technologies which may help to cope with traffic growth, and the inability of large organisations to implement large scale changes. These factors are largely, if not fully, within the remit of the management of ANSPs. The saturation of airspace in the area of responsibility of these ANSPs may also be a driver behind delays, however, it is not clear how much of this impact could be mitigated through measures by ANSPs.

375 For all these cases, it is conceivable, that a certain portion of the delays is caused directly or indirectly by management decisions, or the lack thereof. It goes without saying that it would be essential for the improvement of the network performance to eliminate this portion of the delays.

376 Having identified the above cases, it must also be noted, that the lack of financial resources was not hindering any improvements in capacity performance, as all ANSPs facing unexpected traffic growth benefited from higher revenues through the traffic risk sharing mechanism. Still, despite this increase in revenues, capacity performance deteriorated in RP2.

10.4.2 Terminal capacity performance

377 Table 38 shows an overview of the evolution of the average airport arrival ATFM delay KPI per each Member State, compared to their respective local performance targets. Actual delays which are higher than the targets and instances where targets were not set are highlighted in red, whereas actual values which met or were lower than the respective targets are in green. As it can be seen from the table, most Member States adopted local targets for most years in RP2, with Belgium and Cyprus being the two most notable exceptions, not setting targets for any year in RP2.

Greece and Poland did not set local targets in 2015, whereas Switzerland did not to set targets for 2017, 2018 and 2019.

Member State		2015	2016	2017	2018	2019
Austria	Planned	1.88	1.29	1.28	1.27	1.27
	Actual	0.79	0.72	0.81	0.49	0.71
Belgium	Planned	n/a	n/a	n/a	n/a	n/a
	Actual	0.89	0.73	0.6	0.6	0.62
Bulgaria	Planned	0	0	0	0	0
	Actual	0	0	0	0	0.02
Croatia	Planned	0.05	0.05	0.05	0.05	0.05
	Actual	0.01	0	0	0	0
Cyprus	Planned	n/a	n/a	n/a	n/a	n/a
	Actual	0.09	0.51	0.93	0.82	0.52
Czech Republic	Planned	0.25	0.3	0.35	0.4	0.4
	Actual	0.04	0.01	0.07	0.11	0.16
Denmark	Planned	0.11	0.11	0.11	0.11	0.11
	Actual	0.03	0.03	0.03	0.06	0.07
Estonia	Planned	0	0	0	0	0
	Actual	0	0	0	0	0
Finland	Planned	0.13	0.13	0.14	0.14	0.14
	Actual	0.55	0.27	0.26	0.37	0.37
France	Planned	0.6	0.6	0.6	0.6	0.6
	Actual	0.34	0.59	0.48	0.4	0.42
Germany	Planned	0.65	0.65	0.65	0.65	0.65
	Actual	0.33	0.45	0.44	0.45	0.39
Greece	Planned	n/a	0.1	0.1	0.1	0.1
	Actual	0.06	0.26	0.65	1.47	3.57
Hungary	Planned	0.05	0.05	0.05	0.05	0.05
	Actual	0	0	0.03	0.03	0.03
Ireland	Planned	0.18	0.18	0.2	0.2	0.22
	Actual	0.14	0.15	0.08	0.23	0.14
Italy	Planned	0.9	0.41	0.41	0.41	0.41
	Actual	0.57	0.13	0.22	0.12	0.29
Latvia	Planned	0.04	0.04	0.04	0.04	0.04
	Actual	0	0.01	0	0.07	0
Lithuania	Planned	0	0	0	0	0
	Actual	0	0	0	0.01	0
Luxembourg	Planned	0.48	0.49	0.48	0.47	0.43
	Actual	0.11	0.08	0.05	0.09	1
Malta	Planned	0.1	0.1	0.1	0.1	0.1
	Actual	0.01	0.01	0.01	0.01	0

Member State		2015	2016	2017	2018	2019
Netherlands	Planned	2	2	2	2	2
	Actual	2.91	2	3.21	2.19	3.88
Norway	Planned	0.6	0.6	0.6	0.6	0.6
	Actual	0.37	0.44	0.38	0.26	0.18
Poland	Planned	n/a	0.04	0.04	0.04	0.04
	Actual	0.04	0.21	0.14	0.32	0.39
Portugal	Planned	0.6	0.6	0.6	0.6	0.6
	Actual	0.6	0.63	1.08	2.38	2.76
Romania	Planned	0	0	0	0	0
	Actual	0	0.34	0.31	0.2	0.01
Slovakia	Planned	0	0	0	0	0
	Actual	0	0	0	0	0
Slovenia	Planned	0	0	0	0	0
	Actual	0	0	0	0.05	0
Spain	Planned	0.8	0.8	0.8	0.8	0.8
	Actual	0.62	0.89	0.98	1.51	1.02
Sweden	Planned	0.35	0.35	0.35	0.35	0.35
	Actual	0.07	0.22	0.12	0.41	0.32
Switzerland	Planned	0.43	2.35	n/a	n/a	n/a
	Actual	2.48	1.78	1.33	1.54	1.61
United Kingdom	Planned	0.87	0.78	0.78	0.78	0.78
	Actual	0.95	1.19	1.37	1.24	1.25

Table 38 – Overview of airport arrival ATFM delay performance per Member State in RP2 (Source: Single European Sky Data Portal).

378 Out of the eight Member States, which were unable to meet their local targets in all years of RP2 (for the years when targets were set), Finland, Poland and Romania decided to set local targets, which are considered ambitiously low and actual performance was close to the planned values. Finland and Romania even managed to decrease airport arrival ATFM delay values overall in RP2. The performance of Poland, however, deteriorated consistently over the same period.

379 Greece also decided to adopt ambitious targets, however, delays dramatically escalated from 0.06 minutes per arrival in 2015 to 3.57 minutes per arrival 2019, second only to the actual performance of the Netherlands in the same year.

380 Spain, the Netherlands and the United Kingdom were unable to consistently meet their targets in RP2, even though local targets were already set at relatively unambitious values (especially for the Netherlands).

381 Table 39 shows the evolution of the ATFM slot adherence PI over RP2, measured as the percentage of slot regulated departures that departed within their allocated 15-minute slot. Only Bulgaria, Greece, Ireland and Malta had lower values in 2019 than those in 2015.

382 Austria, Lithuania, Portugal and Switzerland were able to consistently improve their performance throughout the years of RP2, while the other Member States were able to improve their performance overall in RP2 (with the exception of the abovementioned four Member States).

MEMBER STATE	2015	2016	2017	2018	2019
Austria	87.1%	93.2%	94.3%	96.2%	97.4%
Belgium	92.6%	93.5%	94.8%	94.5%	95.3%
Bulgaria	98.8%	98.8%	99.0%	97.9%	98.3%
Croatia	89.7%	89.9%	88.7%	91.9%	94.7%
Cyprus	84.8%	81.0%	82.5%	84.1%	86.1%
Czech Republic	94.2%	94.9%	94.5%	94.3%	95.7%
Denmark	95.9%	97.9%	98.2%	98.1%	98.6%
Estonia	92.2%	91.3%	55.3%	96.8%	97.6%
Finland	89.0%	88.3%	91.2%	92.6%	93.9%
France	85.8%	85.3%	85.9%	86.9%	88.4%
Germany	93.3%	93.3%	93.5%	94.6%	95.2%
Greece	91.3%	91.3%	91.2%	90.7%	86.9%
Hungary	94.3%	93.8%	93.1%	93.3%	94.8%
Ireland	96.9%	95.7%	94.8%	96.2%	96.2%
Italy	92.9%	93.4%	94.1%	94.5%	94.2%
Latvia	95.5%	94.5%	95.8%	96.0%	98.0%
Lithuania	91.0%	91.2%	92.3%	93.0%	95.3%
Luxembourg	82.6%	82.9%	82.6%	82.3%	86.2%
Malta	95.1%	96.3%	95.5%	95.2%	95.0%
Netherlands	88.1%	89.8%	88.6%	95.5%	97.2%
Norway	98.2%	98.1%	98.1%	98.6%	98.9%
Poland	94.0%	94.6%	95.5%	95.8%	95.6%
Portugal	89.3%	90.0%	91.8%	93.3%	95.8%
Romania	93.6%	91.8%	91.6%	92.6%	95.1%
Slovakia	98.0%	97.2%	97.6%	97.6%	98.4%
Slovenia	94.5%	96.3%	94.7%	95.5%	95.6%
Spain	94.5%	93.9%	94.2%	95.2%	96.0%
Sweden	96.9%	95.4%	97.5%	97.2%	96.9%
Switzerland	91.8%	92.2%	93.4%	93.6%	94.7%
United Kingdom	90.7%	91.8%	93.5%	94.7%	94.6%

Table 39 – Evolution of ATFM slot adherence over RP2 per Member States (source: Single European Sky Data Portal).

383 Monitoring of ATC pre-departure delays was hindered by the lack of implementation of the necessary technical systems at many of the relevant airports in RP2. Table 39 shows the overview of ATC pre-departure delay in RP2. Only nine Member States managed to provide valid data for all their airports in all years of RP2, with an additional four Member States providing valid data in at least one year over RP2.

384 From the validated data, it is apparent that performance deteriorated during RP2, with ATC pre-departure delays increasing for most years and most Member States, compared to the previous years.

385 Due to the limited availability of validated data, though, no firm conclusions can be drawn as regards ATC pre-departure delays.

MEMBER STATE	2015	2016	2017	2018	2019
Austria	n/a	n/a	n/a	n/a	n/a
Belgium	n/a	n/a	n/a	n/a	n/a
Bulgaria	0.04	0.03	0.08	0.15	0.15
Croatia	n/a	n/a	n/a	0.09	0.10
Cyprus	n/a	n/a	n/a	n/a	n/a
Czech Republic	n/a	n/a	n/a	n/a	n/a
Denmark	0.03	0.07	0.09	0.14	0.09
Estonia	n/a	n/a	n/a	n/a	n/a
Finland	0.15	0.18	0.34	0.38	0.39
France	n/a	n/a	n/a	n/a	n/a
Germany	n/a	n/a	n/a	n/a	n/a
Greece	0.54	0.75	0.67	n/a	0.97
Hungary	0.13	0.11	0.25	0.20	0.30
Ireland	n/a	n/a	n/a	n/a	n/a
Italy	n/a	1.39	1.20	n/a	1.16
Latvia	n/a	n/a	n/a	n/a	n/a
Lithuania	n/a	n/a	n/a	n/a	n/a
Luxembourg	0.02	0.01	0.04	0.09	0.01
Malta	0.08	0.16	0.17	0.28	0.24
Netherlands	n/a	n/a	n/a	n/a	n/a
Norway	0.04	0.05	0.09	0.11	0.11
Poland	n/a	n/a	n/a	n/a	n/a
Portugal	n/a	n/a	n/a	n/a	n/a
Romania	n/a	n/a	n/a	n/a	n/a
Slovakia	n/a	n/a	n/a	n/a	0.11
Slovenia	n/a	n/a	n/a	n/a	n/a
Spain	0.41	0.49	0.61	n/a	n/a
Sweden	0.04	0.09	0.12	0.07	0.09
Switzerland	1.23	0.80	0.70	0.82	1.13
United Kingdom	n/a	n/a	n/a	n/a	n/a

Table 40 – Overview of ATC pre-departure delays in RP2 per Member States (source: Single European Sky Data Portal).

10.5 Cost-efficiency KPA

10.5.1 Summary of the key en route and terminal cost-efficiency data for RP2

386 Table 41 summarises the key data for each year of RP2 as well as the aggregated values for the reporting period taken as whole. The table comprises data in line with the Commission Implementing Decision on Union-wide targets for RP2, data from the aggregation of the adopted national performance plans, and actual data taken from the annual NSA Monitoring Reports (including latest June 2019 reporting tables for charging purposes for both en route and terminal). The data comprises the 30 Member States that were part of the SES Performance Scheme in RP2.[30]

387 For the entire RP2, the Union-wide actual en route unit cost (47.92€$_{2009}$) was -7.9% lower than planned in RP2 aggregated performance plans (52.04€$_{2009}$). This is because the actual en route costs were -1.4 % (-442.4M€$_{2009}$) lower than the determined costs reported in the performance plans (30,808.1M€$_{2009}$), while the actual number of total service units (TSUs) were +7.0% higher than planned. In addition, the complete RP2 Union-wide actual en route unit cost (47.92€$_{2009}$) was -9.4% lower than the Union-wide target for the whole RP2 (52.89€$_{2009}$).

388 2019 is the only year out of the five years of RP2 and the three of RP1, where actual en route costs were higher than planned. Actual 2019 en route costs were +86.2M€$_{2009}$ (i.e. +1.4%) higher than the determined costs provided in the RP2 performance plans.

[30] UK TCZs were excluded from this analysis in order to ensure consistency with terminal section.

	SES States Costs and Total Service Units						
En-route	**SES States - Data as per EC Decision on Union-wide targets for RP2**	**2015**	**2016**	**2017**	**2018**	**2019**	**RP2**
	Real en-route costs (determined costs 2015-2019) - (in EUR2009)	6 147 905 000	6 055 686 000	5 904 294 000	5 756 687 000	5 612 769 000	29 477 341 000
	Total en-route Service Units	108 541 000	110 196 000	111 436 000	112 884 000	114 305 000	557 362 000
	Real en-route unit costs per Service Unit - (in EUR2009)	**56.64**	**54.95**	**52.98**	**51.00**	**49.10**	**52.89**
	SES States - Data from RP2 performance plans	**2015D**	**2016D**	**2017D**	**2018D**	**2019D**	**RP2**
	Real en-route costs (determined costs 2015-2019) - (in EUR2009)	6 235 113 277	6 195 878 072	6 164 525 008	6 153 524 516	6 059 092 064	30 808 132 937
	Total en-route Service Units	112 687 532	115 027 116	117 494 197	122 148 732	124 649 261	592 006 837
	Real en-route unit costs per Service Unit - (in EUR2009)	**55.33**	**53.86**	**52.47**	**50.38**	**48.61**	**52.04**
	SES States - Actual data from June Reporting Tables	**2015A**	**2016A**	**2017A**	**2018A**	**2019A**	**RP2**
	Real en-route costs - (in EUR2009)	6 079 269 388	6 060 523 324	6 002 852 359	6 077 800 962	6 145 242 571	30 365 688 603
	Total en-route Service Units	114 994 014	120 135 471	126 856 192	133 959 583	137 752 174	633 697 433
	Real en-route unit costs per Service Units - (in EUR2009)	**52.87**	**50.45**	**47.32**	**45.37**	**44.61**	**47.92**
Terminal	**SES States - Data from RP2 performance plans**	**2015D**	**2016D**	**2017D**	**2018D**	**2019D**	**RP2**
	Real terminal costs (determined costs 2015-2019) - (in EUR2009)	1 117 713 492	1 103 962 617	1 066 100 758	1 064 115 512	1 059 985 630	5 411 878 008
	Total terminal Service Units	6 181 013	6 331 707	6 430 770	6 645 093	6 786 564	32 375 146
	Real terminal unit costs per Service Unit - (in EUR2009)	**180.83**	**174.35**	**165.78**	**160.14**	**156.19**	**167.16**
	SES States - Actual data from June Reporting Tables	**2015A**	**2016A**	**2017A**	**2018A**	**2019A**	**RP2**
	Real terminal costs - (in EUR2009)	1 084 292 299	1 096 452 314	1 088 023 758	1 104 601 261	1 128 686 012	5 502 055 644
	Total terminal Service Units	6 318 950	6 621 834	6 890 820	7 215 315	7 382 258	34 429 177
	Real terminal unit costs per Service Units - (in EUR2009)	**171.59**	**165.58**	**157.89**	**153.09**	**152.89**	**159.81**
Gate-to-gate	**SES States - Data from RP2 performance plans**	**2015D**	**2016D**	**2017D**	**2018D**	**2019D**	**RP2**
	Real gate-to-gate ANS costs - (in EUR2009)	7 352 826 769	7 299 840 689	7 230 625 766	7 217 640 028	7 119 077 694	36 220 010 945
	Share of en-route costs in gate-to-gate ANS costs	**84.8%**	**84.9%**	**85.3%**	**85.3%**	**85.1%**	**85.1%**
	SES States - Actual data from June Reporting Tables	**2015A**	**2016A**	**2017A**	**2018A**	**2019A**	**RP2**
	Real gate-to-gate ANS costs - (in EUR2009)	7 163 561 686	7 156 975 638	7 090 876 116	7 182 402 224	7 273 928 583	35 867 744 247
	Share of en-route costs in gate-to-gate ANS costs	**84.9%**	**84.7%**	**84.7%**	**84.6%**	**84.5%**	**84.7%**
	SES States - Actual data extracted from STATFOR dashboard	**2015A**	**2016A**	**2017A**	**2018A**	**2019A**	**RP2**
En-route	**Difference between actuals and EU Decision on Union-wide targets**				**RP2 overall**		
	Real en-route costs - (in EUR20	in value			888 347 603		
		in %			3.0%		
	Total en-route Service Units	in value			76 335 433		
		in %			13.7%		
	Real en-route unit costs per S	**in value**			**-4.97**		
		in %			**-9.4%**		
	Difference between actuals and RP2 performance plans				**RP2 overall**		
	Real en-route costs - (in EUR20	in value			-442 444 333		
		in %			-1.4%		
	Total en-route Service Units	in value			41 690 597		
		in %			7.0%		
	Real en-route unit costs per S	**in value**			**-4.12**		
		in %			**-7.9%**		
Terminal	**Difference between actuals and RP2 performance plans**				**RP2 overall**		
	Real terminal costs - (in EUR20	in value			90 177 635		
		in %			1.7%		
	Total terminal Service Units	in value			2 054 031		
		in %			6.3%		
	Real terminal unit costs per S	**in value**			**-7.35**		
		in %			**-4.4%**		
Gate-to-gate	**Difference between actuals and RP2 performance plans**				**RP2 overall**		
	Real gate-to-gate costs - (in EUI	in value			-352 266 698		
		in %			-1.0%		
	En-route share	in p.p.			-0.4 p.p.		

Table 41 – Summary of key RP2 cost-efficiency data (2015-2019).

389 For the whole RP2, the Union-wide actual terminal unit cost (159.81€$_{2009}$) was -4.4% lower than planned in RP2 aggregated performance plans (167.16€$_{2009}$). This is because the actual terminal costs were +1.7% (+90.2M€$_{2009}$) higher than the determined costs reported in the performance plans (30,808.1M€$_{2009}$), while the actual number of TNSUs were +6.3% higher than planned.

390 Considering the overall RP1 and RP2, only in the last three years of RP2 the total terminal air navigation service actual costs were higher than planned, i.e. +2.1% or +21.9M€$_{2009}$ in 2017, +3.8% or +40.5M€$_{2009}$ in 2018 and +6.5% or +68,7M€$_{2009}$ in 2019.

391 Actual en route costs for RP2 as a whole amount to some 30.808.1M€$_{2009}$, of which 84.9% relate to the main ATSPs (25,783.2M€$_{2009}$).

392 Actual terminal costs for RP2 as a whole amount to some 5,502.1M€$_{2009}$, of which 95.2% relate to the main ATSPs (5,235.4M€$_{2009}$).

393 The RP2 actual average en route cost breakdown by nature for the main ATSPs is shown in Figure 60 and for terminal in Figure 61. The cost structure remained relatively stable over RP1 and RP2 and is not significantly different from the plans. Actual staff costs represent on average 65% of en route costs for the ATSPs and 69% of Terminal costs for the ATSPs.

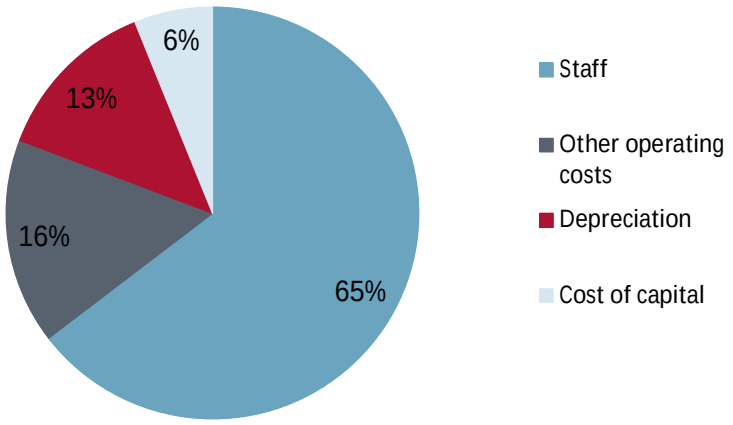


Figure 60 – Actual en route ATSP cost breakdown by nature (RP2 average).

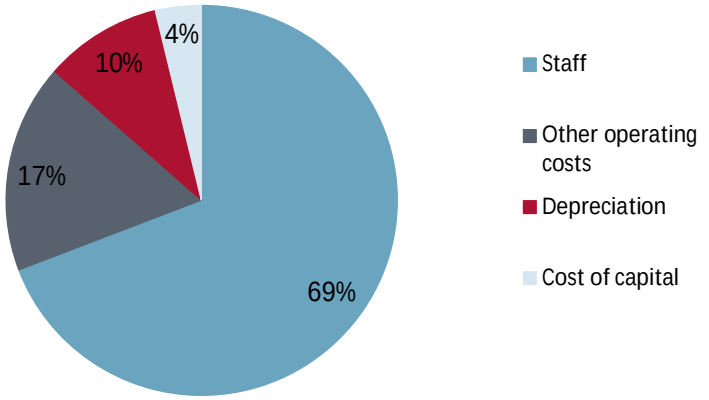


Figure 61 – Actual terminal ATSP cost breakdown by nature (RP2 average).

10.5.2 Actual RP2 en route costs vs costs in adopted performance plans

394 Figure 62 shows the main contributions by entity and by nature (main ATSPs) to the reduction in costs over RP2 (-442.4M€$_{2009}$ compared with the planned). By entity, the main ATSPs contributed most (-350.0M€$_{2009}$) to the reduction. Reductions were also achieved by the other entities covered by the Performance and Charging Regulation, i.e. MET service providers (-31M€$_{2009}$), Member States/NSAs, including Eurocontrol Agency costs (-45.5M€$_{2009}$). By nature, higher staff costs (+0.4%, -70.4M€$_{2009}$), were offset by savings in depreciation costs (-5.2%, -246.6M€$_{2009}$) and other operating costs (-5.6%, -185.4M€$_{2009}$). Reductions were also achieved by the other entities covered by the Performance and Charging Regulation, i.e. MET service providers (-31M€$_{2009}$), Member States/NSAs, including Eurocontrol Agency costs (-45.5M€$_{2009}$).

395 The lower than planned depreciation costs presented in Figure 62 (by nature) could be related to many reasons.[31] The postponement of capital expenditures (CAPEX) that was observed during the RP1 period may have been triggered to adjust to lower than expected traffic volumes (-4.9% TSUs over the whole RP1 period), however this should not be the case in RP2 where traffic was higher than planned (+7% TSUs over the whole RP2 period). Details on CAPEX are available in the Annex IV of this PRB Monitoring Report 2019.

[31] The postponement or delays in capital expenditures (CAPEX), delays in entry into service of the purchased equipment, and in some cases the non-realisation of planned CAPEX.

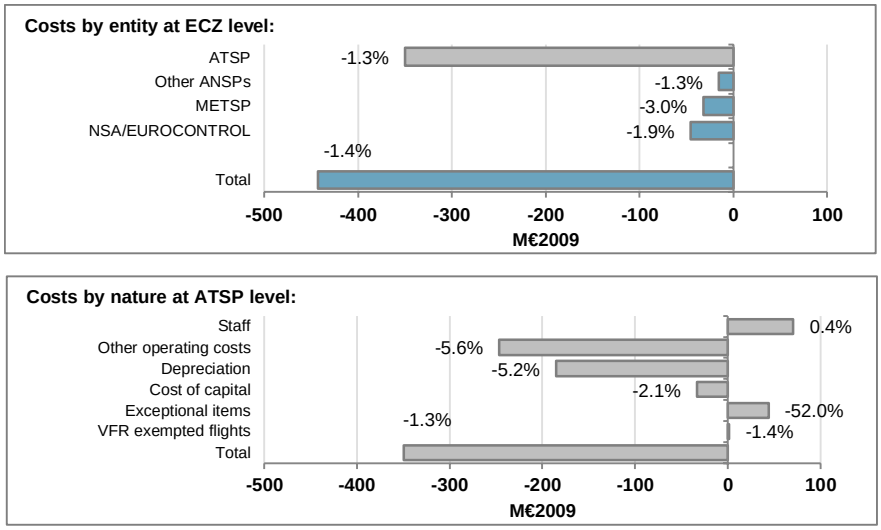


Figure 62 – Breakdown of RP2 actual en route costs compared to NPPs (by entity at Union-wide State level and by nature at Union-wide ATSP level).

396 Figure 63 focuses on the monitoring of Eurocontrol costs, taking into account the evolution of these costs as compared to the costs included in the performance plans. For the purposes of this analysis, the Eurocontrol costs include the Agency for the SES Member States (Part I & IX), as reported in the Reporting Tables, excluding the MUAC costs which are part of the other ATSPs costs.

397 For each year of RP2, with the only exception of 2016, the actual costs were lower than planned in the adopted national performance plans. Considering the whole RP2 (2015-2019), the cumulative Eurocontrol costs were -2.9% (-57.0 M€$_{2009}$) lower than planned. As part of the charging scheme, the difference between the determined costs and the actual costs in relation to Eurocontrol costs (international agreement) is not subject to the cost-sharing arrangements and therefore these savings will be reimbursed to users.

398 Finally, since 2016 Eurocontrol unit costs continuously decreased from 3.5€$_{2009}$ in 2016, to 2.6€$_{2009}$ in 2019.

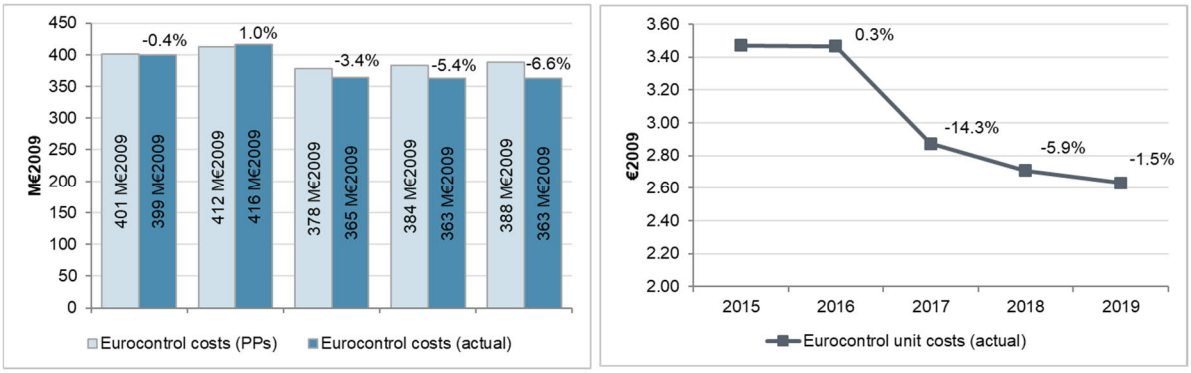


Figure 63 – Eurocontrol costs of the SES Members States (Part I & IX) during RP2.

10.5.3 Actual RP2 terminal costs vs costs in adopted performance plans

399 Figure 64 shows the main drivers by entity and by nature (main ATSPs), to the higher costs over RP2 of +90.2M€$_{2009}$ compared with the planned. Due to their relative size in the CZs, most of the deviation observed for the total terminal ANS costs was due to the main ATSPs (+108.5M€$_{2009}$), while lower costs than planned were achieved by the other entities covered by the Performance and Charging Regulation, i.e. MET service providers (-15.9M€$_{2009}$) and NSAs (-2.7M€$_{2009}$).

400 The observed higher actual costs compared to the determined costs for the main ATSPs masks different situations across the different costs categories in 2019. The main drivers of the deviation are the higher staff costs (+5.4% or +192.9M€$_{2009}$) and the higher other operational costs (+1.8% or 15.4M€$_{2009}$), only partially compensated by lower depreciation costs (-12.4% or -76.3M€$_{2009}$) and lower cost of capital (-9.0% or -26.1M€$_{2009}$).

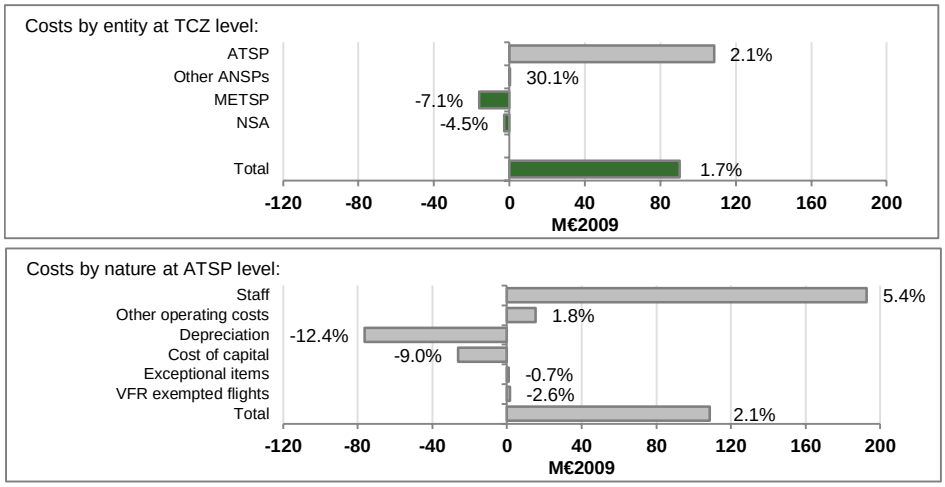


Figure 64 – Breakdown of RP2 actual terminal costs compared to NPPs (by entity at Union-wide State level and by nature at Union-wide ATSP level).

10.5.4 Outcome of RP2 en route traffic risk sharing mechanism

401 The traffic risk sharing arrangements provided in the Commission Implementing Regulation (EU) No 391/2013 foresee that ANSP's additional (or lost) revenue (in respect of determined cost) due to the difference between the actual and the planned TSUs is shared with airspace users (see 7.1.5).

402 Over RP2 as a whole, the additional revenues resulting from the application of the traffic risk sharing mechanism amounted to 2,052.3M€$_{2009}$. This additional revenue arising from the deviation between actual and planned traffic are shared between Member States/ANSPs and airspace users according to the traffic risk sharing mechanism described above.

403 Figure 65 shows the proportion of revenues eligible and ineligible for the en route traffic risk sharing mechanism to be reimbursed to airspace users. Over RP2, 69.0% of the additional revenues are distributed to airspace users, i.e. 55.8% relating to cost subject to traffic risk sharing (1,144.5M€$_{2009}$) and 13.2% relating to costs not subject to traffic risk sharing (270.8M€$_{2009}$). 31.0% of the additional revenues are retained by Member States/ATSPs (637.3M€$_{2009}$, of which 620.3M€$_{2009}$ for the main ATSPs and 16.7M€$_{2009}$ for the other ATSPs).

404 This situation is significantly different from RP1, when actual traffic was consistently lower than planned in the performance plans.

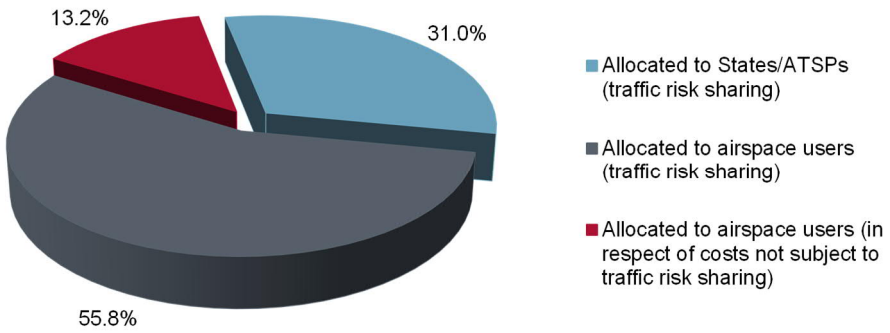


Figure 65 – Outcome of en route RP2 traffic risk sharing mechanism.

10.5.5 Outcome of RP2 terminal traffic risk sharing mechanism

405 For terminal, over RP2 as a whole, the additional revenues resulting from the application of the traffic risk sharing mechanism amounted to 313.9M€$_{2009}$. This additional revenue resulted from the deviation between actual and planned traffic being shared between Member States/ANSPs and airspace users according to the traffic risk sharing mechanism.

406 Figure 66 shows the proportion of revenues eligible and ineligible for the terminal traffic risk sharing mechanism to be reimbursed to airspace users. Over RP2, 81.0% of the additional revenues were distributed to airspace users, i.e. 39.4% relating to cost subject to traffic risk sharing (123.7M€$_{2009}$) and 41.6% relating to costs not subject to traffic risk sharing (130.5M€$_{2009}$). 19.0% of the additional revenues are retained by Member States/ATSPs (59.7M€$_{2009}$, of which 55.0M€$_{2009}$ for the main ATSPs and 4.7M€$_{2009}$ for the other ATSPs).

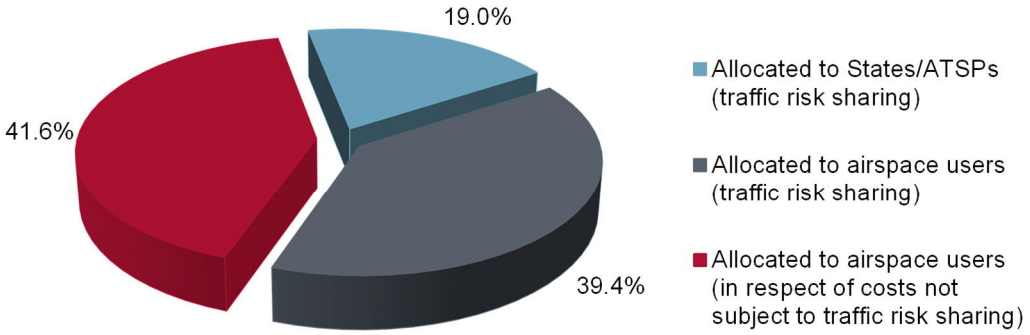


Figure 66 – Outcome of terminal RP2 traffic risk sharing mechanism.

10.5.6 RP2 outcome of overall en route economic surplus for ATSPs

407 The notion of the so-called "overall estimated surplus" has been developed to track the financial strength in a systematic and consistent way across all ATSPs. This is different from, and not comparable to, the net accounting profit disclosed by the ATSPs in their financial statements, as explained in section 7.1.7. Figure 67 presents the breakdown of the overall estimated surplus. The en route "overall estimated surplus" for RP2 amounts to 2,479.3M€$_{2009}$ and it is calculated from two elements:

- Net gain arising from the en route activity (+1,133.1M€$_{2009}$). This comprises the net gain from costs-sharing (503.4M€$_{2009}$), the gain arising from traffic risk sharing (620.3M€$_{2009}$) and the gain for capacity incentive mechanisms (9.2M€$_{2009}$);
- Surplus embedded in the cost of capital (+1,346.4M€$_{2009}$).

408 In the en route performance plans adopted for RP2, the average RoE embedded in the determined cost of capital was 7.0% of the equity included in the determined asset base for the main ATSPs. When looking at the RP2 outturn, the actual average RoE (comprising both the net gain from the en route activity and the surplus embedded in the cost of capital) equals 13.0% of the equity included in the actual asset base. This represents an "overall estimated surplus" of 2,479.3M€$_{2009}$ over RP2.

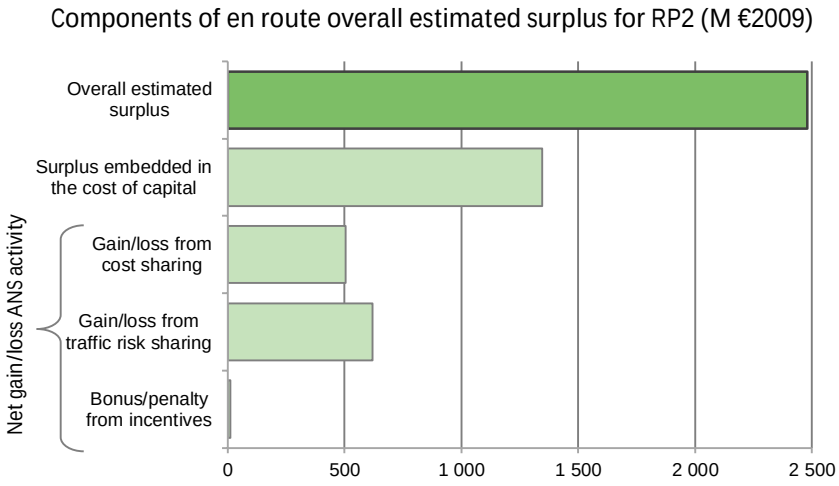


Figure 67 – Outcome of the overall en route economic surplus for ATSPs.
The metric presented in the figure(Estimated surplus for en route activity) is computed using information provided by States/ANSPs in their Reporting Tables for the purposes of the cost-efficiency monitoring analysis. It is important to note that, mainly due to differences in scope, this metric may not reflect the financial situation of ANSPs as it is presented in their audited financial statements.

10.5.7 RP2 outcome of overall terminal economic surplus for ATSPs

409 Figure 68 presents the breakdown of the overall estimated surplus. The terminal "overall estimated surplus" for RP2 amounts to 175.2M€$_{2009}$ and it is calculated from two elements:

- Net loss arising from the terminal activity (-36.02M€$_{2009}$). This comprises the net loss from costs-sharing (-99.0M€$_{2009}$), the gain arising from traffic risk sharing (55.0M€$_{2009}$) and the gain for capacity incentive mechanisms (7.7M€$_{2009}$);
- Surplus embedded in the cost of capital (+211.4.4M€$_{2009}$).

410 In the terminal performance plans adopted for RP2, the average RoE embedded in the determined cost of capital was 6.3% of the equity included in the determined asset base for the main ATSPs. When looking at the RP2 outturn, the actual average RoE (comprising both the net gain from the terminal activity and the surplus embedded in the cost of capital) equals 5.4% of the equity included in the actual asset base. This represents an "overall estimated surplus" of 175.2M€$_{2009}$ over RP2.

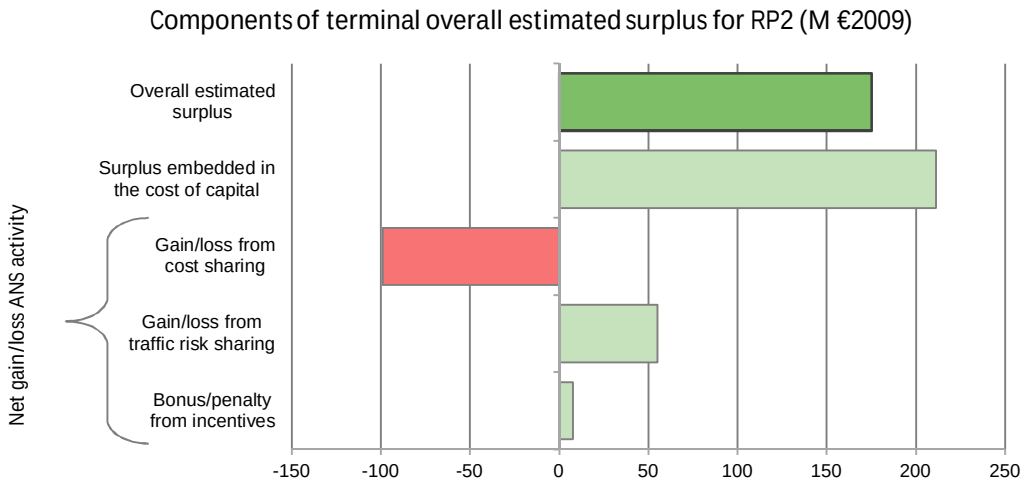


Figure 68 – Outcome of the overall terminal economic surplus for ATSPs.
The metric presented in the figure (Estimated surplus for en route activity) is computed using information provided by States/ANSPs in their Reporting Tables for the purposes of the cost-efficiency monitoring analysis. It is important to note that, mainly due to differences in scope, this metric may not reflect the financial situation of ANSPs as it is presented in their audited financial statements.

10.5.8 Actual gate-to-gate ANS costs vs forecast in adopted performance plans

411 As shown in Table 42, actual gate-to-gate ANS costs[32] at Union-wide level in the whole RP2 were -1.0% lower than planned in the adopted performance plans (35,867.7 M€$_{2009}$ compared to 36,220.0M€$_{2009}$) due to a combination of lower en route costs (-1.4%) and higher terminal costs (+1.7%).

412 Over RP2, the actual proportion of en route in total ANS costs (85.1%) is in line with the proportion planned in the performance plans (84.7%). This indicates that, at system level, there is no noticeable reallocation of costs from en route to terminal ANS.

[32] UK TCZs were excluded from this analysis in order to ensure consistency with terminal section.

2019 Gate-to-gate ANS actual costs vs. PP							
SES States - Data from RP2 Performance Plans		**2015D**	**2016D**	**2017D**	**2018D**	**2019D**	**RP2 Planned**
Real en-route costs (determined costs 2015-2019) - (in EUR2009)		6 235 113 277	6 195 878 072	6 164 525 008	6 153 524 516	6 059 092 064	30 808 132 937
Real terminal ANS costs - (in EUR2009)		1 117 713 492	1 103 962 617	1 066 100 758	1 064 115 512	1 059 985 630	5 411 878 008
Real gate-to-gate ANS costs - (in EUR2009)		7 352 826 769	7 299 840 689	7 230 625 766	7 217 640 028	7 119 077 694	36 220 010 945
Share of en-route costs in gate-to-gate ANS costs		**84.8%**	**84.9%**	**85.3%**	**85.3%**	**85.1%**	**85.1%**
SES States - Actual data from Reporting Tables		**2015A**	**2016A**	**2017A**	**2018A**	**2019A**	**RP2 Actual**
Real en-route costs - (in EUR2009)		6 079 269 388	6 060 523 324	6 002 852 359	6 077 800 962	6 145 242 571	30 365 688 603
Real terminal ANS costs - (in EUR2009)		1 084 292 299	1 096 452 314	1 088 023 758	1 104 601 261	1 128 686 012	5 502 055 644
Real gate-to-gate ANS costs - (in EUR2009)		7 163 561 686	7 156 975 638	7 090 876 116	7 182 402 224	7 273 928 583	35 867 744 247
Share of en-route costs in gate-to-gate ANS costs		**84.9%**	**84.7%**	**84.7%**	**84.6%**	**84.5%**	**84.7%**
Difference between Actuals and Planned (Actuals vs. PP)		**2015**	**2016**	**2017**	**2018**	**2019**	**RP2**
Real gate-to-gate costs (EUR2009)	in value	-189 265 082	-142 865 051	-139 749 650	-35 237 804	154 850 889	-352 266 698
	in %	-2.6%	-2.0%	-1.9%	-0.5%	2.2%	-1.0%
En-route share	in p.p.	0.1 p.p.	-0.2 p.p.	-0.6 p.p.	-0.0 p.p.	-0.0 p.p.	-0.4 p.p.

Table 42 – Overall RP2 gate-to-gate ANS actual costs vs performance plans (SES level). Negative figures are highlighted in red and reflect lower than planned actual values.