



# Space for Prosperity, Peace and Future Generations



## About ESPI2040

ESPI2040 proposes a vision for Europe in space. It outlines how space can provide solutions to respond to the unprecedented challenges Europe and the world are facing and how space can be an inspiration and catalyst for Europe and the world to tackle its challenges.

ESPI2040 defines a goal for Europe in 2040, and the ESPI Agenda to support this vision, building on Europe's achievements to engage in the space revolution, and affirm Europe's role as a strong partner to the world.

ESPI2040 emphasises the policy impact of space and underlines its transformative nature, which affects all aspects of our daily lives, economies and Europe's digital future.

ESPI2040 aspires to look beyond the timescale of electoral cycles and governmental policy-making, beyond the volatility of the economy and financial markets, beyond the horizon of direct return on investment, and beyond individual decision-making milestones of space programmes.

ESPI2040 addresses policy makers and institutions, industry, economic actors and finance, academia and the scientific community, and the media: aspiring to contribute to an open debate on a bold vision, with concrete and ambitious goals and an implementation that delivers tangible results.

*ESPI2040 is proposed at a time when one of the wealthiest persons on Earth is a space entrepreneur, when India became the fourth nation to land on the Moon, and when satellite systems owned by foreign commercial operators provide critical information and services during the war against Ukraine.*

*It is written at a time when reliable weather forecasts can no longer be delivered without space data, when hundreds of millions of cars would not operate without navigation systems relying on signals from space, and when billions of mobile phones will rely on satellite communications.*

*ESPI2040 is presented at a time when Europe lacks the political will at the true scale of its economic power and talent to become a full space power.*

**"The rise of great societies, advancement in science and medicine and the exploration of space all happened because large groups of people, united in common cause, choose to collaborate with no clear end in sight. If a rocket that was headed for the stars crashed, for example, we figured out what was wrong and tried again... and again... and again.**

**And even after we succeeded, we kept going. We did these things not because of the promise of an end-of-year bonus; we did these things because we felt like we were contributing to something bigger than ourselves, something with value that would last beyond our own lifetimes."**

SIMON SINEK, "THE INFINITE GAME" 2019

# A vision for Europe

## Space for prosperity, peace and future generations

Peace and prosperity form the foundation of a positive future. Peace provides stability and security and promotes social cohesion. It allows people to live without fear and enables socio-economic development. A prosperous society encourages innovation and technological advancement, advancing economic growth, promoting international collaboration and fostering a collective drive towards tackling global challenges.

### ESPI2040 proposes ESPI's vision for space in Europe.

It outlines concrete goals for 2040 by which time Europe should have established its capabilities and autonomy in space and achieve the full impact of space in all sectors of European policy and in international cooperation.

It advocates for a strong Europe, as a partner to the world.

ESPI2040 considers the timely achievement of these goals with tangible results as a critical prerequisite to realising the full potential of space for Europe in 2040 and further into the 21st century.

### ESPI2040 defines space as:

A foundation for a prosperous and peaceful future for Europe and humankind at large, shaping the world for decades to come.

The home of innovative solutions to overcome existential crises, such as climate change and global geo-political turmoil.

A rich source of hope, inspiration and transboundary societal cohesion.

An inseparable domain, simultaneously comprising space-for-Earth as much as space for exploration and science, whilst moving beyond the perimeter of the space economy and towards space for the economy.

One of the key arenas for transformative innovations and opportunities in the coming decades, next to AI and the digital revolution affecting all sectors of the economy and society.

→ The realisation of this vision will be supported by ESPI's Mission...

# ESPI's Mission



ESPI's mission will support the proposed vision by:



Promoting European space policy on a global level;

Facilitating an active forum for the analysis and discussion of European needs, capabilities, and long-term prospects in space activities;

Developing approaches to European space policy;

Making proposals and recommendations to European decision-makers and institutions.

ESPI's governing bodies advocate for ESPI to provide an open forum, moderate critical debate, and formulate challenging positions: to be just and opinionated, balanced and not risk averse.

ESPI's mission is implemented through the ESPI Agenda, which is comprised of three types of activities: European and International **Engagement**, **Research**, and **Education**.

ESPI2040 also elaborates on ESPI's own ongoing transformation and institutional evolution to best fulfil its mission in the future, as the independent European Think Tank for space policy and as part of the international hub for space in Vienna.

→ The Vision for Europe and ESPI's Mission are defined against a set of goals...





## Goals for Europe 2040

By 2040, Europe will have realised the full potential of space, capturing 25% of the estimated global value of space for the broader economy.

Europe will have integrated space with other future-shaping innovations, infrastructures, policies and strategies, including digital, green, security and defence, energy, mobility and health.

✓ Europe will have the ability to formulate its interests and space policies on its own, act autonomously from divergent foreign interests, while reaffirming its status as a strong international partner and bridge builder within the global community.

✓ Europe will lead the international community in leveraging space for sustainability on Earth while ensuring the safe, secure and sustainable use of space.

✓ Europe will have sustained its achievements and competitive edge in Meteorology, Earth Observation, Satellite Positioning, Navigation and Timing and Satellite Communications.

✓ Europe will lead the development of new breakthrough applications and have established dual-use solutions of space for security and defence.

✓ Europe will have stepped up on space exploration and have established an independent presence in LEO, lunar orbit and on the Moon.

✓ Europe will lead international multidisciplinary flagship missions in space science, including both space-based and ground-based endeavours.

✓ Europe will have accelerated the use of space in bringing together federated infrastructures and services of individual stakeholders, in Europe and globally.

✓ Europe will have more than doubled its investment in space to 0.15% of its GDP, including significant additional investments from security and defence, from sectors beyond space and from financial markets.

✓ Europe will have invigorated the competitiveness of its industrial and technological base with increased resilience, innovative force and independence from vulnerable global supply chains.

✓ Europe will have established itself as a world-leading hub for empowering new generations of talent, increasing the number of graduates with STEM and other space-relevant curricula by 25%.

➔ This will enable Europe to respond to the challenges of our time...

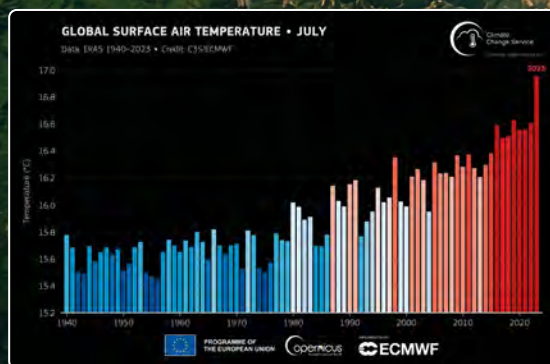
# European and global challenges

Europe and the world are facing unprecedented societal challenges; climate change, a shifting geo-political balance and war endanger our existence and will define the world for decades ahead.

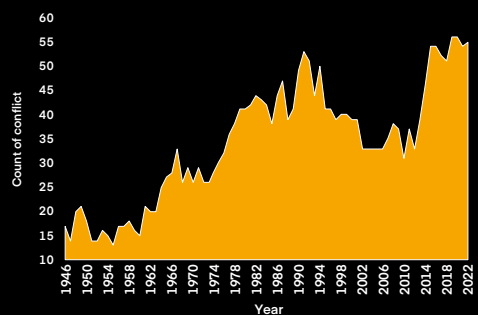
Climate change indicators continue to worsen, spurring a higher frequency of extreme weather events, which have dramatic knock-on effects for the economy and society.

The number of violent conflicts is the highest since the Second World War, with one-quarter of humanity – more than 2 billion people – living in conflict areas or in their direct vicinity.

Reaching NetZero targets by 2050 and establishing peaceful cooperation and multilateralism, in a new multi-polar world, are prerequisites for prosperity and a positive future for generations to come.



## Highest number of active conflicts worldwide



## Uncertain European economy

Europeans have become deeply pessimistic about their economic prospects, with 84% worried about job loss and only 20% of families expecting to be better off in 5 years.

Source: Ipsos and Edelman

Decisive policy action is required now, enabling Europe as a leader in a coalition of global partners to respond to these challenges and affirm its place in the world...

# Europe's place in the world

Europe's weight in the world is diminishing. This has far-reaching geo-political repercussions, with irreversible consequences on Europe's prosperity and its ability to preserve peace and uphold its values.

## LOSS OF WEALTH

The decrease of Europe's share of global wealth is an indicator that Europe is struggling to keep up with global economic advancements. Its role as a leader and strong partner in addressing today's challenges is at risk.

## LOSS OF TRUST

European citizens are increasingly pessimistic about their future and the future of European youth. This is in stark contrast to the prevailing optimism in more future-oriented powerhouses like China and India.

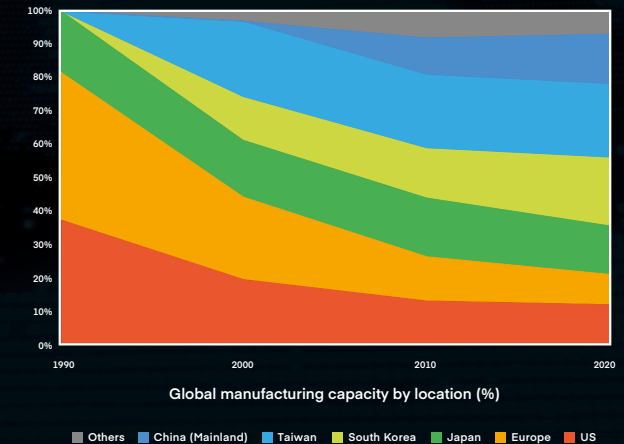
## LOSS OF TECHNOLOGICAL LEADERSHIP

Historically, Europe has been a leader and at the forefront of transformative, future-shaping innovation that defined centuries. Over the past decades it has lost some of its pioneering ethos, most visibly in the digital revolution, and in missed opportunities such as the Internet, AI and semiconductors.



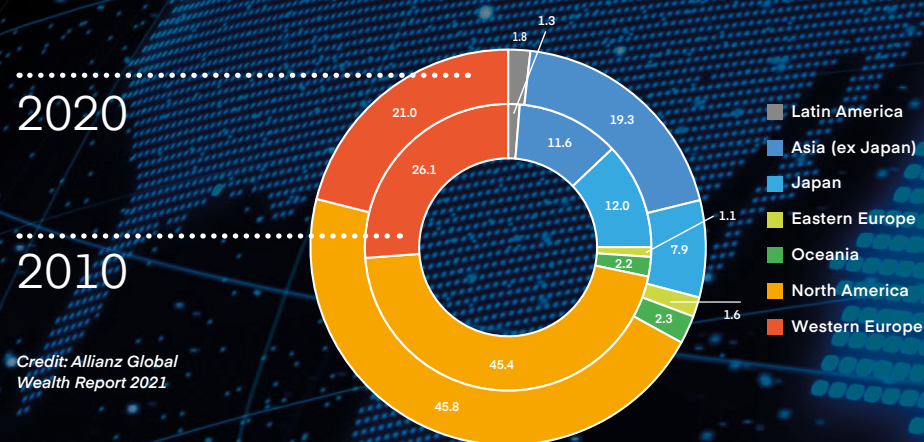
While in 1990, Europe was home to almost half of the global chip manufacturing, its share fell to below 10% by 2020.

Europe missed the opportunity to develop market and industry capability in one of the key enablers of the future economies. This has resulted in a supply chain crisis, affecting other key industries, such as automotive. Decades without a clear European policy vision and inaction can be measured in trillions of Euros. Europe missed out on this essential component for autonomous production and development during the digital revolution.



Credit: Boston Consulting Group x Semiconductor Industry Association

Europe's Decline in the Distribution of Global Wealth



Credit: Allianz Global Wealth Report 2021

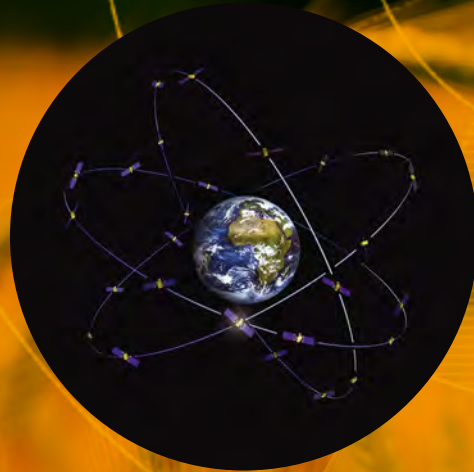


Europe cannot miss the opportunities afforded by space. Finding itself at a unique inflection point, unseen since Sputnik and Apollo, Europe needs to build on its achievements in space...

# Europe's achievements in Space

Europe can be proud of major achievements in space, with a range of state-of-the-art space capabilities, in particular when it comes to meteorology, Earth observation, navigation and telecommunications, as well as in space science, in both space-borne missions and ground-based astronomy.

European space activities have enabled unique socio-economic benefits, supporting and transforming many other policy domains and industrial sectors.



#### Image credits:

Left image: ESA/Rosetta/NAVCAM  
Rosetta navigation camera (NavCam) image taken on 5 June 2015 at 208 km from the centre of comet 67P/Churyumov-Gerasimenko.

Middle image: ESA - J. Huart  
Artist's impression of the complete Galileo constellation of thirty satellites orbiting in three planes.

Right image: EUMETSAT/ESA  
EUMETSAT's MTG-11 allows forecasters to detect and predict severe weather events more rapidly and accurately than ever before.

#### ENHANCING FOOD SECURITY THROUGH SMART & PRECISION AGRICULTURE

Remote sensing and PNT capabilities enabled by EU's Copernicus, Galileo and EGNOS systems empower modern farming, transforming agricultural productivity and resilience.

#### SAVING LIVES THROUGH EARLY DETECTION OF EXTREME WEATHER EVENTS

Innovative capabilities of the new generation of Europe's satellite meteorology programme, EUMETSAT's Meteosat Third Generation, significantly improve response to disasters.

#### BRIDGING THE DIGITAL DIVIDE THROUGH BROADBAND CONNECTIVITY

SATCOM services of European satellite operators, such as Eutelsat or SES, are advancing the pursuit of the Sustainable Development Agenda by endeavouring to "connect the unconnected".

#### INSPIRING CITIZENS THROUGH PIONEERING ENGINEERING AND SCIENTIFIC FRONTIERS

A marvel of modern science, ESA's Rosetta mission in 2014 was humankind's first successful endeavour to orbit a cometary nucleus and land on the surface of a comet.



However, Europe lacks political will to engage in the full spectrum of space, including human space exploration and space for security and defence, to avoid widening the gap...

# Europe in space - the widening gap

Europe risks repeating the mistakes made during the rise of digital technologies and semiconductors and falling behind in space developments.

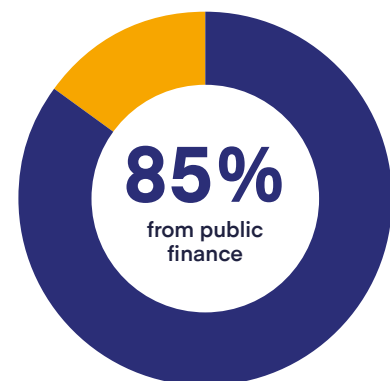
When measuring Europe's ambition against that of the US and China, against rising public funding in space and increasing investments from financial markets globally, the gap between Europe and other regions of the world is widening further.

**With a GDP budget share in the order of 0.07% compared to about 0.25% in the US, space in Europe clearly is not a reflection of its economic power and fails to live up to its full potential.**

The European launcher crisis exemplifies the risks and provides an early warning to the entire space eco-system in Europe, which too often neglects the very purpose of space to attain broader policy objectives.

Unlike all major space powers, European public investments in space have gradually shifted towards direct socio-economic and industrial return considerations, while broader policy rationales, such as autonomy and sovereignty, have tended to be forgotten.

**Space investments are dominated by public budgets, particularly defence**

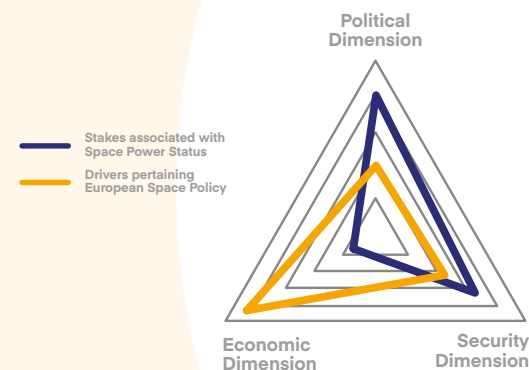


Close to 50% of that originating from defence budgets

Source: EuroConsult, Space Capital

This current European doctrine is in urgent need of revision, so as to prevent Europe's dependence turning into a crippling weakness, as it did for other transformative sectors, such as semiconductors.

While space powers, based on a strong security and political dimension of space, are also increasingly reinforcing the economic dimension of their policy. European space policy faces a double-sided challenge: stimulating a more competitive economic dimension and industrial transformation, while developing the largely neglected security and political dimensions.



**Europe is faced with a revolution in space...**

# Revolution Space



ESPI2040 supports the findings of the High-Level Advisory Group's "Accelerating the Use of Space in Europe" and "Revolution Space", and the emphasis placed on space for crisis response, a green future, the protection of our orbits and space exploration.

**ESPI2040 furthermore considers space for security and defence as part of the ongoing revolution in space.**

While the past decade may mark the beginning of new global dynamics in space, the New Space era is still largely in its infancy. It is not too late for Europe to build on its achievements and participate in the unfolding race.

The contours of this new era are becoming more visible and better understood by citizens, policy makers and commercial actors, and throughout sectors such as digital, green, security and defence, energy, mobility and health. This includes the benefits that space can bring to fight the climate crisis, mitigate geo-political conflicts, help reduce the risk of wars and help secure food, clean water, and a more effective energy transition.

New Space is much more than new companies, more affordable space solutions, new finance, and more agile procurement. It is foremost the force that moves space beyond the supply side, historically focused on the procurement of space systems. It responds to demand-pull from the user, industry and finance sectors such as security, digital and consumer markets, enabling actors to integrate space into their commercial and institutional frameworks.

In Europe, ministries of economy are increasingly responsible for space policy, and more recently also in conjunction with foreign and defence ministries. Traditionally, space was strictly part of research and innovation portfolios.

**➔ All this is much more than space systems capabilities; it is about industrial foundations and above all, about policy impact and wider benefit. It is much more than a space programme...**

**\$1 Trillion**

The size of the global space economy is projected to reach 1T USD by 2040.

**\$160 Billion**

According to the World Bank, the benefit for the wider economy of space-enabled weather forecasting, alone, is estimated today to be 160B USD per year globally, equal to about 40% of the space economy estimated today between 350 - 450B USD. This illustrates how much more value space delivers beyond its own perimeter.

**\$7.9 Trillion**

According to Boston Consulting Group, the wider benefit of space on the overall global economy by 2040 is estimated at about 7.9T USD with the high-economic multiplier of space comparable to that of semi-conductors.





# A bold vision for Europe



## Much More Than a Space Programme

“What, if anything, can we say that could qualify as a maxim in a state’s drive to attain space power? Probably, only that: a state’s drive to attain space power. When all layers are peeled away, what is left is a state’s political will.”

JAMES OBERG, “SPACE POWER THEORY”, 1999

Europe has all the prerequisites to develop into a full space power, by bringing together, federating and developing the excellence of its European, national and industrial capacities.

However, what is missing is a clear political will and a whole-of-Europe vision beyond the perceived bounds of space systems, which would precipitate policy impact.

To date, European space policy and programme action is mostly concerned with **space capabilities**, such as satellites and launchers, and less so with the **policy impact** of space. This includes how to integrate space into other policy sectors including security and defence, and how to build the required **foundations** in industrial competitiveness, scientific and technological excellence, innovation, talent and finance. Developing the policy impact of space is particularly critical at a time when crises affect policy priorities of public spending.

Through ESPI2040, ESPI proposes a bold vision to European policy makers and institutions in an effort to stimulate debate, form political will, and realise European political ambition.

The ESPI2040 Vision proposes to define and implement policy action on three levels and their interconnections:

POLICY IMPACT

SPACE CAPABILITY & AUTONOMY

FOUNDATION



## POLICY IMPACT

### SPACE POLICY INTEGRATED WITH OTHER POLICY DOMAINS

- Integrate space with other policy domains of governments, political programmes, parliamentary action and policy directions for the development of space for the wider economy.
- Align space policies and programme actions with strategies in other sectoral domains, including digital, green, security and defence, energy, mobility and health.
- Design space policy in support of business strategies beyond the space industry for industries in other sectors, including Fortune500 companies and entrepreneurs in energy, food and agriculture, insurance, automotive, telecommunications, chemistry, finance, health and pharmaceuticals.
- Leverage space for diplomacy as an integral component of European action in international cooperation.

## SPACE CAPABILITY & AUTONOMY

### USE OF SPACE

- Scale-up existing state-of-the-art programmes, for meteorology, Earth observation, navigation, connectivity, and space science.
- Fully engage in human space exploration and space for security and defence.
- Initiate new flagship programmes in transformative application domains and science missions as global undertakings.
- Increase the level of resilience and independence from external supply chains, to ensure unrestricted access to state-of-the-art technologies and disentangle from external political and commercial influence.

## FOUNDATION

### INDUSTRIAL BASE, SCIENCE & TECHNOLOGY, TALENT & FINANCE

- Foster a competitive industrial ecosystem, by stimulating intra-European competition, leveraging acquired excellence, and enabling the rise of new actors, through purpose-driven public investment, directed towards policy objectives.
- Ensure the development of enabling space programmes, providing Europe with independent access to space and ensuring the safety and sustainability of operations in the space domain.
- Position technological innovation and scientific excellence as key enablers of all developments in space in support of increased technological sovereignty and complementarity to the procurement of space systems.
- Support the development of new, innovative financing mechanisms, attracting markets driven by demand.
- Prioritise the development of young talent and the best-educated and most productive workforce.



➔ Space policy action of governments and institutions, space programmes of space agencies and related budget structures should be implemented to maximise their impact on all three levels...

# The ESPI Agenda



The ESPI Agenda implements ESPI's mission as promoter of European space policy and aims to support the vision for Europe in 2040 along three activity lines:

## Engagement

Engagement with and beyond the space community and the facilitation of a forum for continued discussion in Europe and globally with varied stakeholders is fundamental, as the number of national, institutional and commercial actors in space has more than doubled in the last 20 years.



## Research

The quality, depth and breadth of ESPI's research lays the foundation for substantiated proposals and recommendations to European decision-makers and institutions, and to fuel the debate across sectors and world regions on needs, capabilities and long-term prospects.

## Education

Education of young talent and a skilled workforce are prerequisites towards developing the technologies and space capabilities that are required to provide benefits to the wider economy and society.



The ESPI Agenda will address a number of overarching programmatic challenges to Europe, to:

Embrace that space remains a predominantly publicly driven ambition based on political will.

Move towards programmatic, pragmatic solutions built on trust in a complex European governance scheme, towards accelerated and empowered decision-making and implementation plans, which deliver tangible results.

Safeguard independent European policy advice and decision-making during times of growing influence of foreign actors and corporations.

Align policy vision with programmatic milestones such as the next EU Multiannual Financial Framework (2027-2033), ESA Agenda 2025 and ESA Ministerial Councils, EUMETSAT Councils, EUSPA and national decision points.

Scale-up its policy ambition in space for security and defence.

Address space applications and space exploration and science as one inseparable part of space, which are required to ensure that the space sector provides maximum benefit.

Better federate requirements and solutions in a fragmented European market.

Embrace a competitive European space industry as a core element of Europe's autonomy of action and integral part of its security and defence policy.

Develop an industrial policy that balances concerns of geo-return and other often nationally motivated procurement policies with the objectives of the whole of Europe.

Stimulate funding from new sources, and initiate programme action at and beyond the established and often inflexible funding cycles.

Establish a legal and regulatory environment fostering entrepreneurship and investment.

# Engagement



## Strong Europe...

Leveraging its independent status and expertise to facilitate dialogue and consensus building, ESPI will drive intensified engagement and lend support to public actors across Europe and provide an active forum for networking and knowledge sharing, connecting different stakeholders.



Reaffirming its role as the independent European think tank for space, ESPI will increase its outreach to European governments, parliaments and institutions and its presence in European states, fostering a whole-of-Europe approach to space policy, while supporting national endeavours.

ESPI will engage in policy debates and expand its value proposition for actors engaged in the formulation and implementation of space policies and strategies at the national and European levels.

ESPI will provide tailored support to European countries, bilaterally and multilaterally inclusive of smaller and emerging European nations, and work towards the inclusion of space in government programmes and programmes of political parties across the continent.

ESPI will continue to support consensus-building in the European space sector by facilitating dialogue between stakeholders from a variety of communities, including space, non-space, public, private, national, and European.



### MEASURABLE OBJECTIVE

**National parliaments from all EU and ESA member states are members of EISC with established permanent bodies for space and its wider socio-economic impact.**

### ESPI's European Engagement Initiatives, Tools and Frameworks

Hosting the secretariat of, providing policy support to, and attracting new states for the European Interparliamentary Space Conference (EISC).

Hosting and supporting the European Centre for Space Economy and Commerce (ECSECO) and efforts towards a future Office for Space Commerce.

Establishing and operating the ESPI Centre of Excellence for Space and Sustainability as part of its global ambitions.

Providing policy support and coordination of federative initiatives including European efforts for Accelerators and Inspirators.

Evolving the ESPI Autumn Conference and developing a European space policy summit with international reach.

Establishing and operating a Network of European Space Think Tanks, driving policy impact through coordinated reflection.



## ...as a Partner to the world

In a transforming world, with more than 80 nations conducting space activities and with new space agencies and private actors emerging, continuous dialogues, engagement and collaboration with relevant stakeholders outside of Europe remains an enabling factor for the effective fulfilment of ESPI's mission and the ESPI2040 vision.

ESPI will support Europe's international role, strengthen established relations, such as with the USA, Japan (including APRSAF) and India, amongst others, and offer cooperation and capacity building to new partners, including those in Africa, Latin America, and Middle East. Furthermore, the European voice within the G7, G20 and United Nations fora will be amplified.

Support to international relations at national and ESA levels as well as to the EU Space Dialogue will be strengthened. In particular in global space applications activities, such as climate change, and in key scientific questions, such as origins of life will receive particular attention, including the global promotion of European-led activities and other universal themes.

Diplomatic agility and innovative and adaptive governance schemes will be essential to navigate an era of fragmentation and multipolarity. ESPI will increase its efforts in networking, partnership building and participation in multilateral processes, within the United Nations and other frameworks.

ESPI will also expand efforts to monitor and analyse international space affairs and their impact on Europe's space activities at large.



### MEASURABLE OBJECTIVE

**Established interregional space dialogues with the Asia-Pacific, Middle East, Africa, and Latin America, consolidating Europe as a leading hub for international cooperation.**



### ESPI's International Engagement Initiatives, Tools and Frameworks

Policy platforms and inter-regional space dialogues, to support ESPI members and Europe at large, building on the successful example of ESPI-APRSAF space policy dialogue.

Operation of Vienna Space Diplomat, a novel engagement platform for the space diplomatic community in Vienna, the world capital of space diplomacy.

Global Fellowship Programme to create international connections for ESPI and tap into regional expertise and network.

An annually updated Global Space Policy Observatory.

# Research



Research and its quality remain at the core of ESPI's activities, underpinning its expertise, initiatives and collaborations.

ESPI research is **mission-oriented**. It considers the traditional space applications including meteorology, Earth observation, navigation and communications as components of missions.

Missions comprise several space applications, and may be implemented through individual and federated purpose-driven systems cutting across the boundaries of traditional space programmes, designing and linking space-based data and services in support of European policy priorities.



ESPI's research agenda responds to:

**Two missions focused on the benefits of space for Earth**, addressing **Green and Sustainable Societies**, moving towards a NetZero and sustainable future, and **Security and Defence**, protecting Europe and its values.

**A third mission** focused on **Exploration and Science**, inspires Europe through New Frontiers.

ESPI's research agenda also includes two transversal research themes addressing foundational and **enabling elements**, without which Europe cannot act in space and on the above missions.

**Space as an Asset** securing Europe's ability to decide and act in space, and **Industry, Innovation, Finance and Workforce**, fostering Europe's competitiveness.

ESPI will continue to serve as a leading source of information for space and non-space stakeholders, promoting open access to ESPI publications and other products and outputs.



# 1: Green & Sustainable Societies

## Moving Towards a NetZero and Sustainable Future

**The European Green Deal commits Europe to achieve climate neutrality by 2050, with the European economy producing a NetZero output of greenhouse gas emissions and paving the way for a sustainable future.**

NetZero is increasingly recognised as an existential question for Europe and the world, with over 70 countries worldwide setting NetZero targets within this century. Dry riverbeds, the melting Arctic ice caps, the rise of sea levels, and extreme weather events are increasingly impacting societies and citizens, while the global biosphere, notably rainforests and oceans, are at risk of biodiversity loss, and long-term degradation.

**Space is instrumental, not only to monitor the climate crisis, but also to act and offer solutions for mitigation and adaptation of future-proof sustainable societies, notably in gaps and challenges identified by the Intergovernmental Panel on Climate Change (IPCC).**

Today **European satellites** (notably the Copernicus Programme) are **instrumental in assessing more than half of the 50 essential climate variables** – parameters critically contributing to understanding our planet's climate. A capability increasingly relevant in a moment where 3.5 billion people globally are highly vulnerable to climate change as reported by the IPCC.

Moreover, European meteorological satellites (e.g., Meteosat, Metop), provide Europe with world-leading infrastructure and data contributing to ever increasingly accurate weather nowcasting and forecasting, helping to protect lives and infrastructure.

Yet, more needs to be done to ensure meteorology, Earth observation, PNT, and telecommunication systems are at the core of future sustainable solutions for enabling smart cities, employing clean, reliable and affordable energy, facilitating water management, implementing green mobility plans, and increasing the efficiency of the Common Agricultural Policy.

ESPI will actively support European, national and regional stakeholders in activities **linking space with climate and sustainability policies, including the European Green Deal, and national energy and climate plans**, promoting the shift beyond monitoring to more action and mitigation.

Our aim is to ensure that Europe is at the forefront of using space solutions and technologies for climate change monitoring, mitigation and adaptation.

Moreover, to accelerate and reinforce these efforts, ESPI will establish and host a **Centre of Excellence for Space and Sustainability** together with the Austrian Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK), its founding member, and other partners.

**As part of the Green and Sustainable Societies agenda, ESPI will facilitate:**

- An increased role for space in the European Green Deal and in National Green Transition Plans.
- An increased role for space in support of the UN Sustainable Development Goals.
- Tailored evolution of capabilities in support of Green Deal policy objectives, and targets set forth by the Paris Agreement.
- Federated and user-driven advancement of space services for energy, digital, mobility and agriculture policies.
- Development of disruptive future technologies and infrastructures that can accelerate the attainment of NetZero targets, such as space-based solar power.
- The creation of links between NetZero-gearred financing sources and space solutions and space infrastructure development.
- A decrease in the environmental impact of the space sector and individual space missions.



### MEASURABLE OBJECTIVE

Space-based data and space-based services integrated in climate mitigation and adaptation policies of all European countries.

# 2: Security & Defence

## Protecting Europe and its Values

**Next to climate change related risks and natural disasters, geo-political confrontation and warfare, including technological vulnerabilities, are among the top future risks.**

Military investments represent close to 50% of public investment in space globally, driving advancements with stronger industrial policies and state intervention in space solutions.

Attacks are anticipated against agriculture, water, financial systems, public security, transport, energy, communication networks and space-based systems. Security of critical supplies and infrastructure and the defence domain are inseparable. Consequently, space policy needs to support future European dual-use space programmes, with research and innovation being addressed in a whole-of-Europe approach.

**Space assets enable managing and decisively acting upon natural and anthropogenic crises, supporting European disaster management, civil protection, and law enforcement agencies as well as national defence stakeholders in pursuing their strategic missions.**

Space-based capabilities have long been crucial enabling pillars of national and allied security and defence portfolios as also recognised by the EU Strategic Compass for Security and Defence. Yet, **today's conflicts show that space assets are becoming fundamental in shifting strategic balances on the ground**, with improved availability of satellite data and services, exemplified by the war in Ukraine. Moreover, the cyber security dimension of space becomes increasingly prominent.

The policy and capability gaps in space for security and defence continue to grow in comparison to other space powers. For Europe to shape, and not be shaped by global developments, ensure international stability, preserve the security of its citizens, infrastructures and institutions and protect its values, it must accelerate the uptake of dual-use space solutions, embedding them into its security and defence doctrines, networks and processes.

ESPI's aim is to ensure that space supports international actors in implementing the Sendai Framework on Disaster Risk Reduction, as well as European and national actors through frameworks such as the EU Common Foreign and Security Policy or EU Civil Protection Mechanism, and national vulnerability and risk assessments.

ESPI will reinforce its work with national, European and international stakeholders including relevant ministries, ESA, the EU SatCen, OSCE, NATO, the European Commission and the EEAS and contribute to established platforms such as EDA's Defence in Space Forum.

In this context, ESPI will continuously support European and international endeavours in the realm of security and defence, notably through creating a **forum for European space security and defence users of space solutions**, undertaking activities for increased operational uptake of space solutions in security operations, focusing on future capability development and R&I, and providing insights for European in-space resilience, deterrence and arms controls in space.

**ESPI research activities will facilitate:**

- A growing adoption of space solutions in disaster management and crisis response.
- An increased uptake and development of dual-use space solutions in support of European security and defence needs.
- An increased recognition of the added value of space in European, national and international security and defence policies.
- The coordination between R&I agencies and military and security actors with boots on the ground.
- The support to the operationalisation of military space doctrine in Europe and full recognition of in-space security at the policy level.
- The security of the industrial supply chain, space operations and ground infrastructure.
- The support of the work of the UN and other multilateral fora to keep space safe and secure.



### MEASURABLE OBJECTIVE

A consolidated European space defence budget on par with the European civil space budget.

# 3: Exploration & Science

## Inspiring Europe Through New Frontiers



**The exploration of outer space and space science has long fascinated humankind, providing a rich source of inspiration, creativity and knowledge.**

Traditionally often considered a tool of prestige and power, today space exploration is increasingly recognised as enabling socio-economic growth and as strengthening positions of global leaders.

Bold and daring science and exploration missions ignite curiosity, innovation, and collaboration. They can drive positive societal impact and elevate Europe's standing in the global space community and enable stronger and meaningful cooperation with both established and new international partners. Exploration and Science are a critical pillar of the industrial capabilities required for other space activities.

These activities are crucial to society at large as *"curiosity and exploration are vital to the human spirit"* as put forward by the UN Action Team on Exploration and Innovation at UNISPACE+50 and can instil a sense of collective achievement within nations and across humanity.

According to the OECD, when primary grade children are asked to draw their future, space features prominently. However, 15-year old students are much less enthusiastic about STEM; this gradual decrease in enthusiasm is particularly visible in Europe.

A plethora of recent developments in space exploration and human spaceflight indicate a rapid evolution towards a new set-up in the international *spacescape*.

While the era of the ISS as the only permanently inhabited orbital outpost is gone, an increasing focus on lunar missions is emerging alongside a growing appetite for the commercial utilisation of LEO. These developments are highlighting the cost and consequences of dependencies developed by Europe in recent decades, as also recognised by the High-Level Advisory Group on Human and Robotic Space Exploration for Europe.

Yet, as recognised by the International Space Exploration Coordination Group (ISECG) all efforts are aligned towards the expansion of human presence into the solar system.

To better understand the universe and expand our presence in the solar system, European Terrae Novae Strategy and Voyage 2050 need to be sustained and reinforced with strong political backing of space science and exploration and their synergies, as a European strategic priority.

ESPI's aim is to ensure Europe remains innovative and takes the lead in space science and exploration, building upon its heritage of pioneering missions such as Rosetta and Huygens and leading a flagship mission of global dimension contributing to humanity's understanding of the universe.



### MEASURABLE OBJECTIVE

**An independent European crewed landing on the Moon accompanied by a European-led international scientific mission of global dimension to search for life beyond Earth.**

### To this end, ESPI will facilitate:

**Dialogue between policy-making, scientific and industrial communities to provide the required political recognition and policy direction needed for science and exploration.**

**A wider policy recognition of space science and exploration as a medium to instil a shared societal belief in a future of opportunities and prosperity, and as a tool of Europe's soft power.**

**Devising capabilities and scenarios striving for a strong European role in the future of space exploration activities.**

**Reflections for optional components of science programmes and public-private partnerships to ensure growth beyond a too often stagnating mandatory baseline.**

**The development of methodologies to measure the impact of space science and exploration on the wider society, beyond traditional SEI assessments.**

**Sustained development of multilateral global governance frameworks for space exploration and resource utilisation.**

**Approaches to answering the mysteries of potentially habitable worlds within and beyond our solar system, that can represent a watershed moment for humankind.**

**Creating stronger ties and societal cohesion between continents, nations, generations and societal layers based on the inspirational dimension of space.**

## 4: Space as an Asset

### Securing Europe's Ability to Decide and Act

As recognised by the UN Secretary General's **Our Common Agenda**, while space assets have 'transformed the way we live and outer space systems are vital for understanding and solving global problems', the outer space environment is confronted by new risks to security, safety and sustainability.

The International Telecommunications Union (ITU) states have registered radio frequencies for the launch of over 1 million satellites by 2029. Currently less than 10,000 satellites orbit our planet. This creates unprecedented challenges for policymakers and regulators alike, while also creating opportunities for businesses and national economies to scale benefits unlocked by space data and services.

To do so it is critical to ensure Europe can autonomously access, operate in and protect space, while having a strong voice in global governance discussions and diplomatic engagements.

#### This research theme covers:

- The infrastructure and capabilities required for **access to space**, launchers, spaceports and ground infrastructure. It includes the **orbits and spectrum** required by space missions as a pre-requisite to fulfil their purpose.
- What is needed to ensure that the space environment can be used in a **safe and sustainable** manner. This includes space safety including Space Situational Awareness (SSA), Space Traffic Management (STM), space weather and long-term sustainability of space activities (addressing also debris generation, mitigation and removal).
- The **legal, regulatory and programmatic frameworks** of space activities at the national, European and international levels, including:
  - National space laws, regulations and programmes;
  - European space governance;
  - International Space Governance (including international rule-setting in UN and other frameworks).

In order to better support the foundations required for Europe's ability to decide and act, ESPI research will support:

- The development of a competitive launch sector, driven by demand from institutional missions as anchor customers as well as stimulated by European demand from commercial missions, to ensure business plans are attractive to financial markets and allowing economically sustainable operation.
- The progress related to orbits and spectrum utilisation via its ITU membership.
- Efforts related to SSA, STM, space weather, debris, including as part of its Centre of Excellence for Space and Sustainability.
- Legal frameworks, which regulate space activities whilst stimulating private investment into space as an asset and into space missions by reducing risk.

ESPI will promote the awareness of European decision-makers and citizens to help them understand the grave implications that the inability of Europe to access, protect and regulate space would bring and the losses that would ensue for future generations.

This would effectively remove the foundations required by any space mission to fulfil its purpose and cancels out Europe's voice in later discussions on the future of space and on outer space governance.



#### MEASURABLE OBJECTIVE

All European institutional missions flying on resilient and competitive European launchers capturing 30% of accessible global commercial markets.

## 5: Industry, Innovation, Finance, Workforce



### Fostering Europe's Competitiveness

Industrial capacity, financial markets, talent and skilled workforces provide the foundations for a competitive space ecosystem required to innovate and to manufacture the space infrastructures and to provide the services needed to fulfil the missions and purposes of space for Green and Sustainability, Security and Defence, and Exploration and Science.

The digital economy, including space data and services is becoming a critical component of national and European transformation. Space solutions need to be integrated into digital business models, and the space industry needs to participate in the digital industry ecosystem.

In this context, a growing European internal market, both institutional and commercial is required to grow and maintain the European space industry and to avoid dependence on foreign markets, finance, acquisition and brain drain.

#### This research theme includes:

- A competitive space industry, embracing digital strategies including the EU Digital Agenda, which all space powers have already integrated, as **part of their security and defence strategies**.
- Public-private partnerships stimulating entrepreneurial dynamics and the **sharing of risks and benefits**.
- **Innovative finance**, including and beyond venture capital, scalable to support the full growth of new enterprises.
- **Intellectual property rights**, which protect the institutional user, owner or operator of space solutions as well as provide rights to industry and business to rely on for commercial benefit.
- **Open data and open-source** policies which allow for scientific progress as well as business development.
- **Innovation** that is independent and outside of the procurement of space solutions.

ESPI will support the reinforcement of these foundations, considering:

- The integration of space in **market-driven digital policies and strategies**.
- Leveraging already highly commercial **demand-driven space markets**, in particular addressing the uptake of future connectivity standards (e.g. 6G and beyond, IoT) and digital markets (e.g. AI, Quantum).
- A balance between the influence of corporate strategies and public policies, ensuring the independence of policy advice and policy making.
- Development of emerging markets, in particular Earth observation, with high growth perspectives, and markets which may be enabled by future heavy launchers and in-orbit transportation.
- Innovative finance, including green finance, from insurances and pension funds.
- Synergies between downstream service developments and required upstream investments into space infrastructures.
- Support for eco-systems of innovation in academia and research institutions to enlarge the choice of solutions available for space procurements.



#### MEASURABLE OBJECTIVE

25% of Europe's investment in space originates from sectors beyond space and from financial markets.



# Education



The future of the European space sector and its capacity to innovate strongly relies on an education ecosystem able to nurture and retain talent and a skilled workforce. This is most relevant in Europe, which is faced with demographic challenges as a result of an ageing population.

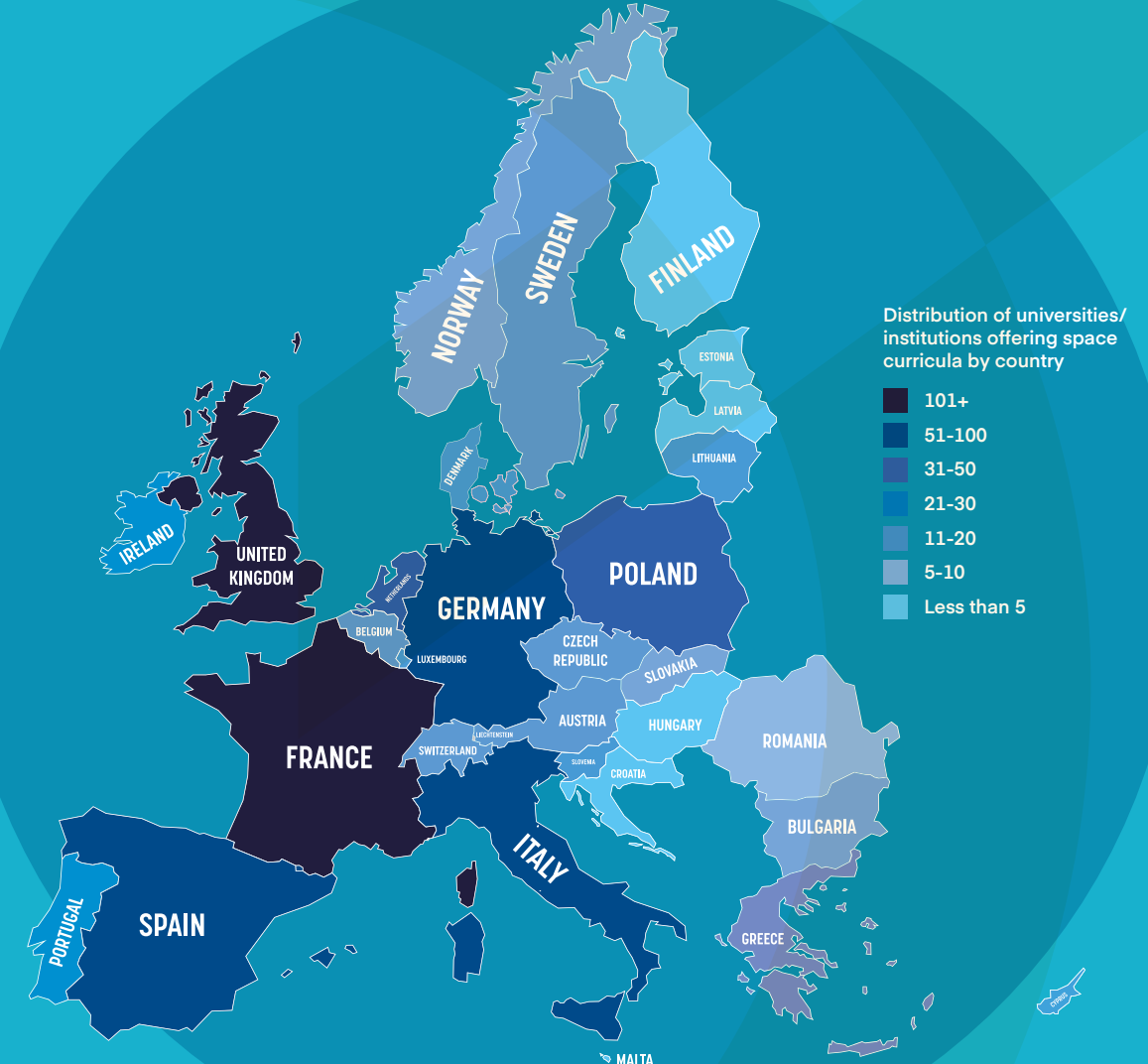
This requires the adaptation of the space education system to the rapidly changing needs of the space sector and its integration into other sectors and policies, with a need for experts across fields, such as engineers and scientists, but also increasingly experts in economics, law, social and political sciences, and strategists with a holistic view.

It requires the seamless integration of the space sector into schooling and academia, to attract and develop European and global talent early on. It requires the creation of a strong European space and entrepreneurial culture, including and beyond the inspiring image of astronaut as a profession, acting as a catalyst for space education.



**ESPI will address these challenges and contribute to a stronger, better connected, and more efficient education ecosystem in Europe by:**

- Providing European decision-makers with information and trends in support to mid- to long-term guidance in space education, talent, and workforce.
- **Fostering and supporting European educational policies and activities**, contributing to capacity building in Europe and beyond, and talent and workforce development by:
  - Creating a network of universities and education institutions to promote space policy;
  - Providing lecturers and tutors to partner universities and research institutes;
  - Supporting the development of hubs linking education to the workforce.
- Providing specialised training to professionals in policy and government functions in space and related sectors
- Advancing ESPI as a **space education provider**, in particular by:
  - Establishing a visiting student programme for young graduates at ESPI;
  - Organising an annual ESPI Space Policy Summer School.



**MEASURABLE OBJECTIVE**  
 25% increase in the number of graduates with STEM and other space-relevant curricula unlocking the full impact of space can bring to society and economy.

*Universities in Europe offering space curricula*  
 Source: "ESPI Report 81 - Space Education in Europe"

# ESPI's future evolution



Space has become part of political strategies and an instrument of diplomacy globally.

Governments in Europe closely link space to their policy making, acting complementary to the traditional role of space agencies, which often focus on the implementation of space programmes.

As a reflection of this trend, the future evolution of ESPI aims for a more direct representation also of governments in ESPI's governance, together with space agencies.

This will further facilitate the link between policy making and space programme action. Consistent with this evolution, the target group for ESPI policy advice will extend to more directly address government functions, ministries, and parliaments while continuing to grow with space agencies and define best practices for a reinforced voice for industry.

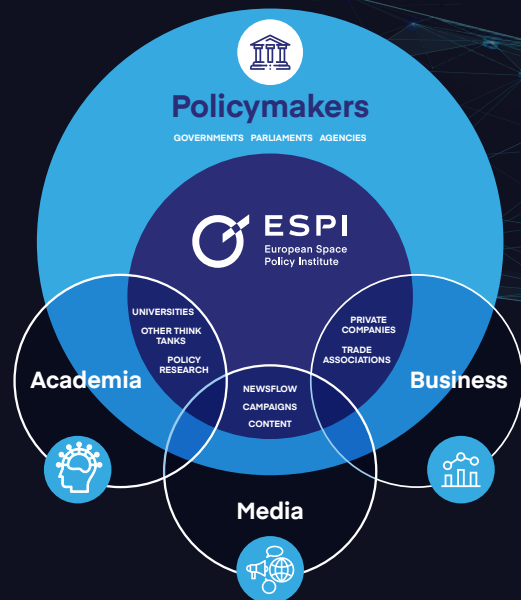
This will enable ESPI to more effectively support the different national and European policies regarding the role of space.

The large majority of ESPI members, mainly space agencies and European institutions, perform the tasks of states and international organisations. ESPI operates on a European level and globally, in a structure similar to that of international organisations. This is recognised by ESPI being considered for the status of a Quasi-International Organisation under the national law of ESPI's host country, Austria, and through reflections made by ESPI's founders regarding a possible evolution to International Organisation status.



## MEASURABLE OBJECTIVE

All ESA and EU member states and space agencies / offices are members of ESPI.



ESPI will scale-up its support to its members' major policy and programmatic milestones, such as those related to the EU Multiannual Financial Framework, ESA Agenda 25, ESA Ministerial Councils, EU presidencies, Space Forces, and help policy and funding support to space programmes at a level commensurate with European economic power and talent.

ESPI will reinforce its role as the European voice, part of Vienna's international hub for space, including its close cooperation with UNOOSA and other international organisations and the ESPI Vienna Space Diplomat engagement framework for the diplomatic community.

The ESPI Advisory Council will evolve further to include new, multi-disciplinary profiles from other sectors of industry and government, entrepreneurs, the scientific community, young professionals and media.

The cooperation and support to the different functions and entities hosted at ESPI, such as the European Interparliamentary Space Conference (EISC) and the European Centre for Space Economy and Commerce (ECSECO), will be expanded further, including the Centre of Excellence for Space and Sustainability and new cooperative arrangements.

Next to ESPI membership, specific agreements with individual members will be established to better respond to their particular priorities. Furthermore, cooperation agreements and MoUs will be implemented with national and international entities globally.

ESPI will continue to balance the perspectives of economic actors, academics and the media and maintain an independent role in an increasingly dynamic and complex ecosystem. It will strengthen its independent space policy advice for Europe in a time when economic actors and foreign stakeholders increasingly influence Europe's space policy decisions, potentially affecting the autonomy of Europe's decision making. It will reinforce its international role as Europe's Think Tank for Space at the centre of a network of other think tanks interested in space, and from other sectors such as economy and security.

ESPI will remain driven by purpose, and retain its high degree of autonomy. It will remain agile, including in its governance structure, just and opinionated, balanced and not risk averse, providing leadership in independent space policy advice in Europe towards accelerated and empowered decision making.

ESPI will remain human-centric, continue to support solidarity, help build bridges, and balance institutional and industrial interests. ESPI has the aspiration to be itself a reflection of the space revolution, endeavouring towards new frontiers and being the most attractive employer in its field. It will continue to draw diverse talent and excellence, trusting the young, and be an advocate for space in its inspirational dimension.



# ESPI2040 calls upon Europe to engage in a collective debate, for Europe to voice a clear political will and act on Europe's ambitions in space.

ESPI's proposal will be developed further, together with ESPI members and in consultations with other European stakeholders and international partners. This will be reflected in ESPI's Agenda, with an implementation plan to guide the realisation of the vision.

ESPI is determined to fulfil its mission and to support Europe's decision makers and institutions in their ambitions and remains fully convinced that Europe today has all it takes to be successful in this endeavour and to develop into a full space power and strong global partner.

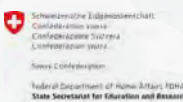
Hermann Ludwig Moeller  
Director of ESPI



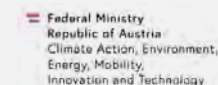
## "Now it's time to leave the capsule if you dare"

Space Oddity by David Bowie  
Released on 11.07.1969, nine days prior to the Apollo 11 Moon landing

### ESPI Members



### Supported by



### Acknowledgements

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# BEYOND 2040

Space will continue to bring new transformative benefits to the wider economy and society. Space-based solar power, one of such expected innovations, could provide Earth with clean and reliable energy, 24 hours a day.

Image credit: ESA, Andreas Treuer, 2022