PRB | Performance review body of the single european sky

Performance Review Body Monitoring Report

Germany - 2021

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1 OVERVIEW

1.1 Contextual information

National performance plan adopted following Commission Decision (EU) 2023/177 of 14 December 2022

List of ACCs 4
Bremen ACC
Langen ACC
Karlsruhe UAC
Munich ACC

No of airports in the scope of the performance plan:
- **≥80'K** 7
- **<80'K** 8

Exchange rate (1 EUR=)
2017: 1 EUR
2021: 1 EUR

Share of Union-wide:
- **traffic (TSUs) 2021** 11.5%
- **en route costs 2021** 15.1%

Share en route / terminal costs 2021 76% / 24%

En route charging zone(s)
Germany

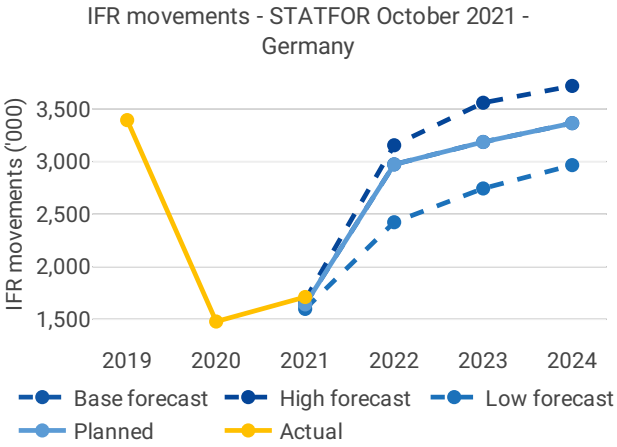
Terminal charging zone(s)
Germany

Main ANSP
- DFS

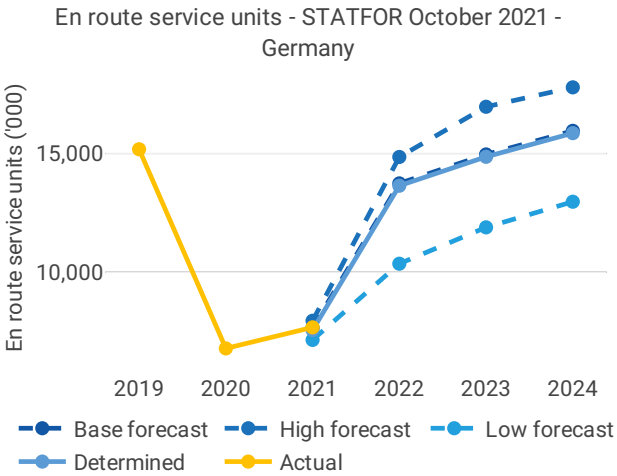
Other ANSPs
- MUAC

MET Providers
- Deutscher Wetterdienst (DWD)

1.2 Traffic (En route traffic zone)

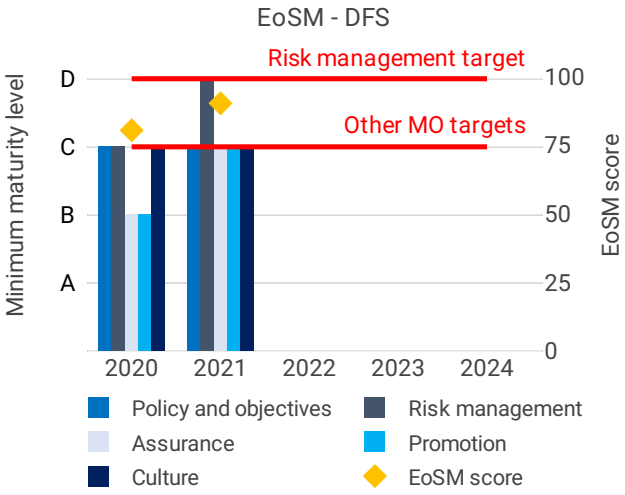


- Germany recorded 1,712K actual IFR movements in 2021, +16% compared to 2020 (1,479K).
- Actual 2021 IFR movements were +4.2% above the plan (1,642K).
- Actual 2021 IFR movements represent 50% of the actual 2019 level (3,394K).



- Germany recorded 7,679K actual en route service units in 2021, +13% compared to 2020 (6,792K).
- Actual 2021 service units were +1.5% above the plan (7,563K).
- Actual 2021 service units represent 51% of the actual 2019 level (15,132K).

1.3 Safety (Main ANSP)



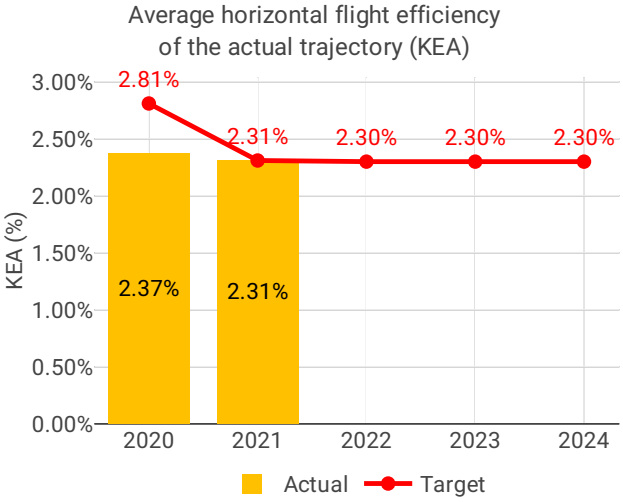
• DFS has successfully improved its performance in safety risk management, safety assurance, and safety promotion and achieved all the EoSM targets earlier than planned. DFS implements specific measures to ensure continuous improvement of safety performance.

• Germany reported a decrease in the rate of both runway incursions and separation minima infringements in 2021 relative to 2020. Both rates are below the Union-wide rates.

• The German NSA aims to improve the monitoring of safety occurrences. Therefore, a procedure was implemented based on regular reviews and in-depth auditing of specific cases.

• DFS should improve its safety management by implementing automated safety data recording systems.

1.4 Environment (Member State)



• KEA performance improved from 2020 and Germany achieved the target of 2.31% and contributed positively to achieving the Union-wide target.

• Both KEP and SCR values improved from 2020 and are at their best since 2017.

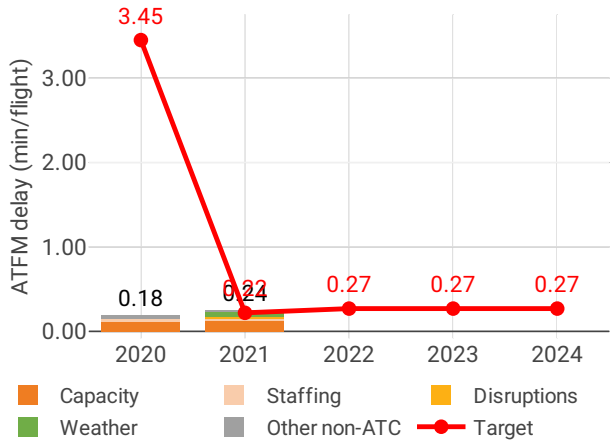
• The share of CDO flights dropped by three p.p., remaining higher than pre-pandemic levels.

• Additional time in terminal airspace remained at similar level to 2020 while additional taxi out time increased from 1.63 min/flight to 1.85 min/flight.

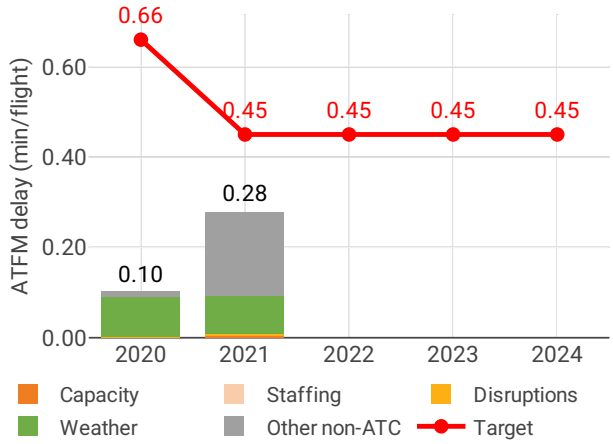
• The NSA states it is continuously developing airport-CDM at German airports in order to reduce taxi times at airports, including a long-term perspective on a total airport management system.

1.5 Capacity (Member State)

Average en route ATFM delay per flight by delay groups



Average arrival ATFM delay per flight by delay groups



• Germany registered 0.22 minutes of average en route ATFM delay per flight during 2021, thus missing the local breakdown value of 0.18.

• Delays were higher than the breakdown value despite the lower traffic: In Germany, IFR movements in 2021 were 50% lower than in 2019.

• The delays were mainly caused by limited ATC capacity, staffing and severe weather at Bremen and Karlsruhe ACCs with new traffic patterns, increased volatility contributing during the summer period in ACCs already affected by staffing issues. Specifically, during the traffic recovery in summer 2021, the main delay causes were ATC capacity and ATC staffing in Bremen ACC, and ATC capacity and weather in Karlsruhe ACC.

• Traffic is expected to grow, with 2019 levels likely being reached in 2023 (in high growth scenario) or 2024 (in base growth scenario). A significant increase in the number of ATCOs in OPS is planned during RP3 in Bremen and Karlsruhe ACCs with a smaller increase in Langen and Münich ACCs.

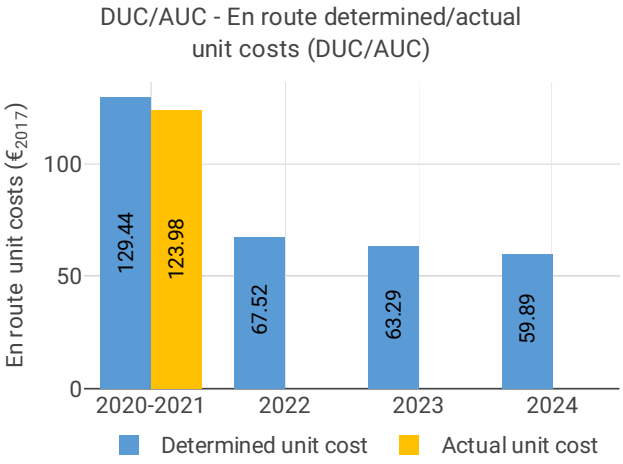
• Delays were highest between July and December, mostly driven by ATC Capacity and Staffing issues and adverse weather conditions.

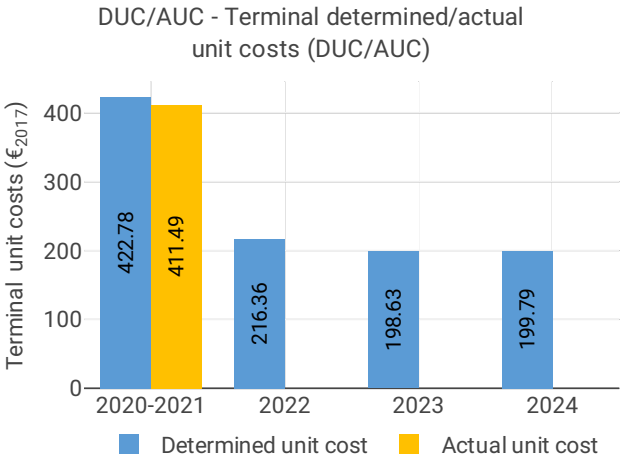
• The share of delayed flights with delays longer than 15 minutes in Germany increased by 6.51 p.p. compared to 2020 and was lower than 2019 values.

• The yearly total of sector opening hours in Langen ACC was 94,626, showing a 20.4% decrease compared to 2020. Sector opening hours are 28.4% below 2019 levels. The yearly total of sector opening hours in Munich ACC was 52,942, showing a 24.3% decrease compared to 2020. Sector opening hours are 45.1% below 2019 levels. The yearly total of sector opening hours in Karlsruhe ACC was 100,596, showing a 14.8% increase compared to 2020. Sector opening hours are 30.6% below 2019 levels. The yearly total of sector opening hours in Bremen ACC was 76,548, showing a 1.8% decrease compared to 2020. Sector opening hours are 26.4% below 2019 levels.

• Langen ACC registered 7.41 IFR movements per one sector opening hour in 2021, being 26.3% below 2019 levels. Munich ACC registered 10.42 IFR movements per one sector opening hour in 2021, being 15.7% below 2019 levels. Karlsruhe ACC registered 10.22 IFR movements per one sector opening hour in 2021, being 19.2% below 2019 levels. Bremen ACC registered 3.92 IFR movements per one sector opening hour in 2021, being 37.9% below 2019 levels.

1.6 Cost-efficiency (En route/Terminal charging zone(s))





• The en route 2020/2021 actual unit cost of Germany was 123.97 €2017, -4.2% lower than the determined unit cost (129.44 €2017). The terminal actual unit cost was 411.50 €2017, -2.7% lower than the determined unit cost (422.78 €2017).

• The en route 2021 actual service units (7,679K) were +1.5% higher than determined (7,563K).

• In 2021, actual total costs were -64 M€2017 lower (-6.9%) than determined. The reduction was mainly driven by -25 M€2017 (-3.8%) in staff costs, due to the continuation of 2020 measures in reaction to the decrease of traffic, and by -27 M€2017 (-132%) in cost of capital.

• DFS spent 82 M€2017 in 2021 related to costs of investments, -13% lower than determined (93 M€2017), mainly driven by a negative 2021 actual cost of capital, the NSA explained that it is stemming from a positive financial result (considering that Germany has no return on equity during RP3). Some investments have also been delayed.

• The en route actual unit cost incurred by users in 2020/2021 was 132.65€, while the terminal actual unit cost incurred by users was 436.34€.

2 SAFETY - GERMANY

2.1 PRB monitoring

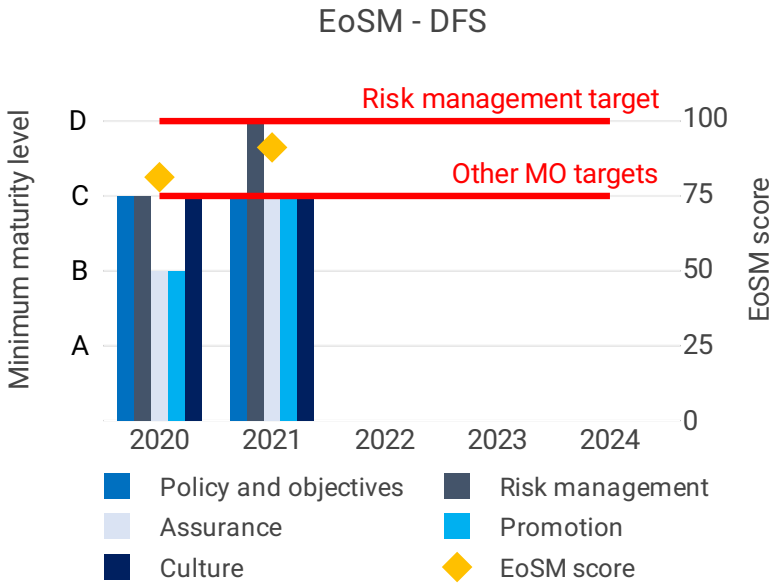
• DFS has successfully improved its performance in safety risk management, safety assurance, and safety promotion and achieved all the EoSM targets earlier than planned. DFS implements specific measures to ensure continuous improvement of safety performance.

• Germany reported a decrease in the rate of both runway incursions and separation minima infringements in 2021 relative to 2020. Both rates are below the Union-wide rates.

• The German NSA aims to improve the monitoring of safety occurrences. Therefore, a procedure was implemented based on regular reviews and in-depth auditing of specific cases.

• DFS should improve its safety management by implementing automated safety data recording systems.

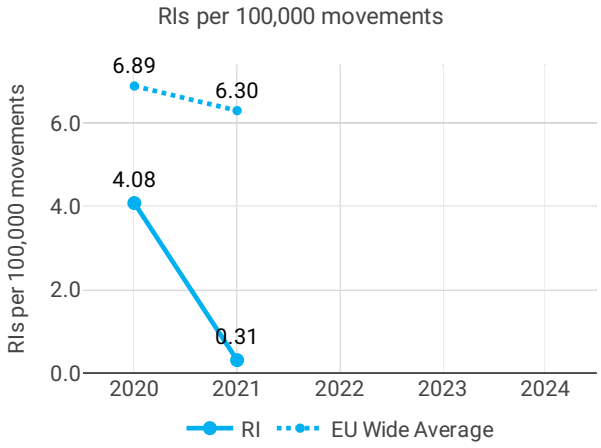
2.2 Effectiveness of Safety Management (EoSM) (KPI#1)

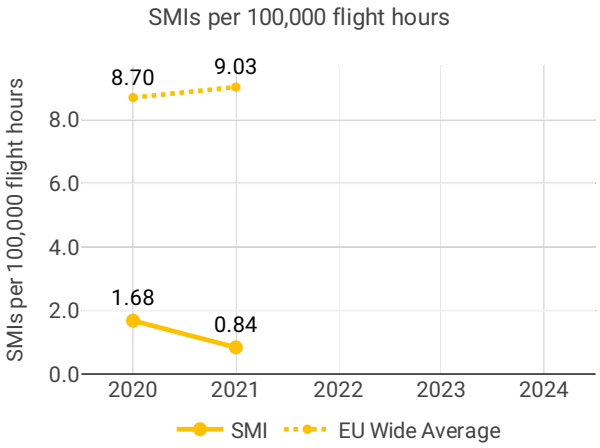


Focus on EoSM

Improvements in maturity levels have been observed with respect 2020, reaching already the 2024 targtes in all components.

2.3 Occurrences - Rate of runway incursions (RIs) (PI#1) & Rate of separation minima infringements (SMIs) (PI#2)





3 ENVIRONMENT - GERMANY

3.1 PRB monitoring

• KEA performance improved from 2020 and Germany achieved the target of 2.31% and contributed positively to achieving the Union-wide target.

• Both KEP and SCR values improved from 2020 and are at their best since 2017.

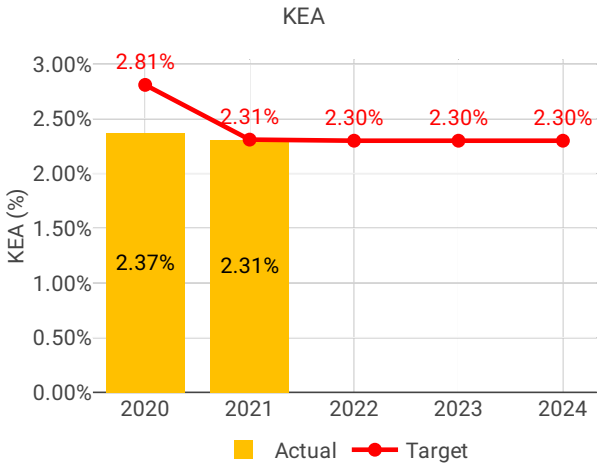
• The share of CDO flights dropped by three p.p., remaining higher than pre-pandemic levels.

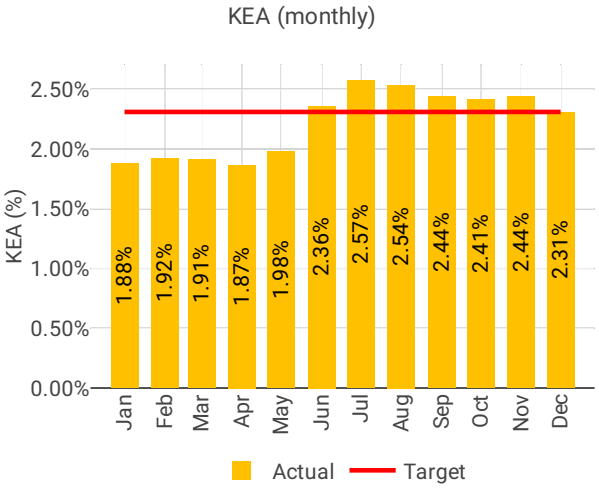
• Additional time in terminal airspace remained at similar level to 2020 while additional taxi out time increased from 1.63 min/flight to 1.85 min/flight.

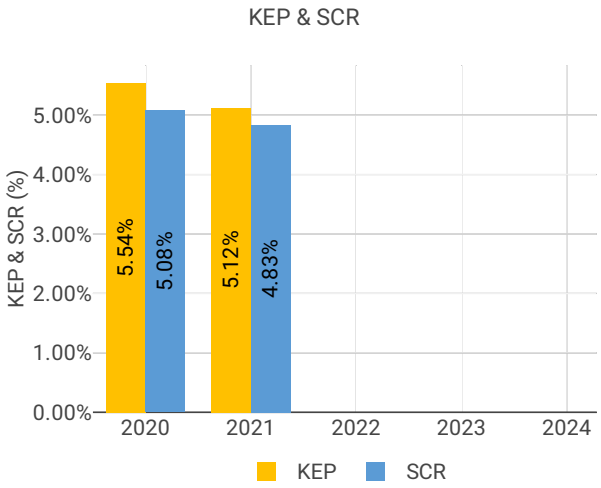
• The NSA states it is continuously developing airport-CDM at German airports in order to reduce taxi times at airports, including a long-term perspective on a total airport management system.

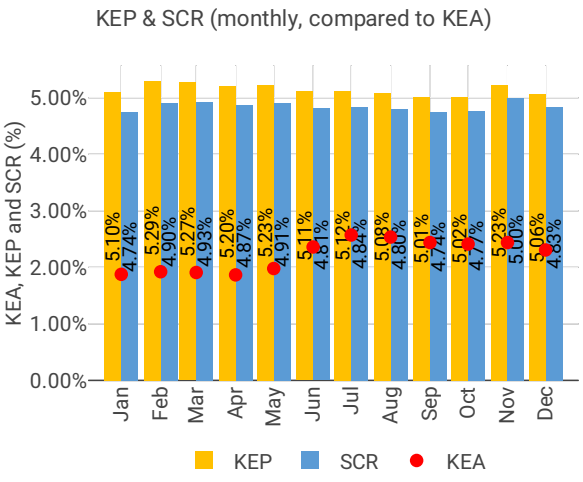
3.2 En route performance

3.2.1 Horizontal flight efficiency of the actual trajectory (KEA) (KPI#1), of the last filed flight plan (KEP) (PI#1) & shortest constrained route (SCR) (PI#2)



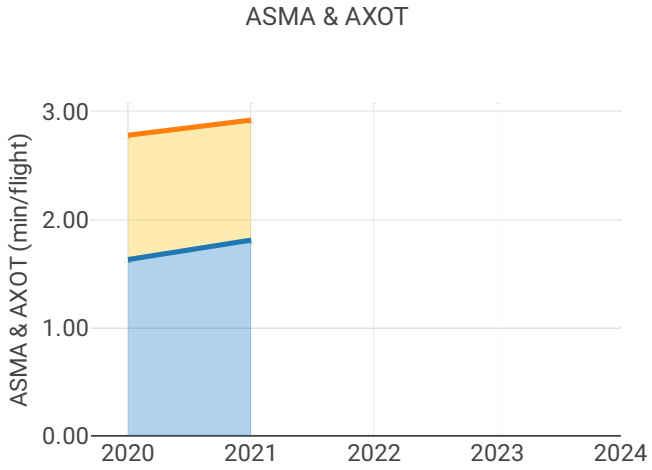


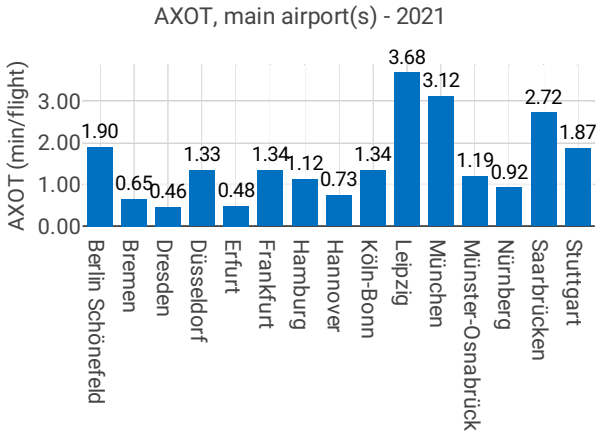


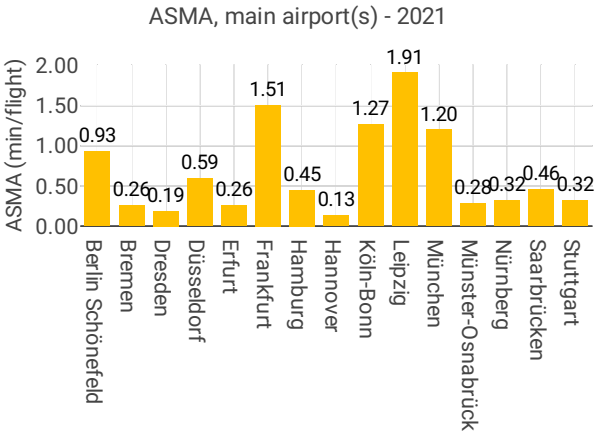


3.3 Terminal performance

3.3.1 Additional taxi-out time (AXOT) (PI#3) & Arrival Sequencing and Metering Area (ASMA) time (PI#4)







Focus on ASMA & AXOT

AXOT

The additional taxi-out times in 2021 at German airports remained in general much lower than in the years previous to the COVID crisis.

In Frankfurt (EDDF; 2019: 3.85 min/dep; 2020: 1.90 min/dep.; 2021: 1.34 min/dep.) these times further decreased with respect to 2020 and although they progresivelly augmented in the second part of the year, they were still less than half of the additional times in 2019.

Berlin Brandenburg (EDDB; 2020: 1.29 min/dep.; 2021: 1.9 min/dep.) observed a significant increase of these additional times as of May with the traffic recovery and also influenced by some runway closures due to noise and ATC staff training.

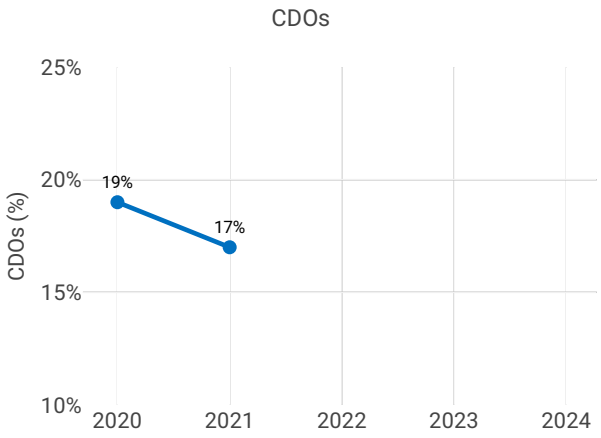
Munich (EDDM; 2019: 3.82 min/dep; 2020: 2.48 min/dep.; 2021: 3.12 min/dep.) also suffered higher additional taxi-out times, mainly in the Summer due to works on taxiways and aprons and then also at the end of the year reaching the same levels as in 2019, despite the lower traffic recovery. This resulted in the highest additional taxi-out times in the SES monitored airports in 2021.

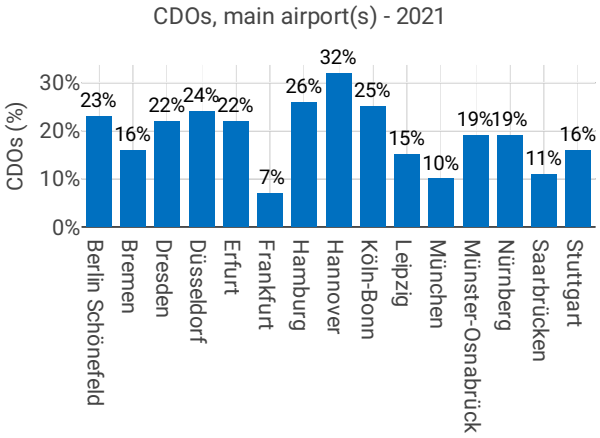
According to FABEC monitoring report: *Despite the fact that the Taxi-Out-Time Methodology is still subject to discussion, DFS is continuously developing Airport-CDM on German Airports in order to reduce taxi times and holding portions with running engines at airports including a long-term perspective on a Total-Airport-Management-System.*

ASMA

The additional ASMA times evolved in a different manner at each German airport. The most significant evolutions were the increase at Berlin Brandenburg and Cologne, and the drastic decrease at Dusseldorf.
Frankfurt's values (EDDF; 2019: 2.17 min/arr.; 2020: 1.73 min/arr.; 2021: 1.51 min/arr.) decreased at annual level, driven by the performance in January and February 2020 vs 2021 (from March to December the additional ASMA times at Frankfurt were higher than in 2020).
Additional ASMA times at Berlin Brandenburg (EDDB; 2020: 0.4 min/arr.; 2021: 0.93 min/arr.) drastically increased in the second half of the year, reaching 1.58 min/arr in October. At Cologne (EDDK; 2019: 1.15 min/arr.; 2020: 0.88 min/arr.; 2021: 1.27 min/arr.) the additional ASMA times exceeded the 2019 figures for approximately half of the year, even if traffic was still lower than in 2019.
Dusseldorf (EDDL; 2019: 1.91 min/arr.; 2020: 1.25 min/arr.; 2021: 0.59 min/arr.) once again improved the performance significantly at annual level, but showed a slight increase at the end of the year.
According to FABEC monitoring report: *ATM in TMAs is primarily considered a matter of noise abatement (departure) and capacity and traffic flow (approach). Mainly because the latter improvements in 2020 were based on low traffic volumes and therefore reduced extra miles on approach could be realized. With traffic recovering more tactical manoeuvring inside TMAs will occur. Nevertheless, projects to shorten TMA detours have been completed (EDDL/MODRU) or are ongoing (EDDS/TEDGO).*

3.3.2 Share of arrivals applying continuous descent operations (CDOs) (PI#5)





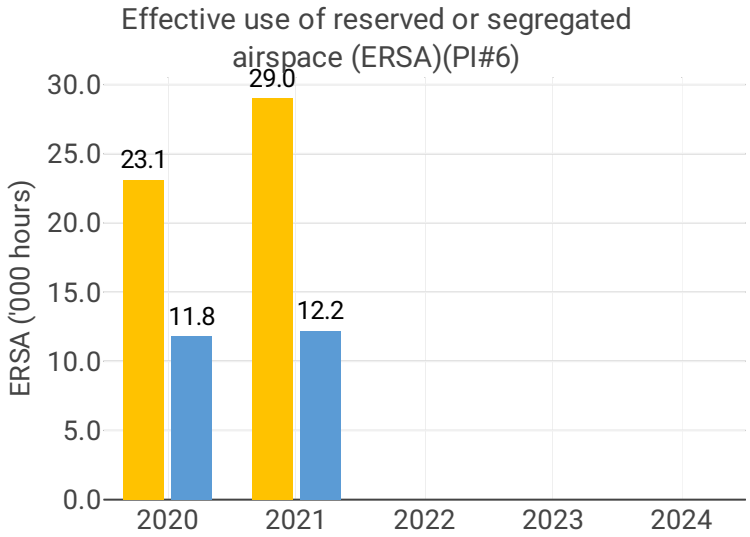
Focus CDOs

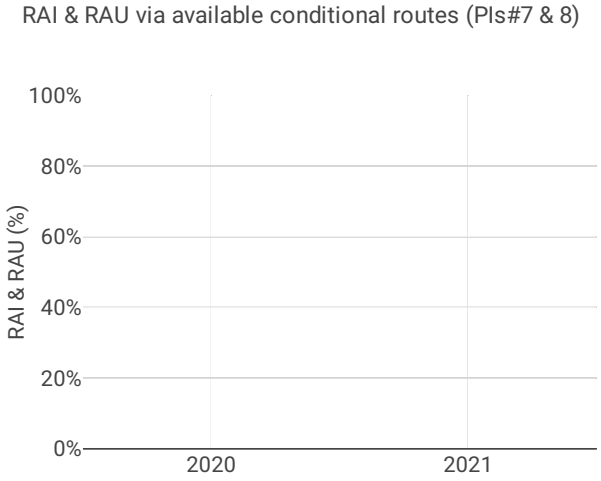
Only for Hanover - EDDV, the share of CDO flights was above the RP3 overall value in 2021 (30.5%). Only Erfurt - EDDE and Münster-Osnabrück - EDDG saw an improvement in the share of CDOs. Overall, the share of CDO decreased from 18.8% in 2020 to 16.2% in 2021.
The two airports with the highest traffic numbers, Frankfurt (EDDF) and Munich (EDDM), still have a rather low share of CDO flights.
The share of CDO at Stuttgart - EDDS decreased significantly throughout the year (January: 26.3%; December: 11.3%).
According to FABEC monitoring report: *Regarding Germany, DFS has successfully implemented High-Transition-Operations to continuously approach Frankfurt from close to cruising levels from the south (EMPAX). The next step is the connection from the north-west ("KUMIK", ongoing, target date: early 2023). Besides DFS is taking every opportunity to apply published or tactical CDO procedures at airspace users individual needs whenever traffic allows.*

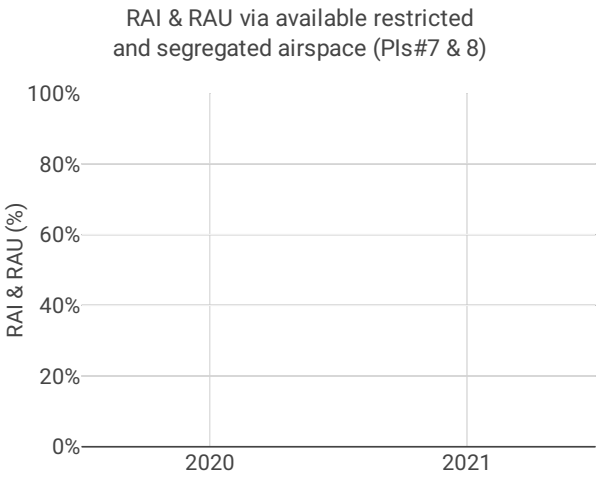
Airport level

	Additional taxi-out time (PI#3)					Additional ASMA time (PI#4)					Share of arrivals applying CDO (PI#5)				
Airport Name	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
Berlin Schönefeld	1.29	1.90	NA	NA	NA	0.40	0.93	NA	NA	NA	29%	23%	NA	NA	NA
Berlin-Tegel	0.94	NA	NA	NA	NA	0.72	NA	NA	NA	NA	26%	NA	NA	NA	NA
Bremen	0.60	0.65	NA	NA	NA	0.51	0.26	NA	NA	NA	25%	16%	NA	NA	NA
Köln-Bonn	1.36	1.34	NA	NA	NA	0.88	1.27	NA	NA	NA	29%	25%	NA	NA	NA
Dresden	0.46	0.46	NA	NA	NA	0.40	0.19	NA	NA	NA	24%	22%	NA	NA	NA
Düsseldorf	1.37	1.33	NA	NA	NA	1.25	0.59	NA	NA	NA	27%	24%	NA	NA	NA
Erfurt	0.41	0.48	NA	NA	NA	0.17	0.26	NA	NA	NA	20%	22%	NA	NA	NA
Frankfurt	1.90	1.34	NA	NA	NA	1.73	1.51	NA	NA	NA	8%	7%	NA	NA	NA
Hamburg	0.91	1.12	NA	NA	NA	0.60	0.45	NA	NA	NA	33%	26%	NA	NA	NA
Hannover	1.03	0.73	NA	NA	NA	0.65	0.13	NA	NA	NA	33%	32%	NA	NA	NA
Leipzig	2.01	3.68	NA	NA	NA	2.07	1.91	NA	NA	NA	18%	15%	NA	NA	NA
Münster-Osnabrück	1.02	1.19	NA	NA	NA	0.53	0.28	NA	NA	NA	17%	19%	NA	NA	NA
München	2.48	3.12	NA	NA	NA	1.12	1.20	NA	NA	NA	11%	10%	NA	NA	NA
Nürnberg	0.63	0.92	NA	NA	NA	0.43	0.32	NA	NA	NA	21%	19%	NA	NA	NA
Saarbrücken	2.43	2.72	NA	NA	NA	0.61	0.46	NA	NA	NA	14%	11%	NA	NA	NA
Stuttgart	1.85	1.87	NA	NA	NA	0.56	0.32	NA	NA	NA	16%	16%	NA	NA	NA

3.4 Civil-Military dimension







Focus on Civil-Military dimension

Update on Military dimension of the plan

Military - related measures implemented or planned to improve capacity

Initiatives implemented or planned to improve PI#6

Initiatives implemented or planned to improve PI#7

Initiatives implemented or planned to improve PI#8

4 CAPACITY - GERMANY

4.1 PRB monitoring

• Germany registered 0.22 minutes of average en route ATFM delay per flight during 2021, thus missing the local breakdown value of 0.18.

• Delays were higher than the breakdown value despite the lower traffic: In Germany, IFR movements in 2021 were 50% lower than in 2019.

• The delays were mainly caused by limited ATC capacity, staffing and severe weather at Bremen and Karlsruhe ACCs with new traffic patterns, increased volatility contributing during the summer period in ACCs already affected by staffing issues. Specifically, during the traffic recovery in summer 2021, the main delay causes were ATC capacity and ATC staffing in Bremen ACC, and ATC capacity and weather in Karlsruhe ACC.

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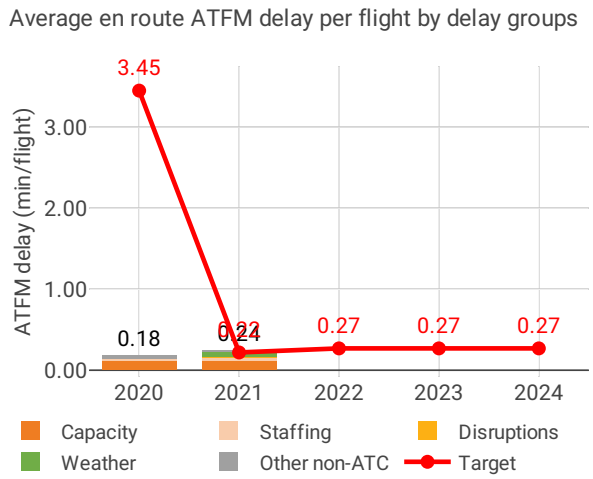
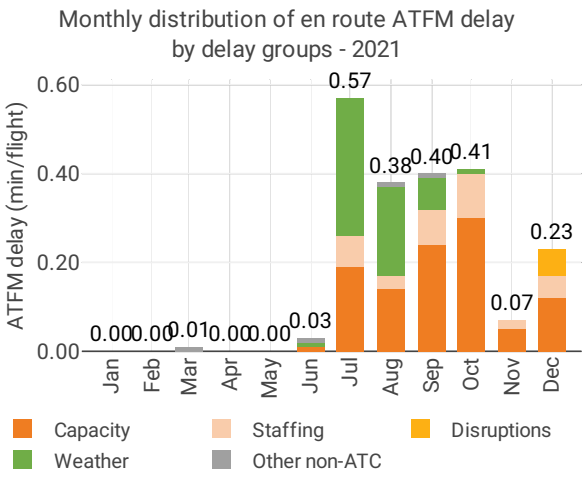
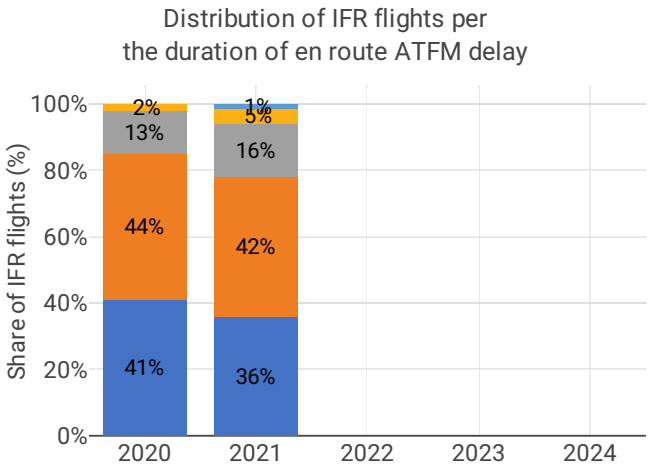
4.2 En route performance

4.2.1 En route ATFM delay (KPI#1)







Focus on en route ATFM delay

Summary of capacity performance

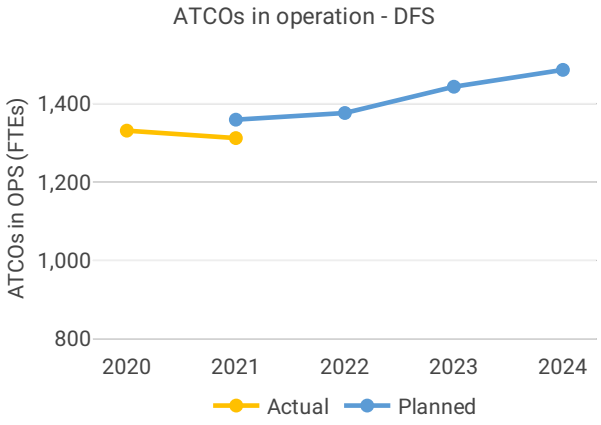
NSA's assessment of capacity performance

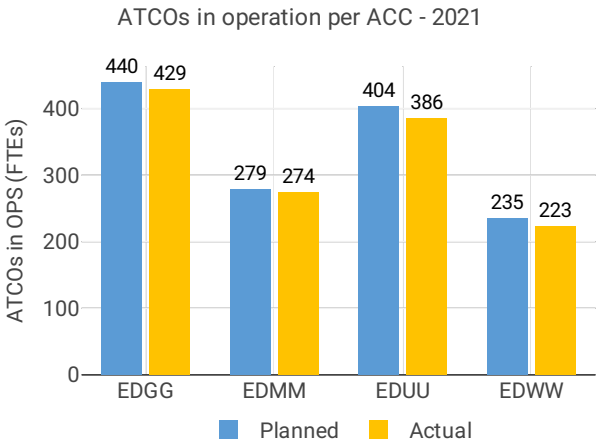
Monitoring process for capacity performance

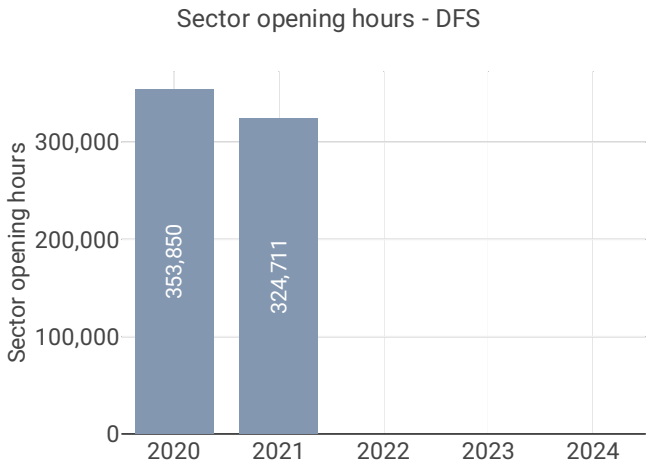
Capacity planning

Application of Corrective Measures for Capacity (if applicable)

4.2.2 Other indicators



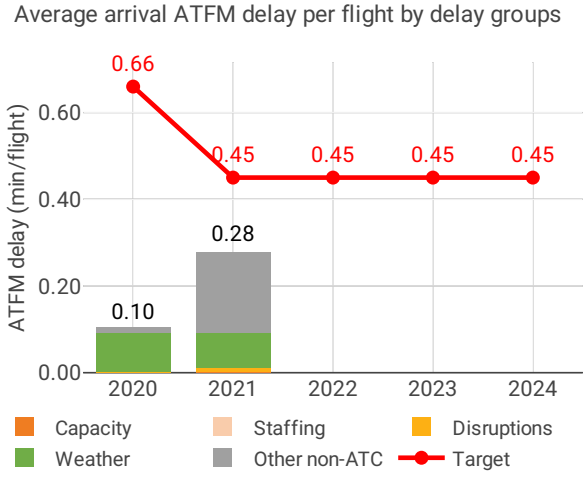


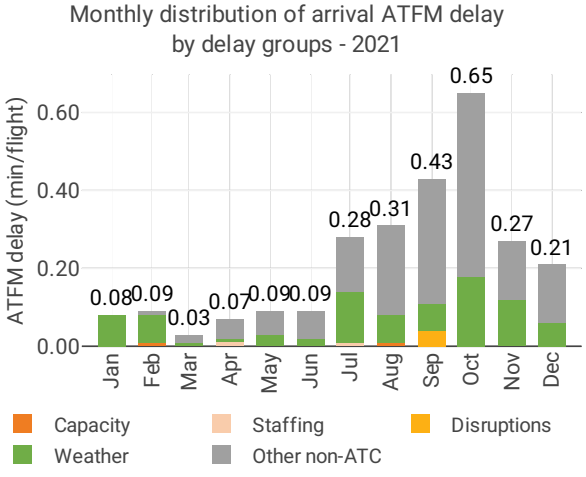


Focus on ATCOs in operations

4.3 Terminal performance

4.3.1 Arrival ATFM delay (KPI#2)





Focus on arrival ATFM delay

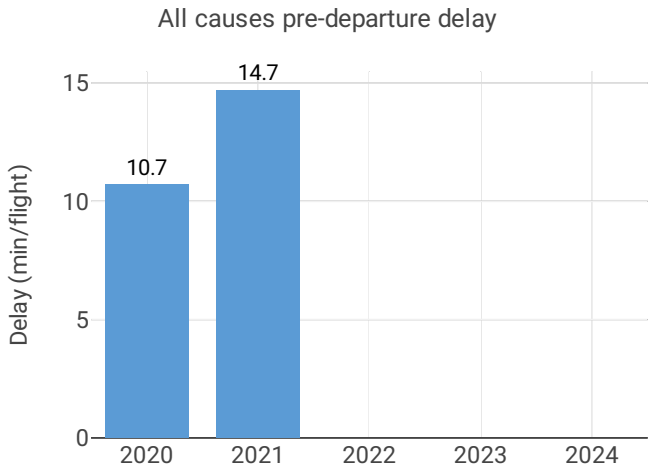
With the closure of Tegel, Germany identifies a total of 15 airports as subject to RP3 monitoring in 2021. However, in accordance with IR (EU) 2019/317 and the traffic figures, only 7 of those 15 airports must be monitored for pre-departure delays.
The Airport Operator Data Flow, necessary for the monitoring of these pre-departure delays, is established for the 8 airports required. Nevertheless, the quality of the reporting does not allow for the calculation of the ATC pre-departure delay at 6 of these airports, with more than 60% of the reported delay not allocated to any cause.

In 2021, traffic at the ensemble of German airports under monitoring was still 55% lower with respect to 2019, with only an 11% over 2020. The recovery differs from airport to airport and while cargo airports like Leipzig (EDDP) saw 98% of the 2019 traffic, Munich (EDDM) and Dusseldorf (EDDL) observed 64% less flights than in 2019.
Berlin Tegel ceased operations as of November 2020, so 2020 is the only year that appeared in the monitoring.
Average arrival ATFM delays in 2021 was 0.28 min/arr, compared to 0.10 min/arr in 2020.
ATFM slot adherence has improved (2021: 97.3%; 2020: 95.5%).

The most important delays at German airports in 2021 were observed at Berlin Brandenburg (EDDB: 2020: 0.00 min/arr.; 2021: 0.94 min/arr.) and Cologne (EDDK: 2020: 0.03 min/arr.; 2021: 0.80 min/arr.)
At Berlin Brandenburg, the traffic recovery in the second half of the year, influenced by some runway closures due to noise and ATC staff training, resulted in high delays attributed mostly to aerodrome capacity.
In Cologne, where the traffic held better throughout the crisis due to the important cargo operation, delays were registered during the entire year but increased significantly in the second half of the year and were mostly attributed, like for Berlin, to aerodrome capacity issues (82%)
Leipzig (EDDP: 2020: 0.14 min/arr.; 2021: 0.31 min/arr.) doubled the delays per arrival, attributed mainly to weather followed by aerodrome capacity.
Frankfurt (EDDF: 2019: 0.69 min/arr.; 2020: 0.19 min/arr.; 2021: 0.19 min/arr.) and Munich (EDDM: 2019: 0.25 min/arr.; 2020: 0.08 min/arr.; 2021: 0.13 min/arr.) showed delays only in the second half of the year, mainly due to weather.
The rest of German airports registered zero or nearly zero arrival ATFM delays in 2021.

The provisional national target on arrival ATFM delay in 2021 was met.
In accordance with Article 3 (3) (a) of Implementing Regulation (EU) 2020/1627: The incentive scheme shall cover only the calendar years 2022 to 2024. No bonus will be awarded to DFS for 2021 achievement.

4.3.2 Other terminal performance indicators (PI#1-3)



Airport level

	Avg arrival ATFM delay (KPI#2)				Slot adherence (PI#1)			
Airport name	2020	2021	2022	2023	2020	2021	2022	2023
Berlin Schönefeld	NA	0.94	NA	NA	97.7%	98.3%	NA%	NA%
Berlin-Tegel	0.05	NA	NA	NA	94.2%	NA	NA	NA
Bremen	0.01	0.02	NA	NA	94.9%	92.5%	NA%	NA%
Dresden	NA	0.00	NA	NA	99.7%	98.8%	NA%	NA%
Düsseldorf	0.26	0.03	NA	NA	95.8%	98.2%	NA%	NA%
Erfurt	NA	NA	NA	NA	96.0%	97.4%	NA%	NA%
Frankfurt	0.19	0.19	NA	NA	92.3%	96.4%	NA%	NA%
Hamburg	0.03	0.01	NA	NA	97.5%	97.6%	NA%	NA%
Hannover	NA	0.07	NA	NA	95.9%	94.4%	NA%	NA%
Köln-Bonn	0.03	0.80	NA	NA	97.2%	97.0%	NA%	NA%
Leipzig	0.14	0.31	NA	NA	98.9%	96.9%	NA%	NA%
München	0.08	0.13	NA	NA	94.3%	96.9%	NA%	NA%
Münster-Osnabrück	NA	NA	NA	NA	97.1%	97.1%	NA%	NA%
Nürnberg	NA	0.01	NA	NA	97.6%	97.7%	NA%	NA%
Saarbrücken	NA	0.00	NA	NA	98.4%	98.7%	NA%	NA%
Stuttgart	NA	0.02	NA	NA	98.9%	98.9%	NA%	NA%

	ATC pre departure delay (PI#2)				All causes pre departure delay (PI#3)			
Airport name	2020	2021	2022	2023	2020	2021	2022	2023
Berlin Schönefeld	0.04	0.32	NA	NA	8.2	12.3	NA	NA
Berlin-Tegel	NA	NA	NA	NA	6.7	NA	NA	NA
Bremen	0.01	0.10	NA	NA	3.4	4.9	NA	NA
Dresden	0.00	0.00	NA	NA	7.9	9.0	NA	NA
Düsseldorf	0.11	0.03	NA	NA	8.2	11.6	NA	NA
Erfurt	0.00	0.00	NA	NA	4.8	7.8	NA	NA
Frankfurt	0.28	0.14	NA	NA	16.5	20.4	NA	NA
Hamburg	0.08	0.12	NA	NA	7.4	10.2	NA	NA
Hannover	0.01	0.08	NA	NA	11.6	16.1	NA	NA
Köln-Bonn	NA	NA	NA	NA	10.8	16.7	NA	NA
Leipzig	0.16	0.12	NA	NA	15.2	21.9	NA	NA
München	0.01	0.07	NA	NA	7.3	9.0	NA	NA
Münster-Osnabrück	0.00	NA	NA	NA	8.6	9.9	NA	NA
Nürnberg	0.03	NA	NA	NA	13.4	15.9	NA	NA
Saarbrücken	0.00	0.00	NA	NA	3.3	6.3	NA	NA
Stuttgart	0.05	0.01	NA	NA	6.9	9.0	NA	NA

Focus on performance indicators at airport level

ATFM slot adherence

With the drastic drop in traffic, regulated departures from German airports virtually disappeared until July 2021.
All German airports showed adherence above 92% and the national average was 97.3%, an improvement with respect to 2020 (95.5%). With regard to the 2.7% of flights that did not adhere, 1.8% was early and 0.9% was late.
According to FABEC monitoring report: *For the time being there is no significant risk. But the ANSP stated that due to the ambitious targets, there is a*
risk that the targets cannot be reached due to a single, longer-lasting disruption at one of the airports. Anyways, ANSP and NSA will, in case of any arising significant risk, go into dialogue to evaluate what the risk is and how it can be solved.

ATC pre-departure delay

The share of unidentified delay reported by 5 of the 7 German airports subject to monitoring of this indicator in 2021 (Tegel is closed) has been above 40% for more than 2 months in the year, preventing the calculation of this indicator. This is partially due to the special traffic composition during the crisis. Most of these airports normally had proper reporting before the pandemic and only after April 2020 the share of unidentified delay exceeded the required minimum for the computation. On the other hand the insufficient data quality provided by Cologne (EDDK) is a long standing issue.
Only Berlin Brandenburg and Dusseldorf provided enough data quality. Dusseldorf has a low ATC pre-departure delay (EDDL: 2021: 0.03 min/dep) while Brandenburg has a slightly higher value (EDDB: 2021:

0.32 min/dep)
FABEC monitoring report mentions that *It should be noted that EDDK faced a deterioration due to "Aerodrome Capacity" (by airport operator, G-Regulations) and that EDDB, EDDM and EDDS faced a deterioration due to more bad weather situations than in 2020 (WX-Regulations).*

All causes pre-departure delay

The total (all causes) delay in the actual off block time at German airports in 2021 was between 9.04 min/dep for Munich(EDDM) and 20.38 min/dep. for Frankfurt (EDDF) which is the 2nd highest among the RP3 monitored airports.
The highest delays per flight at these airports were observed in Summer and increased again at some airports at the end of the year.

5 COST-EFFIENCY - GERMANY

5.1 PRB monitoring

• The en route 2020/2021 actual unit cost of Germany was 123.97 €2017, -4.2% lower than the determined unit cost (129.44 €2017). The terminal actual unit cost was 411.50 €2017, -2.7% lower than the determined unit cost (422.78 €2017).

• The en route 2021 actual service units (7,679K) were +1.5% higher than determined (7,563K).

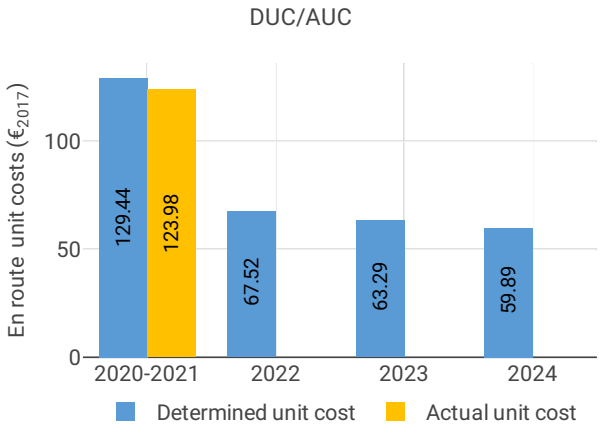
• In 2021, actual total costs were -64 M€2017 lower (-6.9%) than determined. The reduction was mainly driven by -25 M€2017 (-3.8%) in staff costs, due to the continuation of 2020 measures in reaction to the decrease of traffic, and by -27 M€2017 (-132%) in cost of capital.

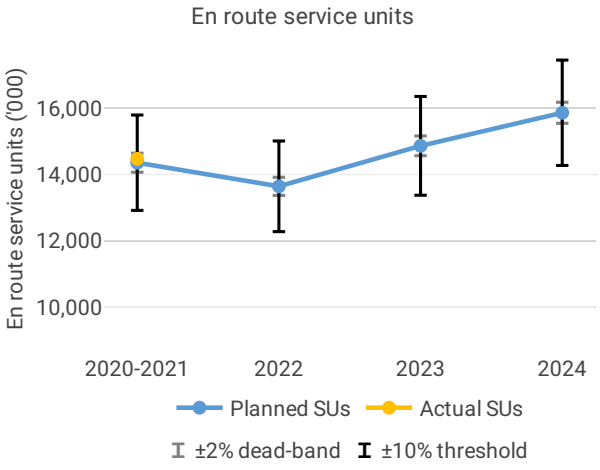
• DFS spent 82 M€2017 in 2021 related to costs of investments, -13% lower than determined (93 M€2017), mainly driven by a negative 2021 actual cost of capital, the NSA explained that it is stemming from a positive financial result (considering that Germany has no return on equity during RP3). Some investments have also been delayed.

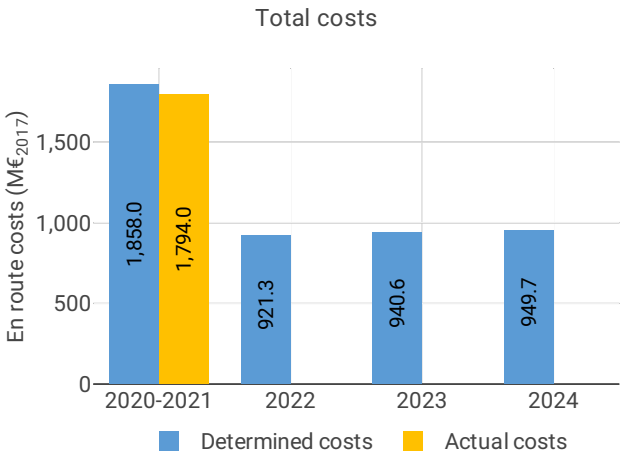
• The en route actual unit cost incurred by users in 2020/2021 was 132.65€, while the terminal actual unit cost incurred by users was 436.34€.

5.2 En route charging zone

5.2.1 Unit cost (KPI#1)

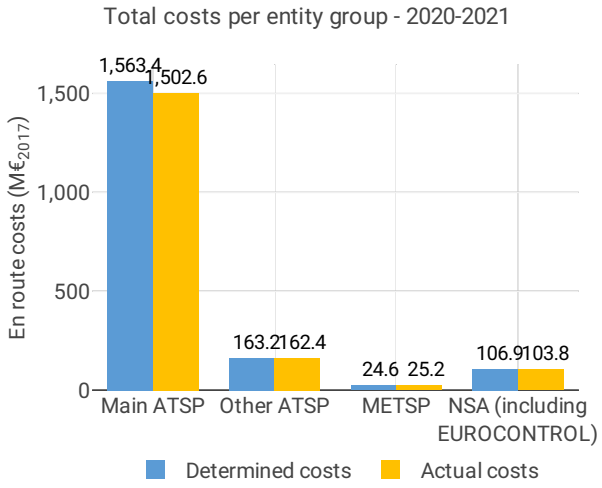


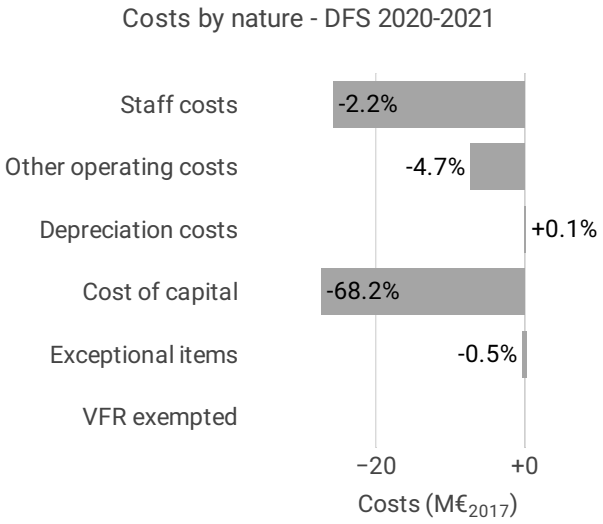




Actual and determined data

Total costs - nominal (M€)	2020-2021	2022	2023	2024
Actual costs	1,877	NA	NA	NA
Determined costs	1,935	977	1,010	1,034
Difference costs	-59	NA	NA	NA
Inflation assumptions	**2020-2021**	**2022**	**2023**	**2024**
Determined inflation rate	NA	1.1%	1.5%	1.7%
Determined inflation index	NA	107.2	108.8	110.6
Actual inflation rate	NA	NA	NA	NA
Actual inflation index	NA	NA	NA	NA
Difference inflation index (p.p.)	NA	NA	NA	NA





Focus on unit cost

AUC vs. DUC

In the combined year 2020-2021, the en route AUC was -4.2% (or -5.46€2017) lower than the planned DUC. This results from the combination of slightly higher than planned TSUs (+0.8%) and lower than planned en-route costs in real terms (-3.4%, or -64.0 M€2017).

En route service units

The difference between actual and planned TSUs (+0.8%) falls within the ±2% dead band. Hence the resulting additional en-route revenue is kept by the ANSPs.

En route costs by entity

Actual real en route costs are -3.4% (-64.0 M€2017) lower than planned. This is driven by the main ANSP, DFS (-3.9%, or -60.8 M€2017), MUAC (-0.5%, or -0.7 M€2017), the MET service provider (+2.7%, or +0.7 M€2017) and the NSA/EUROCONTROL costs (-2.9%, or -3.1 M€2017).

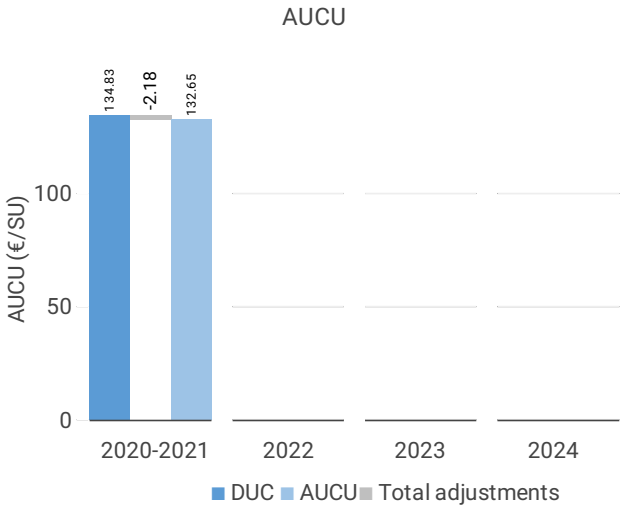
En route costs for the main ANSP at charging zone level

The lower than planned en route costs in real terms for DFS (-3.9%, or -60.8 M€2017) result from:
- lower staff costs (-2.2%), due to “short-term measures to counter the effects of the Corona pandemic, such as suspension of new hires, partial suspension of operational training, and conclusion of a collective agreement to make personnel costs more flexible in the short term”;
- lower other operating costs (-4.7%), due to “a number of several smaller measures and components as travel-expense, education and training, allowance on receivables.”;
- slightly higher depreciation (+0.1%); and
- lower cost of capital (-68.2%), due to a positive financial result in 2021;

- exceptional items corresponding to the IFRS conversion effects in line with the plan (-0.5%).

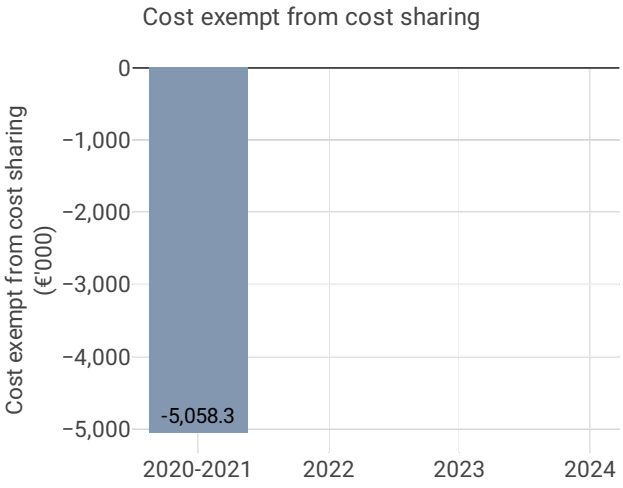
Note: When expressed in €2017, the depreciation and cost of capital are not adjusted for inflation, in accordance with Article 26 of Regulation (EU) 2019/317.

5.2.2 Actual unit cost incurred by the users (AUCU) (PI#1)



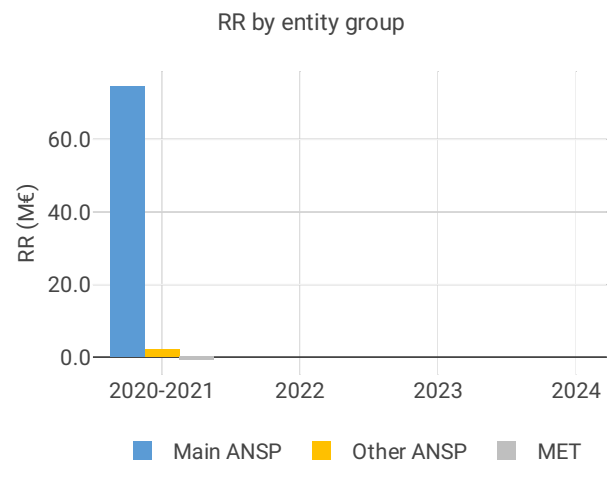
AUCU components (€/SU) – 2020-2021

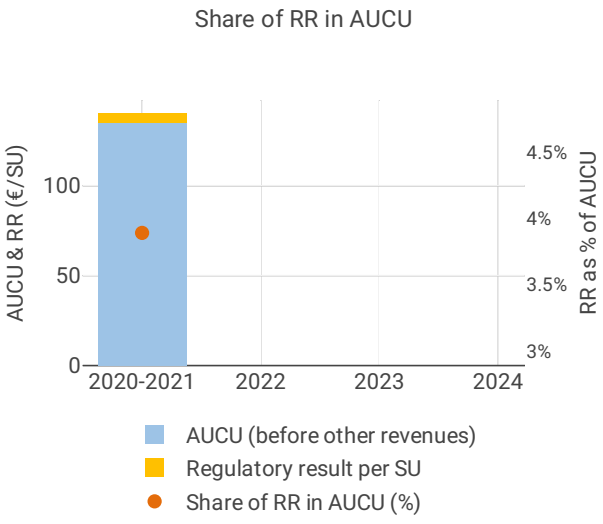
Components of the AUCU in 2020-2021	€/SU
DUC	**134.83**
Inflation adjustment	0.54
Cost exempt from cost-sharing	-0.35
Traffic risk sharing adjustment	0.00
Traffic adj. (costs not TRS)	-0.07
Finantial incentives	0.00
Modulation of charges	0.00
Cross-financing	0.00
Other revenues	-2.29
Application of lower unit rate	0.00
Total adjustments	-2.18
AUCU	**132.65**
AUCU vs. DUC	**-1.6%**

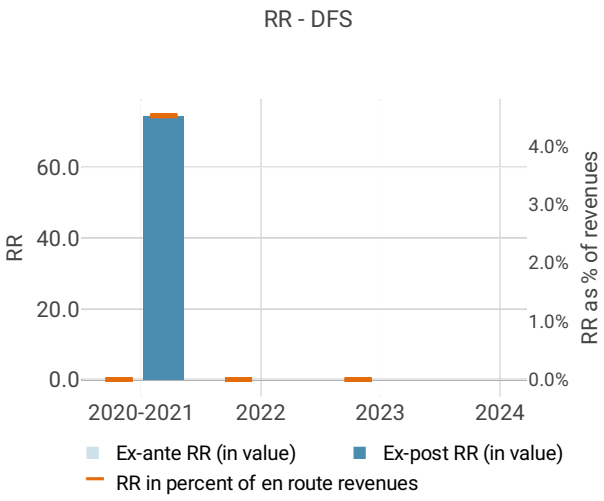


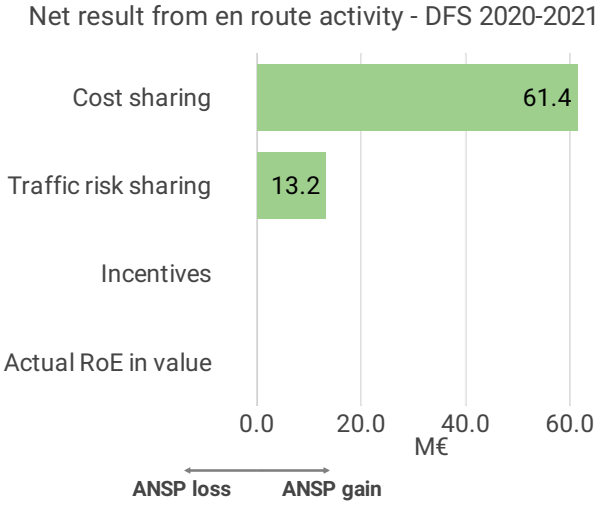
Cost exempt from cost sharing by item - 2020-2021	€'000	€/SU
New and existing investments	-71.9	0.00
Competent authorities and qualified entities costs	-1,005.0	-0.07
Eurocontrol costs	-2,132.5	-0.15
Pension costs	-1,849.0	-0.13
Interest on loans	0.0	0.00
Changes in law	0.0	0.00
Total cost exempt from cost risk sharing	**-5,058.3**	**-0.35**

5.2.3 Regulatory result (RR)









Focus on regulatory result

DFS net gain on activity in Germany en route charging zone in the combined year 2020-2021

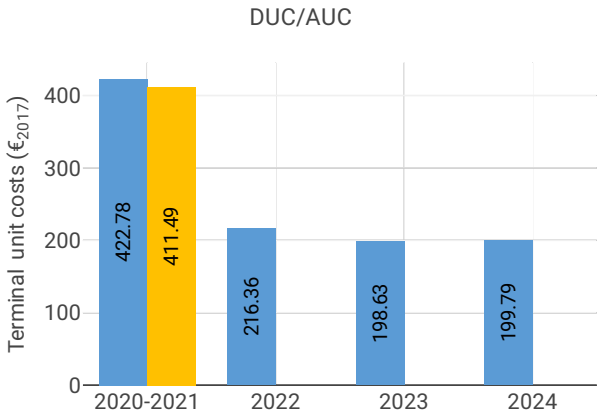
DFS incurred a net gain of +74.6 M€, resulting from a gain of +61.4 M€ arising from the cost sharing mechanism and a gain of +13.2 M€ arising from the traffic risk sharing mechanism.

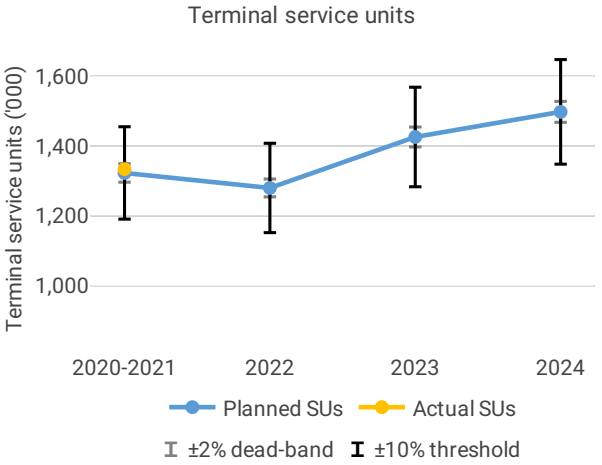
DFS overall regulatory results (RR) for the en route activity

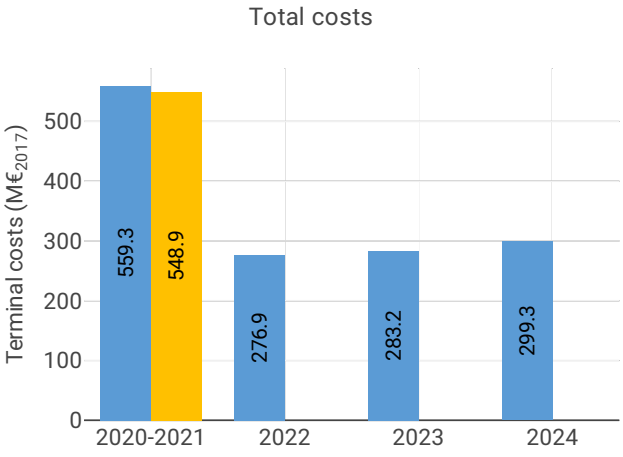
Ex-post, the overall RR corresponds to the net gain from the en route activity mentioned above (+74.6 M€), as the RoE for DFS has been set to zero throughout RP3. The ex-post RR corresponds to 4.5% of the en route revenues). The resulting ex-post rate of return on equity is 7.0%, compared to 0% planned in the PP.

5.3 Terminal charging zone

5.3.1 Unit cost (KPI#1)

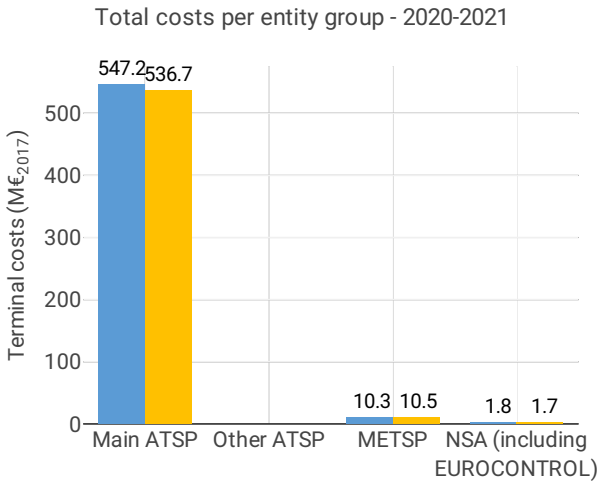


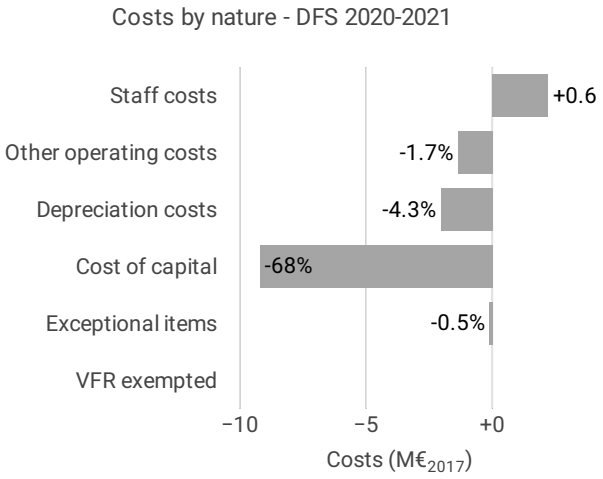




Actual and determined data

Total costs - nominal (M€)	2020-2021	2022	2023	2024
Actual costs	576	NA	NA	NA
Determined costs	584	294	305	327
Difference costs	-8	NA	NA	NA
Inflation assumptions	**2020-2021**	**2022**	**2023**	**2024**
Determined inflation rate	NA	1.1%	1.5%	1.7%
Determined inflation index	NA	107.2	108.8	110.6
Actual inflation rate	NA	NA	NA	NA
Actual inflation index	NA	NA	NA	NA
Difference inflation index (p.p.)	NA	NA	NA	NA





Focus on unit cost

AUC vs. DUC

The AUC for the combined year 2020-2021 is lower than the planned DUC (by -2.7%, or -11.28 €2017). This is due to the combination of higher than planned TNSUs (+0.8%) and lower than planned terminal costs in real terms (by -1.9%, or -10.4 M€2017).

Terminal service units

The difference between actual and planned TSUs (+0.8%) falls within the ±2% dead band. Hence the resulting gain is kept by the ANSPs.

Terminal costs by entity

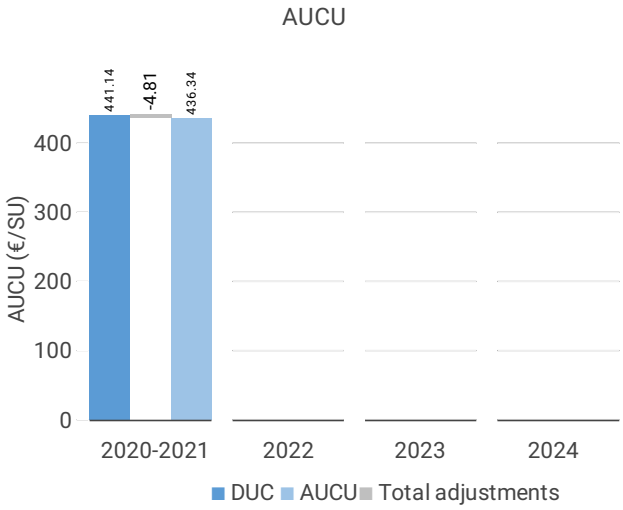
Actual real terminal costs for 2020-2021 are -1.9% (-10.4 M€2017) lower than planned. This result is driven by the main ANSP, DFS (-1.9%, or -10.5 M€2017), the METSP (+1.9%, or +0.2M€2017) and the NSA costs (-4.9%, or -0.1 M€2017).

Terminal costs for the main ANSP at charging zone level

Overall, the terminal costs in real terms for DFS in 2020-2021 were lower than the determined costs from the performance plan (by -1.9%, or -10.5 M€2017 lower). This results from:
- slightly higher staff costs (+0.6%),
- lower other operating costs (-1.6%), due “a number of several smaller measures and components as travel-expense, education and training, allowance on receivables.”
- lower depreciation (-4.3%);
- lower cost of capital (-68.0%) due to a positive financial result in 2021; and
- exceptional items corresponding to the IFRS conversion effects in line with the plan (-0.5%).

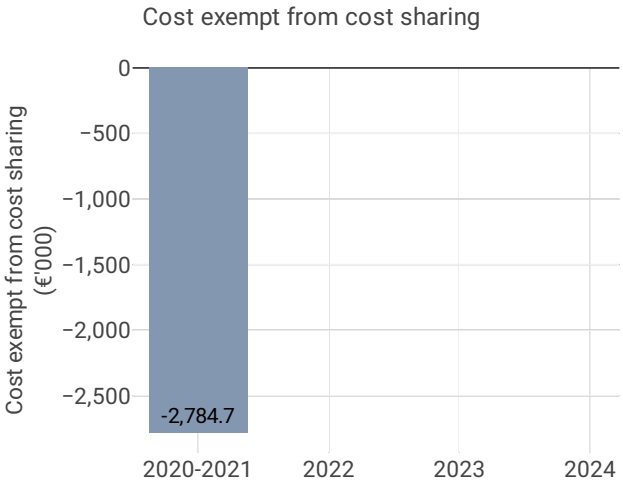
Note: When expressed in €2017, the depreciation and cost of capital are not adjusted for inflation, in accordance with Article 26 of Regulation (EU) 2019/317.

5.3.2 Actual unit cost incurred by the users (AUCU) (PI#1)



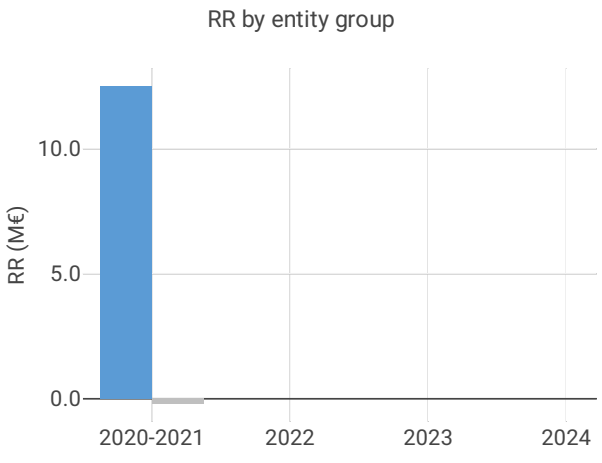
AUCU components (€/SU) – 2020-2021

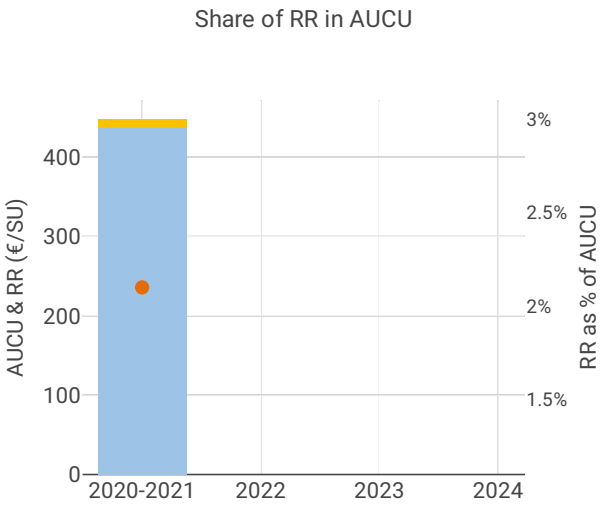
Components of the AUCU in 2020-2021	€/SU
DUC	**441.14**
Inflation adjustment	1.84
Cost exempt from cost-sharing	-2.09
Traffic risk sharing adjustment	0.00
Traffic adj. (costs not TRS)	-0.08
Finantial incentives	0.00
Modulation of charges	0.00
Cross-financing	0.00
Other revenues	-2.42
Application of lower unit rate	-2.06
Total adjustments	-4.81
AUCU	**436.34**
AUCU vs. DUC	**-1.1%**

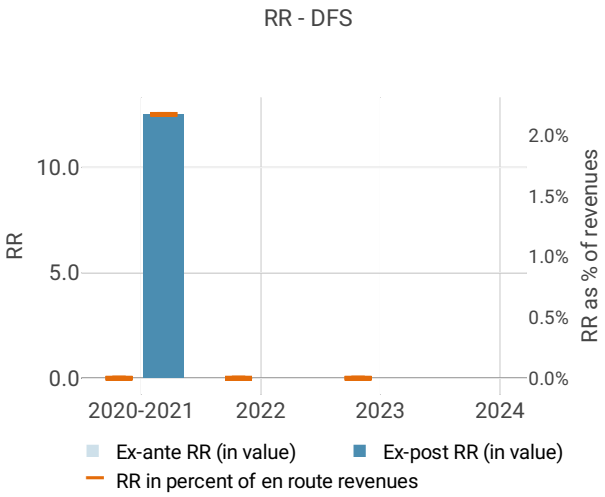


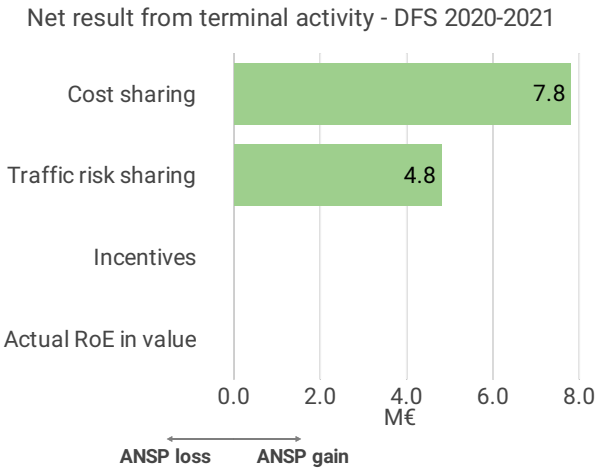
Cost exempt from cost sharing by item - 2020-2021	€'000	€/SU
New and existing investments	-2,048.7	-1.54
Competent authorities and qualified entities costs	-87.4	-0.07
Eurocontrol costs	0.0	0.00
Pension costs	-648.6	-0.49
Interest on loans	0.0	0.00
Changes in law	0.0	0.00
Total cost exempt from cost risk sharing	**-2,784.7**	**-2.09**

5.3.3 Regulatory result (RR)









Focus on regulatory result

DFS net gain on activity in Germany terminal charging zone in the combined year 2020-2021
DFS incurred a net gain of +12.5 M€, resulting from a gain of +7.8 M€ arising from the cost sharing mechanism and a gain of +4.8 M€ arising from the traffic risk sharing mechanism.
DFS overall regulatory results (RR) for theterminal activity
Ex-post, the overall RR corresponds to the net gain from the en route activity mentioned above (+12.5 M€) as the RoE for DFS has been set to zero throughout RP3. The ex-post RR corresponds to 2.2% of the en route revenues). The resulting ex-post rate of return on equity is 10.8%, compared to 0% planned in the PP.