Draft proposal for a

European Partnership under Horizon Europe

Globally competitive Space Systems

Version 27 May 2020

About this draft

In autumn 2019 the Commission services asked potential partners to further elaborate proposals for the candidate European Partnerships identified during the strategic planning of Horizon Europe. These proposals have been developed by potential partners based on common guidance and template, taking into account the initial concepts developed by the Commission and feedback received from Member States during early consultation[1]. The Commission Services have guided revisions during drafting to facilitate alignment with the overall EU political ambition and compliance with the criteria for Partnerships.

This document is a stable draft of the partnership proposal, released for the purpose of ensuring transparency of information on the current status of preparation (including on the process for developing the Strategic Research and Innovation Agenda). As such, it aims to contribute to further collaboration, synergies and alignment between partnership candidates, as well as more broadly with related R&I stakeholders in the EU, and beyond where relevant.

This informal document does not reflect the final views of the Commission, nor pre-empt the formal decision-making (comitology or legislative procedure) on the establishment of European Partnerships.

In the next steps of preparations, the Commission Services will further assess these proposals against the selection criteria for European Partnerships. The final decision on launching a Partnership will depend on progress in their preparation (incl. compliance with selection criteria) and the formal decisions on European Partnerships (linked with the adoption of Strategic Plan, work programmes, and legislative procedures, depending on the form). Key precondition is the existence of an agreed Strategic Research and Innovation Agenda / Roadmap. The launch of a Partnership is also conditional to partners signing up to final, commonly agreed objectives and committing the resources and investments needed from their side to achieve them.

The remaining issues will be addressed in the context of the development of the Strategic Research and Innovation Agendas/ Roadmaps, and as part of the overall policy (notably in the respective legal frameworks). In particular, it is important that all Partnerships further develop their framework of objectives. All Partnerships need to have a well-developed logical framework with concrete objectives and targets and with a set of Key Performance Indicators to monitor achievement of objectives and the resources that are invested.

Aspects related to implementation, programme design, monitoring and evaluation system will be streamlined and harmonised at a later stage across initiatives to ensure compliance with the implementation criteria, comparability across initiatives and to simplify the overall landscape.

[1] https://www.era-learn.eu/documents/final_report_ms_partnerships.pdf

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The Strategic Research and Innovation Agenda (SRIA) used as input for this proposal can be found at
https://ec.europa.eu/docsroom/documents/39528
All the lead entities and the Commission services / contact points mentioned above have been involved in its elaboration and can be contacted in the frame of this proposal.

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1 General information

1.1 Draft title of the European Partnerships

Globally competitive space systems

1.2 Lead entity (main contact)

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The above five associations provide an inclusive setting and any company or any research organisation in Europe can become member of one of these associations.

1.3 Commission services (main contact)

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1.4 Summary (max 500 characters)

Space is a strategic sector for the European Union. Among the objectives set by the Space Strategy for Europe[2] are 'Fostering a globally competitive and innovative European space sector' and 'Reinforcing Europe's autonomy in accessing and using space in a secure and safe environment'. A strategic approach to EU-funded R&I under the form of a Co-Programmed Partnership can bring a key contribution to these objectives.

2 Context, objectives, expected impacts

2.1 Context and problem definition

2.1.1. Proposal context, economic context, problems drivers and strategic opportunities

Horizon Europe context / Proposal context

Like under Horizon 2020, space R&I under Horizon Europe is intended to cover the needs of i) the Space Programme and its four components EGNSS, Copernicus, Space Situational Awareness (SSA) and secured governmental communications GOVSATCOM (the two last components being new), as well as ii) to foster the competitiveness of the EU space sector and reinforce our capacity to access and use space. R&I for i) will be part of 'normal' calls i.e. not

[2] COM(2016)705

under this Partnership proposal. This proposal focuses on point ii) and the centre of gravity is on spacecraft (satellites) and launchers, sometimes referred to as 'space component' or 'upstream'. The so-called 'downstream' sector, which relies on the existence of space infrastructure drives its developments and use it to develop services and applications, is only marginally addressed by this proposal.

This initial proposal is made in the frame of the preparation of Horizon Europe. At this point of the process, it is based mostly on information provided by entities who have expressed their interest to become Partners. While there are references to the European Space Agency, EU Members States (and implicitly countries associated to Horizon Europe), the Space Policy Experts sub-Group on Technologies, other European Partnership proposals, other associations (e.g. ESOA, EESC) with whom the European Commission and the potential Partners of this proposal have had exchanges on EU-funded space R&I, this proposal has not been shared with them and therefore does not imply any commitment from their side. This proposal is intended to be published so that entities can express their interest / view.

Economic Context, importance of the sector for the EU economy and jobs

The space context has been evolving throughout the recent decades. Although the main drivers worldwide remain institutional programmes, a significant market for commercial satellite services, mostly reliant on geostationary communication systems for TV and broadcast applications has developed since the early 1990s, and earth observation.

Today, the global space activity worldwide has stabilised around two main pillars: institutional programmes (including human spaceflights) representing about two thirds of spacecraft launched every year worldwide, and privately funded programmes, which constitute the remaining third. In Europe the reliance on the private market is however higher than in the rest of the world.

With 43000 jobs, the upstream segment of the European space industry, i.e. manufacturing of launcher and spacecraft, represents 6% of the global space industry workforce and generates EUR 8.8 billion of consolidated revenues.

With about EUR 9.5 billion of satellite exports in the last decade and a growing market share on the global commercial satellite market, European industry is a strong global competitor. It has achieved unique leadership positions in the global commercial telecommunications systems market, and in the developing export market for commercial and military Earth observation systems. Today, Europe has a world-class space sector, including a strong satellite manufacturing industry, which captures an average of 33 % of the open world markets[3].

The European launcher industry is also of strong economic and strategic importance. In the past decade, it provided 15% of world launch capacity worldwide, capturing 35% of the total accessible market worldwide, and generating accumulated revenues above EUR 10.6 billion in the decade, of which half are for non-European customers (exports).

3 Eurospace - space economics - 2018

Globally, the space system manufacturing and launch sector exports contributed more than EUR 15 billion to the EU trade balance. Furthermore, the capacity to access and use space is a strategic asset for Europe and its Member States.

Relying on these 'upstream' infrastructure and space assets, much broader mid-stream and downstream sectors have developed a wealth of services and applications. Today, it is estimated that 10% of the EU's GDP depends on the use of space services[4].

The overall European space economy (upstream, mid-stream and downstream) is estimated to employ over 230 000 professionals generating a value of EUR 46-54 billion or 21% of the worldwide business in the sector[5].

It is therefore a critical and strategic sector for the EU economy, which opens up many business opportunities especially in combination with digital technologies and other sources of data and supports an increasing number of public policies.

Where are we today / state of play

The current situation is the result of long-term investments since the 1960s by European Member States, the European Space Agency and of the work done by industry, SMEs, research centres and universities in developing new technologies and concepts and by educating and training the workforce needed by the sector.

Beyond economics and jobs, the capacity of accessing and using space remains a strategic asset for many Member States in relation to security and defence, but also in the context of enabling EU control over future communications and big data infrastructures, as well as with regards to critical applications for environment monitoring and climate assessment.

Access to space is a key enabler and indispensable element in the overall space value chain without which, there is no space policy. In line with the Space Strategy for Europe[6], ensuring independent, reliable and cost-effective access to space is a political imperative for the EU. The EU must indeed ensure and maintain its autonomy and not depend on conditions imposed by others.

Maintaining and expanding our competitive edge across all space actors while reducing our dependence in accessing and using space in the coming years is therefore of utmost importance.

Problem, problems drivers

The current situation of the European space sector in the global context as described above puts into evidence two main problems:

1) The EU Space sector is under a specific global competitive pressure.

4 Socio economic impacts from space activities in the EU in 2015 and beyond, PWC report, 2016
5 Socio economic impacts from space activities in the EU in 2015 and beyond, PWC report, 2016
6 COM(2016)705: Space Strategy for Europe

The problem drivers are:

- The fact that other regions of the world (e.g. US, Russia, China, India) made the choice to have strong institutionally driven and supported space sectors, with a protected national market, places European stakeholders on an unfavourable level playing field. Space systems markets are not only globally heavily regulated but also domestically protected. They are not subject to international trade agreements and they are supported by national policies worldwide.
- Europe is the lead contender to the USA in commercial telecom and has a leadership position in commercial Earth observation. Consequently, it is a net exporter of space systems and launch services and a net positive contributor to the EU global trade surplus. However, although the value of space systems exports has grown by 30% in the past two decades, the European market shares have not improved. USA products are supported by technical advance developed in many labs and have unique performance and cost advantages due to high volume production supported by institutional domestic programmes. Hence, while European systems exports increased, the value of European imports grew even more. As a result, the satellite net trade balance did not grow as much as it could. Today the net surplus provided by satellite trade is in the order of EUR 350 million a year, and about 500 million for launch services.
- There is a new trend in commercial satellite markets, focusing on the use of smaller, lighter satellites in very large numbers (constellations and swarms). Although European industrial players have been the leading suppliers for the first operators of constellation systems in the 1990s and 2000s or in the development of new technologies, they are today not leading in the emerging 'New Space' paradigm, that has seen the emergence of reusable launchers and mega-constellations of small/micro/nano satellites. This also due to also due to a lack of institutional support from large procurement programmes at EU, ESA and national level.

  Competition is now worldwide with a dominance of US players, having a large capacity to adapt to new users' requirements. Unlike in the USA, there is a lack of public support for the 'New Space' sector in Europe.
- Research centres are innovators and are pioneering many technological developments that have later found commercial applications supporting the manufacturing sector. They have partly initiated large-scale innovative scientific or technological space missions. Outside Europe, other regions are strongly supporting their domestic research centres to develop these technological capabilities and their human capital to support the development of a national industrial base. This is also impacting the competitiveness of the European space sector.

2) Our capacity to access and use space with a high level of autonomy is currently strongly challenged by the global context and competition.

The problem drivers are:

- The massive US institutional space programmes create the conditions for a locally protected demand, which is the highest in the world[7]. This enables, for example, the development of an ecosystem of launch services by commercial industrial players offering unparalleled economic conditions, that are then brought to the global market with unmatched prices and

[7] The Space Report (2019 edition) estimates that the global institutional demand for space programmes is in the order of $86 billion, of which the USA alone represent 55%, and Europe 14. The European local institutional demand is about 4 to 5 times lower than the American one.

services. Similarly, satellite systems are supported by high volume local productions, generating low unique costs and volume effects that are then passed on to the commercial segment and create distortion in the global competition. New technological paradigms are being supported by a strong cooperation between institutional labs and the private sector.

- It is essential for EU launch service providers to balance and complement the limited demand from European institutional programmes by capturing a significant share of the global commercial market. This strategy enables the distribution of fixed costs on larger volumes and maintain the launch service cost efficiency, sustainability and reliability.
- New innovative technological concepts have been investigated by other regions and particularly in the field of reusability to lower the costs of access to space.
- The massive flow of R&D and innovation promoted by the US institutional programmes created a technology gap with Europe, with consequences on innovative concepts, systems performance and costs. This situation is now worsening with the step up of Chinese efforts in space and their introduction of breakthrough and innovations in the sector (for instance the first Quantum satellite ever launched was Chinese). As a result, a number of EU space programmes are now dependent on foreign technologies and solutions to achieve their cost and performance objectives. This dependence situation has market and political consequences, and it requires targeted policies supporting the European industry and research centres for its reduction.

Strategic opportunities

By concentrating the R&I efforts on the problems identified above, a Co-programmed Partnership on 'Global competitive space systems' offers the following strategic opportunities:

- Make European satellites and associated systems more competitive by enhancing their capacity and versatility, by reducing their production cost and by preparing the future ecosystems that are likely to serve emerging and future markets. This is required to stop and reverse the current trend where the EU market share is decreasing in an expanding market, and innovation is being led by players in other parts of the world.
- Space is now part of a global value chain that increasingly attracts new companies and entrepreneurs, known as “New Space”, that are pushing the traditional boundaries of the space sector. Moreover, the last few years saw the emergence of promising applications linked to on-orbit operations (e.g. in-orbit servicing/assembly) that have the potential to generate new business cases and open new frontiers. The partnership will be able to reveal and enhance European talents in this area.
- Make the European launcher sector and associated systems more competitive by bringing innovative features such as reusability, versatility in serving a wider range of payloads and orbits and reducing production costs.
- Structure EU-funded research along a strategic agenda and multiannual roadmaps to resolve the current fragmentation of research, place our R&I investments in a long term strategy so as to shorten development times.
- This Co-Programmed Partnership proposal concentrates on space and ground infrastructure components that are the enablers for downstream applications and services. The upstream segment of the European space industry provides 43000 jobs and generates EUR 8.8 billion of consolidated revenues, the overall European space economy is estimated to employ over

230 000 professionals generating a value of EUR 46-54 billion[8], i.e. 1 job in upstream space has the potential to create more than 4 jobs in the downstream sector, and 1 Euro invested in the upstream generates 5 to 6 Euros in applications and services in the downstream. This Partnership will therefore open up new opportunities to develop innovative products, services and processes that can benefit the community in all Member States, creating new capacities and adding value in and outside the space sector.

2.1.2 State and scale of the problems

The global context of the space industry is undergoing profound changes. Since the beginning of the 1990s, private customers for space systems grew consistently, to the point that today commercially procured spacecraft represents almost 33% of the mass activity. Space activities are particularly open to private investments in the areas of satellite communications, Earth observation and launch services.

Problem 1) The EU Space sector is under a specific global competitive pressure

Spacecraft / satellites systems market

European spacecraft exports have been growing quite steadily in the last two decades. While they represented an average USD 500 to 600 million per year in the first decade of the century, in the last decade they rose up to almost USD 1 billion per year (i.e. a 30% growth).

At the same time, in the last decade, European spacecraft imports almost doubled (all of them from US suppliers) [9]. As a result, the net surplus this industry brought to the European trade balance has only slightly improved (from USD 320 million to USD 355 million per year in average on the past decade – 10%), while the USA has improved its trade balance by 30% (from 715M$ to 1B$ per year in average in the past decade).

As a consequence, a great increase of the USA/EU satellite trade deficit from USD 0,13 billion in the first decade to USD 2,09 billion in the second decade is observed, pertaining entirely telecommunication satellites. The conclusion is clear: while the value of European exportations to the USA has been stable over the last decade, the value of US exports to Europe has more than doubled. This import market concerns entirely telecommunication satellites.

Telecommunication systems

The largest market for EU satellite exports consists in Telecommunications systems. They represent 95% of the total value of satellite exports worldwide, worth between 2B$ and 2,5B$ per year. The negative effect described above originates therefore mostly from US/European satellite trade in the telecommunication satellites market. This can be explained by a price/performance gap between the USA and Europe. To give an example, US satellites offer technological solutions (high processing, very large antennas e.g.) that are not available in Europe with a comparable price/performance mix. As a consequence, European customers

[8] Socio economic impacts from space activities in the EU in 2015 and beyond, PWC report, 2016

[9] Source: Eurospace Space Economy © copyright

growingly favoured US suppliers for their commercial telecommunications space infrastructures.

In that regard, the only solution for the EU satellite market (and more precisely telecommunication satellites) is to increase its competitiveness through R&I development in order to bridge this technology gap and to drastically reduce technology dependence. This solution aims at both regaining European domestic market shares (and therefore, reduce importation from US) and trying to capture more market share in the US market.

Earth Observation systems

The second market for satellite exports is in Earth Observation (EO) systems. Today, the European industry exports an average of EUR 200 million worth of EO satellites, addressing the global commercial demand (50% of its exports) and the localised institutional demand from non-space powers (mostly in Latin America, Asia and the Middle East)[10] addressing the needs of the civil security and intelligence communities.

The EO satellite market structure is changing, with a growing development of a purely commercial demand in addition to the historic institutional demand (such as the EU Copernicus programme). PWC states[11] that "*Governmental applications remain the main segment for satellites above 100kg, but recent nanosatellites constellations reverse the trend towards commercial applications*", and indeed in the period 2011-2017, 65% of EO satellites procured worldwide were commercial[12].

This commercial demand exhibits different characteristics than the institutional demand as it has a marked focus on smaller, more compact systems, with larger numbers (potentially for swarms and constellations) and proven sensors. This creates new requirements and drives innovation in EO systems for commercial purposes and markets.

Europe needs to position itself on this new and growing demand segment, enabling both the expanse of its export markets shares, and to support the emergence of European midstream players enabling the offering of a domestically sourced data supply for EO commercial applications and geo-intelligence. The market for geospatial intelligence is also at stake. It is supported by the data supply ensured by midstream players (owners of space EO infrastructures, and/or licensed data distributors). These players provide a service overlay and a complement to the public EO data offering.

While the EU has a strong position on satellites for Earth observation, the global commercial market for EO data is estimated by PWC at roughly 3B€/year with a growth rate of 7% and is currently overwhelmingly dominated by US companies. The PWC report identifies a shift in market shares and market forces on the EO data markets, with an increasing focus being put on value added and information products.

The core segments for growth will rely on data supply focusing on freshness (short revisit time, permanent observation, video streams), resolution (from medium to high and very high), multi-

[10] Source: Eurospace Facts & Figures 2018 and 2019 editions.
[11] Source: PWC Copernicus market report 2019 - study performed for the EU
[12] Source: PWC Copernicus market report 2019 - study performed for the EU

sensor imaging (optical, radar, hyperspectral), on-board data optimisation and cyber-security. The latter is of marked importance considering the growing recourse of the intelligence communities worldwide to commercially sourced imagery, in complement to their own infrastructures.

'New Space'

Furthermore, the most recent years have shown the emergence of a new commercial market segment, focusing on micro and nano-satellites. This reflects a new approach to the use and operation of satellites, triggered by enhanced demand for lower communication latency and freshness of the information, up to persistent coverage. New Low Earth Orbit (LEO) and Medium Earth Orbit (MEO) constellations concepts are being deployed, relying on massive cost reduction of individual satellites, implying a change of scale of constellation numbers (from less than a hundred in the nineties, the constellations of the new millennium range from hundreds to thousands of satellites), and posing a new challenge to the issue of end of life decommissioning for the preservation of the orbital environment.

The European space industry has been pioneer in the domain of private constellations with, for instance O3b or Iridium Next. Today, the EU space sector should be in a position to offer more agility and to diversify its customer base and activities. It should anticipate new trends like the digitalization of our economies and societies (data driven societies, big data and networks, AI, IoT, etc) and adopt a much more agile approach towards innovation (3D print, Additive Manufacturing, Fab-labs, incubators and accelerators).

In addition to the established space sector, a thriving environment of space start-up companies is active in the upstream space segment. This environment is rich of almost 200 start-ups in Europe. 90% of these companies were established in the past decade (with a peak between 2013 and 2018). The average size is rather small: between 10 to 20 employees and often even less. Overall, the estimated number of employees in these companies is slightly more than 2500.[13]

US institutions (NASA, Pentagon et. al.) have since long supported and are further supporting "New Space" by adapting for selected areas their procurement and grant schemes, no longer insisting in such cases on traditional public design authority, public standards and traditional management schemes. They have also allowed a faster transition from technology developed in research labs to the private sector and devise technological partnerships to develop new concepts and technologies.

On-Orbit Operations

On-orbit operations is an emerging domain in the field of commercial satellites, which opens a large number of opportunities. Satellites which have, thanks to robotics technologies and Artificial Intelligence, the capacity to reconfigure themselves on-orbit, to be refuelled on-orbit, to de-orbit themselves and possibly in the longer term to manufacture and assemble in-orbit, offer a potential of drastic cost reduction with increased versatility. In addition, this offers opportunities to service satellites, which are already in orbit, to extend, for example, their operational lifetime.

[13] Eurospace Study 'Newspace in Europe - an analysis of space (upstream) start-ups'

The US industry has developed the first such in-orbit servicing capabilities and initiatives: on 25-02-2020, a servicing satellite (Mission Extension Vehicle MEV-1) owned and operated by SpaceLogistics, a subsidiary of the Northrop Grumman Group, has performed the first ever docking with a satellite that was not built and engineered to support such an operation (Intelsat 901).

Also in the US CONFERS, an industry led initiative, has been setup to research, develop, and publish non-binding, consensus-derived technical and operations standards for servicing and rendezvous, and proximity operations.

In the EU, the Horizon 2020-funded PERASPERA Strategic Research Cluster initiated a first roadmap based R&I initiative on space robotics technology. Research centres are also working on innovative concepts involving AI and robotics in space.

However, EU players are still not in the position to demonstrate on-orbit operations in the short-term if there is no more cooperation between industry and research centres.

Imports and critical dependence situations

The European industry imports a non-negligible part of its satellites and satellite components for its EU-based manufacturing activities. On a typical ESA satellite, more than half of the Electrical, Electronic and Electromechanical (EEE) components are procured outside of Europe[14], some of these being critical.

Security of supply and industry's ability to innovate and to export its products are therefore affected by high dependence on non-European components and technologies. A cooperation between European research centres working on the supply of these technologies and the industry on the demand-side is thus needed to develop European capabilities and foster a sustainable supply chain in the EU.

Problem 2) Our capacity to access and use space with a high level of autonomy is currently strongly challenged

While 6 European vehicle launches were performed in 2010 and 8 in 2018, China performed 15 launches in 2010 and 39 in 2018. In the USA, the private company Space X, achieved 21 launches in 2018. This increase of launch rates is one of the drivers for a significant price reduction of launch services on global commercial market. This is expected to be augmented in the next decade. The reduction of launch costs is supported by innovation and breakthroughs, and in particular by the adoption of reusable launchers, providing high flexibility, greatly increasing launch rates and driving down costs. This new business model, now adopted by Space X and Blue Origin, has also leveraged years of public investment and R&D funding in the US.

It is anticipated that launch prices might drop to 50% of their current values, establishing a new standard for launch services. The reduced launch costs will enable the development of even more space-based applications.

[14] ESA European Space Technology Master Plan 2018

The EU launcher sector has to bridge the innovation gap with its competition in the US and China. New concepts, new approaches, new propulsions, new orbital transportation schemes, are required for the EU space sector to extend its current offer to support rideshare and micro launchers dedicated to small satellites, and to embrace the expanding market opened by drastic launch cost reduction.

The European launch services sector is more exposed to global competition than any other space sector in other regions where the share of institutional order is much larger (e.g. in 2019, 100% of the 34 launches in China are for institutional missions, 63% of the 27 launches in the USA against 22% of the 9 launches in the EU).

In conclusion, there is a need for the EU and its space industry to modernise and adopt the 'New Space' trends, in order to regain long-term worldwide competitiveness.

The best instrument to achieve those objectives is a European partnership that will enable a more streamlined approach from R&D to Innovation and market uptake, by enhancing the investment in demonstrators, by promoting in orbit validation for subsystems and critical technologies.

2.1.3 Bottlenecks, market failures, underlying Research and Innovation, dissemination and exploitation

Bottlenecks and market failures

In a situation where other regions of the world (e.g. US, Russia, China, India) made the choice to have strong institutionally driven and supported space sectors (on the supply and demand side), with a protected national market and increasingly publicly driven R&D, a pure market approach will not allow the EU to compete on equal grounds, particularly when considering the relatively low volume of the EU institutional demand for space systems and related launch services.

While space and ground infrastructures are needed for a wide and diverse downstream sector of services and applications, it is difficult for these downstream businesses to plan and finance this infrastructure, which requires long-term investment before it can be operational.

Under H2020, EU-funded research was still fragmented, relying to a large extent on bottom-up driven calls, targeting mostly middle TRL range outputs (4-6), and mostly small projects with thinly spread EU contributions to the project participants (average contribution: €300k per participant in H2020/Space). The sector requires a more strategic approach to tackle the problems identified in the previous sections, with a better continuity in programming from lower to higher TRL, as well as to better address the higher TRL range up to demonstrators. A greater cooperation between industry and research centers is also needed to leverage the knowledge of all innovation stakeholders in Europe.

Underlying Research and Innovation

This Co-programmed Partnership proposal intends to concentrate the research actions along the problems identified in the Strategic Research and Innovation Agenda (SRIA) and

implement these actions based on a long-term strategy and associated multi-annual roadmaps. In addition, it allows to align the effort of space innovation stakeholders with a common strategy and objectives, to gather a critical mass of competences and it leverages EU-funding.

The underlying Research and Innovation intends to cover a wider range of TRL compared to H2020 with a better intervention logic. This includes both developing new concepts and an evolutionary maturation of technologies in the middle range of TRL for the shorter term perspective but calls also for disruptive technologies for the longer term, the last relying on a more bottom-up approach. Based on the technologies 'bricks' previously developed in the middle range of TRL (e.g. 4-6), a selected number of demonstrations, including in-orbit demonstration can be performed.

Serving private and public interests

In the objectives pursued, some are of interest for the private sector, such as gaining competitiveness by more innovative, versatile and integrated systems and lowering production costs to access commercial markets and to develop breakthroughs technologies and concepts. In contrast, others serve public interest, i.e. by supporting the capacity of the EU to access and use space with an ever increasing autonomy. It is also the responsibility of the public sector to address the areas of market failures that are inherent to space. Eventually, the proposed intervention areas put added emphasis on strengthening the whole value-adding and supply chains from low to high TRLs, fostering industry and research and academia collaborations, with potential positive impacts also for future EU space programmes.

Dissemination and exploitation

The first 'audience' for dissemination and exploitation is the vast network constituted by the members of the 5 associations. The Partnership will include a task, eventually a Working Group which will address these aspects.

Dissemination

Under H2020, the dissemination and exploitation of the results was very much addressed at individual project level and did not follow an overall strategy. The Co-Programmed Partnership will be a much stronger and coordinated vehicle in which the dissemination strategy can address the entire stakeholders' community (rather than limited to the stakeholders concerned by an individual project). Besides, the dissemination will not be limited to results of individual projects but to the contribution of these projects to implement a high-level agenda.

The dissemination will include the list of scientific publications and patent applications which are produced by projects selected in the frame of the Partnerships calls in an organised and structured way. It is also intended to give visibility to project consortia, work content and main results by producing a document in which the information is centralised and structured with yearly updates. This document will be made publicly available, so that potentially interested stakeholders can see who are the engaged partners and eventually liaise with them. Specific effort should be made to widen the coverage of EU Member States. Even if all Member States are using space based resources and have R&I activities in the field, today, the distribution is very unequal with a few Member States concentrating a large share of the activities.

It is also intended to have specific communication channels (both ways) with the Partnership with whom there are synergies (see section on 'links and/or collaboration opportunities' of the SRIA).

Dissemination activities will also be targeted to stakeholders' communities outside the Space domain, in order to reach out to potential users of space services, data and technologies, as well as to maximise synergies across different sectors and economic domains. These will take the form of events, workshops, and activity groups.

It is also planned to have specific communication targeting EU-citizens to inform them about the role of the space sector and of EU-funded space research in contributing the EU societal challenges and policies such as the use of space based infrastructure in telecommunications (e.g. for remote areas or in the upcoming 5G network), for Earth Observation with application to environmental monitoring, disaster mitigation, border surveillance, and other security related applications.

Last but not least, the Partnership communication will benefit from the networks and dissemination means of the 5 associations with references and articles in their existing web-site, newsletter and other types of communications.

Exploitation

In terms of exploitation, thanks to their multidisciplinarity, the ESRE and EARTO research centres are well placed and experienced to spin-in technologies developed in other markets to space and spin-off technologies developed for space to other markets. The SRIA foresees specific tasks under the 'Synergies' section for the spin-in, spin-out and establishment of synergies with other domains.

Industry and SMEs from Eurospace and SME4space are the first 'customers' for the exploitation of results and their involvement in the co-programming should ensure that the R&I outcomes of projects are useful and in line with the exploitation plans of these partners.

A particular attention will be given to include the exploitation phase when developing the technology roadmaps so to maximise the take-up of the projects outcomes, i.e. these outcomes should serve as an input for the next projects in the subsequent phase of the roadmap.

Thanks to its composition ranging from academic labs to industry, the consortium has the capacity to ensure a continuous exploitation from low TRL research up to commercial exploitation perspectives.

2.1.4 Space R&I under previous Framework Programme, Building on previous interventions

Space R&I is relatively new in the EU framework programme compared to other domains. Under H2020, the approach followed was a largely bottom-up driven research with maturation of technologies in the mid-range TRL (4-6) rather than fostering radical innovation and having technology demonstrators.

Overall, H2020 was mainly characterised by a large number of RIA projects of modest financial size targeting lower TRLs as depicted in the two charts in the annex with an average

size of the EU contribution by project of EUR 2,3 million and an average contribution consortium members of EUR 300 000. These low financial volumes preclude involving all necessary stakeholders and limiting the impact of the technologies and systems to be developed. This fragmentation of the EU contribution per participant is not appropriate for the challenges ahead.

A roadmap-based approach was followed in a few domains only. In the case of electric propulsion for satellites, EPIC (http://epic-src.eu/) and space robotics technologies PERASPERA (https://www.h2020-peraspera.eu) the so-called 'Strategic Research Cluster' (SRC) approach was followed. Another area encompassed critical technologies for non-dependence in which technologies are identified by a Joint Task Force ESA-EU-EDA.

While those approaches reduced fragmentation and provided focused budget envelopes on certain priorities to solve R&I challenges, it should be recognised that the involvement of private actors, research centres and academia in the road-mapping and the ex-post developments was limited. This limited inclusiveness is a clear drawback for European competitiveness.

The continuation of the H2020 approach to space R&I would nevertheless not be able to properly answer the new challenges that the sector in facing. High TRL, closer to the market developments aiming at flying demonstrators could lead to the emergence of new, more effective, cost effective solutions, services, applications and products and prepare future disruptive innovations and breakthroughs.

This proposal for a Co-Programmed Partnership builds on the outcome of H2020 and previous Framework Programmes, and aims at scaling up TRLs for the integration and then the validation of demonstrators with a greater inclusiveness of all space stakeholders.

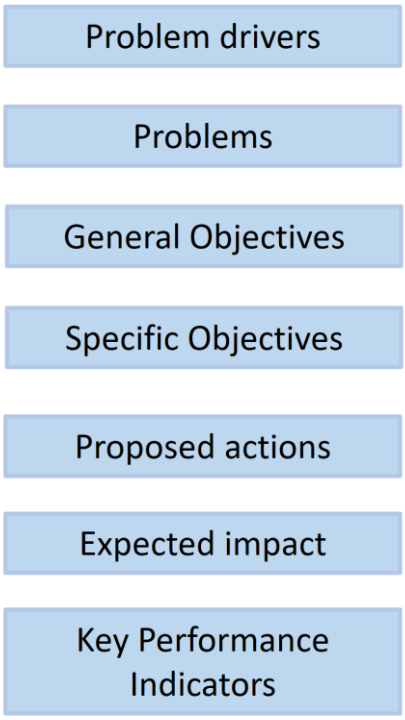
In terms of organisation and governance, the partnership builds on the consultation platform that has been initiated in the last years of H2020, and answers the need to organize an inclusive pan-European coordination scheme for R&I to reduce the fragmentation of funds and to promote a critical mass for actions directed to integration of technology which has already been developed in H2020.

2.2 Common vision, objectives and expected impacts

2.2.1 Intervention logic, economic, scientific and societal objectives, link with broader policy objectives

i) Intervention logic

The generic structure of the intervention logic is depicted below.



Note: SMART objectives: Specific Measurable Attainable Realistic Time-bound

Two main problems have been identified, and the problem drivers have been discussed under 2.1):

- The EU Space sector is under specific global competitive pressure in a rapidly evolving market environment, leading to a potential paradigm shift.
- The European capacity to access and use space with a high level of autonomy is currently strongly challenged by distorted competition forces and market externalities.

ii) Scientific, societal, economic objectives

The centre of gravity of this Partnership's objectives is clearly of economic nature. However, such Partnership would also contribute to scientific and societal objectives.

Economic objectives

Foster competitiveness of space systems

by concentrating R&I efforts on the domains that will enable Europe gain competitiveness (e.g. R&I actions on telecommunications, commercial Earth observation with a short term impact, preparing the future space ecosystems which will provide the sector with a competitive advantage in the longer term, reducing production costs)

Satellite based communications:

+ Specific objective: Contribute to capture 50% of global accessible Telecom satellite market by 2028
+ Action: Demonstrator missions after technology building blocks developments

+ Impact: De-risk the product and services and be closer to the market

+ KPI: at least one demonstration mission carried out by the end of the Partnership – Market studies to investigate evolution of market shares and influence of demonstrator mission.

Earth Observation:

+ Specific Objective: Contribute to become the worldwide leader for Earth Observation systems (i.e. not only satellites) by 2028

+ Action: Demonstrator missions after technology building blocks

+ Impact: De-risk the product and service and be closer to the market

+ KPI: at least one demonstration mission carried out by the end of the Partnership - Market studies to investigate evolution of market shares and influence of demonstrator mission.

Future Space Ecosystem for On-orbit Operations and new system concepts:

+Specific objective: Ensure European sector readiness to compete on all emerging on orbit operation services with mature ecosystems reaching TRL 6 by 2028

+Actions: roadmap-based approach including technology maturation, on-orbit demonstrator, and a European Operations Framework (EOF) for business establishment

+ Impact: create a continuous development framework from technologies to business establishment (versus scattered and uncoordinated actions currently)

+ KPI: by 2027, demonstrator has reached high maturity phase[15], by 2027 the EOF is operational.

Industry 4.0:

+ Specific objective: Production cost and cycle time reduced by 50% at 2026 and deployment over the whole supply chain and commercial programmes by 2030.

+ Actions: Pilot cases based on spin-in technologies to demonstrate efficiency by 2026

+ Impact: Expansion of successful solutions to the whole supply chain by 2030

+ KPI: Evaluation of cost and time evolutions by the end of the partnership on the supply chain.

Reinforce European capacity to access and use space

by focussing the R&I efforts on the domains that will enable the EU, in complementarity and coherence with ESA and Member States, to support (i) the competitiveness of strategic launchers (i.e. for the implementation of EU Space Programme), (ii) improvement of the cost efficiency of European test, production and launch facilities and (iii) the expansion of commercial space transportation offer and services with the objectives of operational capability by 2030.

Launchers:

+ Specific objective: contribute to rapidly improve launch competitiveness and reduce the cost/price of launch services by 50% by 2030, for the benefit of EU Space Programme implementation (reliability, cost effectiveness, EU autonomy)

[15] Phase E/F

+ Action: multi annual roadmap based maturation of technologies (reusability concepts, high performance and green propulsion, next generation structural concepts, smart technologies, engineering tools) up to flight demonstrations

+ Impact: readiness of new technologies enabling an operational capacity by 2030

+ KPI: at least two in-flight demonstrations performed by end of the Partnership – analysis of the launch service cost saving contribution

European test, production and launch facilities

+ Specific objective: contribute to improve the cost-efficiency of the European test, production and launch facility and contribute to the overall objective of cost/price launch services by 50% by 2030, for the benefit of EU Space Programme implementation

+ Action: multi annual roadmap based maturation of technologies for lowering the cost of low production, test and launch rate facilities (e.g. digitalisation, advanced data management, material and process modelling, wireless, modularity, flexibility and configurability)

+ Impact: readiness of new technologies enabling an operational capacity by 2030

+ KPI: at least two technology demonstrations in an operational environment - analysis of the launch service cost saving contribution

New space transportation services

+ Specific objective: Contribute to double the accessible new services space transportation market to European industry by 2030

+ Actions: multi annual roadmap based maturation of technologies enabling new concepts, in particular those for improving versatility, cost reduction and flexibility of launch systems (e.g. micro launchers and launch facilities, rideshare, kick-stages, new types of space routes, re-entry solutions); Design of challenge-based actions (e.g. inducement prizes) and/or options for the use of financial instruments (e.g., debt, equity, , blended finance).

+ Impacts: readiness of new technologies enabling an operational capacity by 2030; readiness by 2030 of new EU access to finance tools for actors addressing new space transportation services

+ KPI: at least three new technologies matured by the end of the Partnership – analysis of the benefits of these technologies to the new space transportation services; at least two challenge-based actions and/or options for the use of financial instruments available for the concerned actors by the end of the Partnership and addressing new commercial space transportation EU solutions or services

Accelerate the pace of Innovation

+ Specific objective: Accelerate the pace of Innovation by a more efficient and effective programming

+ Actions: Establishment of a joint and commonly agreed strategy (SRIA) on multi-annual roadmap, of a methodology to monitor the progress against the objectives and eventually take corrective measures

+ Impact: Enhance the efficiency of programming compared to bottom-up calls, reduce development times

+ KPI: Existence of a SRIA, multi-annual roadmaps and monitoring methodology at the end of Y1, estimate of the gain on development time over the duration of the Partnership.

Scientific Objectives

Disruptive technologies

+ Specific Objective: Foster the emergence of [n -tbd] disruptive technologies for satellites and launchers both for the commercial and institutional markets by the end of the Partnership

+ Actions: Recurrent bottom-up blue-sky research calls with downselection of most promising technologies

+ Impact: Accelerate the pace of development from science/low TRL R&I to innovation

+ KPI: Number of such technologies having reached TRL [4-5] during the life of the Partnership, estimate

Scientific output of EU-funded project under the Partnership

+ Specific Objective: Structure the scientific production of EU-funded projects under the Partnership and foster greater European cooperation

+ Actions: Support actions to analyse, organise and disseminate the scientific output

+ Impact: Reinforce the dissemination, impact and use of the scientific output; space stakeholders benefit from the research conducted in other projects of the partnership taking into account confidentiality issues, accelerate technology transfer to industry

+ KPI: Number of publications and patents produced under the Partnership, living document on the analysis and structuring of the scientific output, existence of publicly available communication material; creation of a knowledge management database at the level of the partnership.

Societal Objectives

Reinforce autonomy in accessing and using space

+ Specific Objective: EU and EU citizens have the capacity to access space, produce satellites and use space based services with a high level of autonomy

+ Actions: Structured approach to programming and funding critical technologies for non-dependence, observatory and support for the sustainability of the associated supply chains in Europe

+ Impact: Contribute to reduce significantly EU supply chain and EU programmes technology dependence

+ KPI: Dependence reduces from currently 50% to [x -tbd]% over the duration of the Partnership

Environmental aspects

The Partnership intends to contribute to reduce the environmental impact of satellites and launchers with several targeted actions such as the development of green propellant for launchers, evolving towards industry 4.0 while fully integrating the concepts of circular economy.

As an indirect outcome, the technology development on Earth Observation (higher accuracy, more frequent revisit up to persistence) will bring key features for the downstream sector who will be using these capacities for environmental monitoring purposes and contribute to the Green Deal.

iii) Link with broader policy objectives

Link with ongoing policies

In 2016, the European Commission published the Communication 'Space Strategy for Europe', with the following main objectives: maximizing the benefits of space for society and the EU economy, fostering a globally competitive and innovative European space sector, reinforcing Europe's autonomy in accessing and using space, and strengthening Europe's role as a global actor. To implement this strategy, a proposal for a Space Programme regarding the period 2021-2027 was published in June 2018. This Co-Programmed Partnership proposal will bring a key contribution to both the EU space strategy by concentrating on competitiveness and access to space and to the Space Programme by developing some of the technologies, which will be used in future systems.

In March 2020, the European Commission published a Communication entitled 'A New Industrial Strategy for Europe". Clearly, this Co-Programmed Partnership would bring key contribution to a number of objectives set out therein such as 'Reinforcing Europe's industrial and strategic autonomy', ', Embedding a spirit of industrial innovation ', ' Upholding a global level playing field', 'An industry shaping Europe's digital future', and 'A globally competitive and world-leading industry'.

The added value of the space sector for EU economy and society, EU policies and EU citizens is obvious. Today, we enjoy increasingly accurate global navigation services for all transport modes and users, extended Earth monitoring for land, marine, atmosphere and climate change, global meteorological observation and accurate cartographies of a wide number of variables. Space also makes important contributions to security crisis management and emergency services. These are key assets for the EU policies on climate, environment, transport, agriculture and secure society (e.g. Maritime Strategy, the Arctic Strategy, the Digital Agenda, the Common Security and Defence Policy, the Sustainable Development Strategy). Space technologies, data and services have also become indispensable in the daily lives of European citizens when using mobile phones and car navigation systems, watching satellite TV or withdrawing cash. Finally, the space sector is a source of economic growth, jobs and exports with the potential to spin-out a number of innovations in other sectors and to create a wealth of downstream applications and services. The two most promising areas for expansive growth in space are commercial, with communications systems and applications, observations systems and applications and the related launch services, being growingly concerned by harsh global competitive environments.

Link with new Commission Priorities

- ✓ A European Green Deal
- ✓ An economy that works for people
- ✓ A Europe fit for the digital age
- ✓ Protecting our European way of life
- ✓ A stronger Europe in the world
- ✓ A new push for European democracy

Regarding 'An economy that works for people - Supporting small business', one of the community targeted by the SRIA is the so called 'New Space', promoting the emergence of new players and a change of mind-set in traditional players. A thriving environment of new start-up companies and new projects aim at seizing the increasing commercial opportunities offered by exploiting larger constellations of smaller satellites in low orbit, making use of Commercial Off The Shelf components developed by non-space sectors or the ones having been de-risked by research centres, and promoting an overall more cost efficient space infrastructure. Seizing the possibilities offered by advances in digitisation allows this new thriving environment to offer more flexible and reconfigurable products and services in the field of telecommunications and Earth observation, and to lower the cost of accessing space.

The development of high accuracy Earth observation technologies with more frequent revisit will contribute to enhance the monitoring of local events for environmental and climate purposes, contributing to the 'Green Deal'.

Space also aims to seize opportunities from 'A Europe fit for the digital age', be it for satellites operation, communications and data/image processing (5G, Artificial intelligence, HPC, big data) or for enhancing its research, manufacturing and operational processes.

Finally, this Partnership will also contribute to a 'stronger Europe in the world' with actions to reinforce European independence and capacity to develop and launch assets in space, including for security purposes. Space systems exports also offer great opportunities for soft power and economic diplomacy, like other strategic sectors.

Link with Sustainable Development Goals

In 2015, all United Nations Member States adopted the 2030 Agenda for Sustainable Development. The core elements of this global action plan for humanity, planet and prosperity is represented by the 17 Sustainable Development Goals (SDGs). All countries aim at working towards the SDGs in a global partnership. Furthermore, they recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth.

Space technologies support many of the SDGs. Space provides non-invasive tools, enabling an equitable and fair data-based decision making process. Against this backdrop, the objectives of this Partnership, supported by a SRIA, will contribute significantly to the monitoring and implementation of the SDGs not only in the European Union but worldwide. Investing in Space represents a guarantee that continuous monitoring of the planet and its environment over time will be feasible and sustainable.

Two examples on how work carried out in support of space technologies contributes to the SDGs are provided herewith:

- space technologies are integral regarding the achievement of SDG 8 "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all". By fostering the European economy and focusing on increased competitiveness, new jobs are created.
- attaining SDG 9 "build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" is also linked to space technologies. Access to space goes hand in hand with innovation. Besides, accessing and using space in a secure environment will not only contribute to improve the life of European citizens but of all people.

Further examples on how space, and in particular EU owned space infrastructure, can contribute to the SDGs can be found in the UN Report on "European Global Navigation Satellite System and Copernicus: Supporting the Sustainable Development Goals
Building blocks towards the 2030 agenda"[16]

2.2.2 Evidence and data, common vision and ambition

Evidence and data

Other regions of the world have a strong institutional support for their space sector (e.g. 100% of the 34 launches in China are for institutional missions, 63% of the 27 launches in the USA against 22% of the 9 launches in the EU).

The USA/EU satellite trade deficit went from 0,13B$ in the first decade to 2,09B$ in the second decade[17], in spite of steadily increasing European spacecraft exports (500 to 600M$ per year in the first decade of the century, in the last decade they rose up to almost 1B$ per year, i.e. a 30% growth).

[16] http://www.unoosa.org/res/oosadoc/data/documents/2018/stspace/stspace71_0_html/st_space_71E.pdf
[17] Source: Eurospace Space Economy © copyright

The largest market for satellite exports is for Telecommunications systems representing 95% of the total value of satellite exports worldwide worth between 2B$ and 2,5B$ per year. European spacecraft exports have been growing quite steadily. The second market for satellite exports is in Earth Observation (EO) systems. The EU has strong assets in both markets.

Europe is lagging behind in two domains which have the potential to open up new markets in a longer term perspective. i) The 'New Space' sector relies on the use of constellations with a large number of smaller satellites that have the potential to reduce cost, provide lower communication latency and freshness of the information, up to persistence. ii) On-orbit operations, an emerging domain where satellites will have the capacity to reconfigure themselves on-orbit, to be refuelled on-orbit, to de-orbit themselves and why not in the longer term to manufacture and assemble in-orbit, which offers a potential of drastic cost reduction with increased versatility.

The upstream segment of the European space sector is an enabler of the downstream sector. While the manufacturing of launcher and spacecraft employs 43000 persons, the overall European space economy (upstream, mid-stream and downstream) is estimated to employ over 230 000 professionals generating a value of EUR 46-54 billion or 21% of the worldwide business in the sector[18] , i.e. 1 job in upstream space has the potential to create more than 4 jobs in the downstream sector, and 1 Euro invested in the upstream generates 5 to 6 Euros in applications and services in the downstream sector.

More detailed evidence and data are provided under section 2.1.

Common vision and ambition

A Co-Programmed Partnership on globally competitive space systems can make a key contribution to these challenges by gathering for the first time in the context of EU funded research a wide, diverse and complementary R&I Stakeholders community of academic, research centers, SMEs and industry around a commonly agreed strategic agenda with institutional stakeholders. It is estimated that this community could leverage the EU funding yielding to a total of up to EUR 3 billion investments.

The reliance on an inclusive Strategic Research and Innovation Agenda and a multi-annual-roadmap based approach has the potential to take EU funded research to a higher level of integration. This will happen through larger projects, higher leverage, targeting higher TRL levels up to flight demonstrators, with a shortened R&I and development times and involving all space stakeholders (primes, SMEs, research centers and academia). This will all contribute to build up operational capacity much faster (at medium term), and to the development of new innovative and breakthrough paradigms in the longer-term.

The partnership will then be able to coordinate and monitor to outcome and impact of the R&D projects. The programmatic guidelines developed by the partnership will allow having a better balance between high and low TRL. This will include bottom-up R&I activities at lower TRL to open the potential for long-term opportunities and to ensure the continuity along the TRL

[18] Socio economic impacts from space activities in the EU in 2015 and beyond, PWC report, 2016

chain for evolutionary maturation of individual technologies and stimulating the emergence of disruptive technologies.

Some activities towards these objectives have been initiated by Space Agencies, Industry and Research Centers but there is a need for coordination and to accelerate the path to improve EU competitiveness. Co-programming of EU funded R&I activities with all the relevant stakeholders is essential to maximize the impact based on common objectives, agreed roadmaps and leverage of resources all across EU.

2.2.3 Collaboration opportunities with Partnership candidates, links with other European Union Programmes

Collaboration opportunities with Partnership candidates

The following collaboration opportunities with Partnership candidates with collaborative research activities under Cluster 4 Digital, industry and space exist:

'Smart Network Services' - beyond 5 G - Telecommunications satellites can provide connectivity where terrestrial communications are insufficient, to serve remote areas or areas where it is difficult and/or/ very expensive to deploy a ground infrastructure.

'Artificial Intelligence, data and robotics' will develop a number of generic technologies that are needed, for example, in the design of future satellites that should be able to reconfigure themselves, perform in-orbit operations such as in-orbit manufacturing, in-orbit assembly, up to deorbiting or process imagery on-board Earth Observation satellites using Artificial Intelligence technologies.

'Made in Europe' proposes to work on future digitally based manufacturing technologies (e.g industry 4.0) that the space sector needs to enhance its manufacturing processes with flexibility and to extend reconfiguration capabilities for both satellites and launchers. Space is usually working with a very limited number of units (e.g. compared to automotive or aeronautic) but with higher levels of quality, reliability and prices. Specific developments are therefore needed.

'Photonics' has the potential to enhance radically the transmission capacity of future satellites. Ultra-High bandwidth capacity at affordable prices has the potential to give the EU satellite manufacturers a key competitive advantage.

'Key Digital Technologies' is promoting the development of electronic components and software by the EU and in the EU. The space sector is particular dependent on EEE components manufactured elsewhere than in Europe, without which European industry would not be able to produce satellites and launchers. The reduction of European dependence in this field is of utmost importance.

Under H2020, there were limited interactions with these Partnerships. Topics Co-funded across Partnerships could represent a feasible and efficient approach to achieve joint developments.

Links with other European Union Programmes

This Co-Programmed Partnership has direct and natural links with the Space Programme 2021-2027, COM(2018) 447. R&I for the space programme and for this SRIA is being programmed in the same Directorate General. It is also the first time that all the components are part of a unique EU Space Programme (before, there were distinct programmes). Synergies have already been identified in cross-cutting areas and actions to exploit those synergies. They include the fields of In-Orbit Demonstration and In-Orbit Validation, Critical Technologies for non-dependence, digital technologies, and Education and skills, all of which are part of the SRIA.

The Partnership also intends to liaise with the Invest EU programme. A study carried out by the European Investment Bank (EIB) identified the need to increase opportunities for space companies (i.e. SMEs) to access risk finance products (e.g. equity, debt)[19]. Under Horizon 2020, the Innovfin Space Equity Pilot (ISEP) fund was set-up and it is currently being implemented under the InnovFin Equity family in Horizon 2020. The overall funding is EUR 111 million. This new product is targeting innovative SMEs, small and midcaps aiming to commercialise new products and services linked to space data (downstream) and space technologies (upstream). It will continue working alongside Invest EU.

Links with the EIC will also be pursued for actions in continuity with H2020 EUR 10 million Prize on Low-cost Small Launchers for low cost space solutions. The prize will be awarded in 2021. The partnership will build of this experience to foster the emergence of new solutions in the EU for new space services, and design actions to help the scaling up of entrepreneurship in this domain.

2.2.4 How much R&I investments are necessary, methodology to monitor investments

How much R&I investments are necessary

The estimated magnitude of R&I investments performed by the partners is based on the review of the activities of the SRIA and is the result of a detailed study based on experts' estimates performed in the frame of the 2-years STEPP pilot project (see detailed description of the project in Annex).

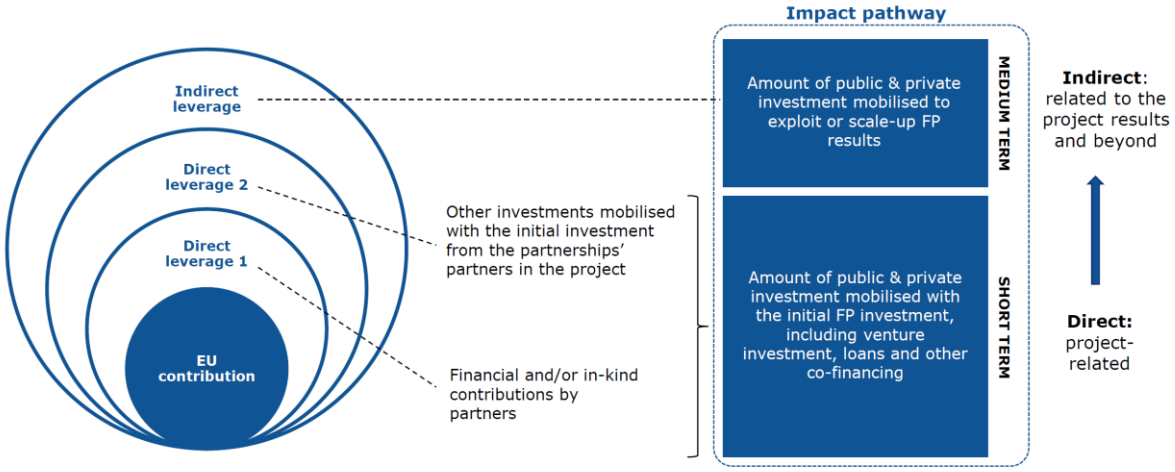
First, experts from the five associations worked on an initial detailed technical and technological recommendation to implement the SRIA, using a top down approach, i.e. working at a finer level of granularity than the SRIA. Then experts provided budget recommendations needed to perform the R&I activities proposed over the duration of the Partnership (2021-2027). The estimate of the overall R&I investments was consolidated following a bottom up approach. This overall volume of R&I investment by the private and public side to implement such an ambitious SRIA over the 7 years of the Horizon Europe programme was estimated to be up to EUR 3 billion.

Resources contributed by the Partners will be:

1. In-kind contributions to the projects funded by the Union contributions (on the basis of non-reimbursed eligible costs), with lower funding rates for higher TRLs;
2. In-kind contribution for additional activities foreseen in the SRIA not covered by Union funding;

[19] The future of the European space sector: how to leverage technological leadership and boost investments for space ventures, EIB report, 2018

3. Investments in operational activities that are spend beyond the work that is foreseen in the SRIA.



Associations involved in the proposal preparation have estimated that, overall, they can leverage each EUR of EU-funding at least by a factor 1.2 with the resources contributed under 1. and 2. above.

The activities under point three will be subject to declarations by the beneficiaries via the trade associations. These activities will address further developments and neighbouring developments complementing the projects funded by the Union, in activities such as product characterisation, product validation, product and technology industrialisation, system level integrations, complementary developments, etc.

In addition, the private partners made a gross estimate that this R&D&I co-invested with the EU funding will generate - in a decade - up to EUR 17,5 billion of additional sales for the European space sector, exclusively on commercial and export markets.

Monitoring of the investment target

The investment target can be monitored during the life of the partnership on a yearly basis. In practice, these estimates would be performed within the European Associations (Eurospace, SME4Space, ESRE, EARTO, EASN) and consolidated.

Based on the experience from former Partnerships in H2020, the associations will perform an inquiry to their members who participated in partnerships' projects in order to acquire data regarding complementary activities mobilised with the initial investment from the partnerships' Partners. Survey and interview will allow the association(s)'s personnel to gather data, aggregate them and scale figures at the level of the partnership.

It is to be noted that many of the members of Eurospace, ESRE (the aeronautics counterpart being EREA) and EARTO have experience in carrying out this evaluation owing to their participation in different Partnerships, in particular Clean Sky.

More details are provided in the 'additionality' section.

2.2.5 Transformational changes, methodology to monitor the changes

Transformational changes

Up to now, EU funded research in space has been largely driven by reacting to external events, a significant amount of bottom up research, for the most part without following an agreed Strategic Research and Innovation Agenda (SRIA).

A Partnership in space would be instrumental for changing the way the space R&I policy strategy is designed at EU level: developing a coherent EU strategy, bringing all innovation stakeholders together from industry to research centers and academia.

The new approach would bring a strong change in the way projects would be developed and implemented (i.e. in strong coordination with each other and under the umbrella of the Partnership), all contributing to reach the objectives set in SRIA and providing feedback and input for the following iterations of the SRIA.

The partnership will provide a platform to better involve and connect the larger industrial supply chain players (large and medium Groups, as well as SMEs), Research Centres and Academia in an inclusive process, facilitating the identification of R&I priorities at EU level.

Such an ecosystem is required to foster EU competitiveness on the global markets, by creating stronger links between industry and academia/research for the development of new innovative products and services, with benefits for the whole EU economy.

A paradigm shift will be brought to the implementation of the Space R&I programme: larger scale projects with larger budgets envelope driven by coordinated multi-annual roadmaps will be set in motion. This would make a major change of direction in comparison to H2020 (see chapter 2.1).

Finally, the availability of the SRIA and multi-annual roadmaps will facilitate the exchanges and collaborations between R&I actors across Europe and help coordinate strategies at Member State level, so as to promote complementarities and synergies. This is further explained in the 'Synergies' section of the SRIA under 'Building on common technology roadmaps'.

Methodology to monitor the proposed changes

Among tangible changes that will be observable will be the existence of a Strategic Research and Innovation Agenda for EU-funded space research (currently existing) and the existence of agreed multiannual roadmaps in a number of areas of the SRIA. This would be a first since this did not exist under Horizon 2020.

The multi-annual roadmaps will be key elements for planning and monitoring. They will identify key sub-capabilities/sub-technologies and related development times, be technology-neutral and will be jointly designed by the Partners.

The establishment of the Programmed-Partnership, the formalisation of the commitments would also be a tangible result since there is no predecessor. Commitments will also be monitored as explained in section 2.2 'Monitoring of the investment target'.

During the life of the Partnership, a dedicated mechanism to monitor the progress towards the objectives will be set up. During the first year of the Partnership implementation, the partners will develop a detailed methodology to monitor and coordinate work and projects. It will be made operational as soon as calls will be launched, the projects will start working and tangible results will be available.

Then, the results and progress of projects funded will be systematically assessed against the objectives, relying on KPIs and advances on TRLs, in close collaboration with the Commission and Executive Agency in charge.

Detailed mappings of challenges and opportunities against the SRIA objectives will be drawn in order to identify both criticalities and remedies, and excellence.

2.2.6 Exit strategy

Horizon 2027

The fulfilment of the objectives targeted by this Partnership's should be the basis for the exit strategy.

The mission critical objective is for industry to include research results into new innovative products, services, and systems, include those into their own development strategies and ultimately benefit from the progress enable by the partnership by gaining an effective competitive advantage on the market, especially in the fields of Telecommunications and Earth observation.

It also expected that the technologies developed for re-usability of rockets will be part of the next generation of European launchers.

For activities in the mid-TRL range, it is expected that the progress achieved will enable a number of technologies to be integrated in future demonstration activities.

For activities in the lower TRL range, and in particular disruptive technologies, it is expected that a certain number of technologies will have reached a solid state of maturation that would lay credible basis for channelling them into the last steps of product development.

For activities in the higher TRL range, it is expected that the technologies will be demonstration and validation ready, in-orbit whenever possible.

The exit strategy will become more precise and granular, and continuously monitored and updated throughout the lifetime of the partnership in parallel with the evolution of the SRIA.

Phasing out / transition

In order to retain as much flexibility as possible with regard to the beginning and design of the next framework programme (2027+), it is being planned to keep the Partnership's operational structure as light as possible so that the strategic activities of the Partnership could continue to be carried out by the involved associations without EU support.

One example for such a light and self-standing construction may be seen in the ACARE Council (Advisory Council for Aviation Research and Innovation in Europe) which has

supported the Commission since long in the preparation and monitoring of the framework programme's work programmes and instruments (JTI) without receiving any funding.

At the end of the programming period, a final evaluation of the Partnership including an assessment of the level of fulfilment of the objectives will allow to conclude on the achievement the partnership under Horizon Europe and to have a clear view of the situation before reflecting about the next steps (e.g. a new SRIA).

2.2.7 Strategic Research and Innovation Agenda

The SRIA is annexed to this proposal. It is also publicly available at https://ec.europa.eu/docsroom/documents/39528. It has been drafted with input from industry (Eurospace) and SMEs (SME4Space), research centres (ESRE, EARTO), academia (EASN), start-ups, Space Agencies and experts from Members States.

The process started in mid-2018 when a Consultation Platform for EU-funded space research and innovation was set-up. It included representatives of the associations mentioned above and several Member States represented through their Space Agency representatives. Since the beginning of 2020, all Members States representatives are invited to participate to the work of the Platform. The Consultation Platform is composed of four Working Groups: Competitiveness, Access to Space, Synergies and Opportunities, see figure below.

A Steering Group was also set up, composed of 27 members with a balanced representation of institutional stakeholders (Commission, ESA, Member States, European Parliament, Council Presidency) and R&I stakeholders (Industry, SMEs, research centres and academia), with the share for each group close to 50%.

Working Group meetings and Steering Committee meetings are typically attended by 20 to 30 experts, while plenary meetings gather 80 attendees.

ESA participated as an observer in all Working Groups, Steering Group and Plenary meetings. ESA has a unique position an expertise in providing an overview of all ongoing R&I at European level, and brought a particularly important contribution.

The consultation platform benefitted from the STEPP Pilot project (detailed description in this Proposal's Annex), an initiative funded by the European Parliament to assess the usefulness of a Partnership in the field of space. It also provided a large amount of structured technical input to the platform.

The STEPP project was industry-led and organised stakeholders consultation meetings. It gathered 217 experts from 40 different organisations (represented by the five main sector's associations) from all over Europe during 18 months. In addition STEPP also organised online open consultations open to all.

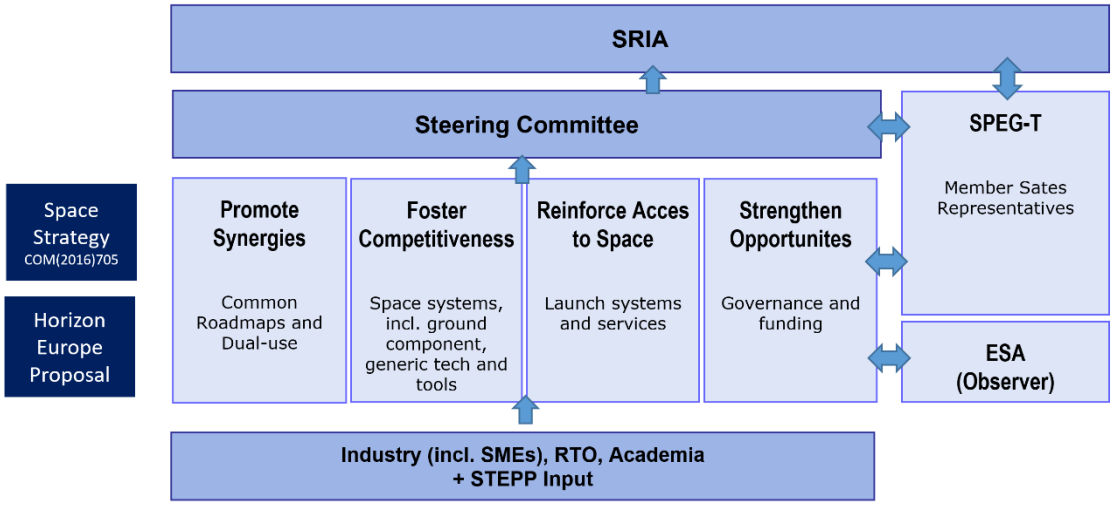
In order to open the consultation and to attract stakeholders, ad-hoc invitation were made to satellite operators (ESOA, SES) or 'New Space' type of companies.

Ad-hoc thematic workshops on, for example, small launchers and small launch pads, were also organized in 2019 in collaboration with ESA.

Member States were also consulted, via the Space Policy Expert Group and its sub-group on space technologies (SPEG-T, see more a detailed description in this Proposal's annex).

The whole community endorsed the SRIA in December 2019 after:

- 7 working meetings with all the WG meeting in parallel sessions followed by a plenary meeting
- a meeting of the Steering Committee of the Platform, at Director level
- a SPEG meeting, at Director level.



2.3 Necessity for a European Partnership

2.3.1 Why a partnership approach would be more effective

As discussed under section 2.1) - Space R&I under previous Framework Programme and in Annex 4.4 - Analysis of H2020 project funding, the approach for programming under H2020 was mostly relying in bottom-up calls with only three areas where a coordinated approach was implemented (robotics, electric propulsion and critical technology or non-dependence) but without overarching R&I agenda. The monitoring of progress was therefore mostly performed in these 3 areas of coordination. The consultation process was broadly relying on bilateral consultations.

The strategic research and innovation agenda, which has been developed by the R&I stakeholders with an ad-hoc consultation platform over the last months sets out an overall strategy with jointly agreed objectives, calls for roadmap based approaches in a larger number of domains and for evolving towards demonstration in a number of areas. Continuing the approach followed under H2020 would not allow to pursue these objectives in an organised and structured way.

A Co-programmed Partnership will ensure that efforts of Partners and the European Union go into the same direction, guided by commonly agreed SRIA and multi-annual roadmaps (with the associated multi-annual budget perspective) and towards agreed objectives (directionality). The implementation relies on a project based approach with a monitoring of the progress

towards the objectives and the possibility to adapt the agenda and the roadmaps based on the achievements and potential evolution and changes in the sector. It will also allow to bring together additional resources, investment, commitments from Partners, that the framework programme cannot provide as such (additionality). These two key arguments of directionality and additionality are further elaborated below as key added-value compared to H2020 .

Directionality

The work done to elaborate the SRIA with the support of the Consultation Platform has demonstrated that the European Space sector and its stakeholders can coordinate to define common objectives, and agree on a common platform to expand and leverage EU-funded research in strategically coordinated fashion.

However, this was achieved in an informal setting, and the exercise was limited to the preparation of the Strategic Research and Innovation Agenda.

In order for the space community to continue to work in a coordinated manner, the Partnership is a necessity.

The objective of the Partnership is to extend and implement the common vision to the full R&I cycle: SRIA, multi-annuals roadmaps, programming, coordination, targeted and coherent collaborations with sectors other than space, monitoring and feedback loops to further develop and update the SRIA and its roadmaps.

In order to achieve the economic, scientific and societal objectives described under the section 2.2 'Common vision and ambition', the entire R&I community needs to be mobilized and coordinated.

A co-programmed European Partnership can achieve the level of coordination required to sustain the ambitious objectives set by the SRIA.

The status quo will inevitably lead to dispersion of resources and potentially a reduction of the overall European competitiveness in Space.

The members of the five associations teaming up together have the skills and experiences that are required to carry out the exercise, spanning across the complete R&I value chain.

Academic labs and research centers will make a key contribution to the scientific objectives thanks to their capacity to perform research at lower TRL level, develop disruptive technologies and produce high level scientific knowledge.

Research centres and industry are experienced in applied research in the mid TRL range (4-6) to mature technology bricks and test them in a system environment. They are capable of making key contribution to mid to long terms objectives such as future space ecosystems for on-orbit operations, new systems concepts, new space transportation services.

In turn, companies have the testing facilities, leverage capacity and industrial experience in key Space domains where the EU is commercially strong and needs to be reinforced in face of increasing international competition.

These includes telecommunication and earth observation, as well as sectors where costs needs to be reduced and development times accelerated, by relying on Industry 4.0 approaches to design, manufacture, assemble, integrate and test.

The launchers sector is also part of this vision, where European capacity to rapidly reduce launch costs and broaden its offer will be key to gain new competitive markets.

This roadmap-based collaboration is also needed to develop a sustainable supply chain for critical technologies, for non-dependence and reinforce EU autonomy in accessing and using space.

In support of directionality, the Partnership will guarantee inclusiveness through openness and transparency of the processes, enabling the integration of all players, large and small, not initially involved.

Additionality

The Framework Programme alone cannot provide the full amount of resources, investments and commitments that are necessary to support the ambitious objectives set by the space stakeholders in the SRIA.

A Co-Programmed Partnership will allow the stakeholders to leverage the European Union contributions. This additional source of funding is becoming growingly necessary in the context of achieving the costly demonstration goals, and create added value.

The Union funding will enable R&D to progress the maturity of technological building blocks, the private funds will complement the investment to enable the development of demonstrators tests, experiments, qualifications and validations, system characterisations, architectures, instruments/payload integrations, mission simulations, etc.

The leverage necessary to perform demonstrators can only be materialised in the frame of a well-defined multi-annual roadmap, that will be designed by the Partnership. The roadmap will provide the capacity for the stakeholders to perform coordinated R&D activities pursuant to a common objective (the demonstrators) but also to perform additional activities (leverage) in the same frame.

Without a Partnership, there will be only a limited road-mapping approach possible, as the H2020 experience has shown. This would lead to very limited coordination and continuation between calls and across projects and finally, no creation of value through additional activities and leverage.

The description of the five associations and their members in the annex show how significant the potential additionally resulting from their resources and knowledge is.

Industrials members from Eurospace have a unique experience in design, manufacturing and operating of space systems. As infrastructure and service providers, they have a good knowledge of customer expectations in terms of cost, capacity and needs.

In particular, the so-called 'primes' have experience of the global competition, and have developed a unique integrated view on R&I performed at European and global levels. They have a key role and interest in structuring the space value chain in close cooperation with other industries, SMEs but also with research institutions.

Through its members, SME4Space has a unique access to the type of R&D-activities with a high potential for SMEs to generate additional business and added-value, and hence to foster the competitiveness of the space sector. SMEs having limited means and resources, the association can act as an interface and a proactive consolidator of SMEs views in the Partnership strategy. This will help to maintain a level-playing field for space SMEs to participate in a variety of space activities bringing added-value to the space ecosystem.

Research centres are represented into two associations: ESRE with a strong specialisation in Space, EARTO activities cutting across a wide range of sectors.

ESRE members comprise 441 major research infrastructures in 61 sites and 8 countries. They can bring synergies from their activities in other intensive R&D domains like aeronautics, transport, security, energy, digital.

The multidisciplinary of EARTO members have the potential to boost the cross-fertilisation of knowledge and innovation between different markets, including non-space. Research centers

are today a major innovation player in Europe with more than 4500 patents currently registered including 1745 in the space sector.

The EASN community comprises academic research laboratory active in the field of aerospace and has the capacity to bring its expertise in coordinating wide-scale projects in the lower TRL range (such as the QB50 H2020 project). It has for example demonstrated its capacity to mobilise the community of Small Spacecraft Projects for Universities with high standardisation level (from CubeSat to PocketQubes as well as to Microsats/Smallsats).

2.3.2 Cooperation with Member States and Associated Countries

As important institutional customers and programmers of national R&I funds for space, it is an added value to have Member States engaged in order to ensure coherency, alignment and additional leverage (Member States collectively mobilize larger amounts of funds for R&I than the EU in Horizon Europe).

It is planned to expand and open this collaboration model while welcoming all Member States willing to be involved and participate in the Partnership activities.

Collaborations with and between Member States has already taken place:

- Throughout H2020 five Member States have been playing a leading role, together with ESA, coordination the efforts of two Strategic Research Clusters on Electric propulsion for satellites, EPIC, and space robotics technologies, PERASPERA. They have developed joint roadmaps for these two technology lines, taking into account their national policy priorities.
- Member States have already been involved through the SPEG-T in the development of the SRIA. Four Member States participated in the Working Group and the Steering Committee of the consultation platform. Since the beginning of 2020, the participation of Member States in the Working Groups is open to all Member States.

  Members States have been supportive of the benefits of involving all stakeholders in the definition of the programming cycle (SRIA, Co-Programming, publication of calls, selection of projects, monitoring and evaluation, feedback loop into the next update of the SRIA).

In this Partnership proposal, it is foreseen to continue involving Member States in a similar way to the SRIA preparation process, by having them participating in the Working Groups and by regular consultation with the SPEG-T or equivalent ad-hoc group.

2.4 Partner composition and target group

2.4.1 Building on existing networks

Existing networks in the field of space R&I have been developed at European level by the five associations who are Partners in this Partnership, in their respective communities: Eurospace for industry, SME4Space for SMEs, ESRE and EARTO for research centres and EASN for academia. This Co-programmed Partnership proposal will de-facto create an operational collaboration between these associations and their respective networks.

The European Space Agency has established several networks on technologies, science, businesses (ESA BICs), and education. Is it proposed to invite ESA as an observer in the Working Groups.

The Partnership will also be built on the already established relationships between the European Commission and ESA such as the European Technology Harmonisation Process, the EU-ESA-EDA Joint Task Force on Critical Technologies, etc. (See also 'Mechanisms to ensure the complementarity with ESA' under section 3.1).

A link between the Partnership and the European Space Science Committee (ESSC), a Committee of the European Science Foundation (ESF) will also be created. ESSC is mostly engaged in fundamental and scientific research, but synergies can be established on a number of Topics.

The Partnership will therefore de-facto create a new level of collaboration between the EU and the Partners but also between their respective networks and other existing networks described above.

This initiative will also give a higher weight, visibility and identity to EU-funded space research in the other networks. It will also ensure more coherence between the R&I agendas of these different network: the SRIA foresees an action on 'Building on common technology roadmaps' under Synergies.

2.4.2 Type and composition of Partners, thematic and geographical coverage, ambition to include new type of partners

Type and composition of Partners / Thematic coverage

The initial Partners in this proposal are members of the five associations Eurospace, SME4space, ESRE, EARTO, and EASN. They all have a stake in the objectives that were put forward in previous sections of this Proposal, whether economic, scientific or societal.

Altogether, they gather the adequate R&I expertise, assets, knowledge and experience from the European upstream space sector required to address the objectives. They comprise industry and SMEs but also research centres and academic labs.

One of the strengths of the consortium is its capacity to cover almost the entire TRL chain, from lower TRLs with academia up to high TRLs industry, going through mid-range TRL (research centres). While ESRE members bring a specialist knowledge and de facto benefit from synergies with the aeronautics energy, transport, security, digital communities, EARTO brings a wide encompassing knowledge from many other non-space disciplines. This is usefully complemented by SME4space whose member are attracted by 'innovation', new business opportunities, and shorter time to market developments.

In terms of thematic coverage, the members of the five associations have demonstrated through their participation in previous framework programmes, in ESA programmes, in national programmes or as recognised players on the commercial market, to master the required scientific disciplines, to have the know-how to develop the relevant technologies in the field of satellites and launchers, to have the capacity to carry out ground and in-orbit demonstration, and to transform R&I results into products and services.

Ambition to include new type of partners

In addition, the Partnership will have the ambition to be inclusive and to recruit new members with a view to expand its technological coverage, potential user base and European geographical balance. Outreach activities will be developed and rolled out, as well as cross-pollination activities with other Horizon Europe Partnerships.

The Partnership also intends to develop tighter links with end users of space technologies. Already during the consultation phase, those end-users, such as satellites operators, were invited to inform on their customer requirements (TV broadcasters, internet providers, earth observation user companies), so that could be considered in the preparation of the SRIA.

A number of the 'New Space' actors are small companies unable to dedicate resources to be part of EU consultation process. The intention is to continue organising ad-hoc workshops targeted to them.

As mentioned earlier, the participation to Working Groups remains open to all entities eligible for participation in Horizon Europe, that also will have the possibility to join more formally as Partners at later stage.

Geographical coverage

In Europe, the space supply chain has been developed historically in a limited number of countries such as France, Italy, UK, Germany and Spain. Today, all Members States are using space-based infrastructures and altogether represent the largest part of the orders.

An increasing number of European countries want to develop their space infrastructures with projects of development or creation of new spaceports in Sweden, Norway, Portugal, UK and Italy. A number of countries are also developing small launchers (e.g. Spain, Germany). Luxembourg host a major global satellite operator (SES) and is hosting a number of 'New Space' companies, some of them looking into the possibility to use resources from space (asteroids, the Moon, etc.).

The ensemble of the five Associations supporting this Partnership proposal ensures a broad coverage of EU Member States.

The industrial supply chain is widening progressively. For example, today, Airbus Defence & Space is present in France, Germany, Spain, UK, Belgium, Poland through subsidiaries. In the same manner, Thales Alenia Space is present in France, Italy, Belgium, Spain, UK, Poland and Switzerland. Finally, OHB is active in Germany, Italy, Luxembourg, Belgium, Sweden, Czech Republic and Greece.

With the shift to the New Space approach, the creation of small independent companies in new diverse European countries such as Finland (ICEYE OY), Denmark (GOMSpace), Poland (FP Space), Hungary (C3S Electronics) or Bulgaria (EnduroSat) is observed. Some of these new companies appearing in non-historic space European countries are even becoming leaders in their markets (e.g. nano satellites).

The launcher supply chain is also a good example of the European dimension of the space sector. Of course, the two leaders in launcher manufacturing are deeply European. ArianeGroup is present in France and Germany but also in Belgium and the Netherlands, and

Avio in Italy and France. It is important to highlight that the independent access to space would have not been possible without the European dimension of the space sector. The best example is the Ariane 6 project coordinated by ArianeGroup, which involved more than five hundred companies in more than 20 countries in Europe. In the same manner, the Vega project coordinated by European Launch Vehicle involved seven companies in ten European countries. Deeply European, the space supply in Europe has early taken advantage of the concept of Europe. In fact, it is impossible today to imagine accessing and using space in our continent without its European dimension, from the concept to the satellite, its manufacturing and integration, up until its launch, orbital placement and finally operations.

SME4SPACE presently has members in 24 different European Countries and consists of 16 Working Members (Associations/Clusters) and 25 Individual Company Members, gathering cumulatively more than 800 entities.

ESRE members include the following national space research centres CBK (Poland), CIRA (Italy), DLR (Germany), INCAS (Romania), INTA (Spain), NLR (Netherlands), ONERA (France) and VZLU (Czech Republic).

The EARTO association counts over 350 Research and Technology Organisations (RTOs) in more than 29 countries in Europe and beyond.

Overall, the geographical coverage of EU Member States is exhaustive and extend to a number of countries associated to Horizon Europe. Today, the distribution of the activities is nevertheless very unequal with an important share of the activities concentrated in a few Member States. Specific actions and dissemination measures will be undertaken to widen participation (see also section Dissemination under 2.1)

2.4.3 Targeted Groups/Stakeholder Community beyond the Partnership members

The first target group to communicate on the R&I achievements of the Partnership will be satellites operators in the field of telecommunication and Earth observation, as well as policy makers who can potentially make use of such enhanced performances and capacities. First contacts were established during the SRIA elaboration phase with the EMEA Satellites Operator Association ESOA for example.

A second natural target group to communicate on the R&I achievements will be the industrial stakeholders of the Space Programme components, EGNSS, Copernicus, Space Situational Awareness and GOVSATCOM. While this Partnership does not answer directly their needs, a number of expected advances such as enhanced bandwidth capacity, higher resolution Earth Observation, telecommunication systems, end-to-end data handling can be of potential interest for them for the longer term (it is reminded that R&I for the Space programme addresses mostly the evolution of the actual constellations).

Taking into account the high level objectives of the Space Strategy for Europe[20] for the European Union of 'Fostering a globally competitive and innovative European space sector' and 'Reinforcing Europe's autonomy in accessing and using space in a secure and safe environment', the international dimension should be carefully managed.

[20] COM(2016)705

3 Planned Implementation

3.1 Activities

3.1.1 Envisaged portfolio of activities

In order to answer the challenges of global competitiveness of the EU space sector and reinforcing our autonomy in using and accessing space, it is proposed to structure the portfolio of research and innovation activities along two main axes.

1) Foster competitiveness of space systems

1.1) Foster Competitiveness of end-to-end systems and associated services: telecommunications, Earth observation, ground segment and data chain. How: Roadmap based research in complementarity with ESA ARTES programme, for telecommunications, synergies with R&I for Copernicus for Earth observation, answering short to mid-term needs (3-5 years), RIAs, IAs, including demonstration.

1.2) Future space ecosystems: new system concepts, new services including de-orbiting and active debris removal, on-orbit servicing, assembly, manufacturing, new system concepts. How: building on the previous Strategic Research Cluster PERASPERA, roadmap based answering longer term needs (3 to 10 years) with three axis: i) maturation of building block (RIAs), ii) in-orbit demonstration of mature technologies towards the end of the Partnership (IAs), iii) Creation of European Operations Framework (EOF) for business establishment (CSA).

1.3) New industrial processes and production tools: digitalisation and automation, Manufacturing, Assembly, Integration and Testing (MAIT) at larger-scale, lean qualification processes. How: spin-in industry 4.0 technologies (RIAs), in synergies with Made in Europe.

1.4) Enabling technologies (cross-mission, space and ground) and disruptive technologies. How: maturation of promising technologies, up to In-Orbit demonstration and validation for the most mature, bottom-up open calls for disruptive technologies with down selection of most promising ones, RIAs

These different axes of R&I will contribute to enhance the competitiveness:

- on the short term by cutting the manufacturing costs and reducing production time, developing new evolutionary improvements leading to higher bandwidth, higher resolution and an end to end design (versus more segmented design for the space and the ground segment and a lack of continuity in the data chain introducing unnecessary interfaces and operations)
- on the medium to long term, we have to prepare the next generation of satellites and associated ecosystems with new concepts (modularity, re-configurability), new services and capacities which do not exist today (e.g. on-orbit operations) that need to be developed and demonstrated in space.

2) Reinforce access to space

2.1) Innovation for competitiveness, targeting initial operational capability by 2030: reusability concepts, optimised low cost propulsion systems, smart technologies. How: R&I actions

should result from identified specific challenges/objectives and priorities driven by cost-effectiveness and will rely on a roadmap approach (RIAs); for the most mature, technology demonstration at component, subsystems or system level, up to flight demonstration.

2.2) Disruptive concepts for access to space. How: targeting solutions for beyond 2030, starting at low TRL, fully bottom-up approach, down selection and further maturation of most promising technologies, RIAs, inducement prizes.

2.3) Fostering and enabling new commercial space transportation solutions: new space transportation services and concepts, new technologies for improved versatility, cost reduction and flexibility, new services requiring re-entry. How: R&I actions identified based on their potential for commercial business growth (RIAs), technology demonstration at component, subsystems or system level (IAs), in coordination with ESA.

2.4) Modern, flexible and efficient European test, production and launch facilities, means and tools: digitalisation and advanced data management, innovation in Europe's existing spaceports, flexibility and configurability of launch systems, promote the use of space test and launch facilities for new actors and concepts. How: R&I actions should result from identification driven by cost-effectiveness and relying on a roadmap approach (RIAs).

These different axes of R&I will contribute to reinforce our capacity to access space:

- by maintaining a competitive edge that is indispensable on the global market to complement the institution orders in the case of the EU launchers sector
- by expanding the offer in the domain of new commercial services such various orbits, launching different types of satellites in order to increase the launch rate. This will contribute to reduce the impact of fixed costs
- by developing and testing new concepts that will prepare the innovation post-2030
- by modernizing launch, test and production facilities in order to reap the full benefit of the flexibility enabled by digital manufacturing technique (e.g. industry 4.0)

Although it is difficult to have an accurate evaluation of the share of the RIA, IAs and other types of actions without the availability of the multi-annual roadmaps, a first estimate is 48%, 48% and 4%.

Activities that are needed to achieve the objectives

Beyond the R&I activities, a certain number of actions are needed to be undertaken by the Partners for the operation of the Partnership. For this purpose, most of the other Partnerships have established a specific association for the Partnership purpose where members work together, independently from the fact that they are affiliated or not to another association.

In the different activities described above, this association will have a particular role in the following subjects:

- Participation and support to the functioning of the Partnership Working Group and the Partnership Board meetings

- Monitoring of the investment target as described under section 2.2 i.e. of their in-kind contribution on R&I and other activities they are carrying out in the frame of the Partnership (e.g. participation to Working Groups, to road mapping and monitoring activities, etc.).

- Consultation beyond the community of members and Partners of the association for example when updating the SRIA or developing multi-annual roadmaps.

- Most of the activities described in this proposal under the section communication, dissemination and exploitation in particular towards the community outside of the members and Partners, for example for the spin-in and spin-out of technologies, awareness campaigns on the activities of the Partnership, the calls for proposals, the projects selected in a spirit of openness and widening, relying on a web site and appropriate social medias, organising public workshops, etc.

3.1.2 Mechanisms to ensure the complementarity with other relevant initiatives of Horizon Europe

A number of collaborations with Partnerships, mostly under Cluster 4 have been identified and discussed under section 2.2). These are 'Smart Network Services', 'Artificial Intelligence, data and robotics', 'Made in Europe', 'Photonics' and 'Key Digital Technologies'.

All these candidate Partnership are under Cluster 4. Links and discussions have been established in the frame of the co-creation process. Beyond the contact established at working level, formal links between the different Partnerships will be established to ensure a regular and reciprocal flow of information, and foster collaboration. As the topics of common interests are well defined (see section 2.2) and most of the Partnerships concerned are developing generic solutions, there is a priori no risk of duplication. The intention is to develop joint Topics where the generic developments are targeted to fulfil space requirements, and jointly fund them.

In practice, the Commission services and the operational working bodies of the Partnership will coordinate their work make sure all relevant stakeholders, organizations, HE Partnerships are aware of the Partnership objectives, work, and events. The mutual exchange will reinforce the global results output, impact, and highlight complementarity of actions.

Mechanisms to ensure the complementarity with ESA

ESA is the largest player in space R&I at EU level. Multiple channels of communication and collaboration exists between the Commission and ESA.

ESA has been participating as an observer to all the Working Group meetings and Steering Committee meetings of the Consultation Platform that has produced and endorsed the SRIA.

In addition, the European Commission is participating in the so-called European Space Technology Harmonisation Process[21] which maps the different ongoing R&I activities in the field of space. The European Commission also takes part in the Joint Task Force with ESA and EDA on critical technologies for non-dependence. All the links are therefore in place and active and will continue to be used in the frame of the Partnership.

[21]https://www.esa.int/Enabling_Support/Space_Engineering_Technology/The_European_Space_Technology_Harmonisation_Process

As far as this Partnership is concerned, it is planned to invite ESA to Working Group meetings as it was the case during the SRIA elaboration phase. This is a strong, reliable and robust way to ensure complementarity at the appropriate level of granularity.

3.1.3 Coherence and synergies with major national policies

The mechanisms in place to ensure the complementarity with ESA have been described in detail in the previous section. This Co-programmed Partnership will fully integrate and formalise these mechanisms in its governance mechanisms.

With the participation of Member States in the Working Groups and the regular dialogues within the framework of the SPEG-T, coherence and synergies with national initiatives will be ensured.

The availability of a SRIA and multi-annual roadmaps agreed at EU level, with the endorsement of the R&I players, National Space Agencies and Member States is a major asset to ensure coherence and synergies between these actors.

It is to be noted that dedicated actions are foreseen for this purpose under the chapter 'Synergies' of the SRIA (5.4 - Building on common technology roadmaps).

3.2 Resources

3.2.1 Types and levels of contributions from partners are necessary to achieve the objectives and impacts

An estimate of the R&I investments and the contribution by partners is provided in chapter 2.2) under 'How much R&I investments are necessary / leverage'. It provides a detailed identification of technologies development that are needed, an estimation of the cost for each of them and consolidated figures of the overall R&I investments of up to EUR 3 billion.

A number of 'soft' measures are also foreseen under 'Synergies', in which Partners will contribute their own resources. For example, road-mapping, standardisation and qualification. Monitoring of progress and ex-post assessment of financial commitments and leverage will also involve mobilization of own resources as well as the participation in the activities of the partnerships. For example, participation to the Working Groups involves significant travel and personnel costs.

3.2.2 Other investments or framework conditions are envisaged / relevant for the deployment.

In general, R&I carried out in the frame of the EU framework programme in the field of space remains in the pre-competitive field (TRL 4-7 max). It is expected that this will aliment a number of higher TRL level demonstration activities that will be carried out in the frame of ESA programmes (i.e. funded by Members States)) while at the same time supporting roadmapped low-TRL levels and blue sky research needed to ensure the future competitiveness of the European space sector. Because the ESA framework does not require a multinational

consortium approach, its environment is better suited to close to market high TRL level demonstration activities for industrial purposes.

As mentioned in section 2.2, the Partnership also intends to seek to increase opportunities for space companies (i.e. SMEs) to access risk finance products (e.g. equity, debt) in the continuity of the Horizon 2020 the Innovfin Space Equity Pilot (ISEP) fund that was set-up and it is currently being implemented under the InnovFin Equity family with an overall funding is EUR 111 million.

3.3 Governance

3.3.1 Governance structure

A description of the process for developing a Strategic Research and Innovation was made under point 2.2. The governance of the Partnership will build on this process.

The Partnership is governed by a Partnership Board and operates with Working Groups (WGs), the scope of which is established to fulfil the objectives of the Partnership.

The governance is intended to be light, simple and proportional to the scope and objectives of the Partnership.

Partnership board

The role of the Board is to steer the activities of the Working Groups, endorse the main documents to be shared / published (e.g. SRIA update). The Partnership Board will establish its Rules for Procedure, based on a harmonised proposal provided by the Commission, covering inter alia rules on confidentiality, transparency and avoidance of conflicts of interests.

Two levels of the Partnership Board are foreseen:

- Operational level, in charge of the normal operation of the Partnership,
- Executive level (typically Director level) to provide high-level guidance and validate the most important milestones (typically once per year).

The Partnership Board will be composed of a limited number of Members (of the order of 30) so as to be able to play its steering and decisive role in an effective way. To the extent possible, the Board should act by consensus but decision making by majority voting should be an operational possibility.

The European Commission will retain half of the decision power (votes) and will bring the 'Institutional view' taking into account the recommendations of the institutional advisory entities. A distribution of seats will be proposed by the European Commission among the Partner associations, Eurospace, SME4Space, ESRE, EARTO, EASN. The final distribution will be jointly agreed by the European Commission and the Partners. The Board may also invite Observers. Entities who want to participate to the Board but are not affiliated to any of these associations can be invited as Observers.

The Partnership Board will also decide on the communication strategy and its implementation. In particular, this strategy should ensure transparency and openness to new partners. In addition, the Partnership Board should regularly inform the bodies dealing with space research matters at the European Parliament (ITRE) and Council (Horizon Europe, Space Working Parties)

Working Groups

As a starting point, the proposed Working Groups will be: **Competitiveness**, **Access to Space**, **Synergies and Opportunities**, in line with the structure of the SRIA.

Initially, these Working Groups will be chaired by the European Commission. Partners will be invited to play a role in the organisational and logistic aspects, together with the European Commission.

The participation will be open to all European entities eligible to participate to Horizon Europe who are willing to contribute to the work and to Member States. A simple application process will be put in place to guarantee the involvement and active participation of the WG participants. A regular update of the Working Group composition will be made to avoid inactive Members.

Furthermore, Member States will be invited to participate in the Working Groups. Finally, ESA will be invited as an observer to all Working Group meetings.

Advisory Entities

Beyond the participation of Member States in the Working Groups, it is foreseen to rely on the SPEG-T for Member States to advise the Commission on the functioning of the Partnership, in particular with respect to transparency and openness.

Ad-hoc advice will also be sought from a number of other entities. ESA will be in particular consulted on the aspects of developing synergies at European level. EDA, who is participating in the Working Group Synergies will be consulted regarding synergies with defence and critical technologies for non-dependence. The Partnerships on 'Smart Network Services', 'Artificial Intelligence, data and robotics', 'Made in Europe', 'Photonics' and 'Key Digital Technologies' will be consulted on the developments foreseen buy this Partnership in which they have a strong expertise and potential for collaboration. Finally ESOA, the European Satellite Operator Associations will be consulted regarding the emerging trends from the users' perspective.

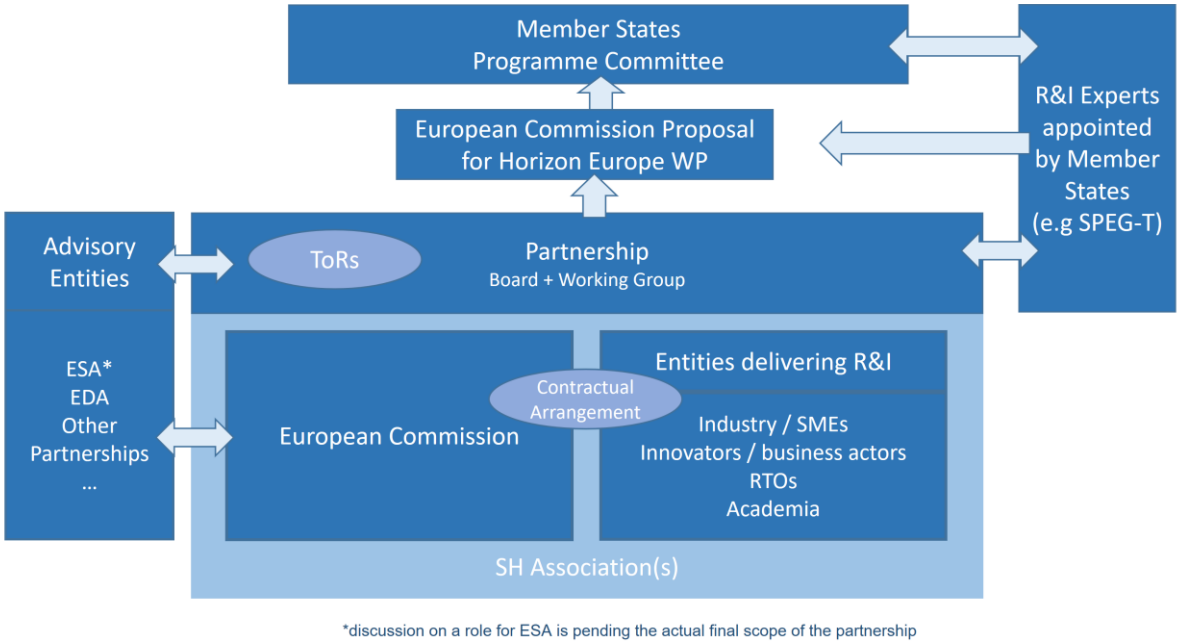
Process to develop objectives, priorities, vision, SRIA, roadmaps

Working process will follow a similar process established to develop the Strategic Research and Innovation described under point 2.2 and is depicted in the figure below. The elements of vision, objectives, roadmaps and recommended implementation modes are discussed and developed in the appropriate Working Groups.

The Operational level of the Partnership Board gathers and assemble the contribution of the Working Groups ensuring a coherent vision, objectives, and relies on the advisory of the SPEG-T to ensure coherence at EU level and with Member States. The Partnership Board also ensures that synergies and coherence with other initiatives under Horizon Europe, in particular with the Partnerships as elaborated in the previous sections.

The fact that the participation to Working Groups is open to all entities eligible for participation under Horizon Europe, and to Member States complemented by the involvement of the relevant advisory entities, as well as the communication policy described above, ensure transparency

and openness. The Partnership Board at Executive Level validates the actions and documents of the Operational Level.



3.3.2 Involvement of the Commission in the preparation and implementation of the Partnership

Since there is no pre-existing space Partnership, the Commission services are more involved in the preparation process than other Horizon Europe Partnerships.

Since the beginning of the consultation platform in July 2018, whose objective was the preparation of the SRIA, the Commission made clear that a Co-programmed Partnership was an option under consideration for its implementation.

In the Working Group 'Opportunities', a number of presentations from other Partnerships were delivered and DG RTD services made a specific presentation on Co-Programmed Partnerships. Numerous presentations and discussions in the SPEG-T also took place around a Co-Programmed Partnership in the field of space.

For the current proposal, the Commission has taken the lead in the drafting of this document and requested specific inputs to the five associations supporting the proposal and that are willing to engage their members as Partners.
In the governance proposal, the European Commission has 50% of the votes in the Partnership Board and most of the advisory entities are of institutional nature (Member States and their space agencies, ESA, EDA, etc.).

It is clear to all Partners that the European Commission remains in charge of drafting Horizon Europe Work Programmes, and that adoption of Work Programmes is subject to comitology.

As regards the development of the SRIA, here as well the Commission has taken an important role by moderating the Working Groups of the Consultation Platform and the Commission is chairing the Steering Committee of the Consultation Platform.

Overall, institutional interests are therefore well represented.

3.4 Openness and transparency

3.4.1 Establishment of the Partnership

The five associations working to establish the Co-Programmed Partnership include industry, SMEs, Research Centres and academic labs and represent a large share of the beneficiaries of H2020.

Under section 2.2) - Strategic Research and Innovation Agenda it was mentioned that the approach to establish the SRIA was opened to entities outside of the 5 associations, included Member State representatives, and that ad-hoc events where organised with entities who do not have the resources to participate to WG meetings.

It is intended to develop this Partnership in this continuity, with the same spirit of openness and transparency with the specific measure described in this proposal under communication, dissemination and exploitation (see also section on 'Activities that are needed to achieve the objectives' under 3.1)

Expression of interest have been made to other Partnerships which are working in technology areas of interest.

It is important to note that some Topics may touch upon security issues, and security restriction may apply (EU 27 only). However, these restrictions apply at Topic level and not at Working Group level.

3.4.2 Strategies and plans throughout the lifetime of the Partnership to ensure easy and non-discriminatory access to information

The strategy to ensure non-discriminatory access to information about the initiative and to stimulate the participation of new partners is as follows:

Open communication and active dissemination on the work and structure of the Partnership, the SRIA and the multiannual roadmaps thanks to a public website.

The dissemination will include a 'synopses' updated after every call for proposals with projects selected in the frame of the Partnership, the description of consortia and a summary of the planned activities. This will allow potentially interested partners to contact coordinators or partners of past and ongoing projects with a specific attention to widen the geographical coverage of participants to the projects.

Furthermore, events and workshops on the work of the Partnership will take place.

Dissemination activities will also be targeted to stakeholders' communities outside the Space domain, in order to reach out to potential users of space services, data and technologies, as well as to maximise synergies across different sectors and economic domains.

In addition, this activity will support the process to include new potential partners into the partnership perimeter, as well as the relationships with other running Partnerships to cross-pollinate each other's activities and research agendas.

More details are given under 2.1 - 'Dissemination' and 3.1 - 'Activities that are needed to achieve the objectives'.

Open participation to Working Group meetings

As mentioned earlier, the participation to Working Groups is open to all entities eligible for Horizon Europe. Presentations shown at Working Group meetings will be shared will all members.

3.4.3 Adapting the Partnership to the evolution of the sector

Working Groups and Partnership Board will invite on a regular basis non-members to present their activities and exchange on ad-hoc topics (e.g. end-users, representatives from other partnerships, Commission services from other relevant areas of Horizon Europe, in particular from Cluster 4).

During the consultation phase, invited end-users of space technologies (such as satellites operators) to inform on their customers requirements (TV broadcasters, internet providers, geospatial technology providers.). Other candidate Partnerships were also invited to present the state of development of their proposals (e.g. 'Made in Europe', 'Smart Network Services', 'Clean Sky'). The intention is to establish tight links with them as explained in previous sections.

As experienced during the phase of drafting the SRIA, SMEs, Newspace, University labs and smaller Members States have few resources to participate and be involved in regular Working Group meetings. Ad-hoc open meetings and workshops will be organised to support their needs. In these meetings, not only Partnership Members will be invited but all relevant stakeholders.

Building on the STEPP experience, it is also foreseen, to open web-based consultation allowing external stakeholder to contribute and to engage.

3.4.4 Processes and measures for consulting all relevant entities and stakeholders

The work of the Co-Programmed Partnership will be based on the pace of the definition of work programmes and follow a similar consultation methodology than the one used during the phase of definition of the SRIA. At every cycle of programming, the different Working Groups will be making recommendations to the Commission for actions to be implement under year 1 and year 2 (assuming a 2 years Work Programme).

The 'core' population of Working Groups are members of the five associations who are the Partners of the Co-Programmed Partnership which include industry, SMEs, Research Centres and academic labs and Member States representatives. This 'core' therefore covers de facto a very large representation of all stakeholders. In addition, the participation to Working Groups is open to all stakeholders who have expressed an interest and are actively contributing.

Thematic meetings will follow on the different proposed Topics (or group of Topics) to which ad-hoc stakeholders will be invited in addition of the Working Group members concerned. The goal here is to include the ad-hoc experts in the consultation and stakeholders who do not have the resources to follow the regular meetings of Working Groups.

4 Annexes:

4.1 Description of the consortium

European Association of Research and Technology Organisations (EARTO)

Founded in 1999, the EARTO association counts over 350 Research and Technology Organisations (RTOs) in more than 29 countries in Europe and beyond. EARTO members represents 150.000 highly skilled researchers and engineers managing a wide range of innovation infrastructures: a significant resource in support of innovation in Europe.

The EARTO missions are to promote and defend the interests of RTOs in Europe by reinforcing their profile and position as a key player in the minds of EU decision-makers and by seeking to ensure that European R&D and innovation programmes are best attuned to their interests; to provide added-value services to EARTO members to help them to improve their operational practices and business performance as well as to provide them with information and advice to help them make the best use of European RD&I programmes funding opportunities.

The EARTO Working Group (WG) Space Research is one of the current EARTO technical WG. It is composed of 24 RTOs working in different markets, being space, one of them which is strategic for all the RTOs members of this WG.

The goals of the WG Space are to be a single address and voice to the EC and ESA in order to represent and defend the interests of the RTOs.

EARTO WG Space has an inclusive approach: a wide range of members are admissible, independently of their country, their size, their turnover and their achievements. Recruitment takes place in all ESA Member States.

The EARTO WG Space vision is a European research and innovation system without borders in which RTOs occupy nodal positions in space and possess the necessary resources and independence to make a major contribution to a competitive European economy and high quality of life through beneficial cooperation with all stakeholders

The European Aeronautics Science Network (EASN)

EASN was established in 2002 with headquarters in Brussels, is the Association of the European Academia active in Aviation and Space research. The main objective of the Association is to support the development of new knowledge, innovation and breakthrough technologies through fundamental research in Aviation & Space.

The long-term goals of the Association are to develop an open, unique European platform structuring, supporting and upgrading the research activities of the European Universities, to facilitate them to respond to their key role within the European Aviation & Space Research Community and to find ways to bridge over rapidly the European academic society with the European business community.

The Association currently has more than 400 registered members, including individuals, universities and other organizations, through which it can network with more than 10.000

academic staff, researchers and scientists throughout Europe. Furthermore, the Association has close and intensive collaboration with industrial entities, research organizations and SME groups for the dissemination of knowledge and research related activities. In this frame, EASN organizes conferences and workshops which have been established over the years as major European Dissemination and Exploitation events of Aviation & Space-related research.

The Association, as a non-profit organization, cannot participate itself in research, development and innovation projects and receive funding. In this context, the Association is contractually linked to a SME (EASN Technology Innovation Services BV) which is authorized to exclusively act on its behalf in R&D and R&I projects. All actions and activities of the Association are in accordance with the statutes of the organization. The General Assembly of the Association composed of the representatives of all members is fully competent to carry out the Aims of the Association. The executive body of the Association is the Board of Directors. The Board of Directors is vested with all powers necessary for the Administration and Management, within the limits of its attributions by the General Assembly.

The Association of the European Space Research Establishments (ESRE)

ESRE was formally established in March 2016 as an international non-profit organisation registered in Belgium. Present member organisations of ESRE are the national space research centres CBK (Poland), CIRA (Italy), DLR (Germany), INCAS (Romania), INTA (Spain), NLR (Netherlands), ONERA (France) and VZLU (Czech Republic). Through ESRE, these national research centres strengthen their cooperation and propose European Research and Development (R&D) actions to advance science and technology both to support the competitiveness of the European space sector and to address the grand societal challenges.

ESRE members collaborate with more than 600 international partner organisations worldwide and 200 in the space sector. ESRE manage a total of 62 sites with 441 research infrastructures and 21 sites with 82 research infrastructures in the space sector. ESRE members are major innovation drivers and hold 4586 patents and 1745 in the space sector and publish 1800 peer-review publications per year and 600 in the space sector.

ESRE members are major drivers of new knowledge, mature technologies and systems, and educate and train the future workforce by hosting more than 1400 PhDs every year. ESRE members have more than 14000 staff and 8000 researchers including half dedicated to space. ESRE published regularly technological roadmaps and position paper on the state and needs of European research centers.

ESRE research areas cover:

- Collaborative Small Satellite Constellations
- Future Launching Systems
- Cost-efficient Satellite Subsystem Technologies
- Satellite-based Greenhouse Gases Monitoring
- Environment Monitoring at Local Scale

The ESRE Association is managed by a Board composed by representatives of each ESRE members, appointed by the General Assembly.

Eurospace

Eurospace – a not for profit organisation incorporated under the French law of 1901 – fosters the development of space activities in Europe and promotes a better understanding of space industry related issues and problems. It gathers industry-relevant information and maintains permanent liaison with ESA (the European Space Agency), National Space Agencies (CNES/France, DLR/Germany, ASI/Italy) and in general any organisation using or compelling the use of space techniques such as the European governments or the European Union.
Eurospace was founded in 1961 as the organisation of the then emerging space industry. Ever since, Eurospace has counted the membership of the major industrial space companies in Europe under the chairmanship of charismatic industry leaders such as Mr Delorme (founder President and CEO of L'Air Liquide until 1993), Mr Vallerani (President of Alenia Spazio until 1998), Mr Öfverholm (President of Saab Ericsson Space), Mr Carlier (CEO of Astrium in 2001), Mrs Pascale Sourisse (CEO of Thales Alenia Space), Mr Marco Fuchs (CEO of OHB-System), up to the current President Jean-Loïc Galle (CEO, Thales Alenia Space).

Its Management structure comprises a Board of Directors, called the 'Council' the composition of which reflects the size of each country's company participation, the General Assembly and a Policy Committee which directs the Association's policy established by the Council and monitors the activity of the various working groups and panels. The Council also nominates the President and the Financial Committee members to be elected by the General Assembly, appoints the members of the Policy Committee (PC), supervises the activities of the latter and sets up temporary committees or working groups to deal with specific issues. A Financial Committee supervises the financial situation and determines the amount of the yearly membership fee to be paid by the companies.

In 2004, Eurospace became the Space Group of ASD (AeroSpace and Defence Industries Association of Europe – formerly AECMA), representing space interests. The new aggregated structure allows industry to benefit from existing synergies between aeronautics, space and defence industrial activities.

Eurospace gathers 45 members representing between 85% and 90% of the sector workforce (between 38 000 and 39 000 employees). Eurospace members are carrying out R&I activities between the range of TRL 3 and 9 with a clear focus on product development, new technology validations and new concept demonstrations. Around 25% of R&I activities carried out by Eurospace members are below TRL 4 and 75% above TRL 5. In total, Eurospace members are investing approximately 300M€ per year in R&I.

Among its members, Eurospace counts ADS Group, AED Cluster Portugal (AEDCP), AIR LIQUIDE, Arianespace, Airbus Defence & Space Spain, France, Germany, UK, Netehrlands), Ariane Group (France, Germany), Alter Technology, Avio SpA, AZUR Space Solar Power GmbH, CGI IT UK, Deimos, Fundacion Tecnalia Research & Innovation, GMV, Indra Sistemas SAS, Kongsberg Defence & Aerospace, MT Aerospace AG, NLR, OHB SE, OHB Italia, RUAG Schweiz AG – RUAG Space, Ruag Space Finland, RUAG Space GmbH, RUAG Space AB, SABCA, SAFRAN HERAKLES, SCISYS UK Ltd., Sener SA, Sitael S.p.A., Safran Aircraft Engines, Telespazio SpA, Telespazio Vega Deutschland, Terma A/S, Tesat Spacecom GmbH & Co. KG, Thales Alenia Space France, Espana, Belgium, Italia), TTTech Computertechnik AG, TNO, Vitrociset SpA.

SME4Space

SME4SPACE VZW is the representative organisation of the SMEs of the European space industry. The association is legally incorporated as a private not-for-profit organization under the Belgian Law, whose aims are:

- defining and defending common positions;
- representing the SMEs with public authorities i.e. the European Space Agency, the European Union and its related agencies;
- organising seminars and information sessions;
- organising a network of SMEs to increase the possibilities for cooperation and related activities;
- supporting the fruitful collaboration among SMEs, large companies and research organizations.
- carrying out research activities.

SME4SPACE has 2 different typologies of Membership:

a) Space Associations/Clusters as Working Members;

b) Space SMEs as Individual Company Member i.e. for countries or regions where no Working Member is presently

SME4SPACE presently has members in 24 different European Countries and consists of 16 Working Members (Associations/Clusters) and 25 Individual Company Members, gathering cumulatively more than 800 entities.

4.2 SPEG-T Expert Group

A Space Policy Expert (SPEG) Sub-group on space technologies has been set up, in 2017, by the Commission in accordance with the respective rules and procedures of Commission Decision C(2016)3301 establishing horizontal rules on the creation and operation of Commission expert groups.

The SPEG sub-group formalises and provides coherence among existing activities such as the work of the Joint Task Force on critical space technologies. The Commission services consults this sub-group for the purpose of obtaining technical expertise and advice for policy-making needs.

A non-exhaustive list of the tasks of this sub-group includes the following: support to technology roadmaping; critical space technologies; in-orbit validation and demonstration; partnership with space sector stakeholders; market/supply chain; standardisation; key enabling technologies; green and clean space.

The SPEG sub-group is composed by the Union Member States. Each Member State shall designate two representatives (member and alternate). In addition, the Commission granted an observer status in this sub-group to Norway, Switzerland and the European Space Agency.

The Commission may invite industry (as represented by its established European associations) and research organisations on a case-by-case basis. The Commission may invite experts with specific expertise on a subject matter of the agenda to take part in the work of the SPEG sub-group on an ad hoc basis.

4.3 STEPP Pilot Project

The objective of the STEPP project is to provide sector consolidated inputs to the Commission-led **consultation platform** for Horizon Europe space technologies. The Platform elaborates a Strategic Research and Innovation Agenda (SRIA) including High Level inputs and implementation recommendations in the context of Horizon Europe. The SRIA is produced on the basis of an inclusive and structured process designed with a view of supporting the implementation of the Space Strategy for Europe.

The **consultation platform** brings together the Institutional community (consulted by COM) and the **Research and manufacturing sector** (consulted by STEPP described above).
Overall the STEPP project brought together:

30 Experts to prepare the SRIA inputs in the context of Task Force (TF) activities
>200 Task Force members to update & improve the original experts proposals through the organisation of 110 TF meetings (3 to 4 TF meetings for each TF in average)
>500 Reviewers assessing and voting the validity of proposals via two targeted public consultations (limited to registered entities)

The STEPP project was carried out between July 2018 and February 2020. It supported the elaboration of consolidated inputs for the meetings of the COM-Led consultation platform. There were 8 meetings of the COM-Led consultation platform in the period.
Project outcome
STEPP supported the Commission-led consultation platform by providing specific inputs to the European Commission in the context of the Platform.

Those inputs were elaborated to support the elaboration of the SRIA, with a phased approach that provided for extensive review and feedback loops with stakeholders within the STEPP project and with stakeholders in the European Commission-led Platform. This approach enabled to gather initial inputs from a few selected experts, and expand their vision towards a sector wide consensus by collecting feedback from a much wider community.

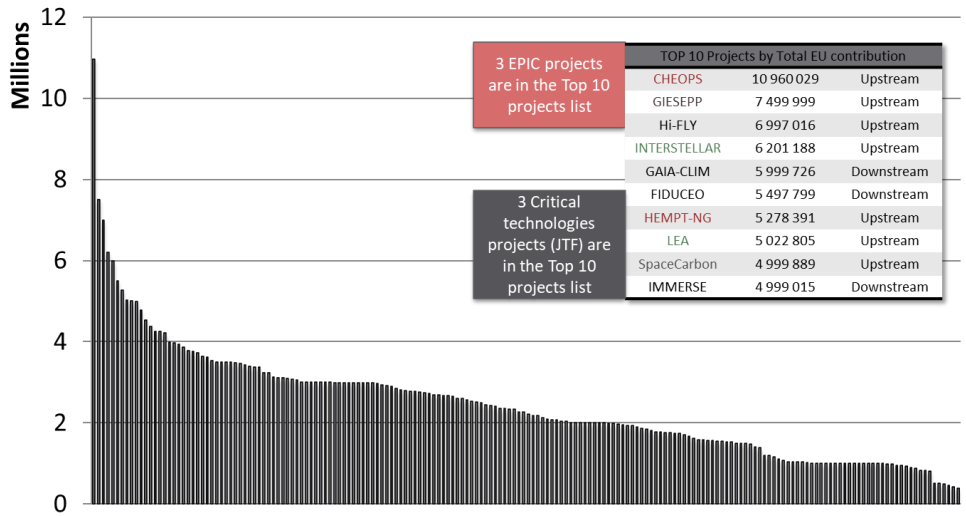
After months of work, those consolidated inputs were presented to Commission and institutional stakeholders, as well as the experts from the Research and manufacturing sector, **during the STEPP Consolidation and Review Workshop in September 2019** which aimed at reviewing in full the key development proposals emerging from the STEPP process.

The full scale SRIA input to the consultation platform is available as a public release document entitled "*STEPP Inputs for the SRIA for Horizon Europe Space Technologies"* delivered in February 2020 to COM. This document is supplemented by two non-public reports: The *STEPP scoping for the SRIA*, a complete overview of all thematic areas that could be applicable to the SRIA, with detailed background information; and the *STEPP Technical Anne*x, a detailed repository of technical activities applicable to the SRIA, with technical description, TRL information and budget requirements.

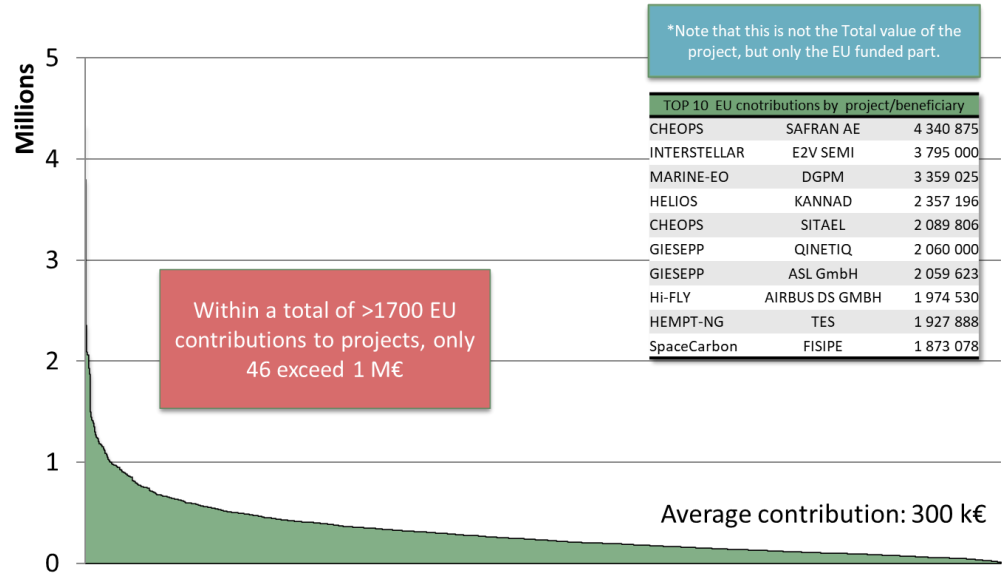
4.4 Analysis of H2020 project funding

Under H2020, the average size of the EU contribution by project was 2,3M€ and then this contribution is divided by all the consortium members (average contribution: 300k€). This is a fragmentation of the UE contribution per participant that is not appropriate for the challenges ahead of us. The Top 10 list shows that 3 out of the 10 biggest projects in H2020 came from EPIC, a Strategic Research Cluster. That demonstrates that a road-mapped based approach

instrument, such as an SRC or a partnership allows less fragmentation and more focused budget envelope on priorities in order to answer the RD&I challenges. A majority of the projects developed in H2020 were more focusing on technology building blocks starting at low TRL (RIA). We need to use the outcome of H2020 and scale up the TRL of these technologies in order to aim for the integration and then the validation of demonstrator.



H2020-Space projects (222) by Total EU contribution



H2020-Space projects - Distribution of EU contributions by project.