Common Project 1

Update of the original CP1 Proposal CBA

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Table of Contents

Table of Contents 2

List of Figures 3

Background and assumptions *4*

1. CP1 CBA results *5*

2. Deviations from the original CP1 Proposal CBA *6*

3. Sensitivity analysis *7*

3.1 Traffic sensitivity 7

3.2 Fuel price sensitivity 7

3.3 Worst case: low traffic + low fuel scenario 8

Annex A Impacts on the original CP1 Proposal CBA *9*

A.1 Updated technical scope 9

A.2 Updated geographical scope 10

A.3 Updated ramp-up of investments and benefits 11

A.4 Updated traffic forecast 12

Annex B Additional CBA on RNP-based operations *14*

List of Figures

Figure 1 – Updated CP1 CBA 5

Figure 2 – Deviations from the original CP1 Proposal CBA 6

Figure 3 – NPV in alternate traffic scenarios 7

Figure 4 – Worst case: low traffic and low fuel scenario 8

Figure 5 – Implementation dates per Sub-AF 11

Figure 6 - Traffic in the 5-year recovery scenario 12

Table 1 - Updated CP1 CBA costs, benefits and NPV per ATM functionality 5

Table 2- Impact of technical scope changes 9

Table 3 – Impact of geographical scope changes 10

Table 4 – Impact of the postponement of investments and benefits (undiscounted €) 12

Table 5 – Impact of the postponement of investments and benefits (discounted €) 12

Table 6 – Impact of traffic decrease on benefits per ATM functionality 13

Background and assumptions

In February 2020, the SESAR Deployment Manager (SDM) delivered to the European Commission the "PCP Review Consolidated Proposal" (subtitle: "Common Project 1 – Proposal for European Commission") and the associated "CP1 Proposal Cost Benefit Analysis".

This original Cost Benefit Analysis ("original CP1 Proposal CBA") showed that an on-time and synchronised implementation of the PCP Review Consolidated Proposal would generate over the period 2014 to 2030 a Net Present Value (NPV) amounting to 8,3 billion €, with a 6-year payback period. Such Net Present Value was derived considering an overall cost of € 3,1 billion (€ 4,4 billion, undiscounted) undertaken by the involved stakeholders and benefits amounting to € 11,4 billion (€ 25,8 billion, undiscounted) over the considered time-frame.

The present document "Common Project One – Update of the original CP1 Proposal CBA" comes as an **addendum to the original CP1 Proposal CBA and provides the updated results of the overall cost-benefit analysis of the CP1**, based on:

-The updates in the technical and geographical scope of the CP1, as well as the new implementing deadlines for the different Sub-ATM functionalities (Sub-AFs);

-The update in air traffic forecast resulting from the impact of the COVID-19 pandemic.

This last parameter is a very important driver in the benefits estimations - hence in the CBA - as operational savings from the CP1 investments are closely linked to the volume of air traffic. This CBA update is conducted based on a **5-year traffic recovery scenario** for the European airspace (5 years from 2020 to recover the traffic of 2019), which at this stage appears as an average "likely-to-happen" scenario[1]. However, a sensitivity analysis was performed on this core assumption to measure the impact in case of significant deviation in the future.

All other parameters and assumptions from the original CP1 Proposal CBA remains unchanged: unit values for investments, CBA timeframe (2014-2030), discount rate (8%), monetisation factors etc.

It is reminded that the discount rate of 8% as commonly used in SESAR CBA consolidations is deliberately chosen as being very conservative.

The first chapter of the document presents the results of the CP1 CBA. The second chapter shows the deviations from the original CP1 Proposal CBA. The last chapter presents the traffic and fuel price sensitivity analysis.

[1] At global level, shorter recovery scenarios with a 4-year recovery period are commonly envisaged (e.g. by IATA), but they include airspaces where recovery is likely to happen faster than in Europe (e.g. Asia)

1. CP1 CBA results

The updated CP1 CBA (Figure 1 below) shows an expected **€4.1B NPV in 2030,** with a total of €6.7B in benefits (€15.7B undiscounted) and €2.6B in costs (€3.8B undiscounted). CP1 payback occurs in 2023, 9 years after the start of synchronized deployment in 2014.

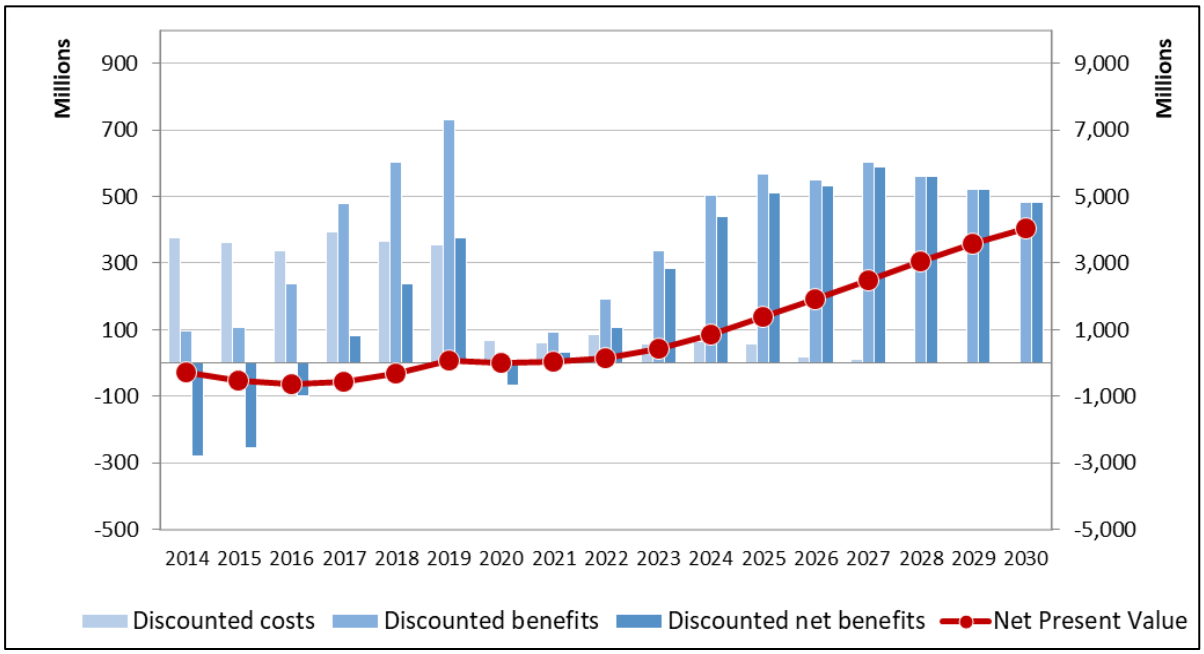

Figure 1 – Updated CP1 CBA

Table 1 below shows the updated CP1 CBA breakdown of costs, benefits and NPV per ATM functionality.

Millions €	**Cost**		**Benefit**		**NPV**
	Undiscounted	Discounted	Undiscounted	Discounted	Discounted
AF1	131	85	941	397	312
AF2	1037	747	709	325	-422
AF3	1011	746	9821	4101	3355
AF4	98	73	4268	1845	1772
AF5	1332	881	0	0	-881
AF6	176	77	0	0	-77
Total	3785	2608	15739	6668	4059

Table 1 - Updated CP1 CBA costs, benefits and NPV per ATM functionality

2. Deviations from the original CP1 Proposal CBA

The expected €4.1B NPV in 2030 is lower by around 50% from the original CP1 Proposal CBA delivered in February 2020 (€8.3B NPV in 2030). The decrease of NPV is explained by:

- Technical scope changes (-€0.8B from the original CP1 Proposal CBA)
- Geographical scope changes (-€0.4B)
- Investments and benefits postponements due to the COVID crisis (-€0.6B)
- Traffic decrease due to the COVID crisis (-€2.4B)

Details and assumptions on these calculations can be found in the Annex.

The COVID crisis is by far the most important factor accounting for the NPV decrease: due to the postponement of investments and the lower air traffic volume, **the COVID crisis is impacting the original CP1 Proposal CBA by -€3.0B** out of the total -€4.2B decrease.

Figure 2 below illustrates the impacts on the original CP1 Proposal CBA.

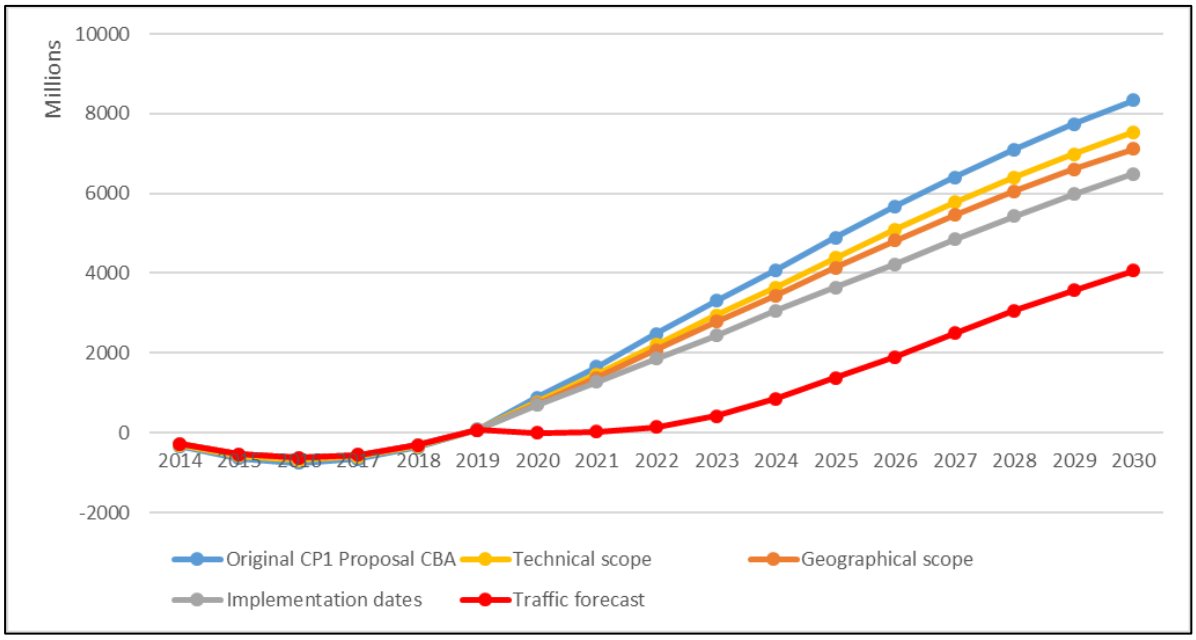

Figure 2 – Deviations from the original CP1 Proposal CBA

3. Sensitivity analysis

3.1 Traffic sensitivity

Alternate traffic scenarios were simulated:

- A short-term recovery scenario assuming a traffic drop by -70% in 2020 and a recovery in 3 years (return to the traffic of 2019 in 2023): it shows an expected €4.8B NPV in 2030 (higher by €0.7B against the 5-year recovery scenario);
- A long-term recovery scenario assuming a traffic drop by -70% in 2020 and a recovery in 8 years (return to the traffic of 2019 in 2028): it shows an expected €3.1B NPV in 2030 (lower by €1.0B against the 5-year recovery scenario);

The results are presented in Figure 3 below.

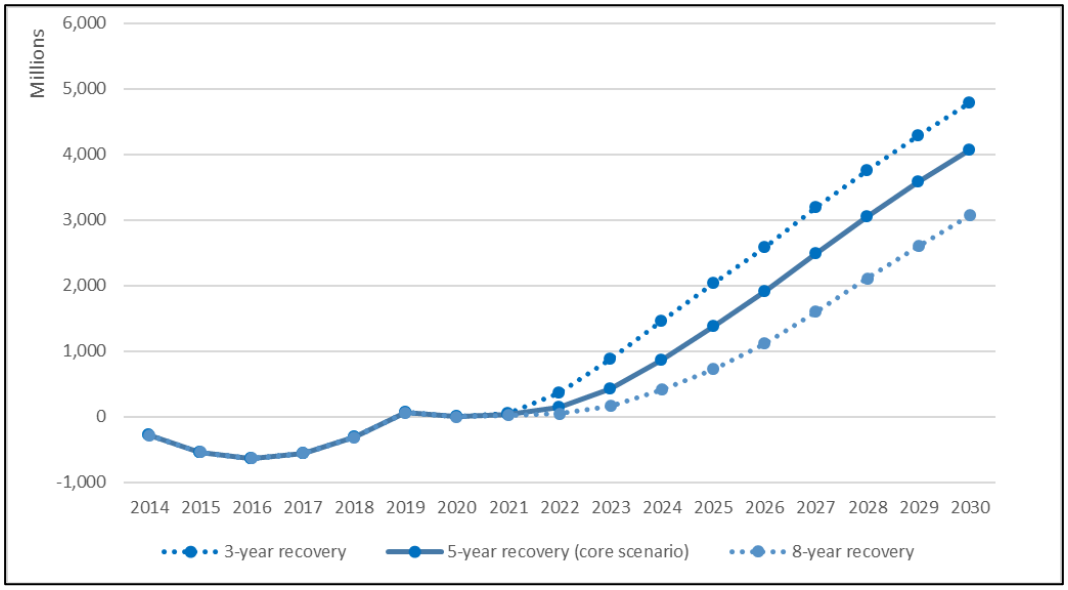

Figure 3 – NPV in alternate traffic scenarios

3.2 Fuel price sensitivity

In the original CP1 Proposal CBA, fuel price was set to €780/ton from 2020 onwards. This forecast was based on the 2019 update of the ATM Masterplan CBA and very close to the one in the initial PCP CBA. However, it could already appear a bit high compared to the latest trends, which determined SDM to perform a sensitivity analysis. The analysis was published in the original CP1 Proposal CBA report: the effects of varying fuel price between 50% and 120% of its base case price resulted in an NPV, which was respectively lower by €0.8B or higher by €0.3B.

Considering that the COVID-19 may also have an impact on this parameter since economic growth would be impacted for a long time, the same sensitivity analysis of varying fuel price by -50% was performed for the core 5-year recovery scenario and also for the alternate traffic scenarios. The following results were obtained:

-In the short-term recovery scenario, NPV decreases from €4.8B to €4.4B

-In the mid-term recovery scenario (core scenario), NPV decreases from €4.1B to €3.7B

-In the long-term recovery scenario, NPV decreases from €3.1B to €2.7B

3.3 Worst case: low traffic + low fuel scenario

Figure 4 below shows the NPV of the long-term recovery scenario (8 years) combined with a -50% fuel price decrease, a combination that can be considered as a "worst case" (and unlikely to happen) scenario for the updated CP1 CBA: nevertheless, it maintains a positive NPV in 2030 (€2.7B) and pay-back occurs before 2025.

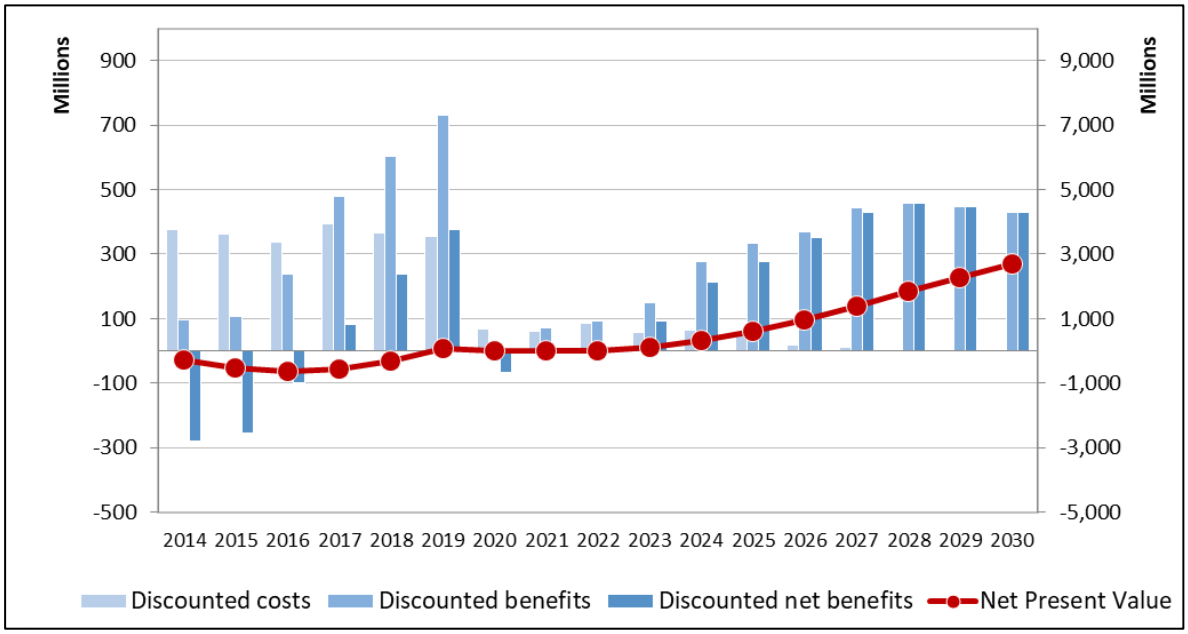

Figure 4 – Worst case: low traffic and low fuel scenario

It is also worth reminding that the discount rate of 8%, although commonly used in SESAR CBA consolidations, is deliberately chosen as being very conservative: with a lower and more realistic discount rate of 4%, all NPVs would be more than 50% higher.

Annex A **Impacts on the original CP1 Proposal CBA**

This Annex describes the different changes applied to the original CP1 Proposal CBA and their outcomes.

A.1 Updated technical scope

The updated CP1 CBA is based on the technical scope of CP1 where, in comparison to the original CP1 Proposal CBA, the following Sub-ATM functionalities (Sub-AF) have been modified:

- AF1 - Sub-AF "Enhanced Terminal Airspace using RNP-based operation": this Sub-AF, although it was present in the Pilot Common Project (PCP), is not in the CP1 to avoid duplication with the specific Performance Based Navigation (PBN) regulation. A specific CBA is provided in the Annex of this report;

- AF4 – Part of Sub-AF "Enhanced integration of Airports with Network", the one dealing with the "Network integration of departure estimates from medium and small sized airports"

  and

  AF5 - SWIM Blue Profile and Flight Object

  are not anymore in the CP1 but should be present in future Common Projects.

  It is noted that "AOP/NOP integration" (the other part of Sub-AF "Enhanced integration of Airports with Network") is still in the CP1 and becomes a full Sub-AF.

Table 2 below shows the impact of the proposed technical changes on the original CP1 Proposal CBA, both in costs, benefits and net benefits (undiscounted values).

Technical changes impact	**Cost (M€ undiscounted)**	**Benefit (M€ undiscounted)**	**Net benefit (undiscounted)**
AF1 - Sub-AF "Enhanced Terminal Airspace using RNP-based operation"	-205	-2371	-2166
AF4 - "Network integration of departure estimates from medium and small sized airports"	-5	-57	-52
AF5 - SWIM Blue Profile and Flight Object	-187	0 [2]	187
Total	-396	-2428	-2032

Table 2- Impact of technical scope changes

After 8% discounting is applied, the NPV impact in 2030 of the technical changes is **-€ 809 million compared to the original CP1 Proposal CBA**.

[2] It is recalled that AF5 has no monetised benefits in the original CP1 Proposal CBA

A.2 Updated geographical scope

The CP1 CBA is based on the geographical scope of CP1 where the changes in comparison to the original CP1 Proposal CBA are as follows:

AF1 – Sub-AF "Arrival management extended to en-route airspace" is applicable to 18 airports instead of 24 airports in the original CBA

AF1 – Sub-AF "AMAN DMAN integration" is applicable to 8 airports instead of 10 airports in the original CBA

AF2 – Sub-AFs "Departure Management Synchronised with Pre-departure sequencing" and "Airport Safety Nets" are applicable to 18 airports instead of 24 airports in the original CBA

AF2 – In Sub-AF "Airport Operations Plan (AOP)":

- "Initial Airport Operations Plan (iAOP)" is applicable to 18 airports instead of 24 airports in the original CBA;
- "Airport Operations Plan (AOP)" is applicable to 28 airports instead of 39 airports in the original CBA.

AF4 – Sub-AF "Collaborative Network Operations Plan (NOP)" is applicable to 18 airports instead of 24 airports in the original CBA

AF4 – Sub-AF "AOP/NOP integration" is applicable to 28 airports instead of 39 airports in the original CBA

Table 3 below shows the impact of the proposed geographical changes on the original CP1 Proposal CBA, both in costs, benefits and net benefits (undiscounted values).

Geographical changes impact	**Cost (M€ undiscounted)**	**Benefit (M€ undiscounted)**	**Net benefit (undiscounted)**
AF1 – Extended AMAN (18 airports vs. 24 airports)	-30	-286	-256
AF1 – AMAN DMAN integration (8 airports vs. 10 airports)	-8	-29	-21
AF2 - Departure Management Synchronised with Pre-departure sequencing and Airport Safety Nets (18 airports vs. 24 airports)	-105	-202	-97
AF2 and AF4 – iAOP and Collaborative NOP (18 airports vs. 24 airports), AOP and AOP/NOP integration (28 airports vs. 39 airports)	-120	-734	-614
Total	-263	-1251	-988

Table 3 – Impact of geographical scope changes

After 8% discounting is applied, the NPV impact in 2030 of the geographical changes is **-€ 411 million compared to the original CP1 Proposal CBA**.

A.3 Updated ramp-up of investments and benefits

The CP1 CBA is based on the implementation dates of the CP1 per Sub-AF, as shown in Figure 5 below:

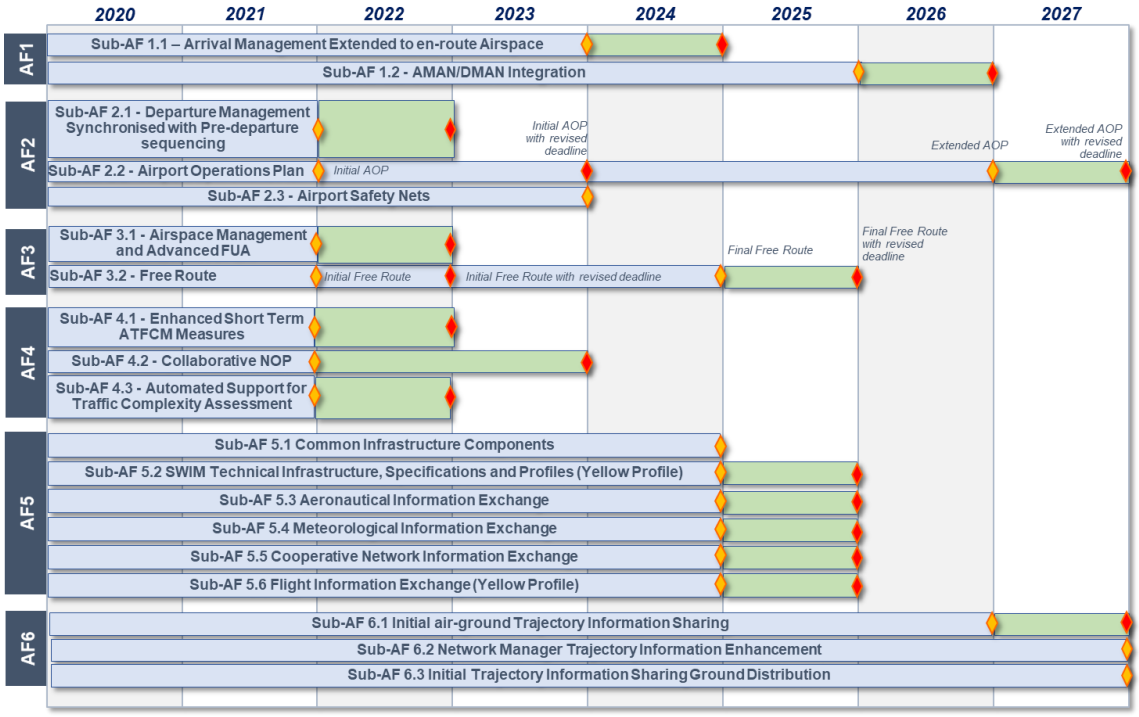

Figure 5 – Implementation dates per Sub-AF

Given the unpreceded situation created by the COVID pandemic, it is difficult to anticipate how the implementing partners will concretely adapt the rate of their CP1 investments to these new deadlines and in consequence, it is also difficult to anticipate the resulting ramp-up of benefits.

However, the following assumptions were considered realistic enough and they were used in the calculations to simulate the ramp-up of future costs and benefits:

- For the costs, the ramp-up was postponed towards the end of each implementing period, with a significantly decreased investment rate in 2020 and 2021 and an increased investment rate in the last two years of the implementing period, without changing the overall value of the investment;

- For the benefits, it was assumed that the impact of the postponed investments would translate into a status-quo of benefits in 2020 and 2021 (same level as in 2019) and a 2-year postponement of benefits for the years after 2021 (e.g. benefits of 2022 = benefits of 2020 in the original CBA, benefits of 2023 = benefits of 2021 etc.)[3].

[3] These assumptions are only used to isolate the impact of investments postponements on benefits, but the resulting benefits after postponement are then impacted by the lower volume of traffic (see section A.4).

Table 4 below shows the impact of the proposed ramp-up changes on the original CP1 Proposal CBA, both in costs, benefits and net benefits (undiscounted values).

Ramp-up changes impact	Cost (M€ undiscounted)	Benefit (M€ undiscounted)	Net benefit (undiscounted)
Extension of the implementation dates and postponements of benefits	0	-1418	-1418

Table 4 – Impact of the postponement of investments and benefits (undiscounted €)

It is preferable to show the impact also with the discounted values: whereas the postponement of investments has no impact in undiscounted €-value, because the overall costs remain the same over the CBA timeframe, it has an impact in discounted €-value because the flows of investments are postponed in time. In contrast, benefits are impacted both in undiscounted and discounted €-values.

Ramp-up changes impact	Cost (M€ discounted)	Benefit (M€ discounted)	Net benefit (discounted)
Extension of the implementation dates and postponements of benefits	-25	-648	-623

Table 5 – Impact of the postponement of investments and benefits (discounted €)

After 8% discounting is applied, the NPV impact in 2030 of the postponement of investments and benefits is **-€ 623 million compared to the original CP1 Proposal CBA**.

A.4 Updated traffic forecast

The CP1 CBA is based on a traffic scenario assuming a traffic drop by -70% in 2020 and a recovery in 5 years (return to the traffic of 2019 in 2025). Traffic over 2026-2030 then increases as over 2020-2024 in the original CP1 Proposal CBA (2.1% per year in average).

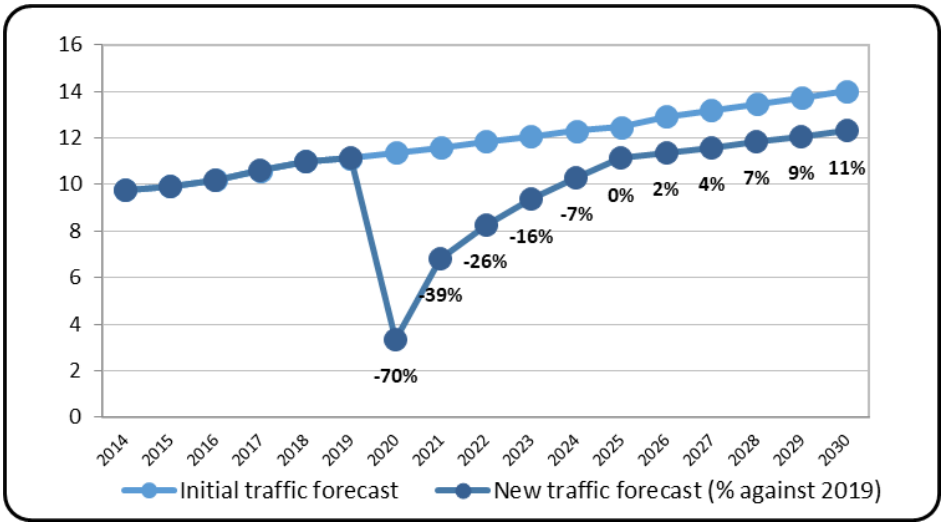

Figure 6 - Traffic in the 5-year recovery scenario

This considerable traffic decrease has a huge impact on the CP1 benefits, particularly over the period 2020-2024. The following assumptions were made to model the benefits deviations against the original CBA:

- In AF1 and AF2, savings decreases in % are equal to the traffic decrease of the year compared to the same year in the original forecast. This elasticity factor of 1 between savings and traffic translates the fact that for the KPIs considered in AF1/AF2, there is no impact of the lower traffic on individual flights performance;

- In AF3, Nautical Miles savings decreases in % are also equal to the traffic decrease of the year compared to the same year in the original forecast. Again, for this KPI it is considered that there is no impact of the lower traffic on individual flights performance;

- In AF3 and AF4, ATFM delay savings in % are apportioned to the traffic decrease of the year compared to year 2021 in the original forecast, because the maximum value in the original envelope of ATFM delay minutes is reached in 2021 (source: Network Manager simulations). In addition, according to exchanges with the Network Manager, an elasticity factor of 3 was used to reflect the impact of lower traffic on individual flight performance, in other words to translate the non-linear impact of lower traffic on capacity limitations;

- Cost efficiency savings were converted with an elasticity factor of 0.3 against the traffic decrease, to translate the fact that ANSPs may partly adapt their staffing under lower air traffic conditions;

- These elasticity factors were used for the years 2021 and beyond. For the year 2020, it was considered they were not significant enough, given the extremely low level of traffic: instead, a conservative assumption was made to consider that no benefits had to be counted for CP1 in 2020.

Table 6 below shows the traffic decrease impact on the benefits, per ATM functionality (undiscounted values).

Traffic change impact	**Benefits with original forecast (M€ undiscounted)**	**Benefits with updated forecast (M€ undiscounted)**	**Traffic impact on benefits (undiscounted)**
AF1	1169	941	-228
AF2	884	709	-175
AF3	12875	9821	-3055
AF4	5739	4268	-1470
Total	20667	15739	-4928

Table 6 – Impact of traffic decrease on benefits per ATM functionality

After 8% discounting is applied, the NPV impact in 2030 of the traffic decrease is **-€ 2437 million compared to the original CP1 Proposal CBA**.

Annex B **Additional CBA on RNP-based operations**

The Sub-AF "Enhanced Terminal Airspace using RNP-based operation", although present in the Pilot Common Project (PCP), is not in the CP1 to avoid duplication with the specific PBN regulation. This Annex provides the CBA of this Sub-AF as if it was to be under the CP1 regulation, transposable to the specific PBN regulation as far as the same definitions are met (technical scope, number of airports).

Description

Enhanced Terminal Airspace using RNP-Based Operations consists of the implementation of environmentally friendly procedures for arrival/departure and approach using PBN in high-density TMAs, as specified below:

• Required Navigation Performance Approach (RNP APCH) with vertical guidance, including Lateral Navigation (LNAV), Lateral Navigation/Vertical Navigation (LNAV/VNAV) and Localiser Performance with Vertical guidance (LPV) minima;

• RNP1 operations in high density TMAs (ground capabilities), including SIDs, STARs and transitions using the RNP 1 specification with the optional inclusion of the Radius to Fix (RF) path terminator to serve the inbound and outbound flows to and from the airports listed in PBN in high density TMAs geographical scope.

Costs

The costs of implementing the systems are shown in the Table below (extract from the original CP1 Proposal CBA).

Sub-AF 1.2 Family 1.2.1 - RNP APCH with vertical guidance	ANSPs	360 k€ per airport 24 k€ per runway end	24 airports 120 runway ends	11520 k€	Average of 5 runway ends per airport and 2 procedures per runway end
	Airports	150 k€ per airport	24 airports	3600 k€	In some countries airports are responsible for the implementation, therefore costs are present here
	Airspace Users	16 k€ per aircraft	7000 aircraft	112000 k€	Costs relate to aircraft equipage Pilot training was not considered
	Total Family 1.2.1 costs: 127120 k€				
Sub-AF 1.2 Family 1.2.3 - RNP1 operations in high density TMAs (ground capabilities)	ANSPs	1600 k€ per airport 19 k€ per procedure per runway end	24 airports 120 runway ends	40680 k€	Average of 5 runway ends per airport
	Airports	1400 k€ per airport	24 airports	33600 k€	In some countries airports are responsible for the implementation, therefore also cists here
	Airspace Users	27.35 k€ per runway end 67 k€ per consulting engagement	120 runway ends 1 consulting engagement	3349 k€	AUs support the procedure design
	Total Family 1.2.3 costs: 77629 k€				

It can be noted that pilot training costs are not taken into account as they are considered to be part of recurrent training.

When considering the limited geographical defined in the CP1 (18 airports instead of 24), the costs are limited to 123,340 k€ for family 1.2.1 and 58,242 k€ for family 1.2.3, for a total of €182 millions.

Costs are beared between 2014 and 2024 and only a slight postponement of the investment flows has been made from the original CP1 Proposal CBA, as a big part of the costs are already beared before 2020 and the deployment is well underway. The discounted costs amount to €123 million.

Benefits

RNP-Based Operations have a strong impact on the KPI "Arrival Sequencing and Metering Area (ASMA) time", which measures the delays in the approach phase and the arrival runway queuing time of the inbound traffic flow. The impact is both during non-congested conditions at arrival airports ("Unimpended ASMA time") and congested conditions ("Additional ASMA time").

The impact is estimated to allow for a reduction of ASMA time delays by 1.5% (family 1.2.1) and 3% (family 1.2.3), enabling very significant savings in minutes, tons of fuel and tons of CO2 as the engines are running (40 kg of fuel /minute in descent). More details of the calculations can be found in the Annex of the original CP1 Proposal CBA.

When considering the limited geographical scope defined in the CP1 (18 airports instead of 24) and the impact of the COVID on air traffic, benefits over 2014-2030 are estimated to reach a total of €1,464 million.

The benefits ramp-up follows the pace of implementation since 2014 and, during the COVID and post-COVID period, the assumptions described in section 3.4 of this report are used. The discounted benefits amount to €639 million.

NPV

The CBA shows an expected **€0.5B NPV in 2030,** with a total of €0.6B in benefits (€1.5B undiscounted) and €0.1B in costs (€0.2B undiscounted). Due to the high return on investment of this Sub-AF, payback is estimated to have occurred as early as 2018, 4 years after the start of synchronized deployment in 2014.