EUROPEAN
COMMISSION

Brussels, 23.2.2021
SWD(2021) 37 final

PART 13/19

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT REPORT

Accompanying the document

Proposal for a COUNCIL REGULATION establishing the Joint Undertakings under Horizon Europe

European Partnership for Integrated Air Traffic Management

{COM(2021) 87 final} - {SEC(2021) 100 final} - {SWD(2021) 38 final}

ANNEXES

TABLE OF CONTENTS

Annex 1 Procedural information

1. LEAD DG, DECIDE PLANNING REFERENCES

Co-Lead DG: Directorate-General for Mobility and Transport (MOVE); Directorate General Research and Innovation (RTD)

Decide number: PLAN/2019/5393

2. ORGANISATION AND TIMING

Institutionalised partnerships are foreseen in Articles 185 and 187 of the Treaty on the Functioning of the European Union (TFEU). The preliminary agreement on Horizon Europe contained a list of possible areas for institutionalised partnerships based on Article 185 and 187. For each of these areas the Commission considered 12 potential institutionalised partnerships. Their set up involves new EU legislation and the establishment of dedicated implementing structures and therefore an impact assessment for each of these initiatives.

Following political validation in June 2019, the impact assessment process started with the publication of inception impact assessments for each initiative in August 2019.

An inter-service steering group (ISSG) on research and innovation partnerships under Horizon Europe was set up in May 2019 and held 4 meetings before submission of the Staff Working Document to the Regulatory Scrutiny Board (7 May 2019, 19 June 2019, 5 December 2019, 20 January 2020). The ISSG consisted of representatives of the Secretariat-General, Directorate-General for Budget, Directorate-General for Research and Innovation Directorate-General for Communications Networks, Content and Technology, Directorate-General for Mobility and Transport, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, Directorate-General for Energy, Directorate-General for Environment, Directorate-General for Climate Action, and the Legal Service.

An online public stakeholder consultation was launched between September and November 2019, gathering 1635 replies for all 12 initiatives.

3. CONSULTATION OF THE RSB

Two upstream meetings with the Regulatory Scrutiny Board of were held on 10 July 2019 and 30 September 2019.

In accordance with the feedback received from the Regulatory Scrutiny Board on 12.06.2020 the Staff Working Document has been revised as presented in Figure 1. The impact assessment was endorsed by the Inter Service Steering Group on 20.01.2020.

4. EVIDENCE, SOURCES AND QUALITY

To ensure a high level of coherence and comparability of analysis for all candidate initiatives, an external study was procured to feed into the impact assessments of the 12 candidate

institutionalised partnerships [1] (Technopolis Group, 2020). It consisted of an horizontal analysis and individual thematic analyses for each of the initiatives under review.

For all initiatives, the evidence used includes desk research partly covering the main impacts and lessons learned from previous partnerships. A range of quantitative and qualitative data sources complement the evidence base, including evaluations; foresight studies; statistical analyses of Framework Programmes application and participation data and Community Innovation Survey data; analyses of science, technology and innovation indicators; reviews of academic literature; sectoral competitiveness studies and expert hearings. The analyses included a portfolio analysis, a stakeholder and social network analysis in order to profile the actors involved as well as their co-operation patterns, and an assessment of the partnerships' outputs (bibliometrics and patent analysis). A cost modelling exercise was performed in order to feed into the efficiency assessments of the partnership options. Public consultations (open and targeted) supported the comparative assessment of the policy options. For each initiative up to 50 relevant stakeholders were interviewed by the external contractor (policymakers, business including SMEs and business associations, research institutes and universities, and civil organisations, among others). In addition the analysis was informed by the results of the Open Public Consultation (Sep – Nov 2019), the consultation of the Member States through the Strategic Programme Committee and the online feedback received on the Inception Impact Assessments of the set of candidate Institutionalised European Partnerships.

A more detailed description of the methodology and evidence base used, completed by thematic specific methodologies, is provided in Annexes 4 and 6.

Figure 1 Modifications to the draft Staff Working Document based on comments received from the Regulatory Scrutiny Board

Comments from the Regulatory Scrutiny Board	**Actions taken for the Staff Working Document**
(1) The report does not sufficiently explain what the current joint undertaking has achieved. The report should better integrate evaluation findings on the current joint undertaking and explain how the new partnership would address them. The report should be clearer about the differences between the current joint undertaking and the future partnership.	Section 1.3, Box 3 was revised to provide additional information about the achievements of the current SESAR Joint Undertaking, as well as to provide information about how the new partnership will address them. Section 5.2, Tables 5 and 6 updated to include an outline of key differences between the current situation and different implementation methods.
(2) The report should clarify how the partnership will address air safety issues and to what extent this aspect will be considered in the development of innovative ATM solutions. The report should also elaborate on how far the partnership could enhance	Section 1 have been revised to clarify how safety has preserved its central role in the development of new technologies. The case for enhanced interoperability and reduced fragmentation was strengthened.

[1] Technopolis Group, 2020, forthcoming.

interoperability and reduce fragmentation.	
(3) The report should better describe the wider context in which the new partnership would operate. It should clarify the link with the European Air Traffic Management Master Plan and the Digital European Sky blueprint. It should be more realistic on the baseline developments of European aviation and on what the partnership can achieve.	Section 1 and 4 have been revised to elaborate the link between the Master Plan and the blueprint and to set them in the context of the Single European Sky policy objectives.
(4) The report should further elaborate on the partnership's expected role in bringing together relevant stakeholders and Member States around a common research and alignment agenda of European ATM systems.	Section 1 and 4 were updated to provide additional information about how all relevant stakeholders will be European ATM Master Plan and the Strategic Research and Innovation Agenda (SRIA) for integrated ATM and about the involvement of stakeholders in preparing these documents.
(5) The report could explain better the links between problems and objectives, and between objectives, targeted impacts and functionalities.	Section 4.3 was updated to better describe the impacts in relation to specific objectives and to describe the link between the intervention logic and the policy, as well as the planning tools, i.e. the European ATM Master Plan and the SRIA.
(6) The report should integrate the latest realistic expectations on the effects of the Covid-19 crisis on air traffic. It could consider these in the analysis of the problems, baseline and impacts.	Section 4, Economic and societal impacts were updated to reflect the current forecasts regarding the evolution of the aviation sector in the coming years. Overall, the impacts do not change significantly, as the initiative has a medium to long-term perspective. The Covid-19 crisis does not change the need for the European ATM system to become more resilient, scalable and sustainable.

Annex 2 Stakeholder Consultation

1. OVERVIEW FOR ALL CANDIDATE INSTITUTIONALISED EUROPEAN PARTNERSHIPS

1.1. Introduction

In line with the Better Regulation Guidelines,[2] the stakeholders were widely consulted as part of the impact assessment process of the 12 candidates for institutionalised partnerships, including national authorities, the EU research community, industry, EU institutions and bodies, and others. These inputs were collected through different channels:

- A feedback phase on the inception impact assessments of the candidate initiatives in August 2019, gathering 350 replies for all 12 initiatives on the "Have your say" web portal during a period of 3 weeks;
- A structured consultation of Member States performed by the EC services over 2019 through the Shadow Strategic Configuration of the Programme Committee of Horizon Europe (in line with the Article 4a of the Specific Programme of Horizon Europe). This resulted in 44 possible candidates for European Partnerships identified as part of the first draft Orientations Document towards the Strategic Plan for Horizon Europe (2021-2024), taking into account the areas for possible institutionalised partnerships defined in the Regulation.
- An online public stakeholder consultation administered by the EC, based on a structured questionnaire, open between September and November 2019, gathering 1635 replies for all 12 initiatives;
- A targeted consultation run by the external study contractors with a total of 608 interviews performed as part of the thematic studies by the different study teams between August 2019 and January 2020.

1.2. Horizontal results of the Open Public Consultation

The consultation was open to everyone via the EU Survey online system.[3] The survey contained two main parts to collect views on general issues related to European partnerships (in Part 1) and specific responses related to one or more of the 12 candidate initiatives (as selected by a participant). The survey was open from 11 September till 12 November 2019. The consultation was available in English, German and French and advertised widely through the European Commission's online channels as well as via various stakeholder organisations.

1.2.1. Profile of respondents

In total, 1635 respondents filled in the questionnaire of the open public consultation. Among them, 272 respondents (16.64%) were identified to have responded to the consultation as part of a campaign (coordinated responses). Based on the Better Regulation Guidelines, the groups of respondents where at least 10 respondents provided coordinated answers were labelled as *'campaigns',* segregated and analysed separately and from other responses. In total 11

[2] https://ec.europa.eu/info/files/better-regulation-guidelines-stakeholder-consultation_en
[3] https://ec.europa.eu/eusurvey/runner/ConsultationPartnershipsHorizonEurope

campaigns were identified, the largest of them includes 57 respondents[4]. In addition, 162 respondents in the consultation also display similarities in responses but in groups smaller than 10 respondents. Hence, these respondents were not labelled as campaigns and therefore were not excluded from the general analysis.

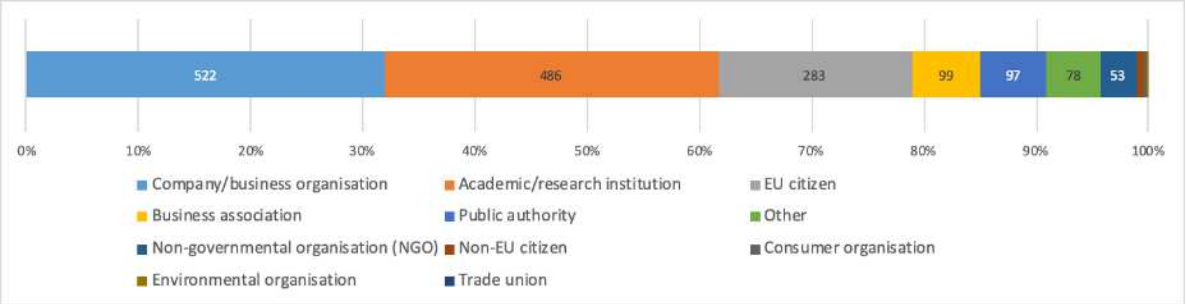
Table 1: Country of origin of respondents (N=1635)

Country	Number of respondents	Percentage of respondents
Germany	254	15.54%
Italy	221	13.52%
France	175	10.70%
Spain	173	10.58%
Belgium	140	8.56%
The Netherlands	86	5.26%
Austria; United Kingdom	61	3.73%
Finland	49	3.00%
Sweden	48	2.94%
Poland	45	2.75%
Portugal	32	1.96%
Switzerland	28	1.71%
Czechia	24	1.47%
Greece	23	1.41%
Norway; Romania	22	1.35%
Denmark	20	1.22%
Turkey	19	1.16%
Hungary	14	0.86%
Ireland	12	0.73%
United States	11	0.67%
Estonia; Slovakia; Slovenia	10	0.61%
Bulgaria; Latvia	9	0.55%
Bosnia and Herzegovina	7	0.43%
Lithuania	4	0.24%
Canada; Croatia; Israel	3	0.18%
China; Ghana; Iceland; Japan; Luxembourg; Morocco	2	0.12%
Bhutan; Botswana; Cyprus; Iran; Malta; Mexico; Moldova; Mongolia; Palestine; Russia; Serbia; South Africa; Tunisia; Ukraine; Uruguay	1	0.06%

As shown in Figure 2, the three biggest **categories of respondents** are representatives of companies and business organisations (522 respondents or 31.9%), academic and research institutions (486 respondents or 29.7%) and EU citizens (283 respondents or 17.3%). Among the group of respondents that are part of campaigns, most respondents are provided by the same groups of stakeholders, namely company and business organisations (121 respondents or 44.5%), academic and research institutions (54 respondents or 19.8%) and EU citizens (42 respondents or 15.4%).

[44] The candidate Institutionalised Partnership Clean Hydrogen has the highest number of campaigns, namely 5. A few initiatives, such as Innovative SMEs, Smart Networks and Systems, were not targeted by campaigns. Some campaign respondents decided to provide opinions about several partnerships.

Figure 2 Type of respondents (N=1635) - For all candidate initiatives



Among all consultation respondents, 1303 (79.69%) have been **involved in the on-going research and innovation framework programme** Horizon 2020 or the preceding Framework Programme 7, while 332 respondents (20.31%) were not. In the group of campaign respondents, the share of those who were involved in these programmes is higher (245 respondents out of 272 or 90.07%) than in the group of non-campaign respondents (1058 out of 1363 or 77.62%). When respondents that participated in the Horizon 2020 or in the preceding Framework Programme 7 were asked to indicate in which capacity they were involved in these programmes, the majority stated they were a beneficiary (1033 respondents) or applicant (852 respondents). The main stakeholder categories, e.g. companies/business organisation, academic/research institutions, etc., show a similar distribution across the capacities in which they 'have been involved in Horizon 2020 or in the Framework Programme 7' as the overall population of consultation respondents.

Among those who have been involved in Horizon 2020 or the preceding Framework Programme 7, 1035 respondents (79.43%) are/were **involved in a partnership**. The share of respondents from campaigns that are/were involved in a partnership is higher than for non-campaign respondents, 89.80% versus 77.03% respectively. The list of partnerships under Horizon 2020 or its predecessor Framework Programme 7 together with the numbers, percentages of participants is presented in Table 4**Error! Reference source not found.**, the table also show the key stakeholder categories for each partnership. Most consultation respondents participated in the following partnerships: Fuel Cells and Hydrogen 2 (FCH2) Joint Undertaking, Clean Sky 2 Joint Undertaking, European Metrology Programme for Innovation and Research (EMPIR) and in Bio-Based Industries Joint Undertaking. The comparison between the non-campaign and campaign groups of respondents shows that the overall distribution is quite similar. However, there are some differences. For the campaign group almost a half of respondents is/was involved in the Fuel Cells and Hydrogen 2 (FCH2) Joint Undertaking, a higher share of campaign respondents is/was participating in Clean Sky 2 Joint Undertaking and in Single European Sky Air Traffic Management Research (SESAR) Joint Undertaking.

When respondents were asked in which **role**(s) **they participate(d) in a partnership**(s), over 40% indicated that they act(ed) as partner/member/beneficiary in a partnership. The second largest group of respondents stated that they applied for funding under a partnership. The roles selected by non-campaign and campaign respondents are similar.

Table 4: Partnerships in which consultation respondents participated (N=1035)

Name of the partnership	Number and % of respondents from both groups (n=1035)	Number and % of respondents from a non-campaign group (n=815)	Academic/research institutions	Business associations	Company/business organisations	Company/business organisations	EU citizens	NGOs	Public authority
Fuel Cells and Hydrogen 2 (FCH2) Joint Undertaking	354 (33.33%)	247 (30.31%)	97	9	37	43	41	8	5
Clean Sky 2 Joint Undertaking	195 (18.84%)	145 (17.79%)	57	2	10	27	37	1	7
European Metrology Programme for Innovation and Research (EMPIR)	150 (14.49%)	124 (15.21%)	64	0	13	9	14	2	19
Bio-Based Industries Joint Undertaking	142 (13.72%)	122 (14.97%)	39	8	20	27	14	1	6
Shift2Rail Joint Undertaking	124 (11.98%)	101 (12.40%)	31	7	5	31	14	3	7
Electronic Components and Systems for European Leadership (ECSEL) Joint Undertaking	111 (10.72%)	88 (10.80%)	42	2	7	20	12	0	5
Single European Sky Air Traffic Management Research (SESAR) Joint Undertaking	66 (6.38%)	46 (5.64%)	10	3	3	20	3	2	3
5G (5G PPP)	53 (5.12%)	47 (5.77%)	20	1	6	14	5	0	1
Eurostrars-2 (supporting research-performing small and medium-sized enterprises)	44 (4.25%)	40 (4.91%)	17	0	6	1	7	0	6
Innovative Medicines Initiative 2 (IMI2) Joint Undertaking	37 (3.57%)	35 (4.29%)	18	2	3	3	2	4	3
Partnership for Research and Innovation in the Mediterranean Area (PRIMA)	28 (2.71%)	26 (3.19%)	15	0	3	1	2	0	2
European and Developing Countries Clinical Trials Partnership	25 (2.42%)	24 (2.94%)	12	0	1	2	3	3	2
Ambient Assisted Living (AAL 2)	22 (2.13%)	21 (2.58%)	11	2	1	1	3	0	3
European High-Performance Computing Joint Undertaking (EuroHPC)	22 (2.13%)	18 (2.21%)	6	0	2	3	5	0	2

For the remaining of the consultation respondents could provide their views on each/several of the candidate initiatives. The majority of respondents (31.4%) provided their views on the Clean Hydrogen candidate partnership. More than 45% of respondents from the campaigns selected this partnership. Around 15% provided their views for European Metrology, Clean Aviation and Circular Bio-based Europe. The share of respondents in the campaign group that chose to provide views on the Clean Aviation candidate partnership is of 20%. The smallest number of respondents provided opinions on the candidate initiative 'EU-Africa research partnership on health security to tackle infectious diseases – Global Health'.

Table 5: Candidate Institutionalised Partnerships for which consultation respondents provide responses (N=1613)

Name of the candidate Institutionalised European partnership	**Number and % of respondents from both groups (n=1613)**	**Number and % of respondents from a non-campaign group (n=1341)**
Clean Hydrogen	506 (31.37%)	382 (28.49%)
European Metrology	265 (16.43%)	225 (16.78%)
Clean Aviation	246 (15.25%)	191 (14.24%)
Circular bio-based Europe	242 (15%)	215 (16.03%)
Transforming Europe's rail system	184 (11.41%)	151 (11.26%)
Key Digital Technologies	182 (11.28%)	162 (12.08%)
Innovative SMEs	111 (6.88%)	110 (8.20%)
Innovative Health Initiative	110 (6.82%)	108 (8.05%)
Smart Networks and Services	109 (6.76%)	107 (7.98%)
Safe and Automated Road Transport	108 (6.70%)	102 (7.61%)
Integrated Air Traffic Management	93 (5.77%)	66 (4.92%)
EU-Africa research partnership on health security to tackle infectious diseases – Global Health	49 (3.04%)	47 (3.50%)

1.2.2. Characteristics of future candidate European Partnerships

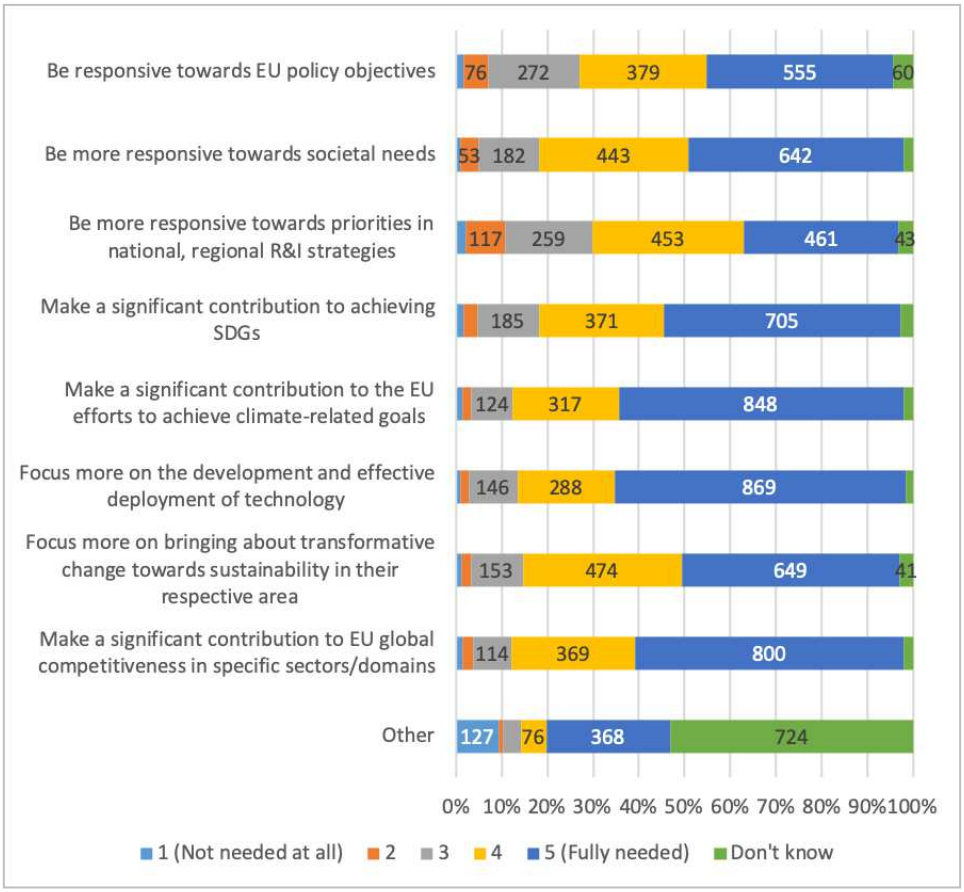
Respondents were asked to assess what areas, objectives, aspects need to be in the **focus of the future European Partnerships** under Horizon Europe and to what extent. According to Figure 6, a great number of respondents consider that a significant contribution by the future European Partnerships is 'fully needed' to achieve climate-related goals, to the development and effective deployment of technology and to EU global competitiveness in specific sectors/domains. Overall, respondents' views reflect that many aspects require attention of the Partnerships. The least attention should be paid to responding towards priorities of national, regional R&D strategies, including smart specialisation strategies, according to respondents.

Overall, only minor differences can be found between the main stakeholder categories. Academic/research institutions value the responsiveness towards EU policy objectives and focus on development and effective deployment of technology a little less than other respondents. Business associations, however, find that the future European Partnerships under Horizon Europe should focus a little bit more on the development and effective deployment of technology than other respondents. Furthermore, business associations, large companies as well as SMEs value the role of the future European Partnerships for significant contributions

to EU global competitiveness in specific sectors domains a little higher than other respondents. Finally, both NGOs and Public authorities put a little more emphasis on the role of the future European Partnerships for significant contributions to achieving the UN SDGs. The views of citizens (249, or 18.3%) do not reflect significant differences with other types of respondents. However, respondents that are/were directly involved in a partnership under Horizon 2020 or its predecessor Framework Programme 7 assign a higher importance of the future European Partnerships to be more responsive towards EU policy objectives and to make a significant contribution to achieving the UN's Sustainable Development Goals.

A qualitative analysis of the "other" answers highlights the importance of collaboration and integration of relevant stakeholders to tackle main societal challenges and to contribute to policy goals against which fragmentation of funding and research efforts across Europe should be avoided. Additionally, several respondents suggested that faster development and testing of technologies, acceleration of industrial innovation projects, science transfer and market uptake are needed. Next to that, many respondents provided answers related to the hydrogen and the energy transition, which corresponds to the high number of respondents that provided answers to the candidate initiative on this topic.

Figure 6: To what extent do you think that the future European Partnerships under Horizon Europe need to (N=1363) (non-campaign replies) For all candidate initiatives



1.2.3. Main advantages and disadvantages of Institutionalised European Partnerships

An open question asked to outline the main advantages and disadvantages of participation in an Institutionalised European Partnership (as a partner) under Horizon Europe (1551 respondents). The advantages mentioned focus on the development of technology, overall

collaboration between industry and research institutions, and the long-term commitment. Disadvantages mentioned are mainly administrative burdens. An overview is provided below.

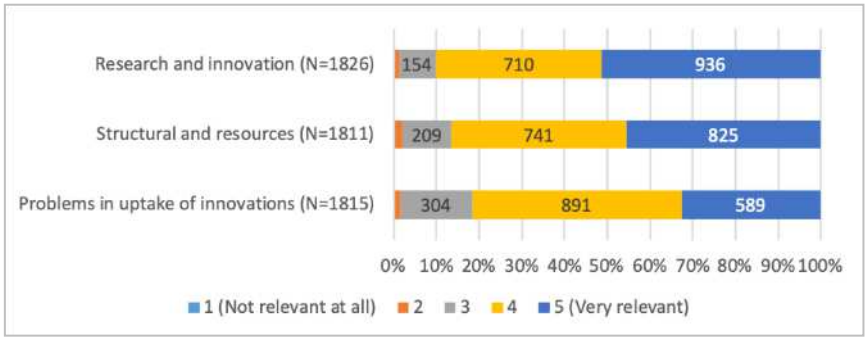
Advantages mentioned: Long term commitment, stability, and visibility in financial, legal, and strategic terms; Participation of wide range of relevant stakeholders in an ecosystem (large/small business, academics, researchers, experts, etc.); Complementarity with other (policy) initiatives at all levels EU, national, regional; Efficient and effective coordination and management; High leverage of (public) funds; Some innovative field require high levels of international coordination/standardisation (at EU/global level); Ability to scale up technology (in terms of TRL) through collaboration; Networking between members; Direct communication with EU and national authorities

Disadvantages mentioned: Slow processes; System complexity; Continuous openness to new players should be better supported as new participants often bring in new ideas/technologies that are important for innovation; Lower funding percentage compared to regular Horizon Europe projects; Cash contributions; Administrative burdens; Potential for IPR constraints.

1.2.4. Relevance of EU level to address problems in Partnerships' areas

Respondents were asked to rate the **relevance of research and innovation efforts at EU level efforts to address specific problems in the area of partnerships**. Research and innovation related problems were rated as most relevant across all candidate initiatives, followed by structural and resources problems and problems in the uptake of innovations. Overall, all three areas were deemed (very) relevant across the partnerships, as more than 80% of respondents found these challenges (very) relevant. Only minor differences were found between stakeholder categories. Research and innovation problems were found slightly more relevant by academic/research institutions, yet slight less relevant by large companies and SMEs. Structural and resource problems were indicated as slightly more relevant by NGOs, but slightly less by academic/research institutions. While both NGOs and public authorities find slightly more relevant to address problems in uptake of innovation than other respondents. The views of citizens are not differing significantly. Respondents that are/were directly involved in a current/preceding partnership find, however, the need to address problems related to the uptake of innovations slightly more relevant than other respondents.

Figure 9: To what extent do you think this is relevant for research and innovation efforts at EU level to address the following problems in relation to the candidate partnership in question? (non-campaign replies) Aggregation of responses of all candidate initiatives

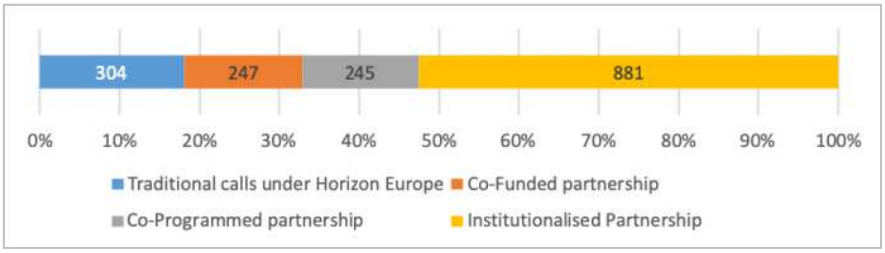


1.2.5. Horizon Europe mode of intervention to address problems

Respondents were asked to indicate how these challenges could be addressed through **Horizon Europe intervention**. Just over 50% of all respondents indicated that institutionalised partnerships were the best fitting intervention, with relatively strong differences between stakeholder categories. The use of Institutionalised Partnership was indicated more by business associations and large companies, but less by academic/research

institutions and SMEs. While academic/research institutions valued traditional calls more often, this was not the case for business associations, large companies and public authorities. Public authorities indicated a co-programmed intervention more often than other respondents. Citizens indicated slightly less often that institutionalised partnerships were the best fitting intervention. Respondents that are/were directly involved in a current/preceding partnership, selected the institutionalised partnership intervention in far higher numbers (nearly 70%).

Figure 10: In your view, how should the specific challenges described above be addressed through Horizon Europe intervention? (non-campaign replies) For all candidate initiatives



When asked to reflect on their answers, respondents that pointed to the need for using institutionalised partnership mentioned the long-term commitment of collaboration, a common and ambitious R&I strategy as well as the overall collaboration between industry and research institutions. Others shared positive experiences with other modes of interventions:

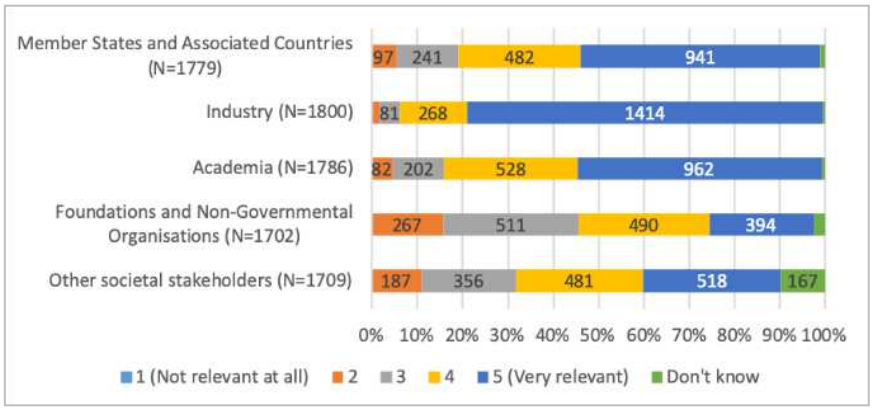
- Traditional calls, because of their flexibility and integration of a wide range of actors, as long as the evaluation panels do not deviate from the policy focus. This was mentioned by 94 participants, including companies (25), academics (26) and EU citizens (25).
- Co-funded partnership, as a mechanism to ensure that all participants take the effort seriously, while allowing business partnerships to develop. This approach was deemed suitable based on previous experiences with ERANETs. This was raised by 84 participants, 36 of them academic respondents, 18 companies and 16 EU citizens.
- Co-programmed partnerships, to tackle the need to promote and engage more intensively with the private sector. This was mentioned by 97 participants, most of them companies (34), followed by academics (22), business associations (15) and EU citizens (11).

1.2.6. Relevance of a set of elements and activities to ensure that the proposed European Partnership would meet its objectives

<u>Setting joint long-term agendas</u>

Respondents were asked how relevant it is for the proposed European Partnerships to meet their objectives to have a strong involvement of specific stakeholder groups in setting joint long-term agenda. All respondents see stakeholders from industry as the most relevant, followed by academia and governments. The involvement of foundations and NGOs as well as other societal stakeholders were, however, still found to be (very) relevant by more than 50% of the respondents. Most respondents indicated the stakeholder group they belong to themselves or that represent them as relevant to involve.

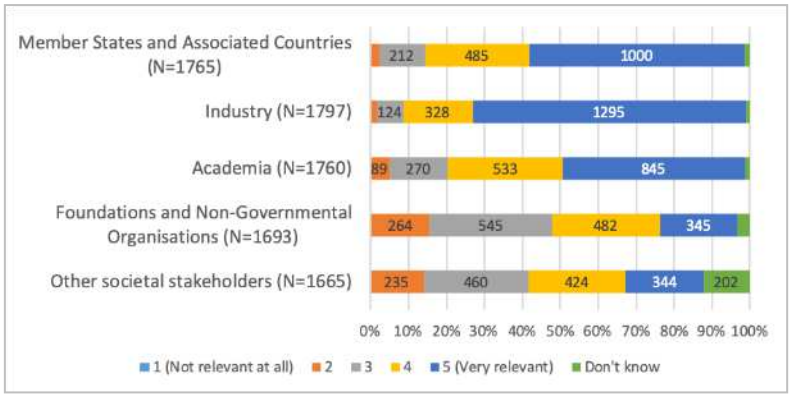
Figure 11: In your view, how relevant are the following elements and activities to ensure that the proposed European Partnership would meet its objectives - Setting joint long-term agenda with strong involvement of: (non-campaign replies) For all candidate initiatives



Pooling and leveraging resources through coordination, alignment and integration with stakeholders

Respondents were asked how relevant it is for the proposed European Partnership to meet its objectives to pool and leverage resources (financial, infrastructure, in-kind expertise, etc.) through coordination, alignment and integration with specific groups of stakeholders. Respondents see stakeholders from industry as the most relevant, followed by academia and governments (Member States and Associated Countries). The involvement of foundations and NGOs as well as other societal stakeholders are also still found to be (very) relevant for more than 50% of the respondents. Similarly as described for the question on setting joint long-term agendas, most stakeholder categories valued their own involvement higher than other respondents – although also here differences between stakeholder categories were minor.

Figure 12: In your view, how relevant are the following elements and activities to ensure that the proposed European Partnership would meet its objectives – Pooling and leveraging resources (financial, infrastructure, in-kind expertise, etc.) through coordination, alignment and integration with: (non-campaign replies) For all candidate initiatives

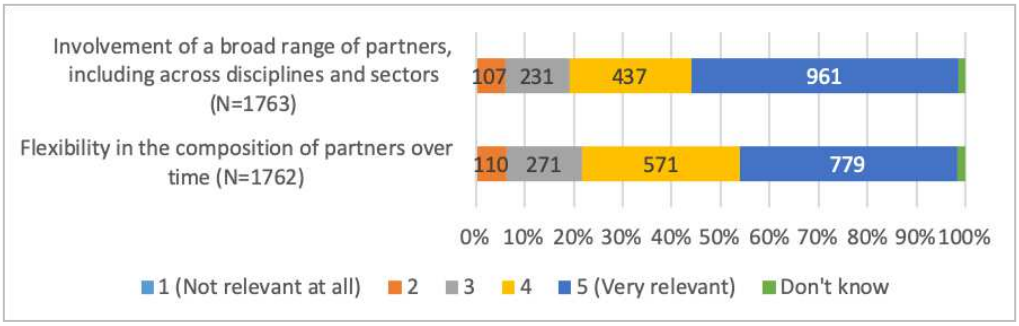


Composition of the partnerships

Regarding the composition of the partnership most respondents indicated that for the proposed European Partnership to meet its objectives the composition of partners needs to be flexible over time and that a broad range of partners, including across disciplines and sectors, should be involved (see Figure 13). When comparing stakeholder groups only minor

differences were found. Academic/research institutions and public authorities found the involvement of a broad range of partners and flexibility in the composition of partners over time slightly more relevant than other respondents, while large companies found both less relevant. SMEs mainly found the flexibility in the composition of partners over time less relevant than other respondents, while no significant differences were found regarding the involvement of a broad range of partners. Citizens provided a similar response to non-citizens. Respondents that are/were directly involved in a current/preceding partnership, when compared to respondents not involved in a current/preceding partnership, indicated a slightly lower relevance of the involvement of a broad range of partners and flexibility in the composition of partners over time.

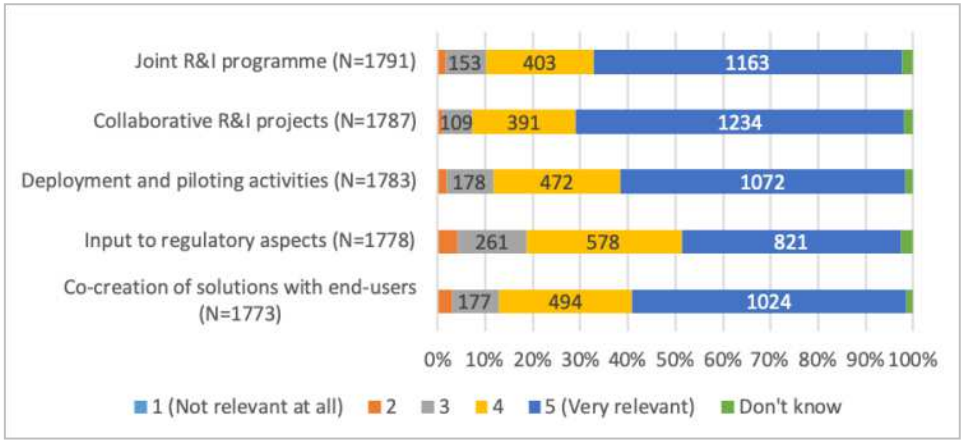
Figure 13: In your view, how relevant are the following elements and activities to ensure that the proposed European Partnership would meet its objectives – Partnership composition (non-campaign replies) Aggregation of responses of all candidate initiatives



Implementation of activities

Most respondents indicated that implementing activities like a joint R&I programme, collaborative R&I projects, deployment and piloting activities, providing input to regulatory aspects and the co-creation of solutions with end-users are all (very) relevant for the partnerships to be able to meet its objectives. Minor differences were found between the main stakeholder categories, the differences found were in line with their profile. As such, academic/research institutions found joint R&I programme & collaborative R&I projects slightly more relevant and deployment and piloting activities, input to regulatory aspects and co-creation with end-users slightly less relevant than other respondents. For SMEs an opposite pattern is shown. Large companies, however, also found collaborative R&I projects slightly more relevant than other respondents, as well as input to regulatory aspects. The views of citizens are similar to non-citizens. Respondents that are/were directly involved in a current/preceding partnership, when compared to respondents not involved in a current/preceding partnership, show a slightly higher relevance across all activities.

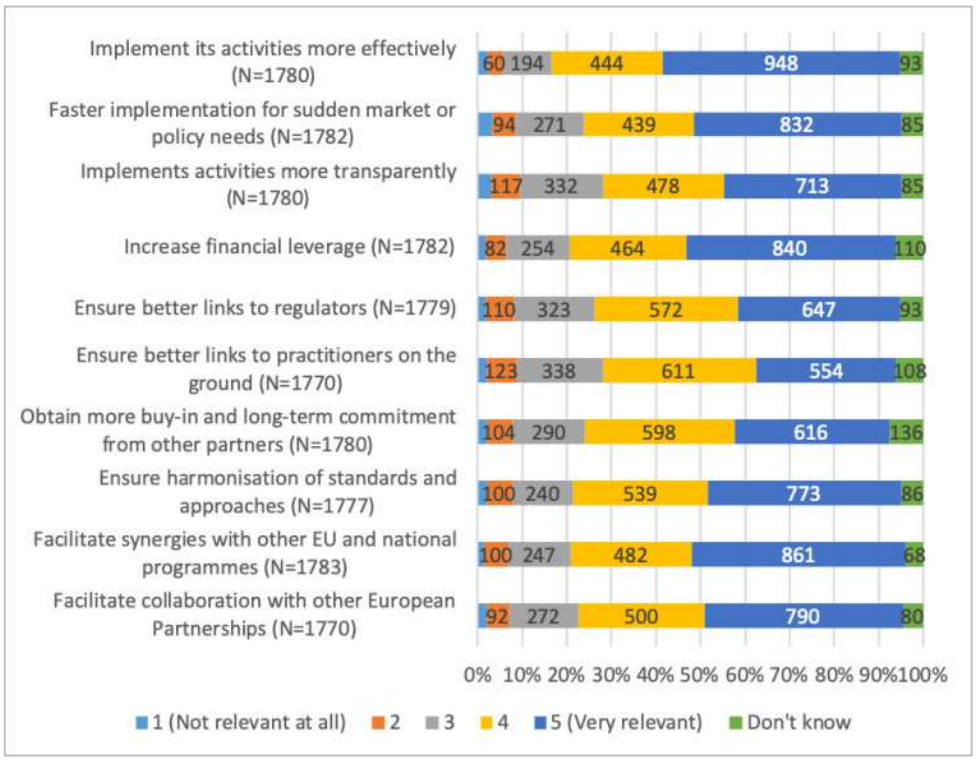
Figure 14: In your view, how relevant are the following elements and activities to ensure that the proposed European Partnership would meet its objectives – Implementing the following activities (non-campaign replies) For all candidate initiatives



1.2.7. Relevance of setting up a legal structure (funding body) for the candidate European Partnerships to achieve improvements

Respondents were asked to reflect on the relevance of setting up a legal structure (funding body) for achieving a set of improvements, as shown in the Figure below. In general, 70%-80% of respondents find a legal structure (very) relevant for these activities. It was found most relevant for implementing activities in a more effective way and least relevant for ensuring a better link to practitioners on the ground, however differences are small.

Figure 15: In your view, how relevant is to set up a specific legal structure (funding body) for the candidate European Partnership to achieve the following? (non-campaign replies) Aggregation of responses of all candidate initiatives



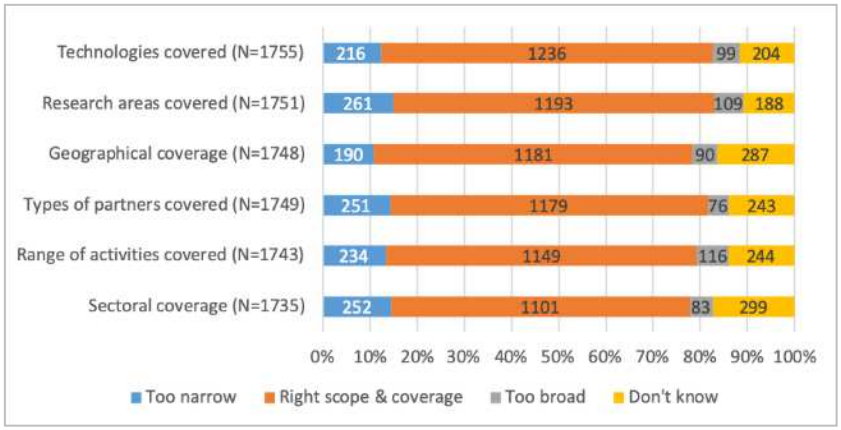
When comparing stakeholder categories there are only minor differences. Academic/research institutions indicated a slightly lower relevance for transparency, better links to regulators as well as obtaining the buy-in and long-term commitment of other partners. SMEs also

indicated a lower relevance regarding obtaining the buy-in and long-term commitment of other partners. Large companies showed a slightly higher relevance for implementing activities effectively, ensure better links to regulators, obtaining the buy-in and long-term commitment of other partners, synergies with other EU/MS programmes and collaboration with other EU partnerships. NGOs find it slightly more relevant to implement activities faster for sudden market or policy needs. Public authorities, however, find it slightly less relevant to facilitate collaboration with other European Partnerships than other respondents. The views of citizens show a slightly lower relevance for a legal structure in relation to implementing activities in an effective way. Respondents that are/were directly involved in a current/preceding partnership indicated a higher relevance across all elements presented.

1.2.8. Scope and coverage of the candidate European Partnerships based on their inception impact assessments

Consulted on the scope and coverage for the partnerships, based on their inception impact assessments, the large majority feels like the scope and coverage initially proposed in the inception impact assessments is correct. However, about 11% to 15% of the respondents indicated the scope and coverage to be too narrow. About 11%-17% of respondents answered "Don't know". Overall, differences between the main stakeholder categories were found to be minor. Academic/research institutions indicated slightly more often that the research area was "too narrow" then other respondents. SMEs on the other hand indicated slightly more often that the research area and the geographical coverage were "too broad". NGOs and public authorities, however, found the geographical coverage slightly more often "too narrow". Large companies found the range of activities slightly more often "too broad" and the sectoral focus slightly more often "too narrow" when compared to other respondents. The views of citizens are the same as for other respondents. Respondents that are/were directly involved in a current/preceding partnership more often indicated that the candidate institutionalised European Partnership have the "right scope & coverage".

Figure 16: What is your view on the scope and coverage proposed for this candidate institutionalised European Partnership, based on its inception impact assessment? (non-campaign replies) Aggregation of responses of all candidate initiatives



1.2.9. Scope for rationalisation and alignment of candidate European Partnerships with other initiatives

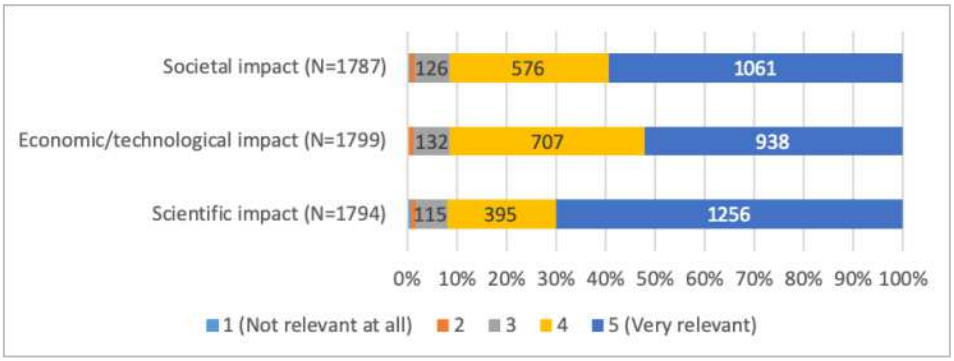
When asked whether it would be possible to rationalise a specific candidate European Institutionalised Partnership and its activities, and/or to better link with other comparable

initiatives, nearly two thirds of respondents answered "Yes" (1000, or 62%), while over one third answered "No" (609, or 39%). Nearly no differences were found between stakeholder categories, only large companies and SMEs indicated slightly more often "Yes" in comparison to other respondents. The views of citizens are the same as for other respondents. Respondents that are/were directly involved in a current/preceding partnership, indicated "No" more often, the balance is about 50/50 between "Yes" and "No" for this group.

1.2.10. Relevance of European Partnerships to deliver targeted scientific, economic/technological and societal impacts

Finally, respondents were asked to rate the relevance of partnership specific impacts in three main areas: Societal; Economic/technological; and Scientific impacts. All three areas were deemed (very) relevant across the candidate partnerships. Scientific impact was indicated as the most relevant impact, more than 90% of respondents indicated that this as (very) relevant. Only minor difference between stakeholder groups were found. Academic/research institutions found scientific impacts slightly more relevant, while large companies found economic and technological impacts slightly more relevant than other respondents. NGOs found societal impact slightly more relevant, while SMEs found this slightly less important. Citizens did not a significantly different view when compared to other respondents. Respondents that are/were directly involved in a current/preceding partnership find all impacts slightly more relevant than other respondents.

Figure 17: In your view, how relevant is it for the candidate European Institutionalised Partnership to deliver on the following impacts? (non-campaign replies) Aggregation of responses of all candidate initiatives



1.3. Stakeholder consultation results for this specific initiative

1.3.1. Feedback to the inception impact assessment on candidate initiatives for Institutionalised Partnerships

Following the publication of the inception impact assessment, a feedback phase of three weeks allowed any citizen to provide feedback on the proposed initiatives on the "Have your say" web portal. In total 350 feedbacks were collected for all initiatives.

For the initiative "Integrated Air Traffic Management" 28 individual feedbacks were collected, mainly from academic/research institutes, business associations, companies/business organisations and public authorities

Among the elements mentioned were:

- Institutional partnership under Article 187 of the TFEU is the one that best suits ATM.
- Baseline scenario of open calls is not an alternative to increase efficiency and speed up development or implementation of the Single European Sky of which EU economy and travelling public are the beneficiaries.
- A partnership for ATM is required due to the fragmented and conservative industry that without coordination will lead to stand alone research projects and lack of research continuity that will not help address the challenging tasks of R&I and deployment.
- ATM has specific challenges that require research coordination, expertise and resources from the whole value chain including key actors. Solutions that are still under development and future challenges are best address by a dedicated institutional ATM partnership
- The momentum, context and success of the SESAR Joint Undertaking should be followed up. The participation stability, resilience and experience acquired in the last 10 years by SESAR's systematic approach are required in order to follow the learning curve that will allow to address the future challenges.
- ATM due to its nature requires to ensure participation from cross-industry stakeholders, effective coordination and efficient execution across the network in order to bring economies of scale amongst a unified vision such as the current European ATM Master Plan, Flightpath 2050 goals or Single European Sky framework. In order to ensure this, political consensus in required.
- A free market will not lead to investments due to them being prohibitively high at an early stage. A European partnership is needed to ensure that R&I investments add value for the public and support job opportunities, sustainable, safety and innovative initiatives. This will allow to have a functioning international air traffic management that is beneficial for a transport network and a guarantor for the economic development in Europe.
- The partnership should create a systematic approach to successfully address the challenges of digitalisation (including augmented and virtual reality), Artificial Intelligence, big data, block chain, cyber security, automation, optimisation, sustainability, maximum environmental efficiency, accommodation of new airspace users, accommodation of traffic in complex airspace and single-pilot operations.
- Take a holistic approach that includes an adapted regulatory framework, operational aspects and development and maturation of the critical enabling technologies. Standardisation, and implementation are crucial to develop an interoperable, scalable and harmonised EU ATM system that safe, efficient, sustainable, connected, airspace and air transport.

- ATM Modernisation is a global issue and the partnership should keep a global mindset pushing towards harmonisation without leaving behind the R&I European focus. It should encourage networking and cooperation to promote EU standards at a global level in order to implement solutions that can be leveraged in terms of global industry. Solutions should be in line with ICAO recommendations and EASA regulations, especially for drones.
- To ensure better transition through the R&I pipeline and acceleration of development processes. Exploratory research is essential to feed the innovation pipeline and must be reinforced whilst accepting uncertainty to allow innovation. Reduction in bureaucracy, administrative overhead, funding flexibility and making results fully available could allow a smoother transition from R&I to development.
- Better regulation is key to close the gap between validation and industrialisation. It will enable to have a synchronized, coordinated and harmonized deployment of technologies based on positive Cost Benefit Analysis. Launch pilot and demonstration projects will also promote this.
- All types (and size) of stakeholders should contribute to the partnership, ensuring leader roles and responsibilities as well as a robust institutional governance. It is crucial to include the industrial or suppliers, social partners representing "human in the loop", service providers or operational stakeholders such as airspace users (this should be reinforced) and regulators like EASA. To enable this it should facilitate openness to enable newcomers to join and covering the whole European network including non-EU associate members that play a significant role.
- Diverging interests from the industry and service providers should not influence the research and development priorities but it should be kept customer and result driven. The focus should be on operational performance benefits for the whole network and society (including passengers).
- An ATM partnership should learn from other industries and domains whilst keeping a strong communication with affected communities. An example is to cooperate closely with Clean Sky. It should also apply lessons learned from previous ATM partnerships such as the SESAR Joint Undertaking.
- Coordination and clarity in the policy, vision, strategy/planning objectives and roles is necessary. The partnership should be in line with the European ATM Master Plan and ensure its maintenance, including recommendations of Airspace Architecture Study, Wise Person Group and European Court of Auditors report on the Single European Sky.

1.3.2. Structured consultation of the Member States on European partnerships

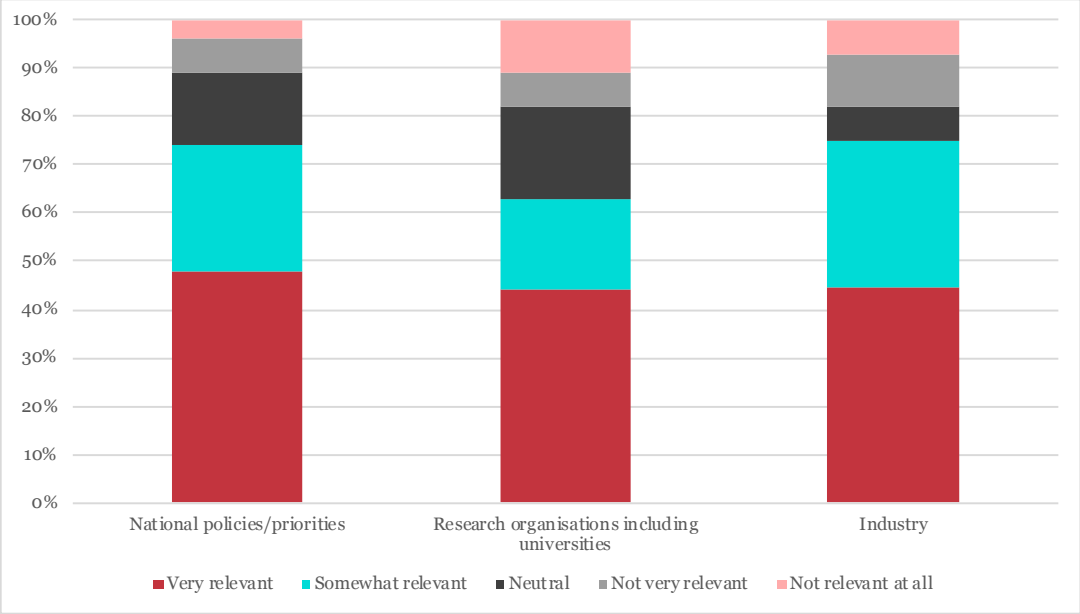
A structured consultation of Member States through the Shadow Strategic Configuration of the Programme Committee Horizon Europe in May/June 2019 provided early input into the preparatory work for the candidate initiatives.

For the initiative "Integrated Air Traffic Management" the following overall feedback was received from Member States. There is good agreement with the overall objectives, with some delegations proposing additional elements to strengthen the proposal – notably the research and innovation aspects. For smaller / EU-13 countries, better integration of aspects related to digitalisation, drones and small aircrafts into the EU ATM system would significantly increase the relevance of the partnership. Several countries highlight the need to elaborate on the involvement of Member States, the national services responsible for regulating and controlling air traffic. Comments also suggest broadening the partner composition with new categories of stakeholders.

Relevance and positioning in a national context

Overall the feedback from countries confirm the relevance of the proposed European Partnership for Integrated Air Traffic Management, with 74% considering it very or somewhat relevant for their national policies and priorities, and for their industry, and slightly less (63%) considering it relevant for their research organisations, including universities.

Figure 1: Relevance of the European Partnership for Integrated Air Traffic Management in the national context



On the question of existing national/regional R&I strategies, plans and/ or programmes in support of the proposed Partnership, 17 countries report to have relevant elements in place. National R&I strategies or plans (52 %, AT, DE, ES, FR, HR, IE, IT, LV, NL, RO, SE, SI, NO) and national economic, sectoral strategy and/or plan with a strong emphasis on research and/or innovation (52 %, AT, ES, FI, FR, HR, HU, IE, IT, LV, NL, RO, SE, SI, NO) were identified most frequently. Countries reported to a lesser extent to having regional R&I and/or smart specialisation strategies (37 %, DE, ES, FR, HR, IE, IT, SE, SI, UK, NO), dedicated R&I funding programmes or instruments (30 %, DE, ES, FR, HR, IE, IT, RO, ES). 22% of countries (CZ, ES, HR, IE, SE, NO) reported other policies/ programmes, such as upcoming sectoral agenda, a national research innovation agenda, or R&I programmes focusing more broadly on disruptive technologies.

Delegations identified a number of aspects that could be reinforced in the proposal for this partnership that would increase its relevance for national priorities.[5] Some delegations emphasised the need to more use of the results of the Airspace Architecture Study[6] and the report of the Wise Persons Group on the Future of the Single European Sky[7] that indicate a number of concrete recommendations aimed at optimising Europe's airspace organisation in such a way that can facilitate the uptake of new technologies, including research on the benefits, risks and effects of these proposals. Other individual comments make suggestions to further strengthen the following areas: reduction of departure/arrival delays, taxing and more

[5] Comments on scope and content have to be assessed in the context of the overall priority setting to ensure coherence.

[6] A proposal for the future architecture of the European airspace, SJU, 2019.

[7] Report of Wise Persons Group on the future of the Single European Sky, 2019.

efficient local traffic management, Human Performance, Safety Performance and Cybersecurity, short term challenges like airspace capacity, integrating drones, and ATM efficiency and aviation safety. In the additional comments some countries reiterated the relevance of the Partnership and overall agreement with the proposed objectives, whilst others express the need for a more integrated/ systemic approach (including by merging the proposed partnership with the one on Clean Aviation), a stronger focus on research activities and better involvement of Member States in the agenda setting.

Most countries (63%) are at this stage undecided concerning their interest to participate, as a partner. At this stage 8 country (CZ, DE, ES, FR, CR, IE, IT, MT) express interest to join as a partner, and 4 (CY, EE, HU, IS) countries express no interest to participate.

A small share of countries report as potential partners or contributors regional R&I and /or smart specialisation strategies (33%), governmental research organisations (33%), research infrastructures (30%), and existing or planned national R&I programmes (30% and 26% respectively). Additional comments highlight countries wish to further clarify national involvement and contributions in the proposed partnerships. While some respondents express readiness for aligning national funding initiatives and contributing to the Partnership, others prefer to limit national involvement to aligning policies and exploiting synergies (notably with Cohesion Funds), but without any further commitment of funding.

While most are undecided concerning their participation, almost all countries (93%) expressed interest in having access to results produced in the context of the partnership.

Feedback on objectives and impacts

Overall there is a good agreement (74%) on the use of a partnership approach in addressing challenges related to air traffic management. There is strong agreement (70%) that the partnership is more effective in achieving the objectives and delivering clear impacts for the EU and its citizens, but to lesser degree that (56%) it would contribute to improving the coherence and synergies within the EU R&I landscape.

Member States indicate strong agreement with the proposed objectives at short, medium and long term (82%) and the expected scientific, economic and societal impacts at European level (82%), with the remaining ones remaining neutral. 71% of countries consider the impacts very or somewhat relevant in the national context. 70% of countries found the envisaged duration of the proposed partnership adequate, while 19% of countries need more information to assess this. Individual additional comments in relation to objectives highlight the following:

The need to address more research and innovation agendas;

The need to encourage deployment and implementation of new solutions;

Support stronger links with other related partnership candidates, notably to promote connectivity across transport modes;

More focus on accelerating digitalisation, integrating drones and small aircrafts into the EU ATM system, and security aspects (in addition to safety).

Views on partners, contributions and implementation

Majority of countries (62%) agree with the proposed type and composition of partners, and 26 % of respondents need more information for informed decision. In additional comments, several countries emphasised the need to move away from the current set up of the SESAR JU towards a model that facilitates the participation of smaller players and SMEs (e.g. in relation to the use of drones). Several countries highlight the need to elaborate on the involvement of Member States, in particular the national services responsible for regulating and controlling

air traffic. Comments also suggest to broaden the partner composition with new categories of stakeholders, such as communication and data service providers or regions with smaller airports represented by private partners and research organizations. Individual feedback also suggests increasing the level of cooperation with the military air traffic and European Union Aviation Safety Agency (EASA) to speed up the process of technology, and to engage citizens and civil society (as changes to the ATM will have impacts on when people will travel).

At this stage, most countries (74%) would need more information on contributions and level of commitments expected from partners.

The proposed use of Article 187 implementation mode is supported by 41% of countries, while 48% would require additional information. Whilst several countries express the added value of having an institutionalised partnerships, many also stress the need to ensure high level of openness and transparency of the JU model (notably by ensuring open competitive calls, and removing entry barriers for the participation of smaller organisation). At the same time, there are also some delegations expressing support to implementing this priority with a co-programmed partnership, and some who suggest a merger with the Partnership on Clean Aviation.

1.4. Targeted consultation of stakeholders

Targeted consultations with businesses, research organisations and other partners on different aspects of the potential on integrated Air Traffic Management.

Details about the methodology and specific interview are presented in the annexes of the Technopolis study.

Table 1: Number of interviews per stakeholder category

Stakeholder category	Number	Share (%)
Academia	2	4%
Airports	3	6%
Airspace user community	5	10%
Air navigation service providers (ANSPs)	7	14%
ATM institutions	7	14%
Member States/ Single European Sky (SES) Committee	3	6%
R&D organisations	2	4%
SESAR Joint Undertaking executive	8	16%
SMEs	2	4%
Staff	1	2%
Suppliers	6	12%
The UAV community	4	8%
TOTAL	**50**	

Key results/messages from the targeted consultation

It is worth noting that despite the variety of stakeholders' types, the responses to the stakeholder consultation show there is a strong consensus on their views of ATM R&I, with only slight differences, mainly in the details.

Emerging challenges

The need to modernise the existing system though the application of emerging technologies such as digitalisation, automation and big data was a recurrent theme amongst the interviewed and throughout all the categories. Generally, and more specifically airspace users, see as the main challenge addressing environmental sustainability. In addition, various stakeholders from the airspace user community, ANSPs, ATM institutions and Member States categories, brought up the fact that these challenges are very well reflected in the Airspace Architecture Study.[8]

In addition, airspace user community believe there should be further research in relation to manned and unmanned vehicle interaction.

[8] SESAR Joint Undertaking (2019). A proposal for the future architecture of the European airspace. Available at https://www.sesarju.eu/node/3253.

EU positioning

Many stakeholders in the categories of ANSPs, ATM institutions and SESAR Joint Undertaking agree that European R&I ATM has currently a strong position worldwide, due to having built over the years a coordinated programme that has allowed them to have discussions at ICAO level and be an example for other parts of the world. Furthermore, some stakeholders, specially ATM institutions and the UAV community, stated the EU is losing its upfront position in some of the emerging markets since they develop quicker than the ATM solutions. In this area, the lack of coordinated R&I included in the ATM programme, would leave Europe behind other regions as China and USA which are investing heavily in the drones and UTM research and development.

Previous programmes

A typical comment, especially in the categories of ANSPs, Member States, staff and the SESAR Joint Undertaking executive, regarding the current R&I ATM partnership, SESAR Joint Undertaking (SJU), is that the past ten years allowed the programme to reach a mature situation creating a momentum in the industry, and the advantages of the partnership that has a common vision and will to implement it, can now be exhaustively exploited. SJU experience and results are the fruit of a continuous learning curve, which should be built upon, and lessons learned should be used for future improvements. Stakeholders across all the categories, stated that the SJU has achieved a balanced partnership, except for the need to involve EASA, standardisation bodies, and some new key players such as the UAV community.

There were comments from stakeholders that have been long time in the industry such as in ANSPs, ATM Institutions, suppliers and Member States that agree framework programmes previous to the SJU had a fragmented nature and were a proof that, in ATM, European network benefit is only achieved if there is coordination, and direction accomplished through the consensus across the whole industry. Furthermore, they agree we should not go back into those days given the challenges in front of the industry and national authorities.

Potential synergies between partnerships

A closer interaction with Clean Sky is required in order to avoid duplication, a greater coordination and synergies on the topics of automation and environment in aviation. However, almost every stakeholder interviewed in every category sees no benefit in merging. Merging the partnerships would not make sense due to their different *objectives, scope, timeline to deployment and KPIs*. In case of merger, we would have two subprogrammes under one partnership with funds distribution disputes and an increase in managerial complexity. This was further emphasised by the stakeholders that are involved in both partnerships.

With Shift to Rail the scope and the technologies to be researched are just too different. It would be a good idea to interact on the multimodality matters.

Directionality

Stakeholders across all the categories consider there is a need for EU funding on ATM research. They believe it provides directionality and coherence to an industry that cannot be developed nationally due to the cross-border nature of aviation operations which requires interoperability of national ATM systems. EU funding acts as a mechanism or framework to develop a common view on the future path and avoid singularities of nations or private companies.

Coordination

Action from EU, as stated by most stakeholders across all the categories, provides steering, avoids fragmentation and harmonises the whole value chain of ATM stakeholders. It ensures the benefits are accrued at European network level, thus providing latest technology to all stakeholders, in all geographical areas, not only for the most developed countries.

EU funding of R&I is required to attract investment and commitment from the industry. This is due to the need to outweigh the heavy administration, use of resources, and effort needed to participate in the EU funded R&I. Suppliers, R&D organisations and SMEs emphasised that they believe it is best to invest and commit to a future common path that benefits the whole European network. They need to see an eventual benefit that is worth the investment in order to overcome their individual interests of developing their own R&I and products in isolation, in the favour of a common architecture and goal. Industrial stakeholders such as suppliers and ANSPs stated this would happen if there was no EU funding.

European ATM Master Plan and Airspace Architecture Study as ATM R&I guidelines

Mentioned as a need by stakeholders in all the categories is the fact that a significant amount of future R&I is needed to complete the current research agenda and deliver the solutions under the latest edition of European ATM Master Plan.[9]

One of the objectives the potential partnership should have, to which all the stakeholders agree is the maintenance and update the European ATM Master Plan. The European ATM Master Plan sufficiently describes R&I needs in the long term, however the Airspace Architecture Study is a more detailed plan that prioritises the research needs in the shorter term. These need to be better linked with other strategic planning documents like EASA's European Plan for Aviation Safety,[10] Deployment Programme,[11] Network Strategic Plan.[12] The European ATM Master Plan should also be more performance driven than it is today.

However, some stakeholders in various categories where critical regarding the heaviness of the document which requires changes so that is more understandable to members of public. There is some criticism of the Master Plan's lack of a far-seeing and innovative vision which the AAS does take into account. Thus, as said by stakeholders from airports, airspace user community, ANSPs, ATM institution, SESAR Joint Undertaking executive and suppliers, the Master Plan should include the AAS findings.

Furthermore, the European ATM Master Plan updates need to involve in consultation all the stakeholders as it is done currently.

R&I fragmentation

Many stakeholders across all categories directly or indirectly referred that the main problems of ATM are fragmentation of R&I and, consequently, operations. In the event of having no partnership, or a partnership without a neutral and strong coordinating body, fragmentation would be caused by two main reasons: diverging industry interests and sovereignty. This would worsen the current lack of interoperability. Most stakeholders, especially in the industrial and institutional side of the value chain: airspace user community, ANSPs, ATM institutions, Member States, SESAR Joint Undertaking executives, staff, suppliers and the

---

9 SESAR Joint Undertaking (2019). European ATM Master Plan: Digitalising Europe's Aviation Infrastructure, Executive View, 2020 edition

10 EASA (2019). European Plan for Aviation Safety 2019-2023

11 SESAR Deployment Manager (2018). Deployment Programme edition 2018

12 EUROCONTROL (2015). Network Strategic Plan 2015-2019

UAV community, agree the interoperability is a key for a cross boundary industry such as aviation. Furthermore, they believe lack of interoperability is one of the key topics that needs further research in ATM since it leads to many issues. Thus, lack of coordination and direction in the ATM R&I would lead to R&I fragmentation, which has been highlighted as a problem that is a source of many other problems.

ATM system modernisation

Some stakeholders in the categories of service providers and suppliers mentioned that one of the needs is to develop a network centric system that is scalable, resilient and flexible to quickly adapt to external changes or new technologies. A system with these characteristics would solve the problem of airspace capacity which is strongly linked with other ATM inefficiencies.

As commented in the section on emerging challenges, stakeholders in all the categories make the point that R&I should focus on developing new technologies and concepts (e.g. automation or artificial intelligence) that aim at the overall system modernisation and digitalisation (ANSPs, suppliers and the UAV community emphasised the importance of digitalisation and automation).

R&I pace and its link with deployment

The pace of R&I is about right today. Acceleration, if needed, should not constrain quality nor safety. However, deployment does need to be accelerated through paying more attention to the implementation challenges (e.g. very large demonstrations and early demonstrators) and change management needed for deployment. This will allow to implement breakthrough technologies faster. Fundamental (exploratory), industrial and validation research activities are all needed, giving more importance to the validation exercises since it collects evidence for standards and regulations which facilitate deployment. There is a need to get closer to deployment and close gaps between the research and industrialisation phases. Eight of twelve stakeholder groups noted that closer cooperation and involvement of EASA and EUROCAE would support narrowing of the gap between the R&I and industrialisation phases. This issue was not commented on by academia, airports, R&D organisations and SMEs. Some stakeholders believe R&I should get a bit closer but to keep it separate from deployment while others believe it would be good to get very close or even into deployment using CEF funds. Airspace users agree that the end users such as ANSPs, airspace users and airports should be the ones driving R&I since they are more aware of the needs and it would avoid emergence of diverging interests among suppliers.

In addition, some stakeholders mentioned the need of prioritising R&I as it moves towards higher TRLs on its way to deployment.

Openness and transparency

Openness and transparency are important to be considered but there is a wide view that the current partnership, SESAR Joint Undertaking, addresses these values correctly. Fragmented data sharing needs to be tackled in order to enable the use of big data techniques. Communication of the research and solutions developed has to be kept as it is in the current partnership with expectations to keep improving it.

Comparative assessment of the policy options

Baseline

Throughout all the categories, stakeholders made the strong point that there is a need to build a partnership as a body that can steer the R&I coordinating key stakeholders continuously, to

achieve the common EU-wide long-term ATM vision. Thus, the baseline is not considered by them as a feasible option.

Co-programmed

A couple of stakeholders inside the categories of airports and the UAV community suggested that a co-programmed partnership could be a good idea in order to promote more competition between ideas and bring innovation whilst giving more opportunities and enhance the competitiveness of SMEs. However, a stakeholder from the SME category mentioned co-programmed could pick either the best or worst direction, and would likely be controlled by the big players. It was also seen as the preferred option by a stakeholder from the airspace user community since they believe it limits national influence. However, most of the stakeholders see it as a partnership type that lacks the cohesive strength required to move the R&I in the direction that has EU-wide benefits as a goal. Even if the European Commission may act as coordinating figure, it is not likely that the general Horizon Europe services would necessarily have core industry expertise to be able to coordinate R&I taking into account the long-term goals of deployment of results (as the services focus on R&I, not the uptake). The fact that it is non-legally binding creates a big risk in commitment from the key stakeholders leading to diverging interests.

Furthermore, many stakeholders, especially those at institutional level, agree that a co-programmed partnership would not have a necessary neutrality of coordination (given diverging interests). As co-programmed partnership would not have a status of a state institution, it would lose the ability to represent the EU ATM interests on international stage.

Institutional partnership under article 187

To progress the R&I in ATM and produce benefits for the entire society and network, there is a need to have legally binding commitments, strong leadership and steering because high efforts are required. In addition, the nature of ATM requires to have private members which have the industry experts but also public authorities such as EUROCONTROL and the European Commission in the centre to be the guiding light. Therefore, most of the stakeholders share the conviction that an institutionalised partnership (IP) under Article 187 with a similar set up to SESAR Joint Undertaking is the best option.

Furthermore, the current partnership achieved a unique vision for the future and the consensus between the stakeholders on the roadmap. The IP under Art 187 would push further the previous effort and make sure the last 10 years were not in vain.

Discarded options: co-founded and institutional partnership under article 185

Every interviewed stakeholder in all the categories, including stakeholders in the Member States category, made clear the point that in the ATM industry the relevant stakeholders are both in the public and in the private sector. The knowledgeable expertise can mainly be found in the private sector and the public sector is mainly composed by the Member States which do not get involved in R&I as such. This was highlighted when the Member States forwarded our interview invitation to their Single Sky Committee representatives (or advised to talk to their ANSP representative) as their role is in steering the R&I at a higher level, through providing opinion and approving the European ATM Master Plan.

Therefore, due to the low participation of public authorities in the R&I and the need to include the private industry, all the stakeholders (including those from Member States/SES) agreed that co-founded and institutional partnership under article 185 should be discarded.

The preferred option

Stakeholder involvement

One of the key added value of the current partnership is that it brings together the key stakeholders of the value chain to agree on the key European issues whilst keeping it manageable. This should be kept in the preferred option. However, some stakeholders across all the categories commented on the possibility of extending the partnership to the UAV community, business aviation, regulators, communication service providers and satellite communication service providers, and to have a stronger involvement of EASA (as a regulator) and standardisation bodies (e.g. EUROCAE). Airspace users, SMEs, staff and supplier stakeholder groups did not directly cite the inclusion of drones, but did endorse the European ATM Master Plan as a good strategic agenda (which includes these emerging challenges). There is a need to further involve airspace users and make R&I more market-driven for which EASA needs to be strongly involved. It would be interesting, if they exist, to involve experts in change management. Some stakeholders made the point of bringing innovative companies with cutting-edge solutions in the partnership, with the caveat to ensure they are stable.
Most of the airspace users stated that they do not have resources to participate directly in the research activities, but would like stronger involvement in the partnership similar to the current one. In the current one, they have a voice in the governance, but would like to expand that to the opportunity for higher involvement in the work.

Increase flexibility
There should be flexibility to enrol different stakeholders. Airspace users, the drone community, academia, SMEs and innovative companies should be enrolled in the partnership specially in topics where they can add significant value, but taking care to keep the governance manageable. In order to do so, some interviewees, especially in the ANSP and supplier category, suggested these could be involved as third party beneficiaries, through open calls or having different membership options with different membership fee and resource contribution. In having different membership options, it was mention that even if the contribution is different having members with different levels of say around the table adds complexity, so they should have the same say but not the same project engaging options.

Level of funding
The funding level of SESAR 2020 is the minimum needed. It must be borne in mind that if adding into the scope of the partnership, either by including new wide topics such as drones and digitalisation or by implementing Very Large Demonstration/ early adopters to get solutions closer to deployment, the funding should double. There is a threshold in the funding under which there is no leverage of the investment.

Winding down
Some suggestions from stakeholders, interviewed in the categories of ATM institutions and SESAR Joint Undertaking executive, on when to close down the institutional partnership include: once the European ATM Master Plan is achieved and the system only needs to be maintained in order make sure it does not degrade, once the process of digitalisation is sufficiently mature or once the industry is able to coordinate themselves following a strategic research and innovation agenda and overcoming individual interests.
This would slowly take place by reducing activity and switching from a strong coordinating body to a monitoring body.

1.5. Open Public Consultation

1.5.1. Characteristics of respondents

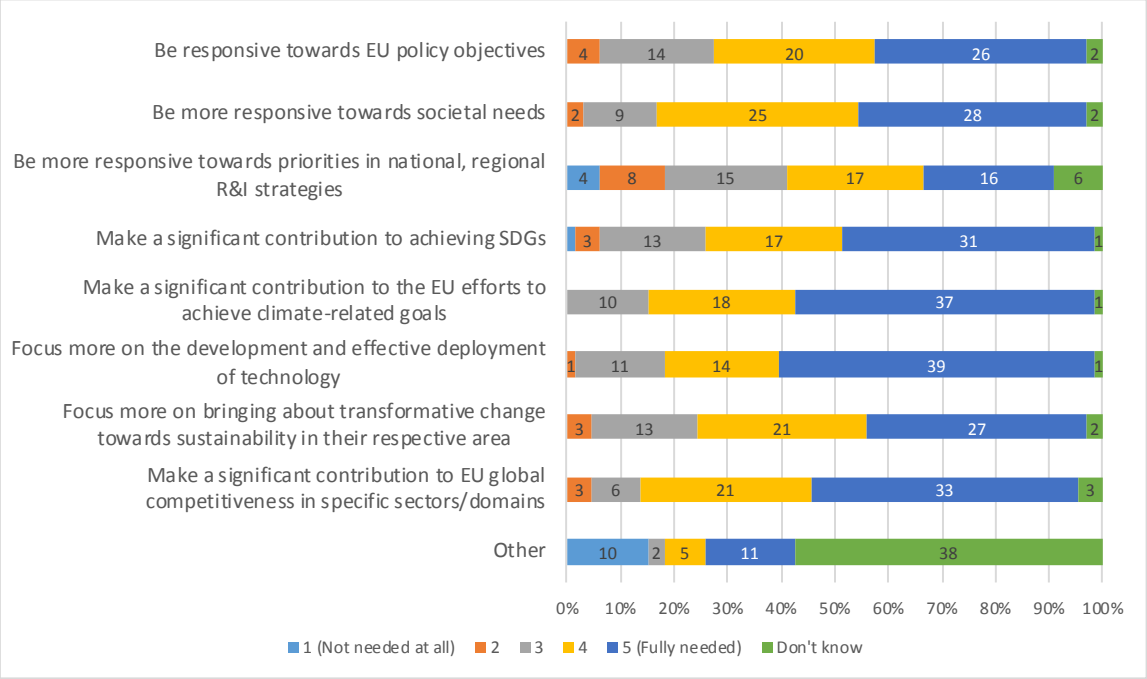
There are 66 respondents who have answered (part of) the consultation for the Integrated Air Traffic Management Partnership. Of these respondents, 10 (15.15%) were citizens. The largest group of respondents were businesses with 28 (42.42%) respondents. There were 8 respondents from academic and research institutions (12.12%) and 7 from both public authorities and business associations (10.61%). The remaining respondents were from NGO's (2, 3.03%), environmental organisations (1, 1.52%) and other (3, 4.55%). both with 123 respondents (32.20%). Over 3/4s of respondents, namely 51 (77.27%), have been involved in the on-going research and innovation framework programme, of which 38 respondents (74.51%) were directly involved in a partnership under Horizon 2020 or its predecessor Framework Programme 7.

1.5.2. Results on general questions

Relevance of efforts of the candidate European Partnership to address problems

At the beginning of the consultation, the respondents were asked on their views of the needs of the future European Partnerships under Horizon Europe. All 66 respondents answered this question. Overall, respondents indicated that many of these needs were very relevant. The needs where most respondents indicated this, was focusing more on the development and effective deployment of technology (39, 59.09%) and making a significant contribution to EU efforts to achieve climate related goals (37, 56.06%). Aside from 'other', the options where the least amount of respondents indicated that they were very relevant, being more responsive towards priorities in national and/or regional R&I strategies (16, 24.24%). In the case of this option, the responses differ. This is also the only option (aside from other), where multiple respondents have indicated that it is not needed at all.
No statistical differences were found between the views of citizens and other respondents.

Figure 1: Views of the respondents in regard to the needs of future European Partnerships under Horizon Europe (N=66)



The respondents also had the option to indicate other needs. The results show that respondents have indicated needs around extensive support linkage, sustainable stakeholder development and safety.
The respondents also had the option to indicate other needs. Some indicated that ensuring the safety levels are taken into account is important. A few called for implementation of strategic research agenda and the long-term vision. Another topic was the importance of bridging the gap between the research and actual deployment of researched innovation. To finish with the call for paying attention to regulation from early research stages.

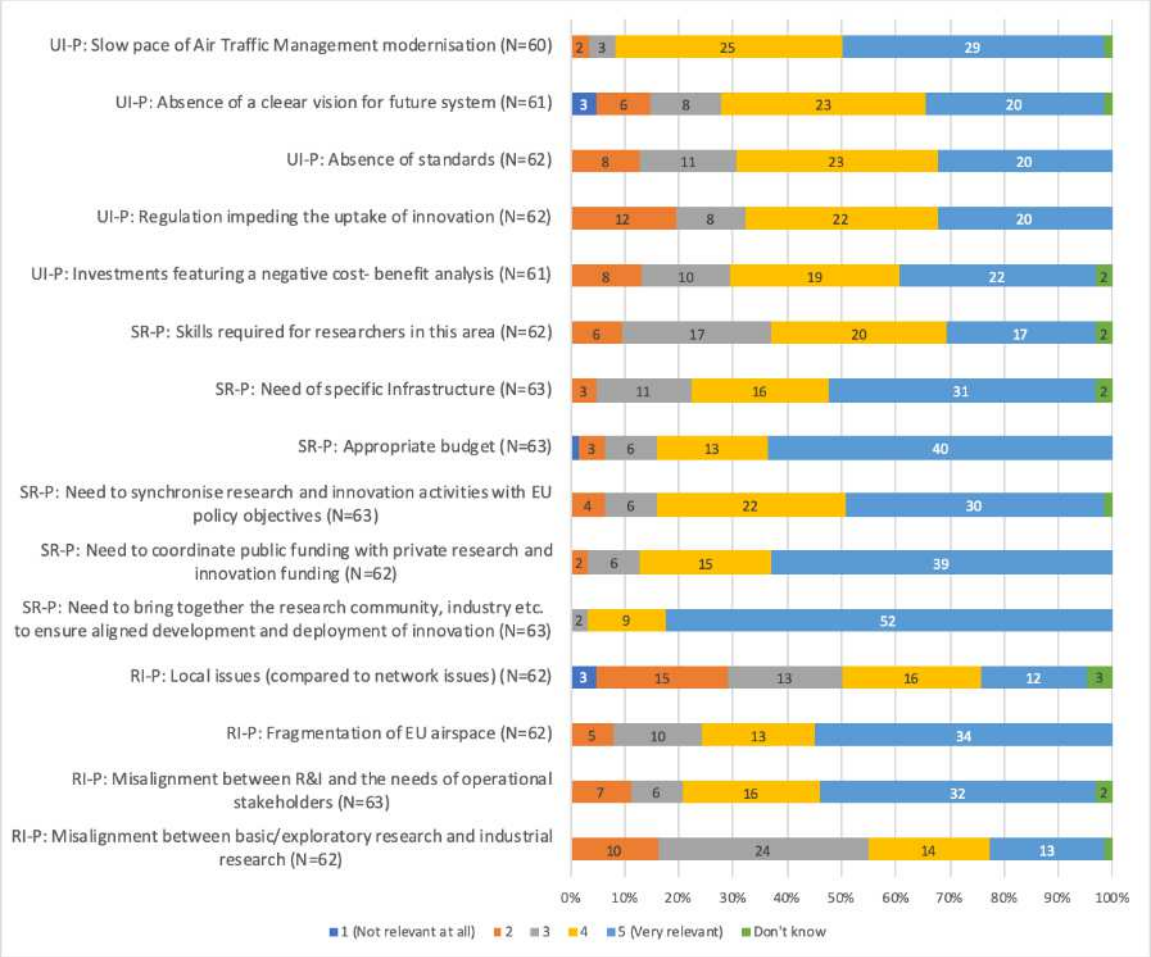
Main advantages and disadvantages of participation in the Institutionalised European Partnership

The respondents were asked what they perceived to be the main advantages and disadvantages of participation in an Institutionalised European Partnership (as a partner) under Horizon Europe. The keyword analysis used for open questions resulted in the graph shown in Figure 20. This analysis showed the respondents mentioned administrative burden, research and innovation programme framework and political agendas.

1.5.3. Results on the Integrated Air Traffic Management initiative

Relevance of research and innovation efforts at the EU level to address problems
In the consultation, respondents were asked to provide their view on the relevancy of research and innovation efforts at EU level to address the following problems in relation to air traffic management, specifically on three types of problems: problems in uptake of air traffic management innovations (UI-P), structural and resource problems (SR-P) and research and innovations problems (RI-P). In Figure 21, the responses to these answers are presented.

Figure 2: Views of respondents on relevance of research and innovation efforts at the EU level to address problems in relation to air traffic management



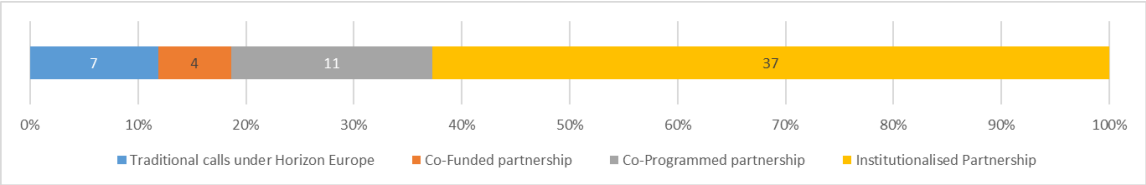
With regard to the uptake in innovation problems, 29 respondents have indicated that the research and innovation efforts at the EU level to address the issue of slow pace of Air Traffic Management modernisation is very relevant (48.33%), and further 25 stated it is relevant – 90% of all respondents, across all categories, find this as a relevant problem. Regarding other uptake of innovation problems, like absence of clear vision for future systems, regulation impeding the uptake of innovation and investments featuring negative cost-benefit analysis, about 60% of respondents stated that these are either very relevant or relevant. Furthermore, majority of individual stakeholders consider the absence of standards as one of the problems in uptake of air traffic management innovations (30% stated very relevant and 37% relevant problem). Majority of academic and half of business association stakeholders do not consider this problem as relevant.

There are large differences in the responses that the respondents have given with regard to structural and resource problems. 52 respondents have indicated that the need to bring together the Air Traffic Management research community is very relevant (82.54%). This problem has the most 'very relevant' answers of any of the problems that the respondents were asked to reflect on. About 85% of respondents stated that the questions of appropriate budget and the need to coordinate public funding with private research and innovation funding received are either very relevant or relevant. Another important finding is that 52 respondents (82%) stated that the need to synchronise research and innovation activities with EU policy objectives is very relevant or relevant in the ATM. While another of the structural

problems outlined: skills required for researchers in this area, only received 17 very relevant answers (27.42%). No specific differences in responses have been noted across different stakeholder categories.
Two of the research and innovation problems have received over 30 responses indicating that they are very relevant problems, namely the fragmentation of EU airspace and the misalignment between R&I and the needs of operational stakeholders. Almost 80% of stakeholders declared that fragmentation of EU airspace is relevant (13, or 21%) or very relevant (24, or 58%) problem to be addressed by research and innovation efforts at EU level. The two other problems only received a little over 10 of very relevant responses (12, 19.35% and 13, 20.97% respectively).
Slight statistical differences were found between the views of citizens and other respondents. Citizens found the "research and innovation problems related to more relevant and the structural and resource problems" less relevant. Respondents involved in a current or preceding partnership (Horizon 2020 or Framework Programme 7), found the uptake in innovation problems regarding regulation and the absence of a clear vision for future system less relevant.

Horizon Europe interventions to address problems
After providing their views on the relevance of problems, respondents were asked to indicate how these challenges could be addressed through Horizon Europe intervention. As shown in Figure 22, over 60% of respondents indicated that institutionalised partnerships were the best fitting intervention.
Citizens, compared to other respondents, indicated less often that institutionalised partnerships were the best fitting intervention.

Figure 3: Assessment of Horizon Europe intervention



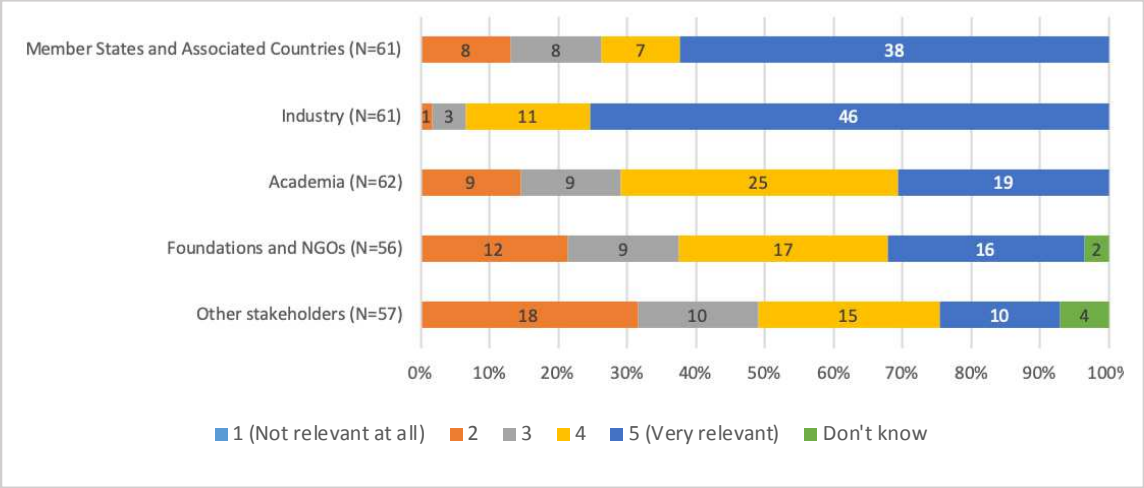
The respondents were asked to briefly explain their answers to the question above. People who stated that an institutionalised partnerships was the best fitting answer, mentioned that the current partnership mechanism worked well, and that in order to achieve common EU-level goals, this should be continued. The changes to the current settings mentioned by respondents relate to the need of more flexibility to be able to address changing goals in an agile manner. Further reasons included the statements that the entire ATM value chain is needed, where the respondents feel that the involvement of the value chain around the common strategic agenda in ATM is possible only through the Institutionalised Partnership. Further, the military cooperation on ATM issues should be formalised in the case of partnership continuation. Most of the respondents choosing this option mention the need to reduce as much as possible the administrative burden. Respondents choosing the Co-programmed partnership (N=11) mentioned this being the middle ground between the offered options when complexity of the agenda, flexibility of partnership and costs are taken into account. The respondents choosing the Traditional calls mentioned that those are very well established (i.e. evaluation, management), and more open to competition, reducing the number of funding instruments. Most of the respondents choosing the Traditional calls are from citizen category.

Relevance of involvement of actors in setting joint long-term agenda

Respondents were asked how relevant the involvement of actors is in setting a joint long-term agenda to ensure that the proposed European Partnership would meet its objectives (Figure 24). The highest amount of respondents indicated that the involvement of Industry is very relevant (46 respondents or 69.70%). A large part of respondents also indicated that the involvement of Member States and Associated Countries (38, 57.58%) is very relevant. Less respondents indicated that the involvement of academia, foundations and NGO's and other stakeholders was very relevant. However over half of the respondents have indicated given academia and foundations either a score of 4 or 5 (very relevant) on the relevance scale. For other stakeholders this percentage is 37.87%.

No statistical differences were found between the views of citizens and other respondents.

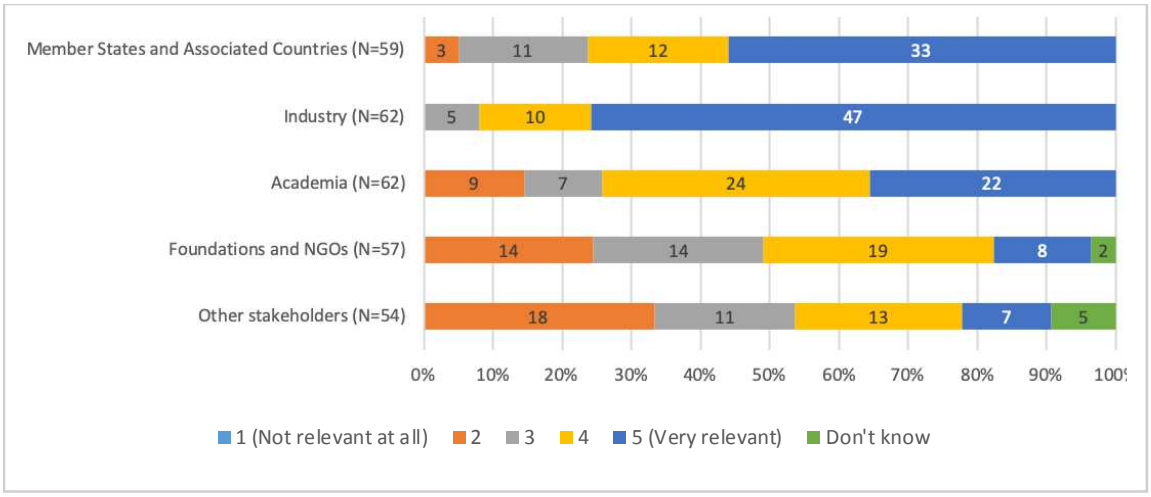
Figure 4: Views of respondents on relevance of actors in setting a joint long-term



Relevance of elements and activities in pooling and leveraging resources

With respect to the relevance of actors in pooling and leveraging resources, such as financial, infrastructure, in-kind expertise etc.), to meet Partnership objectives, the patterns are very similar. Most of the respondents (47, 75.81%) indicated that industry was very relevant. A large part of respondents also indicated that the involvement of Member States and Associated Countries (33, 55.93%) and Academia (22, 35.48%) is very relevant. Also, similar to the previous question, the Foundations and NGO's and other stakeholders were seen as less relevant and the opinions of the respondents seem divided on these types of stakeholders. No respondents indicated that any of the categories was Not relevant at all.
No statistical differences were found between the views of citizens and other respondents.

Figure 5: Views of respondents on relevance of actors for pooling and leveraging resources

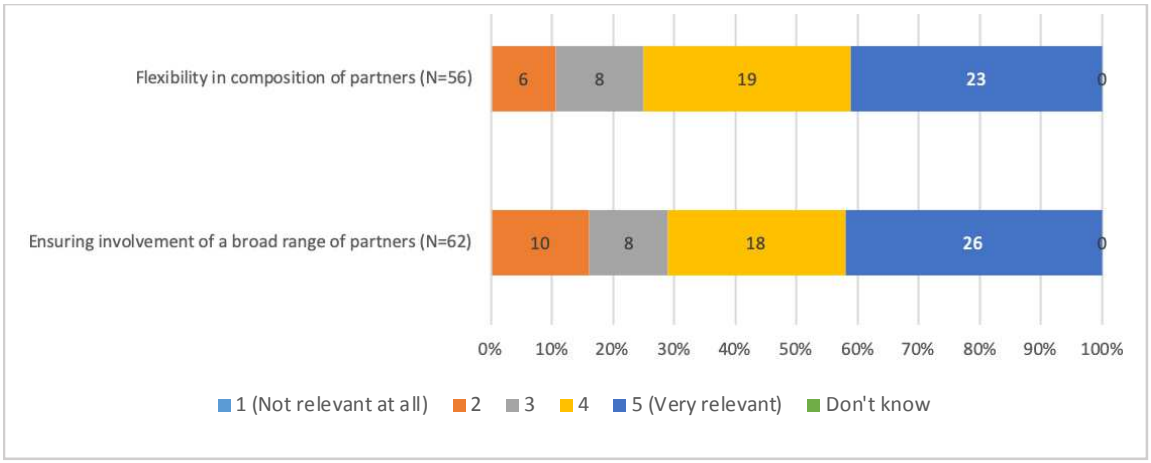


Relevance of the partnership composition

Respondents were asked about the relevance of Partnership composition, such as flexibility in the composition of partners over time and involvement of a broad range of partners (including across disciplines and sectors), to reach Partnership objectives. As it is visible in Figure 26, these questions were answered similarly. Ensuring involvement of a broad range of partners has slightly more 'very relevant' answers (26, 41.94%) than the flexibility in the composition of partners (23, 41.07%). Overall 75% of respondents have given flexibility either a score of 4 or 5 (very relevant) which is higher than the 70.97% who have given the broad range of partners a score of 4 or 5 (very relevant).

No statistical differences were found between the views of citizens and other respondents.

Figure 6: Views of respondents on relevance of partnership composition elements



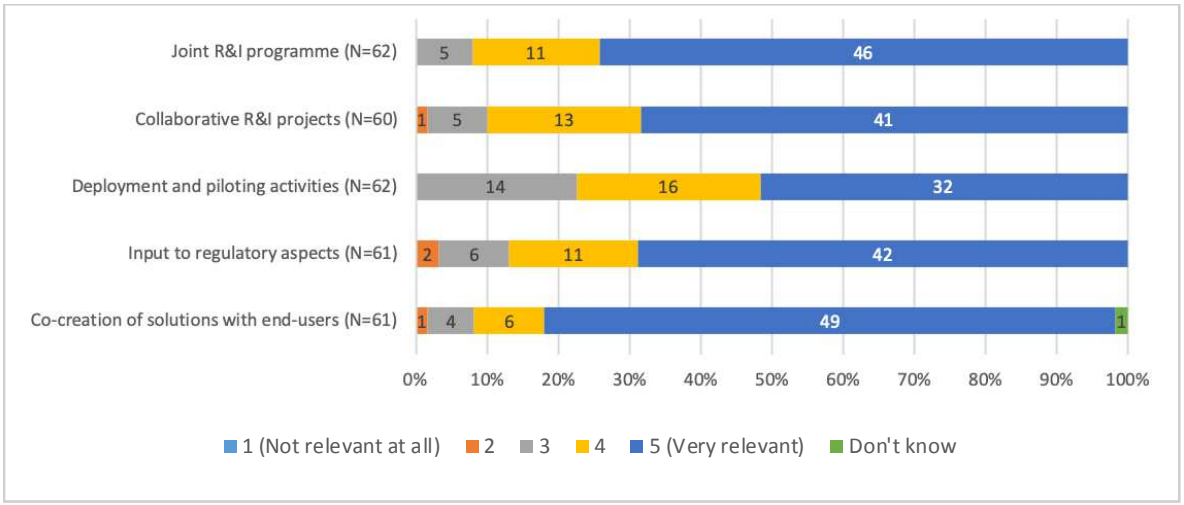
Relevance of implementation of activities

Respondents were asked to provide opinions on relevance of implementation of several activities for meeting objectives of the Integrated Air Traffic Management Partnership. Among activities were listed – a joint R&D programme, collaborative R&D projects, deployment and piloting activities, input to regulatory aspects and co-creation of solutions with end-users. Out of 61 respondents, 49 (80.33%) indicated that co-creation of solutions

with end users were very relevant to ensure that the Partnership would meet its objectives. For all the other options, the majority (over 50%) of all respondents have indicated that these are very relevant. Respondents have answered 5 (fully relevant) the least in regard to deployment and piloting activities, although still 51,62% of respondents have given this answer. See Figure 27.

No statistical differences were found between the views of citizens and other respondents.

Figure 7: Views of respondents on relevance of implementation of the following activities

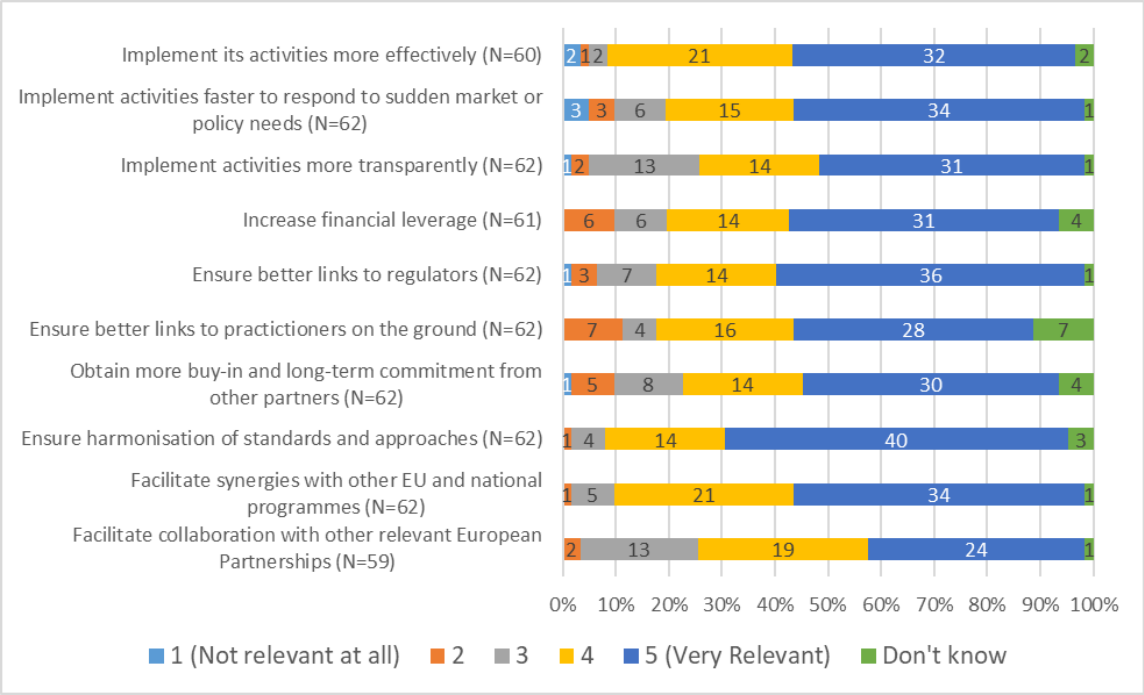


Relevance of a legal structure (funding body) to achieve specific objectives

Respondents were also asked to assess the relevance of a specific legal structure (funding body) for the candidate European Partnership to achieve several activities. According to Figure 28, respondents indicated that it was very relevant to set up a specific legal structure for the partnership to ensure harmonisation of standards and approaches (40, 64.52%), followed by the need to ensure better links with regulators (36, 58%).The implementation of activities more effectively is deemed relevant (21 respondents) or very relevant (32 respondents).The relevance of a specific legal structure to facilitate collaboration with other Partnerships is deemed the least relevant, as this question has received the most answers in category 3 of the 5 point relevance scale (20,97%) and the least 5 (very relevant) answers (24, 38.71%) of all the questions.

No statistical differences were found between the views of citizens and other respondents.

Figure 8: Views of respondents on relevance of a specific legal structure

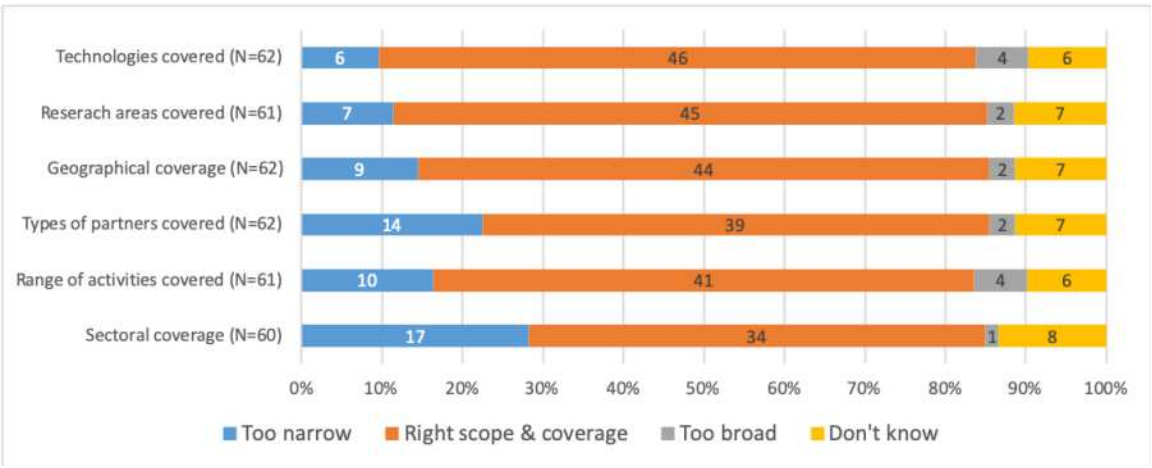


Scope and coverage of the candidate European Partnership

Respondents were asked to assess the scope and coverage of the Integrated Air Traffic Management, based on its inception impact assessment. The clear majority of the respondents have indicated that the partnership has the right scope and coverage across all areas. The respondents have been the most positive with regard to technologies covered, where 46 respondents (75.41%) have indicated the partnership has the right scope and coverage. Respondents found that the sectoral scope and coverage was right, the least often, while still over 56% of the respondents has indicated that it was the right scope. On average, the respondents who have indicated that the scope and coverage are too narrow, have done so as they feel that airspace users should be more involved in the new partnership than is the case today.

No statistical differences were found between the views of citizens and other respondents.

Figure 9: Views of respondents on the scope and coverage proposed for the Integrated Air Traffic Management Partnership



Aside from this multiple choice question, the respondents were also asked to provide any comment that they may have on the proposed scope and coverage for this candidate Institutionalised Partnership. Several responses (about 10 out of 34) mention the need for higher involvement of end-users, i.e. airspace users in the programme, taking into account their diversity (e.g. schedule, cargo, business airlines, general aviation). Several respondents just clarified that the assessment of scope and coverage was based on the current partnership, as they have not seen the proposal for the future partnership. Some stakeholders stated that the membership of the current partnership was not open to new entrants. The current partnership was mentioned as a good starting point for the future partnership. Furthermore, the need to reach sustainability goals was mentioned.

Alignment of the European Partnership with other initiatives

The respondents were also asked if they thought it would be possible to rationalise the candidate European Institutionalised Partnership and its activities, and/or to better link it with other comparable initiatives – 37 respondents (66.07%) have indicated that they think this is the case, 19 respondents (29%) have stated no (10 interviewees offered no responses).
No statistical differences were found between the views of citizens and other respondents.
The respondents who answered affirmative, where asked which other comparable initiatives it could be linked with. Thirteen respondents indicated that the Partnership should be linked to Clean Sky partnership. Several responses further stated that there should be no rationalisation, or that it was not clear what was meant by rationalisation. Key Digital Technologies and Smart Networks and Services initiatives were also mentioned as candidates for synchronisation and strong synergies.

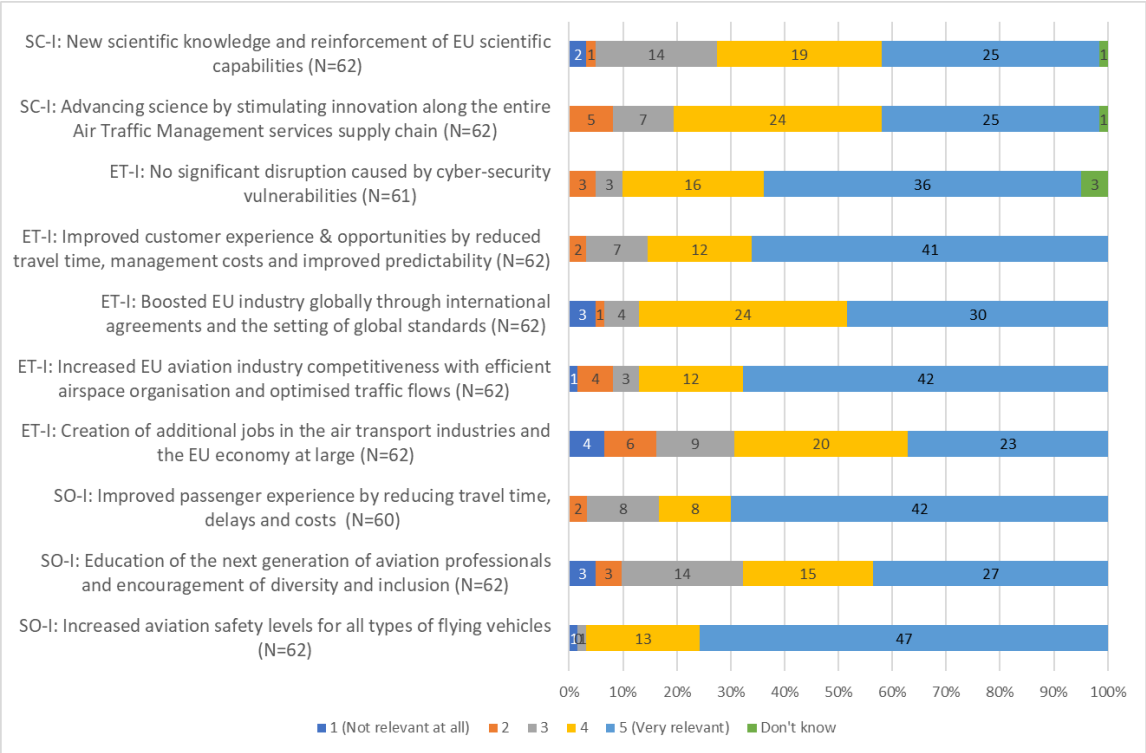
For the respondents who answered negatively on the previous question, respondents feel that there is almost no overlap on content of this initiative with other initiatives, but clear interfaces exist. According to them ATM R&I need very specific partners and expertise, and while it is already extremely complex, it must stay manageable.

Relevance of the Candidate European Partnership to deliver impacts

Respondents were asked to assess the relevance of the candidate European Institutionalised Partnership to deliver on listed impacts. According to Figure 33, the candidate Partnership is expected to be 'very relevant' for increasing aviation safety levels for all types of flying vehicles and for improving passenger experience by reducing travel time, delays and costs. In contrast, the impact on education of the next generation of aviation professionals and encouragement of diversity and inclusion is expected to be lower, as only 27 out of 62 respondents (43.55%) consider that the Partnership would be 'very relevant' for this, but further 39% of respondents find it relevant. Among listed economic/technological impacts, over 60% of respondents indicated that the candidate Partnership is relevant to achieve an impact on EU aviation industry competitiveness, on customer experience & opportunities by reduced travel time, management costs and improved predictability, and on the number of disruptions caused by cyber-security vulnerabilities. The pattern of responses about the scientific impacts are similar, however, a smaller number of respondents (about 40%) consider that the Partnership would have a very relevant effect on generation of new scientific knowledge and reinforcement of EU scientific capabilities, while further 30% of respondents find it relevant.

No statistical differences were found between the views of citizens and other respondents, except for the economic/technological impact related to the creation of additional jobs in the air transport industries and the EU economy at large which citizens found less relevant.

Figure 10: Views of respondents on the relevance of the candidate European Institutionalised Partnership to various impacts



Annex 3 Who is affected and how?

1. PRACTICAL IMPLICATIONS OF THE INITIATIVE

The proposed ATM R&I partnership aims to develop the technology needed to address the emerging challenges in the air traffic management sector, making the European airspace the most efficient and environmentally friendly sky to fly in the world. It will produce quantifiable contributions towards achieving two of the Commission's top priorities: the "European Green Deal" and a "Europe fit for the digital age" while supporting robust economic recovery of Europe and its hardly hit aviation sector after the COVID 19 crisis.

The following stakeholder groups are affected by the proposed initiative, as explained below:

- An aviation infrastructure that opens up digital opportunities for people and business and enhance Europe's position as a world leader in the digital economy will have a positive impact on private stakeholders across the whole aviation value chain. In particular airborne and ground system manufactures, air navigation and data service providers, airports and aircraft operators. This includes a number of European start-ups, SMEs and innovators that are challenging the status-quo in the field of drone technology.
- European universities and research-based organisations will play a pivotal role to increase the scientific knowledge base and contribute to accelerate the development of aviation innovations through collaboration with private enterprises.
- Citizens and the society will benefit from reduced emissions and noise as well as improved mobility by losing less time in airports and in the air, allowing European passengers to spend an additional 14.5 million hours currently lost with delays with their families or at work.
- Finally, in an increasingly globalized and interlinked world, there is pressure on policy makers and regulators to deliver rapid, functioning solutions to address climate change. The proposed Partnership will be instrumental in providing the relevant scientific and technology evidence in aviation to support those choice sand facilitating interactions between breakthrough innovators and early movers to help develop regulatory frameworks that allow the benefits of digital technologies to be fully realised.

2. SUMMARY OF COSTS AND BENEFITS

I. Overview of Benefits (total for all provisions) – Preferred Option		
Description	***Amount***	***Comments***
Direct benefits		
Improve the Ability to handle additional flights enabling	Direct benefits of ATM value chain	Full **scalability**: creates the capacity needed to handle traffic in the most efficient way

growth in air transport	Cumulative Benefit up to 2050: EUR 510bn	where and when capacity is needed. **Safety:** better trained humans using new technologies will increase safety beyond the current (already high) levels.
Enable new economic activity based on drones	Direct benefits of the U-space value chain Cumulative Benefit up to 2050: EUR 350bn	**U-space and urban air mobility:** A digitally native traffic management system will ensure the safe and secure integration of drones in the airspace especially in urban areas, taking into account new and existing air vehicles and autonomous operations. One of the most challenging use cases from U-space will be to enable urban air mobility, which is expected to advance autonomous technologies in a number of areas.
Boost EU industry globally through international agreements and the setting of global standards	Grow market share to 70% of the global market of approximately €4b per annum Cumulative Benefit up to 2050: EUR 84bn	**Leadership of Europe in the world**: Europe is currently the world leader in aerospace and aviation infrastructure technology. Unless this opportunity is taken it is likely that Europe will lose its leadership position and become more dependent on imports from third countries.
Reducing aviation noise and gas emissions	Reduction of 240 kg to 450 kg of CO_2 on average per flight due to improved flight efficiency Cumulative Benefit in terms of fuel savings up to 2050: EUR 12bn	**Zero environmental waste:** eliminates environmental inefficiencies caused by the aviation infrastructure, ensuring that it offers solutions that will fully exploit the potential offered by the next generation aircraft for cleaner and quieter flight. A digital European sky could save 28 million CO_2 tonnes per year, which is roughly equivalent to CO_2 produced by 3.2 million people or the population in the metropolitan area of a city like Madrid.
Indirect benefits		
Improve passenger experience by reducing travel time, delays and costs	Indirect benefits for passengers and EU citizens. Cumulative Benefit up to 2050: EUR 760bn	A digital and optimally managed European sky will ensure that passengers do not lose time at airports or in the air in Europe. In doing so, it could save yearly up to 14.5 million hours that passengers will be able to spend instead with their family or at work.

(1) Estimates are relative to the baseline for the preferred option as a whole (i.e. the impact of individual actions/obligations of the preferred option are aggregated together); (2) Please indicate which stakeholder group is the main recipient of the benefit in the comment section;(3) For reductions in regulatory costs, please describe details as to how the saving arises (e.g. reductions in compliance costs, administrative costs, regulatory charges, enforcement costs, etc.; see section 6 of the attached guidance).

(2) Estimates assume the successful roll-out into operations of the results of R&D as defined in the European ATM Master Plan which will be coordinated by the future partnership but will depend also on the evolution of the supporting regulatory framework which is outside of the direct control of the future partnership.

(3)

II. Overview of costs – Preferred option							
		Citizens/Consumers		Businesses		Administrations	
		One-off	Recurrent	One-off	Recurrent	One-off	Recurrent
Administrative Costs, including Personnel	Direct costs				EUR 6.1million (annual contribution for admin costs, jointly paid by the current 19 private partners + Eurocontrol)		EUR 3.3million (Union's annual contribution for administrative costs, including 39 FTEs)
	Indirect costs						
Action (b)	Direct costs						
	Indirect costs						

REFIT Cost savings table

Not applicable for the proposed ATM Partnership. The initiative will benefit from the existing organisation/structure (e.g. the Programme Office) already in place for the SESAR JU. There are no additional regulatory costs associated, and no specific simplification measures apply in this case.

Annex 4 Analytical Methods

The methodology for each impact assessment is based on the Commission Better Regulation Guidelines[13] to evaluate and compare options with regards to their **efficiency, effectiveness and coherence**. This is complemented by integrating the **conditions and selection criteria for European Partnerships**, as well as requirements for setting up Institutionalised Partnerships.[14]

1. OVERVIEW OF THE METHODOLOGIES EMPLOYED

In terms of **methods and evidence used**, the set of impact assessments for all candidate Institutionalised European Partnerships draw on an external study covering all initiatives in parallel to ensure a high level of coherence and comparability of analysis [15].

All impact assessment mobilised a mix of qualitative and quantitative data collection and analysis methods. These methods range from desk research and interviews to the analysis of the responses to the Open Consultation, stakeholder analysis and composition/portfolio analysis, bibliometrics/patent analysis and social network analysis, and a cost-effectiveness analysis.

The first step in the impact assessment studies consisted in the definition of the context and the problems that the candidate partnerships are expected to solve in the medium term or long run. The main data source in this respect was desk research. This includes grey and academic literature to identify the main challenges in the scientific and technologic fields and in the economic sectors relevant for the candidate partnerships, as well as the review of official documentations on the policy context for each initiative.

In the assessment of the problems to address, the lessons to be learned from past and ongoing partnerships were taken into account, especially from relevant midterm or ex-post evaluations.

The description of the context of the candidate institutionalised European Partnerships required a good understanding of the corresponding research and innovation systems and their outputs already measured. Data on past and ongoing Horizon 2020 projects, including the ones implemented through Partnerships, served as basis for descriptive statistic of the numbers of projects and their respective levels of funding, the type of organisations participating (e.g. universities, RTOs, large enterprises, SMEs, public administrations, NGOs, etc.) and how the funding was distributed across them. Special attention was given to analysing the participating countries (and groups of countries, such as EU, Associated Countries, EU13 or EU15) and industrial sectors, where relevant. The sectoral analysis required enriching the eCORDA data received from the European Commission services with sector information extracted from ORBIS, using the NACE codification up to level 2. These data enabled the identification of the main and, where possible, emerging actors in the relevant systems, i.e. the organisations, countries and sectors that would need to be involved (further) in a new initiative.

[13] European Commission (2017), Better Regulation Guidelines (SWD (2017) 350)

[14] A pivotal element of the present analysis is the so-called two-step 'necessity test' for European Partnerships, used to establish: step 1) the need for a partnership approach in the first place, followed by step 2) a justification for the form of Institutionalised Partnership. The necessity test is described in Annex 6. This impact assessment focuses on the second step of the test.

[15] Technopolis Group (2020), Impact Assessment Study for Institutionalised European Partnerships under Horizon Europe

A Social Network Analysis was performed by the contractors using the same data. It consisted in mapping the collaboration between the participants in the projects funded under the ongoing R&I partnerships. This analysis revealed which actors – broken down per type of stakeholders or per industrial sector – collaborate the most often together, and those that are therefore the most central to the relevant research and innovation systems.

The data provided finally served a bibliometric analysis run by the contractor aimed at measuring the outputs (patents and scientific publications) of the currently EU-funded research and innovation projects. A complementary analysis of the Scopus data enabled to determine the position and excellence of the European Union on the international scene, and identify who its main competitors are, and whether the European research and innovation is leading, following or lagging behind.

A cost modelling exercise was performed in order to feed into the efficiency assessments of the partnership options.

The conclusions drawn from the data analysis were confronted to the views of experts and stakeholders collected via three means:

- The comments to the inception impact assessments of the individual candidate institutionalised European Partnerships;
- The open public consultation organised by the European Commission from September to November 2019;
- The interviews (up to 50) conducted by each impact assessment study team conducted between August 2019 and January 2020 (policymakers, business including SMEs and business associations, research institutes and universities, and civil organisations, among others).

The views of stakeholders (and experts) were particularly important for determining the basic functionalities (see further below) that the future partnerships need to demonstrate to achieve their objectives as well as their most anticipated scientific, economic and technological, and societal impacts. The interviews allowed more flexibility to ask the respondents to reflect about the different types of European Partnerships. Furthermore, as a method for targeted consultation, it was used to get insights from the actors that both the Study Teams and the European Commission were deemed the most relevant. For the comparative assessment of impacts, the external contractors confronted the outcomes of the different stakeholder consultation exercises to each other with a view of increasing the validity of their conclusions, in line with the principles of triangulation.

Annex 2 includes also the main outcomes of the stakeholder consultation exercises.

2. METHOD FOR ASSESSING THE EFFECTIVENESS, EFFICIENCY AND COHERENCE OF EACH OPTION - THE USE OF FUNCTIONALITIES

Given the focus of the impact assessment on comparing different forms of implementation, the Better Regulation framework has been adapted to introduce "**key functionalities needed**" – so as to link the intended objectives of the candidate European Partnerships and what would be crucial to achieve them *in terms of implementation*. The identification of "key functionalities needed" for each initiative as an additional step in the impact assessment is

based on the distinguishing factors between the different options (see Section 2.2.1 in the main body of the impact assessment). In practical terms, each option is assessed on the basis of the degree to which it would allow for the key needed functionalities to be covered, as regards e.g. the type and composition of actors that can be involved ('openness'), the range of activities that can be performed (including additionality and level of integration), the level of directionality and integration of R&I strategies; the possibilities offered for coherence and synergies with other components of Horizon Europe, including other Partnerships (internal coherence), and the coherence with the wider policy environments, including with the relevant regulatory and standardisation framework (external coherence). This approach guides the identification of discarded options. It also allows for a structured comparison of the options as regards their effectiveness, efficiency and coherence, and also against a set of other key selection criteria for European Partnerships (openness, transparency, directionality)[16].

Figure 3 Overview of key functionalities of each form of implementation of European Partnerships

Baseline: Horizon Europe calls	**Option 1: Co-programmed**	**Option 2: Co-funded**	**Option 3.1: Institutionalised Article 185**	**Option 3.2: Institutionalised Article 187**
Type and composition of actors (including openness and roles)				
Partners: N.A., no common set of actors that engage in planning and implementation Priority setting: open to all, part of Horizon Europe Strategic planning Participation in R&I activities: fully open in line with standard Horizon Europe rules	Partners: Suitable for all types: private and/or public partners, foundations Priority setting: Driven by partners, open stakeholder consultation, MS in comitology Participation in R&I activities: fully open in line with standard Horizon Europe rules	Partners: core of national funding bodies or govern-mental research organisations Priority setting: Driven by partners, open stakeholder consultation Participation in R&I activities: limited, according to national rules of partner countries	Partners: National funding bodies or governmental research organisation Priority setting: Driven by partners, open stakeholder consultation Participation in R&I activities: fully open in line with standard Horizon Europe rules, but possible derogations	Partners: Suitable for all types: private and/or public partners, foundations Priority setting: Driven by partners, open stakeholder consultation Participation in R&I activities: fully open in line with standard Horizon Europe rules, but possible derogations
Type and range of activities (including additionality and level of integration)				
Activities: Horizon Europe standards that allow broad range of individual actions Additionality: no additional activities and investments outside the funded projects Limitations: No systemic approach beyond individual actions	Activities: Horizon Europe standard actions that allow broad range of individual actions, support to market, regulatory or policy/ societal uptake Additionality: Activities/investments of partners, National funding Limitations: Limited systemic approach beyond individual actions.	Activities: Broad, according to rules/programmes of participating States, State-aid rules, support to regulatory or policy/ societal uptake Additionality: National funding Limitations: Scale and scope depend on the participating programmes, often smaller in scale	Activities: Horizon Europe standards that allow broad range of individual actions, support to regulatory or policy/societal uptake, possibility to systemic approach Additionality: National funding	Activities: Horizon Europe standards that allow broad range of individual actions, support to regulatory or policy/societal uptake, possibility to systemic approach (portfolios of projects, scaling up of results, synergies with other funds. Additionality: Activities/investments of partners/ national

[16] The criterion on the ex-ante demonstration of partners' long term commitment depends on a series of factors that are unknown at this stage, and thus fall outside the scope of the analysis.

Baseline: Horizon Europe calls	Option 1: Co-programmed	Option 2: Co-funded	Option 3.1: Institutionalised Article 185	Option 3.2: Institutionalised Article 187
				funding
Directionality				
Priority setting: Strategic Plan and annual work programmes, covering max. 4 years. Limitations: Fully taking into account existing or to be developed SRIA/ roadmap	Priority setting: Strategic R&I agenda/ roadmap agreed between partners and COM, covering usually 7 years, including allocation of Union contribution Input to FP annual work programme drafted by partners, finalised by COM (comitology) Objectives and commitments are set in the contractual arrangement.	Priority setting: Strategic R&I agenda/ roadmap agreed between partners and COM, covering usually 7 years, including allocation of Union contribution Annual work programme drafted by partners, approved by COM Objectives and commitments are set in the Grant Agreement.	Priority setting: Strategic R&I agenda/ roadmap agreed between partners and COM, covering usually 7 years, including allocation of Union contribution Annual work programme drafted by partners, approved by COM Objectives and commitments are set in the legal base.	Priority setting: Strategic R&I agenda/ roadmap agreed between partners and COM, covering usually 7 years, including allocation of Union contribution Annual work programme drafted by partners, approved by COM (veto-right in governance) Objectives and commitments are set in the legal base.
Coherence: internal (Horizon Europe) and external (other Union programmes, national programmes, industrial strategies)				
Internal: Between different parts of the Annual Work programme can be ensured by COM External: Limited for other Union programmes, no synergies with national/regional programmes and activities	Internal: Coherence among partnerships and with different parts of the Annual Work programme of the FP can be ensured by partners and COM External: Limited synergies with other Union programmes and industrial strategies If MS participate, with national/ regional programmes and activities	Internal: Coherence among partnerships and with different parts of the Annual Work programme of the FP can be ensured by partners and COM External: Synergies with national/ regional programmes and activities	Internal: Coherence among partnerships and with different parts of the Annual Work programme of the FP can be ensured by partners and COM External: Synergies with national/ regional programmes and activities	Internal: Coherence among partnerships and with different parts of the Annual Work programme of the FP can be ensured by partners and COM External: Synergies with other Union programmes and industrial strategies If MS participate, with national/ regional programmes and activities

In line with the Better Regulation Framework, the assessment of the effectiveness, efficiency and coherence of each option is made in comparison to the baseline. Therefore, for each of the above criteria, the performance of using traditional calls under Horizon Europe is first estimated and scored 0 to serve as a reference point. When relevant, this estimation also includes the costs/benefits of discontinuing existing implementation structures. The policy options are then scored compared to the baseline with a + and – system along a two-point scale, to indicate limited (+ or -) or high (++ or --) additional/lower performance compared to the baseline. When a policy option is scored 0, this means that its impact is expected to be roughly equal to the baseline option.

On the basis of the evidence collected, the intervention logic of each initiative and the key functionalities needed, the impact assessments first evaluate the **effectiveness** of the various policy options to deliver on their objectives. To be in line with the Horizon Europe impact framework, the fulfilment of the specific objectives of the initiative is translated into 'expected impacts' - how success would look like -, differentiating between scientific, economic/ technological, and societal (including environmental) impacts. Each impact assessment considers to which extent the different policy options provides the 'key functionalities needed' to achieve the intended objectives. The effectiveness assessment does not use a compound score but shows how the options would deliver on the different types of expected impacts. This is done to increase transparency and accuracy in the assessment of options[17].

A similar approach is followed to evaluate the coherence of options with the overarching objectives of the EU's R&I policy, and distinguishes between **internal** and **external coherence**. Specifically, internal coherence covers the consistency of the activities that could be implemented with the rest of Horizon Europe, including European Partnerships (any type). External coherence refers to the potential for synergies and/or complementarities (including risks of overlaps/gaps) of the initiative with its external environment, including with other programmes under the MFF 2021-27, but also the framework conditions at European, national or regional level (incl. regulatory aspects, standardisation).

To compare the expected costs and benefits of each option (**efficiency**), the thematic impact assessments broadly follow a cost-effectiveness approach[18] to establish to which extent the intended objectives can be achieved for a given cost. A preliminary step in this process is to obtain a measure of the expected costs of the policy options, to be used in the thematic assessments. As the options correspond to different implementation modes, relevant cost categories generally include the costs of setting-up and running an initiative. For instance, set-up costs includes items such as the preparation of a European Partnership proposal and the preparation of an implementation structure. The running costs include the annual work programme preparation costs. Where a Partnership already exists, discontinuation costs and cost-savings are also taken into account[19]. The table below provides an overview of the cost categories used in the impact assessment and a qualitative scoring of their intensity when compared to the baseline option (traditional calls). Providing a monetised value for these average static costs would have been misleading, because of the different features and needs of each candidate initiative.[20] The table shows the overall administrative, operational and coordination costs of the various options. These costs are then put into context in the impact assessments to reflect the expected co-financing rates and the total budget available for each of the policy options, assuming a common Union contribution (cost-efficiency):

[17] In the thematic impact assessments, scores are justified in a detailed manner to avoid arbitrariness and spurious accuracy. A qualitative or even quantitative explanation is provided of why certain scores were given to specific impacts, and why one option scores better or worse than others.

[18] For further details, see Better Regulation Toolbox # 57.

[19] Discontinuation costs will bear winding down and social discontinuation costs and vary depending on e.g. the number of full-time-equivalent (FTEs) staff concerned, the type of contract (staff category and duration) and applicable rules on termination (e.g. contracts under Belgian law or other). If buildings are being rented, the cost of rental termination also apply. As rental contracts are normally tied to the expected duration of the current initiatives, these termination costs are likely to be very limited. In parallel, there would also be financial cost-savings related to the closing of the structure, related to operations, staff and coordination costs in particular. This is developed further in the individual efficiency assessments.

[20] A complete presentation of the methodology developed to assess costs as well as the sources used is described in the external study supporting this impact assessment (Technopolis Group, 2020).

- The costs related to the baseline scenario (traditional calls under Horizon Europe) are pre-dominantly the costs of implementing the respective Union contribution via calls and project, managed by the executive agencies (around 4%, efficiency of 96% for the overall investment).
- For a Co-Programmed partnership the costs of preparation and implementation increase only marginally compared to the baseline (<1%),[21] but lead to an additional R&I investment of at least the same amount than the Union contribution[22] (efficiency of 98% for the overall investment).
- For a Co-Funded partnership the additional R&I investment by Member States accounts for 2,3 times the Union contribution[23]. The additional costs compared to the baseline of preparing and implementing the partnership, including the management of the Union contribution implemented by the national programmes, can be estimated at 6% of the Union contribution (efficiency of 98% related to the overall investment).[24]
- For an Article 185 initiative the additional R&I investment by Member States is equal to the Union contribution[25]. The additional costs compared to the baseline of preparing and implementing the partnership, including the management of the Union contribution implemented by the dedicated implementation structure, can be estimated at 7% of the Union contribution (efficiency of 96% related to the overall investment).
- For an Article 187 initiative the additional R&I investment by partners is equal to the Union contribution[26]. The additional costs compared to the baseline of preparing and implementing the partnership, including the management of the Union contribution implemented by the dedicated implementation structure, can be estimated at 9% of the Union contribution (efficiency of 94% related to the overall investment).

Figure 4 - Intensity of additional costs compared with Horizon Europe Calls (for Partners, stakeholders, public and EU)

Cost items	Baseline: traditional calls	Option 1: Co-programmed	Option 2 Co-funded	Option 3a - Art. 185	Option 3b -Art. 187
Preparation and set-up costs					
Preparation of a partnership proposal (partners and EC)	0	↑↑			
Set-up of a dedicated implementation structure	0			Existing: ↑ New: ↑↑	Existing: ↑↑ New: ↑↑↑
Preparation of the SRIA / roadmap	0	↑↑			
Ex-ante Impact Assessment for partnership	0			↑↑↑	
Preparation of EC proposal and negotiation	0			↑↑↑	

[21] Specifically, some additional set-up costs linked for example to the creation of a strategic research and innovation agenda (SRIA) and additional running costs linked with the partners role in the creation of the annual work programmes and the Commission's additional supervisory responsibilities. A CPP will have lower overall costs than each of the other types of European Partnership, as it will function with a smaller governance and implementation structure than will be required for a Co-Funded Partnership or an Institutionalised Partnership and – related to this – its calls will be operated through the existing HEU agencies and RDI infrastructure and systems.

[22] Minimum contributions from partners equal to the Union contribution.

[23] Based on the default funding rate for programme co-fund actions of 30%, partners contribute with 70% of the total investment.

[24] These costs reflect set-up costs and additional running costs for partners, and the Commission, of the distributed, multi-agency implementation model.

[25] Based on the minimum requirement in the legal basis that partners contribute at least 50% of the budget.

[26] Based on the minimum requirement in the legal basis that partners contribute at least 50% of the budget.

Cost items	Baseline: traditional calls	Option 1: Co-programmed	Option 2 Co-funded	Option 3a - Art. 185	Option 3b -Art. 187
Running costs (Annual cycle of implementation)					
Annual Work Programme preparation	0	↑			
Call and project implementation	0	0 In case of MS contributions: ↑	↑	↑	↑
Cost to applicants	Comparable, unless there are strong arguments of major differences in oversubscription				
Partners costs not covered by the above	0	↑	0	↑	↑
Additional EC costs (e.g. supervision)	0	↑	↑	↑	↑↑
Winding down costs					
EC	0				↑↑↑
Partners	0	↑	0	↑	↑

Notes: 0: no additional costs, as compared with the baseline; ↑: minor additional costs, as compared with the baseline; ↑↑: medium additional costs, as compared with the baseline; ↑↑↑: higher costs, as compared with the baseline.

The cost categories estimated for the common model are then used to develop a scorecard analysis and further refine the assessment of options for each of the 12 candidate Institutionalised Partnerships. Specifically, the scores related to the set-up and implementation costs are used in the thematic impact assessments to consider the scale of the expected benefits and thereby allow a simple "value for money" analysis (**cost-effectiveness**). In carrying out the scoring of options, the results of fieldwork, desk research and stakeholder consultation undertaken and taken into account.

More specifically for the ATM partnership, building on the assumptions outlined in Figure 4 and the known real costs, e.g. from the current SESAR JU implementation, the additional costs compared to the baseline are about 6-7% of the Union's contribution. When considering the fact that over 60% of these administrative costs are covered by private and inter-governmental partners (i.e. Eurocontrol), re-establishing the JU is roughly similarly efficient to the baseline scenario (96%-97%), and only one percentage point behind in efficiency to the co-programmed partnership. Considering the fact that the Art 187 initiative has the highest ability to deliver the highest expected impacts, it delivers the best value for the Union budget investment.

3. METHOD FOR IDENTIFYING THE PREFERRED OPTION – THE SCORECARD ANALYSIS

For the **identification of the preferred option,** a scorecard analysis is used to build a hierarchy of the options by individual criterion and overall in order to identify a single preferred policy option or in case of an inconclusive comparison of options, a number of 'retained' options or hybrid. This exercise supports the systematic appraisal of alternative options across multiple types of monetary, non-monetary and qualitative dimensions. It also allows for easy visualisation of the pros and cons of each option. Each option is attributed a score of the adjudged performance against each criterion with the three broad appraisal dimensions of effectiveness, efficiency and coherence.

This scorecard approach also relies on a standard cost model developed for the external study supporting the impact assessment, as illustrated in **Error! Reference source not found.**. Specifically, the scores related to the set-up and implementation costs are used in the thematic impact assessments to consider the scale of the expected benefits and thereby allow a simple "value for money" analysis (**cost-effectiveness**). In carrying out the scoring of options, the

results of fieldwork, desk research and stakeholder consultation undertaken and taken into account.

These costs essentially refer to the administrative, operational and coordination costs of the various options. The figure shows how the scoring of costs range from a value of 0, in case an option does not entail any additional costs compared to the baseline (traditional calls), to a score of (-) for options introducing limited additional costs relative to the baseline and a score of (- -) when substantial additional costs are expected in comparison with the baseline. Should the costs of a policy option be lower than those of the baseline, (+) and (+ +) are used.

It is considered that while there is a clear gradation in the overall costs of the policy options, the cost differentials are less marked when one takes into account the expected co-financing rates and the total budget available for each of the policy options, assuming a common Union contribution. From this perspective, there are only one or two percentage points that split the most cost-efficient policy options – the baseline (traditional calls) and the Co-Programmed policy options – and the least cost-efficient – the Institutionalised Partnership option. A score of + is therefore assigned for **cost-efficiency** to the Co-Programmed and Co-Funded options, a score of 0 to the Article 185 option and a score of (-) for the Article 187 Institutionalised Partnership policy option[27].

Figure 5: Matrix on 'overall costs' and 'adjusted cost scoring'

	Baseline: Horizon Europe calls	**Option 1: Co-programmed**	**Option 2: Co-funded**	**Option 3a: Institutionalised 185**	**Option 3b: Institutionalised 187**
Administrative, operational and coordination costs	0	(0)	(-)	(- -)	(- -)
Administrative, operational and coordination costs adjusted per expected co-funding (i.e. *cost-efficiency*)	0	(+)	(+)	(0)	(-)

Notes: Score 0 = same costs as for the baseline; score (-) = limited additional costs compared to baseline; score (- -) = substantial additional costs compared to baseline. ; score (+) = lower costs compared to baseline

[27] The baseline (traditional calls) is scored 0, as explained above.

Annex 5 Subsidiarity Grid

1. Can the Union act? What is the legal basis and competence of the Unions' intended action?
1.1 Which article(s) of the Treaty are used to support the legislative proposal or policy initiative?
This proposal is based on (1) Article 185 TFEU which stipulates that in implementing the multiannual framework programme, the Union may make provision, in agreement with the Member States concerned, for participation in research and development programmes undertaken by several Member States, including participation in the structures created for the execution of those programmes; and (2) Article 187 TFEU according to which the Union may set up joint undertakings or any other structure necessary for the efficient execution of Union research, technological development and demonstration programmes (both Articles are under Title XIX of the TFEU - Research and Technological Development and Space). The proposal aims to implement Article 8 of the Commission proposal for Horizon Europe - the future EU research and innovation (R&I) programme for 2021-2027, according to which, "*European Partnerships shall be established for addressing European or global challenges only in cases where they will more effectively achieve objectives of Horizon Europe than the Union alone and when compared to other forms of support of the Framework programme*". The Horizon Europe proposal has received the political agreement of the Council and the European Parliament.
1.2 Is the Union competence represented by this Treaty article exclusive, shared or supporting in nature?
Research is a shared competence between the EU and its Member States according to the TFEU. Article 4 (3) specifies that in the areas of research, technological development and space, the European Union can carry out specific activities, including defining and implementing programmes, without prejudice to the Member States' freedom to act in the same areas.
Subsidiarity does not apply for policy areas where the Union has ***exclusive*** *competence as defined in Article 3 TFEU*[28]*. It is the specific legal basis which determines whether the proposal falls under the subsidiarity control mechanism. Article 4 TFEU*[29] *sets out the areas where competence is shared between the Union and the Member States. Article 6 TFEU*[30] *sets out the areas for which the Unions has competence only to support the actions of the Member States.*

[28] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:12008E003&from=EN
[29] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:12008E004&from=EN
[30] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:12008E006:EN:HTML

2. Subsidiarity Principle: Why should the EU act?

2.1 Does the proposal fulfil the procedural requirements of Protocol No. 2[31]:

- Has there been a wide consultation before proposing the act?
- Is there a detailed statement with qualitative and, where possible, quantitative indicators allowing an appraisal of whether the action can best be achieved at Union level?

This proposal and the accompanying impact assessment were supported by a wide consultation of stakeholders, both during the preparation of the Horizon Europe proposal and - later on, all the candidates for European Partnerships. Member States were consulted via the Shadow Strategic configuration of the Horizon Europe Programme Committee. On candidates for institutionalised Partnerships based on Article 185/187 of the TFEU, an Open Public Consultation (OPC) was held between 11 September and 6 November 2019. Over 1 600 replies were received. In addition, targeted consultation activities were undertaken to prepare the present impact assessment. In particular, for each of the candidate partnerships, an external consultant interviewed a representative sample of stakeholders. The need for EU action as well as its added value were covered in those interviews.

The explanatory memorandum and the impact assessment (horizontal part, Section 3) contain a dedicated section on the principle of subsidiarity, as explained in question 2.2 below.

2.2 Does the explanatory memorandum (and any impact assessment) accompanying the Commission's proposal contain an adequate justification regarding the conformity with the principle of subsidiarity?

The impact assessment accompanying the proposal features a horizontal part on relevant common elements to all the candidate partnerships, including the conformity of the proposed initiative with the principle of subsidiarity (Section 3). Moreover, the individual assessments of each candidate partnership include additional details on subsidiarity, touching in particular on the specificities of a candidate partnership that could not be adequately reflected in the horizontal part of the impact assessment. This will also be reflected in the explanatory memorandum.

2.3 Based on the answers to the questions below, can the objectives of the proposed action be achieved sufficiently by the Member States acting alone (necessity for EU action)?

National action alone cannot achieve the scale, speed and scope of support to R&I needed for the EU to meet its long-term Treaty objectives, to deliver on the EU's strategic policy priorities (including the climate and energy goals set out in the Paris Agreement, and the European Green Deal), and to contribute to tackling global challenges and meeting the

[31] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:12016E/PRO/02&from=EN

Sustainable Development Goals (SDGs).
(a) Are there significant/appreciable transnational/cross-border aspects to the problems being tackled? Have these been quantified?
The thematic areas covered by the candidate partnerships feature a series of challenges in terms of cross-border/transnational aspects, need to pool resources, need for a critical mass to meet intended policy objectives, need to coordinate different types of actors (e.g. academia, industry, national and regional authorities) across different sectors of the economy and society, which cannot be tackled to the same degree by Member States alone. This is particularly true for the research and innovation (R&I) dimension of the proposed initiative: the importance of a multi-centre and interdisciplinary approach, cross-country data collection and research, and the need to develop and share new knowledge in a timely and coordinated manner to avoid duplication of efforts are key to achieve high quality results and impact. The Interim Evaluation of Horizon 2020 and the impact assessment of Horizon Europe provide extensive qualitative and quantitative evidence on the above points. In addition, Sections 1 and 2 of the individual impact assessments on the candidate partnerships include more detail on the necessity to act at EU-level in specific thematic areas. Finally, it is worth noting that not all Member States have the same capacity or R&I intensity to act on these challenges. As the desired policy objectives can be fully achieved only if the intended benefits are widespread across the Member States, this requires action at the EU-level.
(b) Would national action or the absence of the EU level action conflict with core objectives of the Treaty[32] or significantly damage the interests of other Member States?
As per Article 4(3) TFEU, national action does not conflict with core objectives of the Treaty in the area of R&I. The absence of EU level action in this area would however prevent the achievement of core objectives of the Treaty. Indeed, national action alone cannot achieve the scale, speed and scope of support to R&I needed for the EU to meet its long-term Treaty objectives on e.g. competitiveness, to deliver on the EU's strategic policy priorities, and to contribute to tackling global challenges and meet the Sustainable Development Goals (SDGs).
(c) To what extent do Member States have the ability or possibility to enact appropriate measures?
As foreseen by Article 4(3) TFEU, this proposal does not hamper Member States' ability to enact appropriate measures in the field of R&I. However, the scale and complexity of the policy objectives pursued by the present initiative cannot be fully addressed by acting at national level alone.
(d) How does the problem and its causes (e.g. negative externalities, spill-over effects)

[32] https://europa.eu/european-union/about-eu/eu-in-brief_en

vary across the national, regional and local levels of the EU?
As described in the horizontal part of the impact assessment accompanying the present proposal, several problems (e.g. on competitiveness, global challenges, demographic change) and their underlying causes affect the EU as a whole rather than individual Member States. Where important differences between Member States are present, these are described in Sections 1 and 2 of the individual impact assessments.
(e) Is the problem widespread across the EU or limited to a few Member States?
The problem of coordinating R&I efforts in the thematic areas covered by the candidate partnerships affects all Member States, albeit to different degrees. However, from a general EU perspective, available evidence shows that the EU as a whole needs to step up efforts and investments in thematic areas that are crucial to tackle present and future policy challenges on several fronts, e.g. ageing population, global technological trends, and climate change to name a few. The way these problems affect the EU and its Member States is described in the horizontal part of the impact assessment and in Sections 1 and 2 of the individual impact assessments.
(f) Are Member States overstretched in achieving the objectives of the planned measure?
As indicated in the horizontal part of the impact assessment and in Sections 1 and 2 of the individual assessments, the sheer scale, speed and scope of the needed support to R&I would overstretch national resources, without guaranteeing the achievement of the intended objectives. Acting at EU-level would achieve greater impact in a more effective and efficient manner.
(g) How do the views/preferred courses of action of national, regional and local authorities differ across the EU?
No specific differences between the views of national, regional and local authorities emerged from the stakeholder consultation.
2.4 Based on the answer to the questions below, can the objectives of the proposed action be better achieved at Union level by reason of scale or effects of that action (EU added value)?
EU funded R&I activities, including those covered by the present proposal, produce demonstrable benefits compared to the corresponding national and regional initiatives, due to the scale, speed and scope achievable by acting at the EU level. In addition, the proposed initiatives should be seen as complementary and reinforcing national and sub-national initiatives in the same area.

(a) Are there clear benefits from EU level action?
Quantitative and qualitative evidence of the benefits of EU level action are available in the interim evaluation of Horizon 2020 and in the impact assessment of Horizon Europe, among others. An analysis of the emerging challenges in each thematic areas, of the EU's competitive positioning, as well as feedback gathered from different types of stakeholders for the present impact assessment indicate that EU level action remains appropriate also for the present proposal. In addition, the benefits of acting at EU-level have been illustrated by the success and the impact achieved by the predecessors to the proposed initiative.
(b) Are there economies of scale? Can the objectives be met more efficiently at EU level (larger benefits per unit cost)? Will the functioning of the internal market be improved?
EU funded R&I activities, including those covered by the present proposal, produce demonstrable benefits compared to the corresponding national and regional initiatives, due to the scale, speed and scope achievable by acting at the EU level. This is the case both in terms of effectiveness in achieving intended policy objectives, but also in terms of efficiency. Positive impact is also visible in terms of competitiveness: recent data on EU funded R&I activities indicate that EU-funded teams grow 11.8% faster and are around 40% more likely to be granted patents or produce patents applications than non-EU funded teams. Efficiency gains are also visible in terms of dissemination of results to users beyond national borders, including SMEs and citizens. EU funded R&I is more effective in leveraging private investment. Finally, there are clear additionality benefits (i.e. EU R&I funding does not displace or replace national funding), as the EU focuses on projects that are unlikely to be funded at national or regional level. Overall, this is beneficial to the functioning of the internal market in several respects, including human capital reinforcement through mobility and training, the removal of barriers to cross-border activity for economic players including SMEs, easier access to finance and to relevant knowledge and research, and increased competition in the area of R&I.
(c) What are the benefits in replacing different national policies and rules with a more homogenous policy approach?
A homogeneous policy approach in the various thematic areas covered by the present proposal would reduce fragmentation and increase efficiency and effectiveness in meeting the intended policy objectives. Indeed fragmentation, persisting barriers in the internal market and differences in the resources available to Member States are some of the key problems that stand in the way of fully achieving the intended policy objectives and reaching the required critical mass to obtain tangible results. Specific detail on how these issues differ in each thematic area are illustrated in Sections 1 and 2 of the individual impact assessments, so as to reflect the specificities of each case.
(d) Do the benefits of EU-level action outweigh the loss of competence of the Member States and the local and regional authorities (beyond the costs and benefits of acting at

national, regional and local levels)?

The proposed initiative does not lead to a loss of competence of the Member States. In fact, the proposed initiative should be seen as complementary and reinforcing national and sub-national initiatives in the same area. Previous quantitative and qualitative assessments of Horizon Europe and Horizon 2020 have shown that the proposed EU-level action do not displace national ones and tend to concentrate on initiatives that would not have been funded by the Member States themselves, or would not have reached the same scale and ambition without EU-level intervention, due to their complexity and trans-national nature.

(e) Will there be improved legal clarity for those having to implement the legislation?

Yes. The proposed initiatives will be implemented in line with the Horizon Europe single set of rules for participation; this will ensure increased clarity and legal certainty for end beneficiaries, other stakeholders and programme administrators. It will also reduce the administrative burden for beneficiaries, and for the Commission services. In addition, the accessibility and attractiveness of the broader Horizon Europe programme, in particular for applicants with limited resources, would be sustained.

3. Proportionality: How the EU should act

3.1 Does the explanatory memorandum (and any impact assessment) accompanying the Commission's proposal contain an adequate justification regarding the proportionality of the proposal and a statement allowing appraisal of the compliance of the proposal with the principle of proportionality?

The principle of proportionality underpins the entire analysis of the candidate partnerships. Specifically, the analysis included in the accompanying impact assessment is structured along the following logic: 1. Justification of the use of a partnership approach in a given area (including considerations on additionality, directionality, link with strategic priorities) instead of other forms of intervention available under Horizon Europe; 2. If the partnership approach is deemed appropriate, proportionality considerations guide the assessment of which type of partnership intervention (collaborative calls, co-programmed, co-funded or institutionalised partnership) is most effective in achieving the objectives. This will also be reflected in the explanatory memorandum.

3.2 Based on the answers to the questions below and information available from any impact assessment, the explanatory memorandum or other sources, is the proposed action an appropriate way to achieve the intended objectives?

The proposed initiative only focuses on areas where there is a demonstrable advantage in acting at the EU-level due to the scale, speed and scope of the efforts needed for the EU to meet its long-term Treaty objectives and deliver on its strategic policy priorities and commitments. In addition, the present proposal leaves full freedom to the Member States to

pursue their own actions in the policy areas concerned. This will also be reflected in the explanatory memorandum.
(a) Is the initiative limited to those aspects that Member States cannot achieve satisfactorily on their own, and where the Union can do better?
The proposed initiative only focuses on areas where there is a demonstrable advantage in acting at the EU-level due to the scale, speed and scope of the efforts needed for the EU to meet its long-term Treaty objectives and deliver on its strategic policy priorities and commitments.
(b) Is the form of Union action (choice of instrument) justified, as simple as possible, and coherent with the satisfactory achievement of, and ensuring compliance with the objectives pursued (e.g. choice between regulation, (framework) directive, recommendation, or alternative regulatory methods such as co-legislation, etc.)?
For each of the candidate partnerships, the analysis carried out in the accompanying impact assessment has explored several options for implementation. A comparative assessment of the merits of each option also included an analysis of the simplicity of the intervention, its proportionality and effectiveness in achieving the intended objectives. This is reflected in the fact that a tailored approach has been suggested for each candidate partnership, ranging from looser forms of cooperation to more institutionalised ones, depending on the intended policy objectives, specific challenges, and desired outcome identified in each case.
(c) Does the Union action leave as much scope for national decision as possible while achieving satisfactorily the objectives set? (e.g. is it possible to limit the European action to minimum standards or use a less stringent policy instrument or approach?)
The proposed approach leaves full freedom to the Member States to pursue their own actions in the policy areas covered by the present proposal.
(d) Does the initiative create financial or administrative cost for the Union, national governments, regional or local authorities, economic operators or citizens? Are these costs commensurate with the objective to be achieved?
The proposed initiatives do create financial and administrative costs for the Union, national governments and, depending on the chosen mode of implementation, for regional and local authorities. In addition, economic operators and other stakeholders potentially involved in the candidate partnerships will also incur some costs linked to implementation. The financial cost of the proposed initiative is covered under the Horizon Europe programme. Its exact amount is still subject to political decision. As regards the candidate partnerships and the different modes of implementation (co-programmed, co-funded, institutionalised), the relevant costs and benefits are assessed in the individual impact assessments covering each candidate partnership. The additional administrative costs of implementation via partnerships are

limited, when compared to the administrative costs of implementation through traditional calls. As indicated by comparable experience with previous initiatives and in feedback provided by a variety of stakeholders, these costs are expected to be fully justified by the benefits expected from the proposed initiative. Where available, additional details on costs are provided in Annex 3 of the impact assessment.
(e) While respecting the Union law, have special circumstances applying in individual Member States been taken into account?
Where relevant, differences between Member States in capacity and stage of advancement of R&I in specific thematic areas have been taken into account in the individual impact assessments.

Annex 6 Additional background information

1. BACKGROUND INFORMATION FOR ALL INITIATIVES

1.1. Selection criteria of European Partnerships

Partnerships based on Article 185 and 187 TFEU *shall be implemented only where other parts of the Horizon Europe programme, including other forms of European Partnerships would not achieve the objectives or would not generate the necessary expected impacts, and if justified by a long-term perspective and high degree of integration.* At the core of this impact assessment is therefore the need to demonstrate that the impacts generated through a Partnership approach go beyond what could be achieved with traditional calls under the Framework Programme – the Baseline Option. Secondly, it needs to assess if using the Institutionalised form of a Partnership is justified for addressing the priority.

The necessity test for a European Partnership (as set out in the Horizon Europe regulation) has two levels:

1. **The justification for implementing a priority with a European Partnership** to address Horizon Europe and EU priorities. This is linked to demonstrating that a European Partnership can produce added value beyond what can be achieved through other Framework Programme modalities, notably traditional calls in the work programmes (Option 0 – Baseline).

2. **The justification for the use of the form of Institutionalised Partnership**: Once it has been demonstrated that a partnerships approach is justified, co-programmed and/or co-funded forms are considered for addressing the priorities as they are administratively lighter, more agile and easier to set-up (Options 1 and/or 2). As Institutionalised Partnerships require setting up a legal framework and the creation of a dedicated implementation structure, they have to justify higher set-up efforts by demonstrating that it will deliver the expected impacts in a more effective and efficient way, and that a long-term perspective and high degree of integration is required (Option 3).

The outcomes of the 'necessity test' is presented together with the preferred option.

Figure 5 Horizon Europe selection criteria for the European Partnerships

Common selection criteria & principles	Specifications
1. More effective (Union added value) clear impacts for the EU and its citizens	Delivering on global challenges and research and innovation objectives
	Securing EU competitiveness
	Securing sustainability
	Contributing to the strengthening of the European Research and Innovation Area
	Where relevant, contributing to international commitments

Common selection criteria & principles	Specifications
2. Coherence and synergies	Within the EU research and innovation landscape
	Coordination and complementarity with Union, local, regional, national and, where relevant, international initiatives or other partnerships and missions
3. Transparency and openness	Identification of priorities and objectives in terms of expected results and impacts
	Involvement of partners and stakeholders from across the entire value chain, from different sectors, backgrounds and disciplines, including international ones when relevant and not interfering with European competitiveness
	Clear modalities for promoting participation of smes and for disseminating and exploiting results, notably by smes, including through intermediary organisations
4. Additionality and directionality	Common strategic vision of the purpose of the European Partnership
	Approaches to ensure flexibility of implementation and to adjust to changing policy, societal and/or market needs, or scientific advances, to increase policy coherence between regional, national and EU level
	Demonstration of expected qualitative and significant quantitative leverage effects, including a method for the measurement of key performance indicators
	Exit-strategy and measures for phasing-out from the Programme
5. Long-term commitment of all the involved parties	A minimum share of public and/or private investments
	In the case of institutionalised European Partnerships, established in accordance with article 185 or 187 TFEU, the financial and/or in-kind, contributions from partners other than the Union, will at least be equal to 50% and may reach up to 75% of the aggregated European Partnership budgetary commitments

1.2. Overview of potential functions for a common back office among Joint Undertakings

Functions	Current situation	Option of joint back-office	Comments
Organising calls for grant and proposal evaluations	Each JU organises this independently.	A central organisation of evaluation, logistics, contracting evaluators, managing the data of the evaluation results Central database of potential evaluators with domain expertise in thematic areas of partnerships	The evaluations would still need to be supervised by the Scientific staff of the individual Joint Undertakings (consensus meetings of expert evaluators etc)
Human Resources related matters	Each JU has own HR policy and resources Quite some resources spent on recruitment in some JUs	More generic resources and expertise for HR matters More consistency in HR	Ensuring consistency with EC HR policies is already in place

	Some HR facilities are procured from external contractors Some JUs have a Service Level Agreement with COM for HR	policy Shared HR investment for specialised expertise (IP and legal)	
Financial management	Each JU conducts own financial contract management; differences between JUs Each JU is audited separately. Auditing at project level more frequent than in other Horizon 2020 parts and outsourced by JUs thus differences ECA: too many audits on JUs	Financial management by one core team of financial staff Would reduce the number of interfaces for audits and simplifies the auditing of the all JUs Harmonisation of project auditing	Simplifies the harmonisation of financial management across JUs in line with Horizon Europe
Communication (internal and external)	Each JU has a separate communication strategies, teams and resources	A common back-office can support activities such as event organisation, dissemination of results, setting up website communication Can help create a more visible Partnership brand	A considerable share of communication activity is partnership specific (addressing particular target groups, synthesising project results) however there are generic communication activities that can be shared Needs to avoid duplication of efforts
Data management on calls, project portfolios, information on project results	Most JUs but not all use e-Corda for project data Overall IT integration of JUs still difficult	Harmonised data management Reduction of IT systems and support that is procured	This will need to happen regardless of the common back office but will likely be more smooth if managed centrally

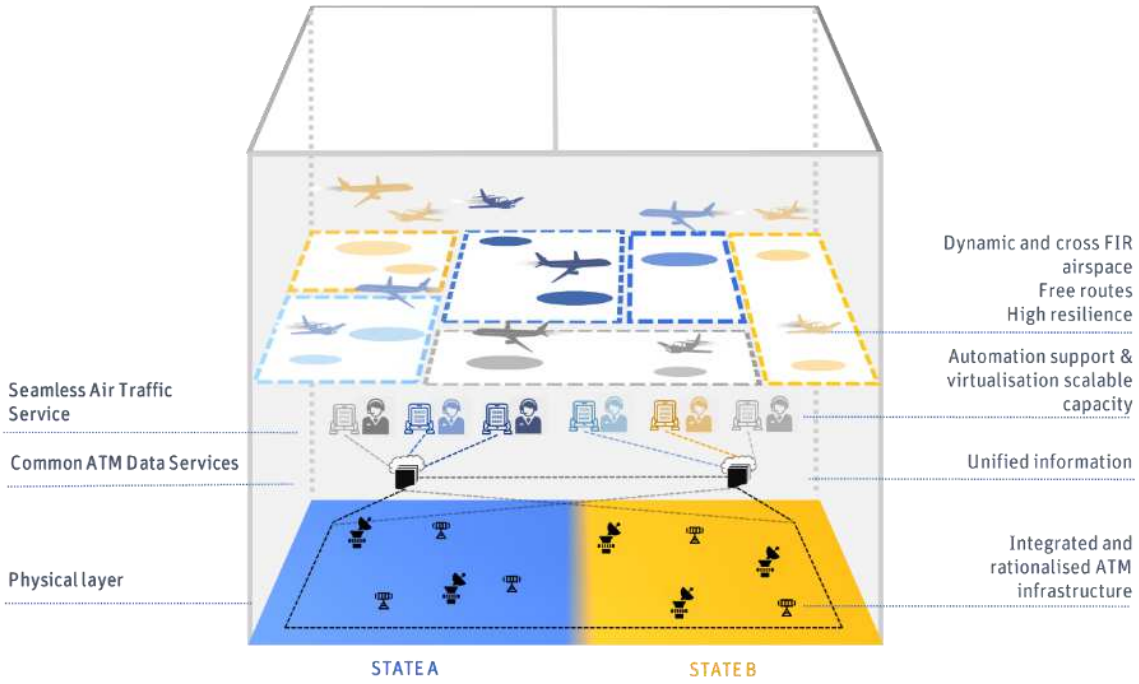
2. BACKGROUND INFORMATION FOR THIS SPECIFIC INITIATIVE

2.1. European ATM Master Plan – scenarios and economic impacts

Future R&I Needs

The European ATM Master Plan defines the vision for the digital transformation of ATM infrastructure. The vision was developed to accelerate modernisation of ATM using an architectural approach that brings together the airspace, operations and infrastructure in a harmonised manner across the EU. The main principles of this architecture are shown in Figure 6.

Figure 6: Proposed Future Architecture



Source: A proposal for the future architecture of the European airspace, SJU, 2019.

The proposal is based on a number of key transformations that require R&I as defined in Table 2. The R&I needs are a step change to the current programme: rather than focussing on contained individual ATM solutions that support marginal performance improvement of specific functions the need is now to focus on a small number of breakthrough technologies that together create a step change in overall system performance.

Table 2: Key transformations to achieve the future airspace architecture

Key Transformations		
	Connected and automated ATM	The future ATM system will deliver hyper connectivity between all stakeholders (vehicle-to-vehicle, vehicle-to-infrastructure) via high bandwidth, low latency fixed and mobile networks. Highly automated systems with numerous actors will interact with each other seamlessly, with fewer errors making the system scalable and even safer than today.

	Air-ground integration and autonomy	The progressive move towards autonomous flying enabled by self-piloting technologies requires a closer integration between vehicle and infrastructure capabilities so that the infrastructure can act as a digital twin of the aircraft.
	AI for aviation	Tomorrow's aviation infrastructure will be more data intensive and thanks to the application of machine learning, deep learning and big data analytics we will be able to design an ATM system that is smarter and safer by constantly analysing and learning from the ATM environment.
	U-space and urban air mobility	A digitally native traffic management system will ensure the safe and secure integration of drones in the airspace especially in urban areas, taking into account new and existing air vehicles and autonomous operations. One of the most challenging use cases from U-space will be to enable urban air mobility, which is expected to advance autonomous technologies in a number of areas.
	Virtualisation and cyber-secure data sharing	Service provision will be decoupled from the physical infrastructure, enabling air traffic and data service providers, irrespective of national borders, to plug in their operations where needed in a secure manner.
	Capacity-on-demand and dynamic airspace	Technology will enable the dynamic reconfiguration and the activation of cross-border capacity-on-demand services to maintain smooth traffic services at busy times.
	Civil/military interoperability and coordination	Dual-use technologies such as those for communications, navigation and surveillance, and other solutions that allow real-time exchange trajectory information will improve the predictability of military operations and overall network capacity.

In addition to scientific R&I, significant research is also required into regulatory issues:

- Ability of Member States to dynamically change responsibility for ATS in their airspace,
- Certification and approval of highly automated systems,
- Economic regulation of different elements of the value chain.

Importance of Architecture

The specific objectives place high importance of developing a service oriented architecture to develop and maintain consensus.

Many of the limitations of the current system have been caused by a lack of a defined architecture. Rather, bespoke national systems have been connected together using a range of bespoke interface standards specific to ATM. This has led to limited interoperability, high maintenance costs and significant difficulty in achieving widespread deployment of new systems (due to the high level of local adaptation required).

The required transition needs to be highly coordinated and based on commonly agreed service and infrastructure principles. The proposed architecture is the framework to achieve those agreements.

Once established, the architecture will allow different parts of the system to develop at different speeds depending on local needs whilst maintaining an overall coherence at network level. The wider implication of this is the ATM R&I would then need to be less coordinated and innovations would be developed within the common framework.

Importance of standards

As a highly regulated industry, ATM has many standards, at global level as annexes to ICAO's Chicago Convention[33] and at regional level – in Europe ATM standards and

[33] See: https://www.icao.int/publications/pages/doc7300.aspx

specifications are developed by EUROCAE, EUROCONTROL and the European Standardisation Organisation.

However, it is still possible to implement a change to an ATM system without a standard. In this case the ANSP prepares a detailed safety case for the regulator demonstrating that the proposed change is safe and interoperable. This route has enabled piecewise modernisation of the current fragmented system – in which the level of local adaptation can outweigh the benefits of standardisation.

Adoption of a common architecture reduces the need for local adaptation and increases the needs for standards. Many of the existing standards may need to be updated to suit the new architecture. Proposals are being developed within the architecture to separate key concerns leading to new forms of standards, for example:

- Operational services – The ATM services (separation, sequencing),
- Information services - The information services required to provide ATM services,
- Infrastructure requirements – The technical performance of the underlying infrastructure to provide the information services,
- Hardware requirements – Specifications of specific physical equipment (radars, radios etc).

A key output of the R&I will be the evidence required by the standards development organisations to develop and validate the required standards.

Economic impact

The European ATM Master Plan,[34] identified two rollout scenarios differentiated by the extent to which the ATM community joins forces and changes working methods to accelerate the R&I lifecycle:

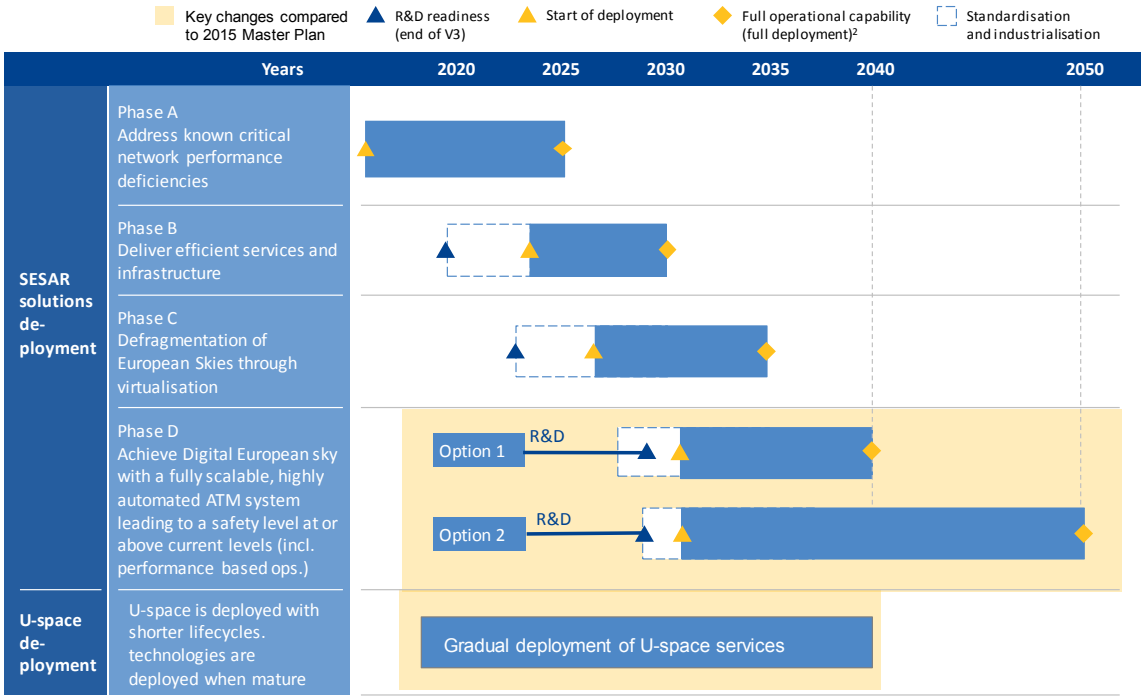
- Option 1: Full implementation of the SESAR vision by 2040 (requires strong partnership approach)
- Option 2: Full implementation of the SESAR vision by 2050

Figure 7 illustrates the roll-out of the SESAR Vision, supported by the existing SESAR programme, including the implementation of an optimised European airspace architecture and the 'fast tracking' of the deployment of U-space services during the next MFF.

The two options for the rollout of technology enabling the completion of phase D of the Master Plan (which related to the R&I required during the Horizon Europe timeframe) are shown; option 1 requires an earlier start of implementation and thus industry and stakeholders' consensus and commitment.

[34] European ATM Master Plan, Edition 2020, SJU.

Figure 7: SESAR Roll Out Plan



Source: European ATM Master Plan Edition 2020, SJU, 2019.

The economic benefits are summarised in Table 3, where:

- All monetary figures are expressed in EUR billion.
- The table shows the cumulative results for the period 2019 to 2050 (both years included).
- Although Option 1 is fully deployed by 2040, the benefits continue to be accrued until 2050.

Table 3: Economic Value of SESAR Roll-out scenarios

	Option 1	Option 2	Delta
Level of investment	37	53	16
Direct benefits of the ATM value chain	510	490	20
Indirect benefits of additional GDP	170	160	10
Indirect benefits for passengers and EU citizens	760	730	30
Total benefits for Manned Aviation	1440	1380	60
Benefits of deploying U-space	350 to 400	250 to 300	Over 100
Total Benefits	**1790 to 1840**	**1630 to 1680**	**Over 160**

Source: SJU analysis of Business Cases developed for the European ATM Master Plan Updated Programme.

Achieving option 1 would make it possible to reap crucial benefits about a decade earlier and at a lower cost, thanks to cutting on transition costs and going straight to the performing solutions and organisation. This requires new ways of working:

- More agility: creating solutions through prototypes and demonstrations developed in smaller teams with shorter time frames; developing solutions by addressing service-related challenges without prejudging upfront what the optimal technical solution is; creating innovation labs to fast-track R&D, perform quick prototyping and incubate new ideas.
- Openness, in the form of increased collaboration between 'traditional' engineering domains and new entrants that are now likely to attract more capital.
- Coordination to reduce innovation cycles from about 30 years to about 5-10 years, focusing on disruptive innovation. To achieve this, the development and deployment of the integration of drones into the airspace, and in particular the development and implementation of U-space services, may be used as a 'laboratory' that can support faster life cycles in the manned aviation environment; in addition, 'sandboxing' between organisations may allow faster times to market.

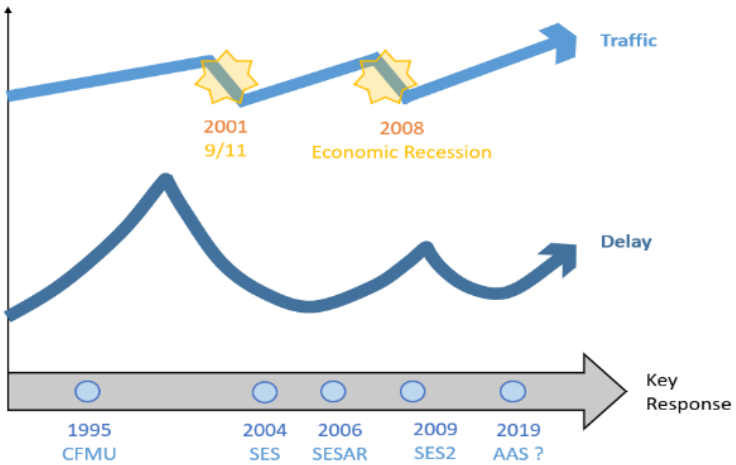
A regulatory framework that will also be required to support innovation — through market take-up, incentives for early movers and focus on delivery of services, with an emphasis on what services should be provided and how, rather than on what technologies should be implemented.

This innovative approach would allow better connections and synchronisation between ground-based developments and the airborne industry, whose plans and expectations for the future are already known.

The need for SESAR

Figure 8 illustrates the historical evolution of air traffic delays in Europe, also referred to as en-route Air Traffic Flow Management delay. This is the delay accumulated due to the lack of capacity of portions of airspace dedicated to cruise phase of the flights (also referred to as en-route). When capacity is reached, all aircraft planned to enter that portion of airspace subsequently are delayed.

Figure 8: Evolution of en-route Air Traffic Flow Management delay in Europe.



Source: Authors analysis of PRR2018.

The three peaks in delay are worthy of note. In late 1990s significant delays led to two forms of intervention:

- The creation by EUROCONTROL of the Central Flow Management Unit (CFMU)[35] and successful implementation of key capacity enablers including RVSM[36] and B-RNAV.[37]
- The development of the Single European Sky initiative, leading to the first package of legislation in 2004.

In the early 2000's delays were growing, and a similar delay crisis was predicted - but with limited confidence that technical solutions existed. This led to the creation of the SESAR programme. The crisis did not materialise due to fall in air traffic following the 2008 financial crisis.

In 2018 significant delays returned. Potential solutions from the current SESAR programme have been identified in the Airspace Architecture Study[38] to resolve the problem. The proposed integrated ATM partnership would have the objective of accelerating the development and deployment of the necessary solutions.

SESAR in the SES Context

The EU competence in Air Traffic Management, exercised through the Single European Sky, is designed to drive performance improvement at EU level through a range of measures including economic regulation[39] and network functions.[40]. As the recent Court of Auditors report makes clear,[41] the SES initiative is justified but not yet fully effective.

The Single European Sky (SES) was the Commission's response to the significant air transport delays that plagued the 1990s. The SES legislation promotes the development, modernisation, and harmonisation of Air Traffic Management (ATM) across Europe. Over the years, SES has developed into a performance-oriented system in which the service providers (or ANSPs) are incentivised to adopt new concepts and technologies (as well as new ways of managing the business) to achieve the SES High Level goals.

In 2006, the European Commission launched the SESAR programme, "technological pillar" of the Single European Sky: "*It aims to improve Air Traffic Management (ATM) performance by modernising and harmonising ATM systems through the definition, development, validation and deployment of innovative technological and operational ATM solutions"* .[42]

Thus, the SESAR programme consists of definition of the strategic research and innovation agenda, R&I activities and deployment activities, all linked through the SESAR innovation lifecycle. The SESAR innovation lifecycle is central to the SES policy. SESAR is designed to mature and validate operational concepts and systems necessary for the modernisation of ATM. European airspace is amongst the busiest and most complex in the world. Traditionally Air Navigation Services have been provided by a patchwork of different national systems operated by national providers known as Air Navigation Service Providers (ANSPs).

The SESAR programme is defined as a continuous lifecycle that steers the R&I programme to effectively close performance gaps in the deployed system as illustrated in Figure 9.

---

[35] The Central Flow Management Unit (CFMU) provides Air Traffic Flow Management across Europe and is now a central part of the Network Manager, and changed the name to Network Manager Operations Centre (NMOC).

[36] Reduced Vertical Separation Minima (RVSM) allowed the vertical separation minima to be reduced from 2000 to 1000 ft in en-route airspace and provided a large capacity increase.

[37] Basic Area Navigation (B-RNAV) is a forerunner of Required Navigation Performance (RNP5) for en-route airspace and enabled a flight efficient and capacity benefit.

[38] A proposal for the future architecture of the European airspace, SJU, 2019.

[39] Commission Implementing Regulation (EU) 2019/317 of 11 February 2019 laying down a performance and charging scheme in the single European sky and repealing Implementing Regulations (EU) No 390/2013 and (EU) No 391/2013.

[40] Commission Implementing Regulation (EU) 2019/123 of 24 January 2019 laying down detailed rules for the implementation of air traffic management (ATM) network functions and repealing Commission Regulation (EU) No 677/2011.

[41] Single European Sky: a changed culture but not a single sky, Special Report 18/2017, European Court of Auditor.

[42] Source: https://ec.europa.eu/transport/modes/air/sesar_en

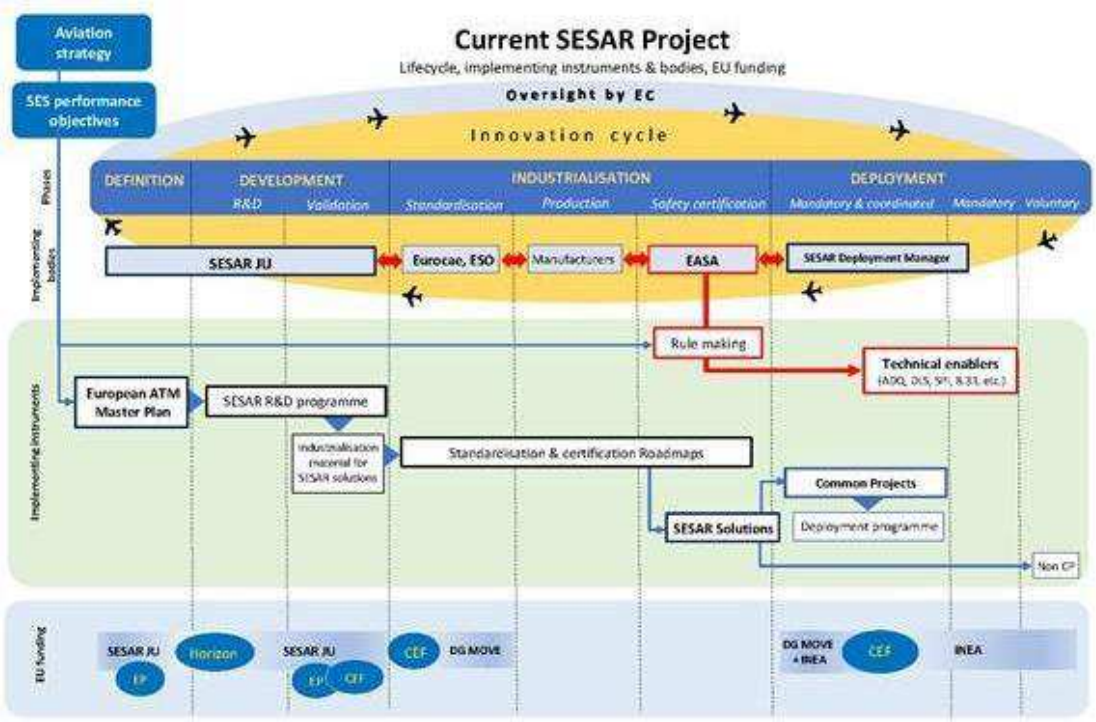


Figure 9: SESAR Innovation Lifecyle[43]

Source: DG-MOVE.

Key issues for accelerating deployment in ATM are:

- Reducing the implementation risks for both equipment supplier and ANSPs by ensuring that regulators and standardisation bodies have the current evidence to support operational approval and standards development. This is referred to as closing the industrialisation gap[44] and should be an objective of the future integrated ATM partnership.
- Ensuring a common and agreed evolution of systems hence reducing the commercial risk in developing products – in Europe this is achieved through the ATM Master Plan.
- Enabling synchronised deployment to reduce the time between system deployment and accruing benefits by ensuring that national ANSPs invest in a coherent manner – this is an objective of the SESAR deployment phase and common project legislation.[45]

R&I Prior to SESAR

Prior to SESAR, significant R&D was being undertaken in Air Traffic Management:

- EUROCONTROL spent about €150-200m a year on R&D;

[43] Source: DG-MOVE, European Commission

[44] Interim evaluation of the SESAR Joint Undertaking (2014-2016) operating under Horizon 2020, Experts Group Report.

[45] Commission Implementing Regulation (EU) No 716/2014 of 27 June 2014 on the establishment of the Pilot Common Project supporting the implementation of the European ATM Master Plan Text with EEA relevance.

- The Commission funding for ATM under the Fifth Framework Programme amounted to €20.8m between 1998 and 2002, and by around €100m over the 2002-2006 period;
- The European Investment Bank also contributed €390m to support ATM in Europe between 1999 and 2003.[46]

A 2006 review of existing R&D identified 58 initiatives; including:[47]

- FP6 funded 44 ATM[48] related research projects. The topics covered wide range, and some, became central to the SESAR Development Phase work programme, for example:
  - EPISODE 3 set foundation for the SESAR operational concept and performance framework.
  - SWIM-SUIT project came up with the precursors of the current SWIM solutions.
  - The ART project laid groundwork for SESAR remote tower solutions.
  - The EMMA projects pioneered A-SMGCS solutions.

- EUROCONTROL research included the PHARE programme which included research on 4D trajectory management and formed the basis of the concept developed within the SESAR Definition Phase. PHARE included strong input from the national programmes including Netherlands (NLR), Germany (DLR), France (DSNA) and the UK (NATS, DERA).
- National Programmes which fed into the procurement plans of ANSPs. In particular, LFV in Sweden had a strong national programme.

Despite the reasonable level of research, the programmes overlapped with each other and the results were fragmented leading to low value for money. The combined research effort was leading to competing rather than a common view of the future of ATM.

A key objective of SESAR was to coordinate all European ATM research towards a common goal, which was mandated by the SESAR Joint Undertaking regulation.[49]

The SESAR Joint Undertaking[50]

Scope and objectives

The SESAR Joint Undertaking was initially established in 2007 with the objectives and tasks defined in Table 4.

Table 4: Objectives and tasks of the SESAR Joint Undertaking

Objectives and tasks of the SESAR Joint Undertaking
The aim of the Joint Undertaking shall be to ensure the modernisation of the European air traffic management system by coordinating and concentrating all relevant research and development efforts in the Community. It shall be responsible for the execution of the European ATM Master Plan and in particular for carrying out the following tasks: • organising and coordinating the activities of the development phase of the SESAR project, in accordance with the

[46] SEAME CBA and Governance Study, Steer Davies Gleave, 2005.

[47] SESAR Consortium DLT-0507-221-00-02, 2006.

[48] The R&I tended to be conducted by research organisations and ANSPs, with limited involvement from airspace users and airport operators. Total ATM related research received €167m in funding (with the total budget of €289m).

[49] Council Regulation (EC) No 219/2007 of 27 February 2007 on the establishment of a Joint Undertaking to develop the new generation European air traffic management system (SESAR)

[50] Interim Evaluation of the SESAR Joint Undertaking (2014-2016) operating under Horizon 2020, Experts Group Report.

Objectives and tasks of the SESAR Joint Undertaking
European ATM Master Plan, resulting from the definition phase of the project managed by EUOCONTROL, by combining and managing under a single structure public and private sector funding, • ensuring the necessary funding for the activities of the development phase of the SESAR project in accordance with the European ATM Master Plan, • ensuring the involvement of the stakeholders of the air traffic management sector in Europe, in particular: air navigation service providers, airspace users, professional staff associations, airports, and manufacturing industry; as well as the relevant scientific institutions or the relevant scientific community, • organising the technical work of research and development, validation and study, to be carried out under its authority while avoiding fragmentation of such activities, • ensuring the supervision of activities related to the development of common products duly identified in the European ATM Master Plan and if necessary, to organise specific invitations to tender.

Source: Council Regulation (EC) No 219/2007 of 27 February 2007 on the establishment of a Joint Undertaking to develop the new generation European air traffic management system (SESAR).

At the core of the activities of the SESAR Joint Undertaking is the European ATM Master Plan which acts as the strategic research and innovation agenda for the partnership.

The first version of the European ATM Master Plan was developed prior to the establishment of the SESAR Joint Undertaking and endorsed by the European Council in 2009. Since then, the European ATM Master Plan has been regularly updated by the SESAR Joint Undertaking following widespread stakeholder consultation. Each version requires approval of Member States through a positive opinion of the Single Sky Committee.[51]

Table 25 defines the main changes in each subsequent version of the European ATM Master Plan.

Table 5: Versions of the European ATM Master Plan

Edition	Additional Changes	MS State Endorsement
2009	Initial version created by the SESAR Definition Phase	Council Decision[52]
2012[53]	Increase the ATM community's awareness and focusing efforts on a manageable set of essential operational changes. Prepare for SESAR deployment phase, developing clear stakeholder roadmaps which provide a temporal view of the ATM. Promote and ensure interoperability at global level, in particular with the US ATM Modernisation programme, NextGen and ICAO. Promote synchronisation of ATM R&I and Deployment Programmes to ensure global interoperability.	SSC Opinion
2015[54]	Introduced a vision for the future European ATM system, including Common Support Services and cybersecurity. Explicitly introduces drones and rotorcraft as airspace users. Incorporates the results of more comprehensive military involvement through the European Defence Agency (EDA).	SSC Opinion
2020	Addresses new challenges: tackling the unprecedented increase in traffic demand from both manned, and unmanned aviation, enabling the emergence of new business models, while supporting the sustainability of	SSC Opinion

[51] The Single Sky Committee is the comitology committee for the Single European Sky.

[52] Council resolution on the endorsement of the European Air Traffic Management Master Plan 2935th TRASPORT, TELECOMMUICATIONS and EERGY Council meeting, Brussels, 30 March 2009. Available at: https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/trans/106966.pdf

[53] European ATM Master Plan, Edition 2012, SJU. Available at: https://ec.europa.eu/transport/sites/transport/files/modes/air/sesar/doc/2012_10_23_atm_master_plan_ed2oct2012.pdf)

[54] European ATM Master Plan, Edition 2015, SJU. Available at: https://ec.europa.eu/transport/sites/transport/files/modes/air/sesar/doc/eu-atm-master-plan-2015.pdf

	aviation. Enables digital transformation of the aviation infrastructure to accommodate aerial vehicles, which are set to become more autonomous, more connected and more intelligent.	

Source: authors analysis of each edition of the European ATM Master Plan.

In 2014, the Council agreed that continuation of SESAR was the most effective way to achieve ATM modernisation[55,56] in Europe and extended the duration of the SESAR Joint Undertaking from 2016 to 2024,[57] leading to two distinct phases of the SESAR R&I programme, see Table 6.

Table 6: Phases of the SESAR Joint Undertaking

Phase	Dates	EC Contribution	Total Available Budget
SESAR1	2008 – 2016	TEN-T: €350 M FP7: €350	€2.1 b
SESAR2020	2015 – 2024	H2020: €585	€1.8 b

Source: Interim Evaluation of the SESAR Joint Undertaking (2014-2016) operating under Horizon 2020, Experts Group Report.

SESAR is the only source for funding of air traffic management R&I funding under Horizon 2020.

SESAR Joint Undertaking Work Programme

The main elements of the SESAR Joint Undertaking R&I programme are[58] presented in Table 7.

Table 7: Main elements of SESAR Joint Undertaking R&I Programme

Programme	Forms of R&I	Budget	Type of call
Core Programme	• Industrial Research and Validation • Very Large Scale Demonstrations • Transversal Activities (including ATM Master Plan maintenance)	80%	Restricted to SJU members
Exploratory Research Programme	• Fundamental Scientific Research • ATM Application Oriented Research	20%	Open Calls

Source: SESAR Single Programming Document, SJU, 2019.

The structure of the SESAR work programme is illustrated in Figure 10.

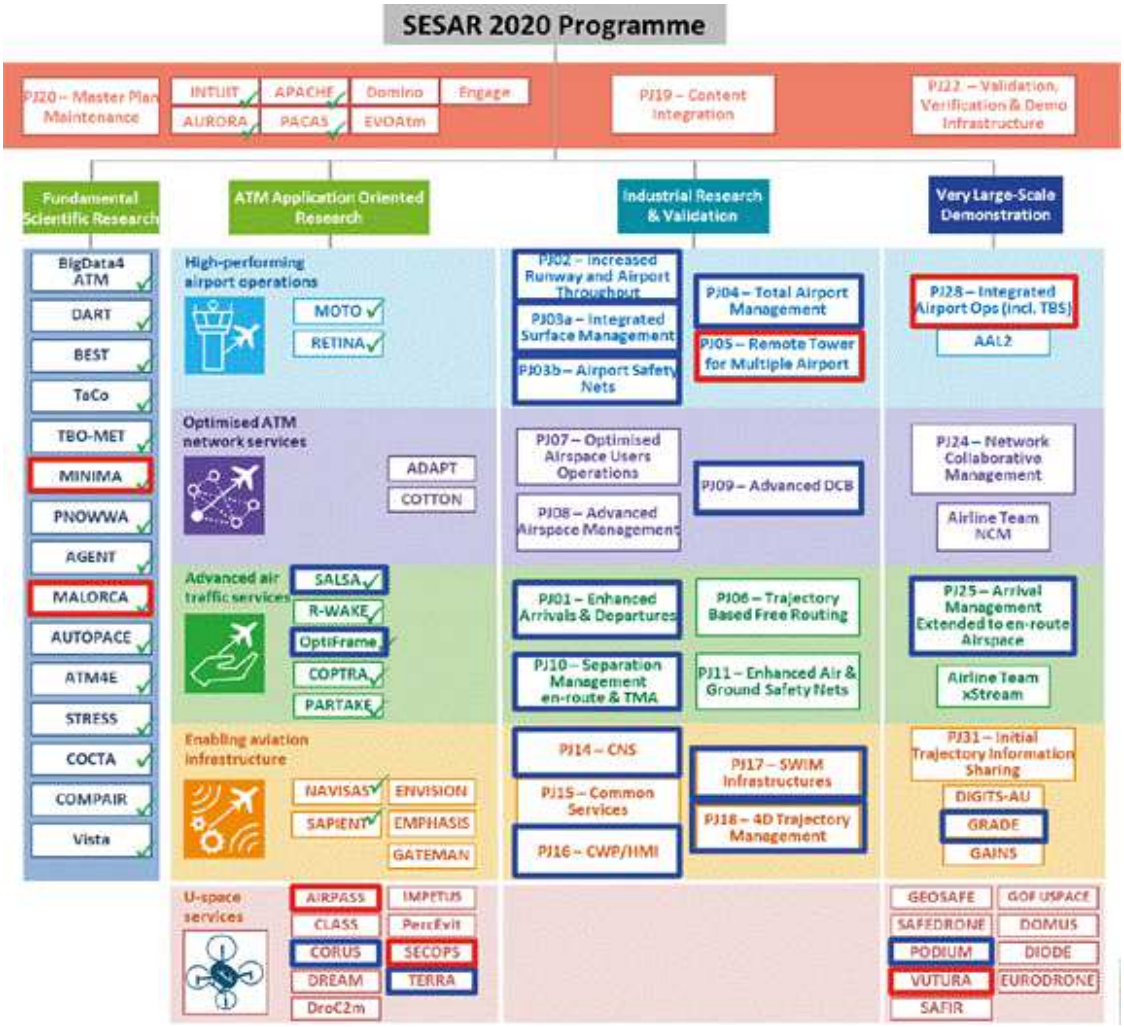
[55] SJU Extension – Impact Assessment Study, Ernst and Young, 31 July 2012.

[56] COMMISSION STAFF WORKING DOCUMENT Revision of Council Regulation (EC) N°219/2007 of 27 February 2007 on the establishment of a Joint Undertaking to develop the new generation European air traffic management system (SESAR).

[57] Council Regulation (EU) No 721/2014 of 16 June 2014 amending Regulation (EC) No 219/2007 on the establishment of a Joint Undertaking to develop the new generation European air traffic management system (SESAR) as regards the extension of the Joint Undertaking until 2024.

[58] SESAR Joint Undertaking Single Planning Document, SJU, 2019.

Figure 10: Structure of the SESAR2020 Programme



Source: SESAR Joint Undertaking Single Planning Document, 2019 to 2022, April 2019.

SESAR Joint Undertaking Membership

SESAR Joint Undertaking membership includes the main stakeholders of the European ATM industry including air navigation service providers, airports, equipment manufacturers and R&I laboratories. There are currently 19 SESAR Joint Undertaking members composed of 37 individual companies (see Table 8). In addition, EUROCONTROL is a founding Member.

Table 8: Members of the SESAR Joint Undertaking

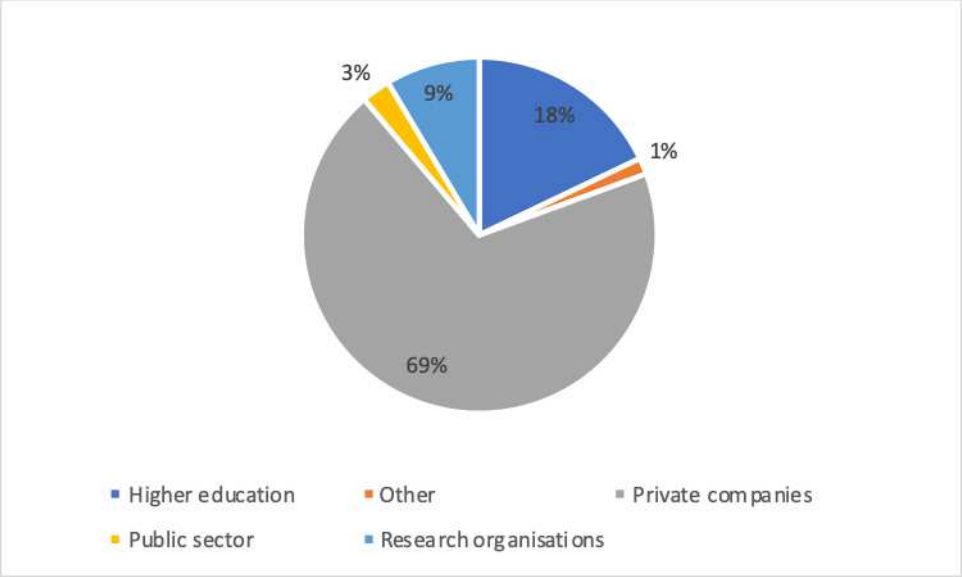
Member	Beneficiary	Sector	Country
AT-ONE	DLR	Research Org	Germany
	NLR	Research Org	Netherlands
B4	PANSA	Service Provider	Poland
	ANS CR	Service Provider	Czech Republic
	ORO Navigacija	Service Provider	Lithuania
	LPS SR	Service Provider	Slovak Republic
COOPANS	Naviair	Service Provider	Denmark
	Croatia Control Ltd	Service Provider	Croatia
	LFV	Service Provider	Sweden
	AustroControl	Service Provider	Austria
	IAA	Service Provider	Ireland
FSP	Frequentis AG	Ground Industry	Austria
	Atos Belgium SA/NV	Ground Industry	Belgium
	HungaroControl	Service Provider	Hungary
NATMIG	Sintef	Ground Industry	Norway
	AirTel ATN Ltd	Ground Industry	Ireland
	SaaB AB	Ground Industry	Sweden
SEAC2020	Heathrow Airport Ltd	Airport	UK
	Munich Airport	Airport	Germany
	Aeroports de Paris	Airport	France
	Zurich Airport	Airport	Switzerland
	Schiphol Airport	Airport	Netherlands
	Avinor AS	Airport	Norway
	Swedavia AB	Airport	Sweden
Airbus SAS	Airbus SAS	Airborne Industry	France
Dassault Aviation	Dassault Aviation	Airborne Industry	France
Honeywell Aerospace SAS	Honeywell Aerospace SAS	Airborne Industry	France
Thales Avionics SAS	Thales Avionics SAS	Airborne Industry	France
Finmeccanica – Leonardo	Finmeccanica – Leonardo	Ground Industry	Italy
Indra Sistemas SA	Indra Sistemas SA	Ground Industry	Spain
Thales Air Systems SAS	Thales Air Systems SAS	Ground Industry	France
DFS	DFS	Service Provider	Germany
DSNA	DSNA	Service Provider	France
ENAIRE	ENAIRE	Service Provider	Spain
ENAV SpA	ENAV SpA	Service Provider	Italy
NATS EnRoute Plc	NATS EnRoute Plc	Service Provider	UK
Skyguide	SkyGuide	Service Provider	Switzerland

Source: Interim Evaluation of the SESAR Joint Undertaking (2014-2016), Experts Group Report.

Approximately 80% of SESAR R&I is performed by the members following "closed calls". The members' supply chains support their contributions as third link parties or as subcontractors to the members.

SESAR Joint Undertaking membership does not directly include Universities and SMEs. However, the remaining 20% of R&I activities is performed by a range of academia and SMEs following open calls – mostly of Exploratory Research. In total, there have been 268 individual participants in the SESAR2020 programme (both open and closed calls). The private sector dominates with almost 70%, with the 18% of participation from Higher education sector, and 9% coming from Research organisations, as depicted in Figure 11.

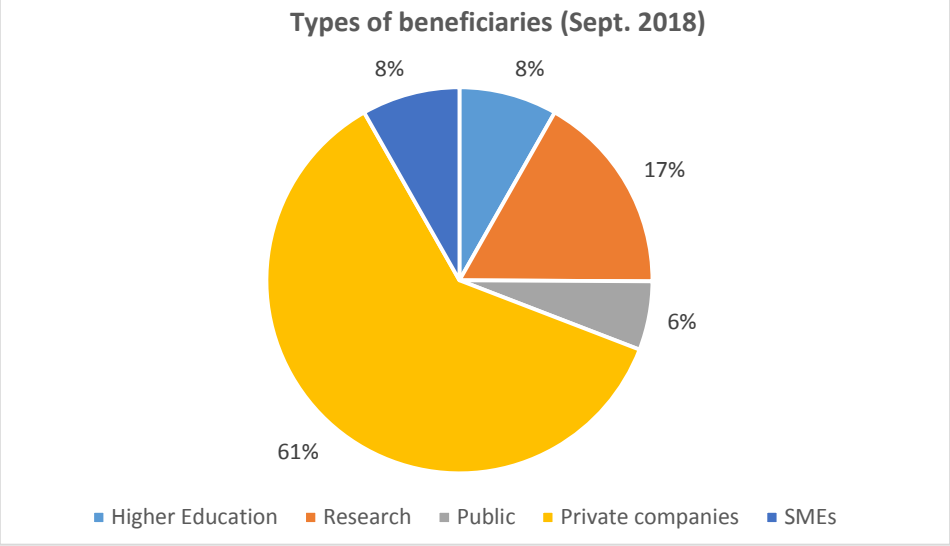
Figure 11: Type of participants in the SESAR Joint Undertaking.



Source: DG RTD data, calculation: Technopolis Group.

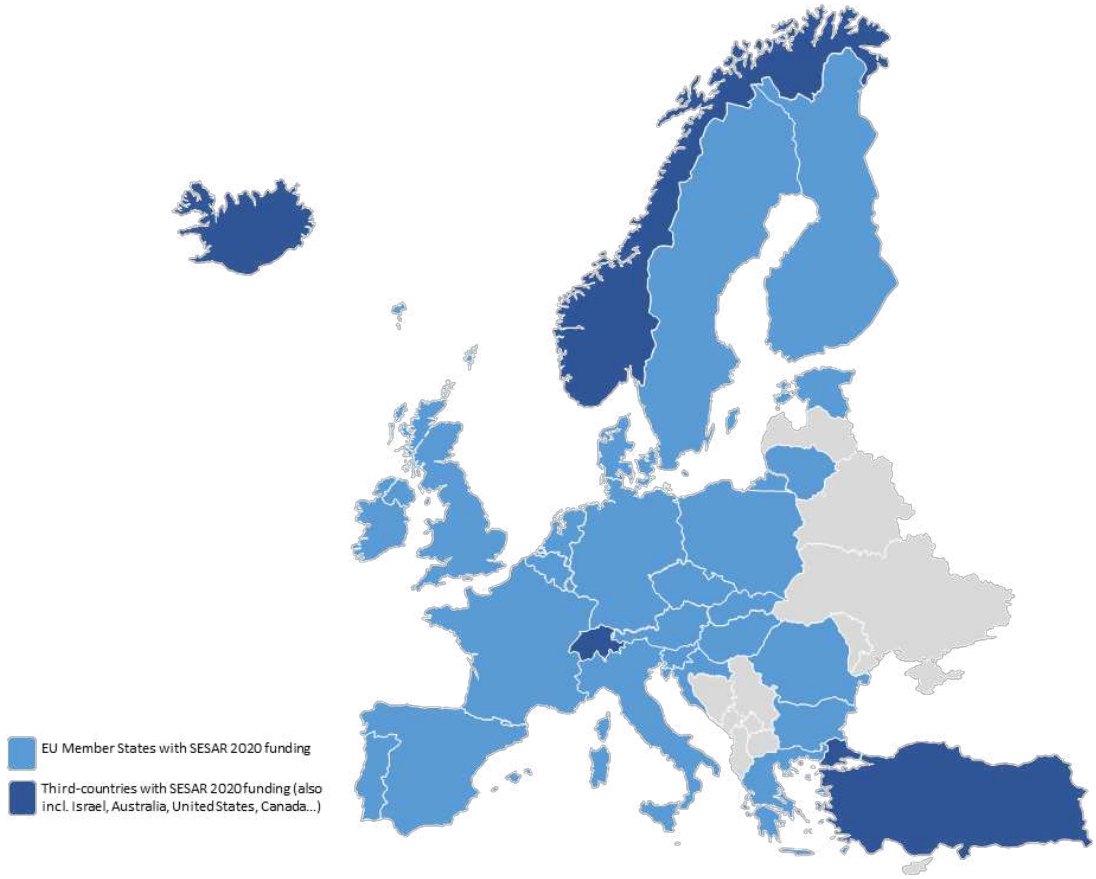
Figure 12 and Figure 13 illustrate the forms and geographical spread of SESAR Joint Undertaking beneficiaries.

Figure 12: Types of SESAR Joint Undertaking beneficiaries



Source: DG RTD data, calculation: Technopolis Group.

Figure 13: Location of SESAR Joint Undertaking beneficiaries



Source: DG RTD data, calculation: Technopolis Group.

Achievements of the SESAR Joint Undertaking

The focus of the current R&I programme is to develop and validate advanced solutions and concepts for the future air traffic management system in line with the European ATM Master Plan. Each solution represents a change in the way air traffic management is performed, and is supported by:

- A business case,
- A safety case,
- A performance case,
- A human performance case,
- A specification or similar material to support standardisation.

The SESAR Solutions Catalogue[59] defines 63 such solutions that have reached a sufficient maturity for deployment. EUROCAE and EUROCONTROL have developed over 50 standards to support deployment of SESAR solutions.[60]

For **scientific and technological analysis** of the current partnership, it is important to bear in mind the type of partners involved and the field of partnership, which is ATM. Scientific publications can be

[59] SESAR Solutions Catalogue 2019 Third edition, SJU, 2019.

[60] Source: https://ec.europa.eu/transport/sites/transport/files/ec-716-2014_article4b_standardisatregulatroadmap.pdf_

expected predominantly from the academic partners and from research organisations, but much less so from industry partners.

Based on the data available through DG RTD, 24 of the SESAR projects produced 32 publications in the field of 'Smart, green and integrated transport' (see Table 9).

Table 9: Number and share of publications by year.

Smart, green and integrated transport	2016	2017	2018	2019	Total
Total	5	22	4	1	32
Share	16%	69%	13%	3%	100%

Source: DG RTD, calculation: Technopolis Group

Table 10: Main journals from SESAR Joint Undertaking publications.

Journal Title	Total	Journal Title	Total
IEEE Transactions on Intelligent Transportation Systems	3	IEEE Access	1
IEEE Transactions on Visualization and Computer Graphics	3	IEEE Transactions on Biomedical Engineering	1
ANADOLU UNIVERSITY JOURNAL OF SCIENCE AND TECHNOLOGY A - Applied Sciences and Engineering	2	IEEE Wireless Communications Letters	1
Computer Graphics Forum	2	IFAC-PapersOnLine	1
Frontiers in Neuroscience	2	Informatics	1
Journal of Applied Meteorology and Climatology	2	Journal of Aircraft	1
Aerospace	1	Journal of Geophysical Research: Atmospheres	1
Atmospheric Measurement Techniques	1	Journal of Guidance, Control, and Dynamics	1
Augmented Reality, Virtual Reality, and Computer Graphics - Lecture Notes in Computer Science	1	Journal of The Royal Society Interface	1
Augmented Reality, Virtual Reality, and Computer Graphics - Lecture Notes in Computer Science, 9768	1	MATEC Web of Conferences	1
Brain Sciences	1	Transportation Research Part A: Policy and Practice	1
Frontiers in Human Neuroscience	1	Transportation Research Procedia	1

Source: DG RTD, calculation: Technopolis Group

The search of SCOPUS database produced 93 scientific papers in the period 2012-2019 (87 in the period 2014-2019) that listed as the source of funding SESAR Joint Undertaking. A number of these papers have been presented at the conferences (which are indexed in SCOPUS), as in some of the disciplines that are participating in the ATM, conferences are of more importance than the publications in journals.

The three main, peer-reviewed conferences in the ATM are:

1. The ATM Seminar, organised biannually, jointly by the Federal Aviation Administration and EUROCONTROL, aimed at established researchers (www.atmseminarus.org);
2. International Conference on Research in Air Transportation (ICRAT), organised biannually, jointly by the Federal Aviation Administration and EUROCONTROL, aimed at young researchers (www.icrat.org);
3. SESAR Innovation Days, organised by the SESAR Joint Undertaking, every year (https://www.sesarju.eu/sesarinnovationdays).

Conference proceedings are publicly available on the conference websites, and are indexed in the SCOPUS database.[61] The last three editions of ATM Seminar (2013-2017, as listed in SCOPUS) include 217 peer-reviewed papers. The ATM Seminar confers awards for best papers in each session and best conference paper. In the last two editions of the ATM Seminar, about half of the awards were won by European researchers, a significant number working on SESAR Joint Undertaking funded projects.[62]

The SESAR Innovation Days conference is open to any research in the field of ATM, and is aimed at reviewing and showcasing the research performed in the SESAR Joint Undertaking. There have been eight editions of the conference so far, and the number of accepted papers has been growing.

In summary, the research produced under the current partnership is of high scientific value, when assessed across the indicators that are important in the field – participation and awards received at the main conferences.

The **technological achievements** of the partnership are presented in terms of patent analysis and the technological solutions developed and implemented.

Patents can be expected from industry partners since they have a genuine interest in protecting their innovation. However, due to competition, business practices and the pre-competitive nature of collaborative R&I projects at EU-level, etc. most industrial partners in the field of ATM are not likely to apply for IPR. Therefore, the numbers of IPs recorded in the DG RTD database are of little use to describe properly the technological achievements of the partnership. IPRs can be found as outputs from three projects: two applied for a patent and one for a trademark.

The more important technological achievement of the partnership can be found in the catalogue of mature[63] ATM solutions produced by the partnership: SESAR Solutions Catalogue 2019,[64] containing 63 mature solutions and 79 solutions being developed. These solutions have been tested in over 200 validation exercises, at over 50 test beds across Europe.

Figure 14 displays a sample of locations deploying the SESAR solutions. The blue markers denote the airports deploying SESAR Solutions that are mandated through the EU's Pilot Common Project[65], while the green markers point to the sample of locations where local SESAR deployments[66] are taking place.

[61] It takes a while for the proceedings to be indexed in SCOPUS, which is why the last ATM Seminar from June of 2019 and several SESAR Innovation Days proceedings are not yet available.

[62] Source: www.atmseminarus.org

[63] Mature from the R&I point of view, which is to say passing TRL 6.

[64] SESAR Solutions Catalogue, SJU, 2019.

[65] Commission Implementing Regulation (EU) No 716/2014 of 27 June 2014 on the establishment of the Pilot Common Project supporting the implementation of the European Air Traffic Management Master Plan Text with EEA relevance.

[66] The detailed implementation data is available at: https://www.atmmasterplan.eu/deployment

Figure 14: Locations where SESAR Joint Undertaking solutions are being deployed

Source: SESAR Solutions Catalogue 2019.

The current deployment programme encompasses 349 projects with total costs of €2.9 billion with €1.2 billion co-funding the Connecting Europe Facility.

In summary, the current partnership (and as such the ATM R&I in Europe) produces high-quality scientific knowledge and a number of technological achievements are available and are being deployed, not only in Europe.

Outcomes and (expected) impacts

Since its inception in 2008, the SESAR Joint Undertaking has successfully coordinated European ATM R&I. The success of SESAR is best illustrated by the European ATM Master Plan, culminating in the 2015 edition,[67] and SESAR Solutions Catalogue.[68] To date 63 ATM solutions have been developed.

In addition, SESAR is strong brand demonstrating EU leadership in ATM in a competitive global landscape.[69] Indeed, the SESAR Joint Undertaking played a strong role in the development of global plans at ICAO level and in maintaining international interoperability of ATM systems through coordination with the FAA (Federal Aviation Authority) and other similar initiatives.[70]

[67] European ATM Master Plan, Edition 2020, SJU.

[68] SESAR Solutions Catalogue 2019 Third edition, SJU, 2019.

[69] Interim Evaluation of the SESAR Joint Undertaking (2014-2016) operating under Horizon 2020, Experts Group Report.

[70] Section 2.5 of SESAR Joint Undertaking Single Programming Document 2019-2021, SJU, 2019.

The SESAR Joint Undertaking has also supported the European Commission's development of aviation and ATM policy through key studies performed at the request of DG-MOVE, including datalink communications,[71] U-space[72] and the recent Airspace Architecture Study.[73]

The SESAR Joint Undertaking results have therefore contributed to improvement of ATM both in the EU and globally. The key strengths of the SESAR Joint Undertaking are:

- Strong global brand supporting EU leadership,
- SESAR solutions demonstrably improving ATM performance,
- Integrated R&I platform including users, providers, suppliers, staff and regulators.

Identified needs for action

Previous assessments stress the importance of *SESAR and the* SESAR Joint Undertaking *as key enablers for the implementation of the wider SES policy"*[74]. However, two key weaknesses were found:

- Limited exploitation of advanced external R&I and internal exploratory research in the core ("closed call") programme. This illustrates a potential issue in the limited membership of the SESAR Joint Undertaking not enabling the beneficiaries of Exploratory Research to continue on the topic in the core programme.
- Limited progress on key enablers where there is limited industry consensus (for example, next generation datalinks and flight data processing) potentially highlighting the need for greater emphasis on transformational technologies.

In 2018, the SESAR Joint Undertaking performed a study on behalf of the European Parliament and European Commission to develop a proposal for a Future Airspace Architecture. Whilst the proposal is largely based on the current European ATM Masterplan, it also represents a step change in requiring both more transformational technologies and faster pull through from scientific research of digital enablers to support enhanced automation.

The European Court of Auditors has considered both SES[75] and SESAR Deployment,[76] other parts of the SESAR innovation lifecycle. The former provided three recommendations relevant to the SESAR Joint Undertaking and to the future ATM research and development activities:

- Review the EU's support structure to ATM R&I in light of its objectives – including the need to justify continued support and whether a temporary structure is appropriate.
- Reinforce the accountability of the SESAR Joint Undertaking – by defining clear milestones and regular reports on progress with the implementation of the European ATM Master Plan.
- Prioritise EU support to R&I solutions that promote defragmentation and a competitive environment.

Delivering the Single European Sky and ensuring ATMs role in a sustainable aviation sector requires a much greater transformation than has hitherto been achieved. The level of transformation is discussed in Annex F.

[71] Source: https://www.sesarju.eu/newsroom/brochures-publications/vdlm2-%E2%80%93-measurements-analysis-and-simulation-campaign-elsa-study

[72] Source: https://www.sesarju.eu/U-space

[73] Source: https://www.sesarju.eu/news/airspace-architecture-study-presented-european-parliament

[74] Interim Evaluation of the SESAR Joint Undertaking (2014-2016) operating under Horizon 2020, Experts Group Report.

[75] Single European Sky: a changed culture but not a single sky, Special Report 18/2017, European Court of Auditors.

[76] The EU's regulation for the modernisation of air traffic management has added value – but the funding was largely unnecessary, Special Report 11/2019, European Court of Auditors.

Aviation contribution to SustAainable Development Goals

"The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership."[77]

Aviation as a provider of transport and mobility is able to support a number of SGDs. ATM as an enabler of efficient transport contribute to multiple Sustainable Development Goals:

- SDG 9 (Industry, Innovation and Infrastructure)
- SDG 11 (Sustainable Cities and Communities)
- SDG 13 (Climate Action)

Indirect positive impact is expected for example in:

- SDG 3 (Good health and well-being)
- SDG 8 (Decent work and economic growth)
- SDG 12 (Responsible production and consumption)[78]

The following table has been developed from a report developed by Air Transport Action Group (ATAG) to illustrate how aviation can contribute to 11 SDGs.[79]

Table 11: How aviation can contribute to 11 Sustainable Development Goals

SDG	How Aviation can support		
	Direct	**Indirect**	**Induced**
1. No poverty	Creating jobs in air transport connected places	Continuity of remittances is supported by the maintenance of family and cultural ties is aided by air transport links.	
2. Zero hunger		The World Food Programme (WFP), in partnership with the UN Humanitarian Air Service, is tasked with getting food to those in the midst of war, civil conflict and natural disasters. Because many of these zones are inaccessible by road, air transport is the only option.	
3. Good health and well-being		The industry, too, has a vital role to play in responding to disaster. In 2010, Airlink was established to help coordinate responses to emergencies by the air transport industry.	Aviation also has a crucial role to play in pandemic response. When a viral outbreak occurs, it is vital that the air transport sector acts quickly to work with governments and international institutions to ensure that the virus does not travel further.

[77] Sustainable development goals knowledge platform. Available at: https://sustainabledevelopment.un.org/sdgs

[78] European Commission (2019) Orientations towards the first Strategic Plan implementing the research and innovation framework programme Horizon Europe. Co-Design via web open consultation.

[79] Aviation Benefits Beyond Borders, ATAG, October 2018.

SDG	How Aviation can support		
	Direct	**Indirect**	**Induced**
4. Quality education		Ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for many means travelling to another country, sometimes in another region of the globe. For students from developing countries, the opportunity to travel to established universities for higher education is invaluable.	Air transport connectivity make these ambitions far more likely to be realised.
7. Affordable and clean energy		Airport planning and design also takes into consideration environmental aspects to maximise efficiency with the minimal possible impact on the environment.	
8. Decent work and economic growth	Creating jobs that directly serve passengers at airlines, airports and air navigation service providers (ASNPs)	Employment and activities of suppliers to the air transport industry	Spending of those directly or indirectly employed in the air transport sector supports additional jobs in other industries
9. Industry, innovation and infrastructure	Since the dawn of air travel, aviation has been at the forefront of technological innovation, researching and developing disruptive, ground-breaking technology with each new generation of aircraft or each new control technique.		Connectivity contributes to improved productivity by encouraging investment and innovation, improving business operations and efficiency.
10. Reduced inequalities	The greatest increase in propensity to travel is in developing economies, reducing geographical inequalities.		In developed economies the connectivity to rural areas is increasing, making it more accessible to everyone.
11. Sustainable cities and communities	New technology will enable some remote and seasonal airports to remain open and viable improving sustainability.	Smaller airports within a network generate traffic that ensures the sustainability of larger airports, resulting in improved load factors and optimal aircraft utilisation by airlines.	
12. Responsible consumption and production	Once an aircraft reaches the end of its service life, it can be recycled to ensure safe disposal and to take advantage of the many high-quality components and materials of which it is made. The idea is to move this idea into the ATM industry too by recycling and not having an excess of radars. Virtual centres allow to have a responsible use of air traffic services.	It is the role of countries to ensure that improvements in ATM infrastructure are properly financed. As there are long lead times for procuring new equipment, such as air traffic control centres and the latest surveillance equipment, ATM investment needs long-term planning.	

SDG	How Aviation can support		
	Direct	**Indirect**	**Induced**
13. Climate action	In 2008 industry leaders announced a climate action plan based on three global goals, which the entire sector has committed to: 1. Achieve a 1.5% average annual fuel efficiency improvement from 2009 to 2020 (already being surpassed, average 2.1% per year). 2. Stabilise net CO2 emissions at 2020 levels through carbon-neutral growth. 3. Reduce net emissions to 50% of what they were in 2005 by 2050.	While the aviation industry is prioritising fuel efficiency to try and reduce its climate change impact, there are a number of ways in which a changing climate could impact air transport operations.	
17. Partnerships for the goals	For the potential of new navigational technology to be realised, the industry needs the engagement and cooperation of governments and international institutions. Airspace is governed by sovereign states, meaning that any reform needs governmental buy-in. But aviation transcends national boundaries.	Encouraging progress has been made on the first three pillars of the industry's environmental strategy. However, to achieve the goal of carbon-neutral growth from 2020 other measures need to be taken.	

Source: Aviation Benefits Beyond Borders, ATAG, October 2018.