Ministry of
Education and Science
Republic of Latvia

Ministry of Economics
Republic of Latvia

The Space Strategy of Latvia 2021-2027

2024

The Space Strategy of Latvia 2021-2027 is an operational document that was collectively developed by the Ministry of Education and Science and the Ministry of Economics of the Republic of Latvia. The strategy has been reviewed and adapted by the Latvian Space Policy Working Group, and its aim is to structure and coordinate the space policy related matters in Latvia as well as to demonstrate the willingness of the stakeholders to work together for the development of the space sector.

The strategy was designed in 2020 following Latvia's accession as an associate member of the European Space Agency and updated in 2024, and it establishes a focused framework for the cooperation of Latvia with the European Space Agency.

The strategy contributes to the achievement of the objectives, priorities and actions defined in the Latvian National Development Plan 2021-2027, the National Industrial Policy Guidelines 2021-2027 and the Science, Technological Development and Innovation Guidelines 2021-2027.

List of Abbreviations

ESA BIC	European Space Agency Business Incubation Centre
COPUOS	Committee on the Peaceful Uses of Outer Space of UN
EC	European Commission
ECS	European Cooperating State
ECSS	The European Cooperation for Space Standardization
EDA	European Defence Agency
EGNOS	European Geostationary Navigation Overlay Service
EO	Earth Observation
ESA	European Space Agency
ESERO	European Space Education Resource Office
ESOC	European Space Operations Centre
ESRIN	ESA Centre for Earth Observation
ESTEC	European Space Research and Technology Centre
EU	European Union
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
EUSPA	European Union Agency for the Space Programme
EVN	European Very Long Baseline Radio Interferometry Network
GNSS	Global Navigation Satellite System
GOVSATCOM	Governmental Satellite Communications
GSA	European GNSS Agency
IAC	International Astronautical Congress
ICT	Information and communications technology
ILT	International LOFAR Telescope network
INSPIRE	INfrastructure for SPatial InfoRmation in Europe (directive)
IPR	Intellectual Property Rights
JIVE	Joint Institute for VLBI, a European Research Infrastructure Consortium
KPI	Key Performance Indicator
LIAA	Investment and Development Agency of Latvia
LOFAR ERIC	LOFAR European Research Infrastructure Consortium (LOFAR ERIC)
LSI	Large System Integrators
PECS	Plan for European Cooperating States
SatCen	European Union Satellite Centre
SSA	ESA's Space Situational Awareness Programme
STEM	Science, technology, engineering, and mathematics
VC	Venture capital
VIRAC	Ventspils International Radio Astronomy Centre
VLBI	Very-long-baseline interferometry

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Executive Summary

Latvia, as a country of 2 million inhabitants located in the innovative northern part of Europe, sees its potential in the new space economy through finding and filling niches open to innovation as well as building on the historical heritage of space technologies and competences initially developed in the second half of the 20th century.

Since 2015, Latvia has been making notable investments in space-related industries, particularly through various European Space Agency (ESA) and other international projects. This includes the development of cutting-edge research and technology (upstream: instruments, electronics, materials, astronomy catalogues; downstream: space communication and tracking hardware) with a view to improving the local industry's technical capabilities and facilitating its integration into the European and global markets, while maximising socio-economic benefits such as the creation and preservation of highly skilled labour in these sectors.

The educational dimension has the pivotal role in the development of the expertise required for geospatial data processing and operations. Further promotion of downstream solutions (i.e. telecommunications, Earth Observation, navigation, and space situational awareness) would support sectorial policies, Latvian public administration services and sustainable business models, and above all, would benefit the country's citizens.

Latvia is successfully developing an increasing presence in the international space sector. This has been facilitated by its associate membership of ESA, as well as its participation in EUMETSAT, JIVE, ILT, and EU space programmes.

These memberships, in particular that of ESA, are used as a platform for innovation and development of various technologies, and enhance the national support for the local space research and business community, as well as offer local players valuable access to highly specialised facilities and knowledge.

The Space Strategy of Latvia 2021-2027 sets out to deliver the following results[1]:

1. Sufficient numbers of educated and suitably skilled new workers are available for employment in the Latvian space sector;

2. Latvia's overall return from the ESA's programmes meets the targets – the minimum cumulative return coefficient of 0.95 at the end of 2027;

3. At least 15 new companies benefit from the ESA engagement;

4. At least 15 start-up and spin-off companies benefit from the ESA Business Incubator engagement;

5. Latvian entities outside the ESA and EU programs have won commercial or scientific contracts with global space industry organizations, totalling at least 9 million euros;

6. Number of space contracts won in ESA, EU or EDA programmes of Latvian companies in partnership with Large System Integrators;

7. The number of financed project through the EU Horizon Europe programme or other international programmes e.g. Interreg Europe, European Defence Fund and other in space-related activities (from years 2021 to 2027) – at least 20.

8. Latvian researchers are included in the core science team of at least one ESA science mission, or are key authors the production of at least three published research papers based on the data from the ESA spacecraft or missions.

9. At least five new sustainable Earth Observation or navigation services (applications) that are based on advanced data analytics capabilities of space data are developed and integrated in the public or private sector.

10. At least five Latvian companies operating in non-space markets have integrated and used space-based capabilities into their commercial service portfolio (e.g., civil/geotechnical engineering, consulting engineering, mining services, transport services, infrastructure providers, forestry, agriculture, energy, financial services, etc.).

[1] The scope of the strategy focuses on education (skills), scientific and industrial aspects of Latvian space sector development and does not include other broader dimensions

1. Latvia's and global space activities in a changing world

Context of the strategy – global trends

The global space economy reached $464 billion in 2022, of which 78% represent commercial markets, but 22% government spendings. A leading global space consulting and market intelligence firm estimates that the global space market grew by 8% in 2022 and is expected to reach over $737 billion within a decade. In the commercial market, downstream services represent the largest sector (around 97%) of which satellite navigation accounts for 67%; satellite communication for 32% and EO 1%. In the government sector, the global public space investment have risen by 9%, largely driven by defence space budgets. In 2022, 86 nations invested approximately $103 billion in space, which is a new record and an especially notable jump[2].

The main current trends affecting the space economy include:

- An increasing public interest and investment in space activities worldwide;
- An unprecedented level of private investment in space ventures, linked to a higher attractiveness and expected profitability and a growing venture capital (VC) market;
- An ever-increasing number of actors;

[2] Euroconsult, Space Economy Report 2022

- The continued growth of space industry revenues;
- Further development of commercial activities worldwide, including ones based on small satellites and the development of commercial activities in new fields, e.g. micro-launchers and space flight;
- A traditional space industry, still generating the main share of revenues, but facing more competitive and uncertain markets;
- Further development of the NewSpace worldwide;
- Further integration of space into the society and economy leading to more value creation and more socio-economic benefits[3].

NewSpace[4]

Space is one of the central enablers of digital economy. In recent years, a new operating model, the "NewSpace" economic model, has emerged alongside the traditional, institutionally led, space industry. The NewSpace economy refers to commercialisation of the space sector, in particular, to businesses using small satellites to deploy systems which offer commercial services and utilise space data and applications. The NewSpace economy enables easier and cheaper access to space than ever before. The traditional space industry and the NewSpace economy complement one another and constitute a market-oriented continuum for work in the space sector, which was formerly only publicly funded at national level. The shrinking of satellite sizes associated with NewSpace creates opportunities for new market entrants. Spacecraft development has historically been dominated by Large System Integrators such as Airbus, Thales Alenia and others. Components for small satellites, however, are mostly produced by small enterprises founded in the last 10 years.

Satellite Telecommunication Constellations

There are presently four commercial constellations in development seeking to provide broadband communications and internet service to consumers and enterprises in every corner of the world. SpaceX has launched over 2000 satellites, currently offering beta service (up to 150 Mbps) for select users in 29 countries, with pending regulatory approval in many more. Similarly, OneWeb has deployed over 300 satellites and rolled out initial commercial service in 2021 to select northern regions including Alaska, the United Kingdom, Greenland, and Iceland. OneWeb plans to extend coverage by the end of 2022. Tens of thousands of additional smallsats are planned for the next several years with other communications constellations scheduled to deploy (e.g., Amazon Kuiper and Telesat LightSpeed).[5]

[3] ESA Intermediate Report on the Space Economy 2019

[4] NewSpace: a global trend encompassing an emerging investment philosophy and a series of technological advancements leading to the development of a private space industry largely driven by commercial motivations.

[5] Start-Up Space Update on Investment in Commercial Space Ventures 2022 - Bryce Space and Technology

Earth Observation

The Earth Observation (EO) market has grown consistently over the last decade. In 2021, the global turnover reached EUR 2,8 billion across EO data and value-added services and by 2031, revenues of the global EO data and value-added services market will approach €5.5 billion. The downstream EO sector is now growing at about 6,7% globally resulting in €4.7 bn total revenues by 2031. Together US and European companies hold over 83% of the global market, each accountable for over 40%. The remaining market is distributed around the rest of the world. Chinese companies accounts for 6% of the market, while Canada and Japan generate respectively 4% and 3% of global revenue. Information Products and Big Data solutions will drive this growth in the short-term.[6]

Global Navigation Satellite Service

Estimates for the Global Navigation Satellite Service (GNSS) downstream market revenues from both devices and services are projected to grow from €199 billion in 2021 to €492 billion in 2031. This growth is mainly generated through the revenues from added-value services. Over the next decade, these service revenues are expected to witness a skyrocketing growth of 11% per year reaching just over €354 billion in 2031 (compared to around €126 bn in 2021). The revenues from GNSS augmentation services are foreseen to grow annually by 7%, doubling their value from €25 billion in 2021 to nearly €51 bn in 2031. Combined, services' revenues (i.e. both added-value services and augmentation services) will account for €405 billion in 2031, more than 82% of the total global GNSS downstream market revenues[7].

Stewardship of space

The proliferation of large constellations of satellites has raised concern that satellite collisions and resulting fragmentation could create a space debris problem that could close space as a resource for future generations. This has given rise to a global effort to improve Space Situational Awareness (SSA), which monitors space weather and near-Earth objects, and tracks debris. In Europe, the activity of observing, detecting and monitoring of man-made space objects is known as Space Surveillance and Tracking (EU SST). As part of the Space Situational Awareness component of the EU Space Programme, EU SST is the key operational capability for the Europe future approach to Space Traffic Management. EU SST is continuously working on improving its sensors network and data processing capabilities as well as on developing new services to support space debris mitigation and remediation.

[6] EUSPA EO and GNSS Market Report (2022)
[7] EUSPA EO and GNSS Market Report (2022)

Context of the strategy – European collaborative space programmes

ESA and the EU have set out to invest EUR 52 billion combined in their space programmes between 2021 and 2027. In 2023, ESA's budget was EUR 7.08 billion and the Euro-volume of annual EU space programmes are EUR 2.28 billion (EUR 16 billion in total for 2021-2027).

The global uptake of Galileo and Copernicus is a priority of the EU under its Space Strategy.

European Space Agency

ESA remains the primary tool and partner for Latvia in supporting innovative companies and researchers in the development of leading technologies for commercial use in the global space market. This collaboration also secures the local talent with valuable research and business linkages with other space organisations, building a collaborative platform where high-reliability and performance technologies are developed to serve both the space sector and other markets that could benefit from these technologies but are not necessarily operating in the space industry.

It is important to highlight that ESA carries out an industrial policy – known as the "GeoReturn". It is a fundamental pillar enshrined in the ESA convention. In other words, ESA undertakes to award industrial contracts to the member states or associate states in a ratio equalling the relative financial contributions which they make. As a simplified illustration, if Latvia's contribution to an Earth Observation programme amounts to 10% of the programme's total funding, then ESA aims to award about 10% of the value of the contracts for this programme to the Latvian industry. This is a major incentive for smaller European countries to be a member of ESA, as the benefit to be brought back to the country

is directly related to the investment in ESA with a high level of certainty. The GeoReturn principle ensures that all member nations have opportunities in developing expertise in high-tech sectors.

In the last ESA Council at Ministerial Level 2022 (called CM22), the member states committed the biggest ever budget with total subscriptions amounting to EUR 16,9 billion – substantially increasing funding allocation for ESA's science and technology programme.

EU Space Programme

The European Commission proposed a total budget allocation of EUR 16 billion to finance space and a Horizon Europe budget of EUR 100 billion to invest in EU research and be allocated to Galileo and EGNOS, the EU's global and regional satellite navigation systems, EUR 5.8 billion would be allocated to Copernicus, the EU's Earth Observation programme, and EUR 500 million would be earmarked for security, such as the Space and Situational Awareness (SSA) programme and the new Governmental Satellite Communication (GOVSATCOM) initiative to support border protection, civil protection and humanitarian interventions, for instance. In 2023, the new component of the EU Space Programme arrived, namely IRIS² - a multi-orbit satellite internet constellation.

The main aims of the new EU Space Programme are to secure the EU's leadership in space activities, foster innovative industries, safeguard autonomous access to space and simplify its governance. The EU Space Programme has upgraded the European GNSS Agency (GSA) by expanding its tasks and transforming it into the new EU Agency for the Space Programme (EUSPA).

Galileo: Galileo is the global satellite navigation system (GNSS) of the European Union. Galileo offers exact information on position and time. This programme is under civilian control, and its data may be used for a wide range of applications. It is autonomous, but at the same time interoperable with existing satellite navigation systems. Galileo will consist of 30 satellites and an on-ground infrastructure.

Copernicus: The operational Copernicus programme is the largest provider of Earth Observation data in the world today, and is projected to generate at least EUR 56 billion-worth of socio-economic benefits in the period 2019-2035[8]. Currently, there are eight Copernicus satellites, called Sentinels, orbiting the Earth and several more are planned to be launched in the future. Moreover, Copernicus processes and delivers information through its six Copernicus Services[9]. The Copernicus programme offers its data and information on a full, free and open basis.

Copernicus is envisaged to play an important role in implementing the key EU directives for example: EU Marine and Water Strategy Directive, EU Water Framework Directive, INSPIRE Directive, EU Nitrates Directive, Ambient air Quality Directive, Cleaner Air for Europe Directive, Habitats Directive, Fauna Flora Habitat directive, and the Floods Directive. It is therefore of high importance to develop and

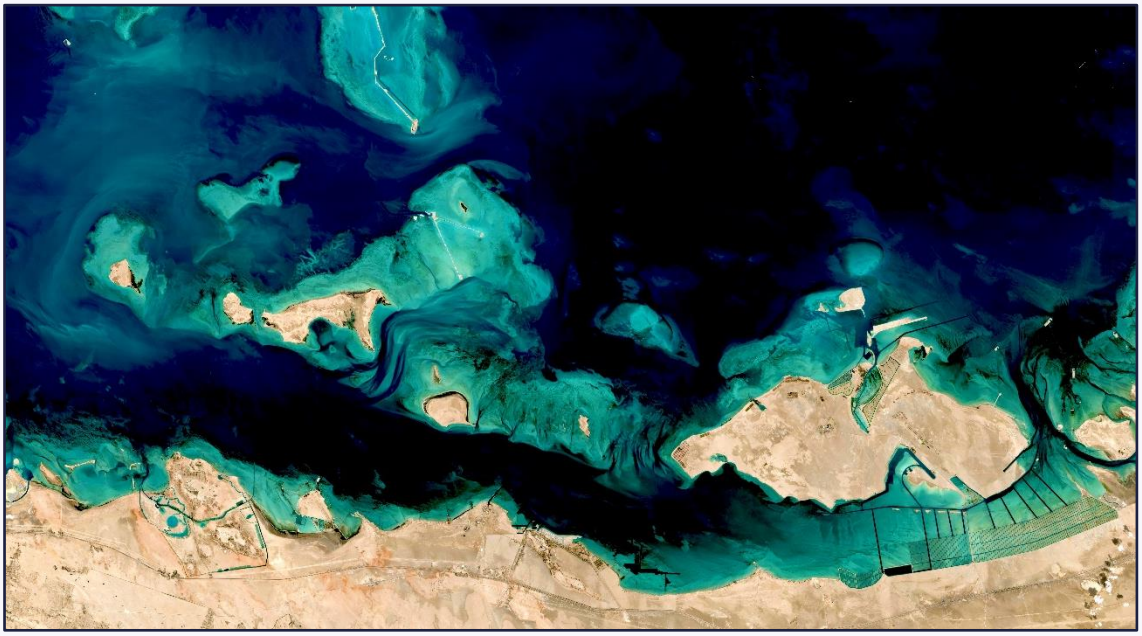
[8] PwC, Copernicus ex-ante benefits assessment, 2017

[9] Copernicus Land Monitoring Service, Copernicus Marine Service, Copernicus Air Monitoring Service, Copernicus Climate Change Service, Copernicus Emergency Management Service and Copernicus Security Service.

exploit competences and services addressing these if Latvia is to keep pace in such an emerging market. Opportunities also exist in the area for international and inter-governmental cooperation on such tools and services, such as remote sensing, data processing, satellite communication, etc.

IRIS² (Infrastructure for Resilience, Interconnectivity and Security by Satellite): is a new planned multi-orbit satellite internet constellation to be deployed by the European Union by 2027. It is set to provide secure communication services to the EU and its Member States as well as broadband connectivity for European citizens, private companies and governmental authorities.

2. Participation in international space programmes



Cooperation with ESA

After the initial cooperation agreement on 23 July 2009, Latvia signed the European Cooperating State (ECS) agreement with ESA on 15 March 2013. This agreement came into force once the Plan for European Cooperating States (PECS) Charter was signed on 30 January 2015, which had a duration of 5 years.

Within the PECS framework, Latvian entities[10] have had an opportunity to submit their ideas to six calls for Outline Proposals under PECS in Latvia. The total sum of the Latvian commitments was EUR 8,5

[10] Legal Entity is any legal person or public entity or group of persons and/or bodies which offers on the

million, and altogether 51 contracts have been awarded to 16 Latvian entities under the six PECS calls[11]. On 27 July 2020, Latvia became an Associate Member of ESA for the duration of seven years.

Since 2020, Latvia contributes to several ESA optional programmes – GSTP, Space Safety (S2P), FutureEO, Exploration (E3P) and Scale UP. Additionally, Latvia implements the ESA national programme – Requesting Party Activities (RPA). As of mid-2023, about 30 projects are being implemented altogether under ESA programmes. Latvia is part of two global missions – in the planetary protection mission Hera, contributing a time-of-flight detector for the mission's laser altimeter, and the Lunar Gateway mission contributing to xenon refuelling systems.

As of mid-2023, final preparations are underway to establish an ESERO office, while an ESA_Lab@RTU was established in 2021. An ESA Business Incubation Centre is expected to open in 2024.

EUMETSAT

A Cooperating State of EUMETSAT since 2004, Latvia joined the organisation as a Member State in May 2009. The contact point for EUMETSAT in Latvia is the state-owned limited liability company "Latvian Environment, Geology and Meteorology Centre" (https://videscentrs.lvgmc.lv). The Latvian contribution to EUMETSAT annually amounts to EUR 0.503 million.

JIVE and EU SST

On 25 November 2016, Latvia became a full member of Joint Institute for Very Long Baseline Interferometry (VLBI), a European research infrastructure consortium (JIVE). The main partners from Latvia are the Ministry of Education and Science and Ventspils International Radio Astronomy Centre (VIRAC) of Ventspils University of Applied Sciences. JIVE is a central body of the European VLBI Network (EVN). JIVE has developed unique expertise in space science, near-field VLBI and geodetic VLBI. The European Commission has viewed JIVE as a valued ingredient of the European Research Infrastructure landscape in the area of radio astronomy. On 2 October 2019, Latvia became a member of the International LOFAR Telescope (ILT) network. LOFAR is a generic Wide Area Sensor Network that is used for astronomical observations at radio-frequencies below 250 MHz, as well as geophysical research and studies in precision agriculture. It is envisaged that by 2025, ILT infrastructure is set up as LOFAR European Research Infrastructure Consortium (LOFAR ERIC).

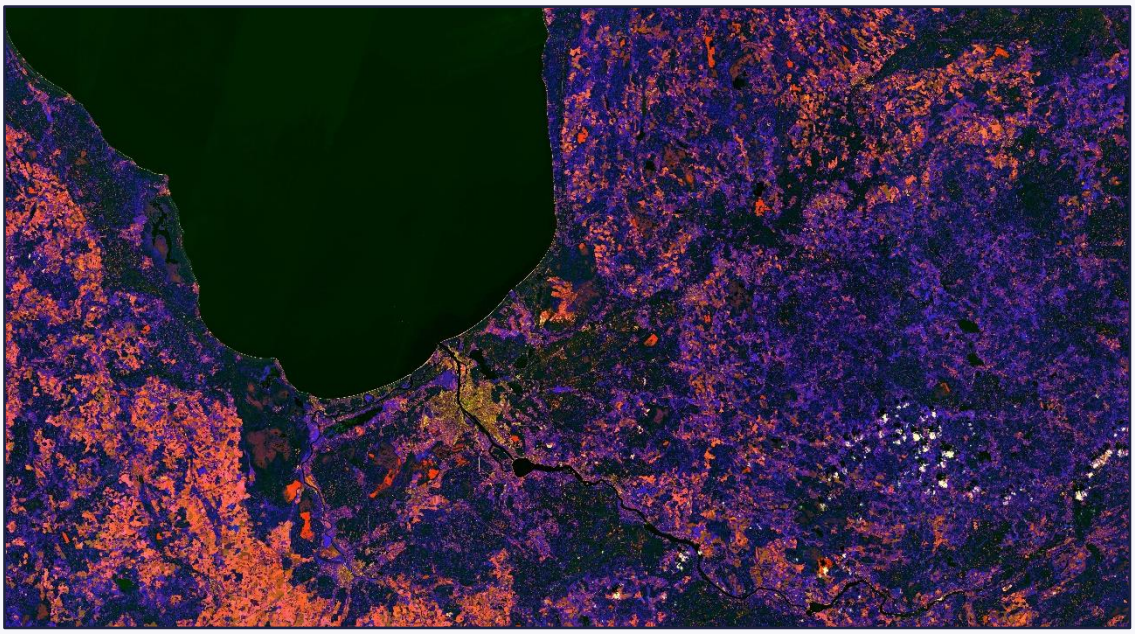
The EU Space Surveillance and Tracking (EU SST) Partnership Agreement has officially entered into force on 11 November 2022. This new EU SST Partnership replaces the EU SST Consortium created in 2015 and includes 15 EU Member States, represented by their Constituting National Entities. Latvia,

market, respectively, the delivery of supplies, products or services and which satisfies the eligibility criteria specified in Article 18 of the ESA Procurement Regulations (ESA/REG/001, rev. 5) and therefore is eligible to submit proposals to ESA. In case of universities, faculties can be considered as separate entities.

[11] List of contracts awarded, Ministry of Education and Science of the Republic of Latvia (in Latvian)

the only Baltic state among the partners, is represented in the EU SST by the Ministry of Education and Science, alongside with the University of Latvia.

3.Latvian space industry



Science

The early development of Latvian space science has been influenced by the USSR's space exploration policy, as well as military research policy. Latvian scientists have participated in approximately a hundred world-level importance space programmes since 1950s, mainly, taking an active and important part in the space programmes, including manufacturing the first satellite telescope and range finder as well as producing thermal isolation materials for rockets. Since regaining the independence, space science is performed mainly by the University of Latvia, Riga Technical University, Latvian State Institute of Wood Chemistry, Institute of Environmental Solutions, Institute of Electronics and Computer Science and Ventspils International Radio Astronomy Centre.

The key competences in the space science have been assessed through the analysis of successful ESA PECS and Horizon 2020 bids made by Latvian entities. They show that high-level research is carried out in such fields as radio astronomy, planetary small bodies (asteroids, comets, meteors) detection, orbit determination and physical properties, electronics and telecommunications, satellite technologies, remote sensing, data processing, high performance computing, low density thermal insulation materials, structural safety assessments and composite structures, algorithms for EO applications, remote sensing data-based solution and others.

Industry

Since joining ESA in the ECS capacity in 2015, Latvian companies have developed dozens of scientific instruments, electronics components, materials and EO solutions. Space activities can significantly help Latvia develop its “value chain” through knowledge-intensive and innovative products. Such space activities undertaken in Latvia can be considered as capabilities that are yet to be fully exploited in the space sector. Therefore, they should be strategically developed further. In the area of electronic components, there is wide expertise in the development and supply of integrated circuits. Latvia also has a rich heritage in the field of satellite laser and radio ranging. These competencies, together with the leading Latvian technology in event timing devices, thermal management and infrastructure, could be exploited within the relevant ESA programmes.

A significant expertise is being deployed in the development of instruments for radiation detection and measurements for developing scientific payloads in space. Fiber optic gyroscopes is another space capability which exists in Latvia. This technology is offered by very few companies worldwide and is potentially of great interest to ESA programmes.

The key existing industry competences[12] in Latvia can be summarised as:

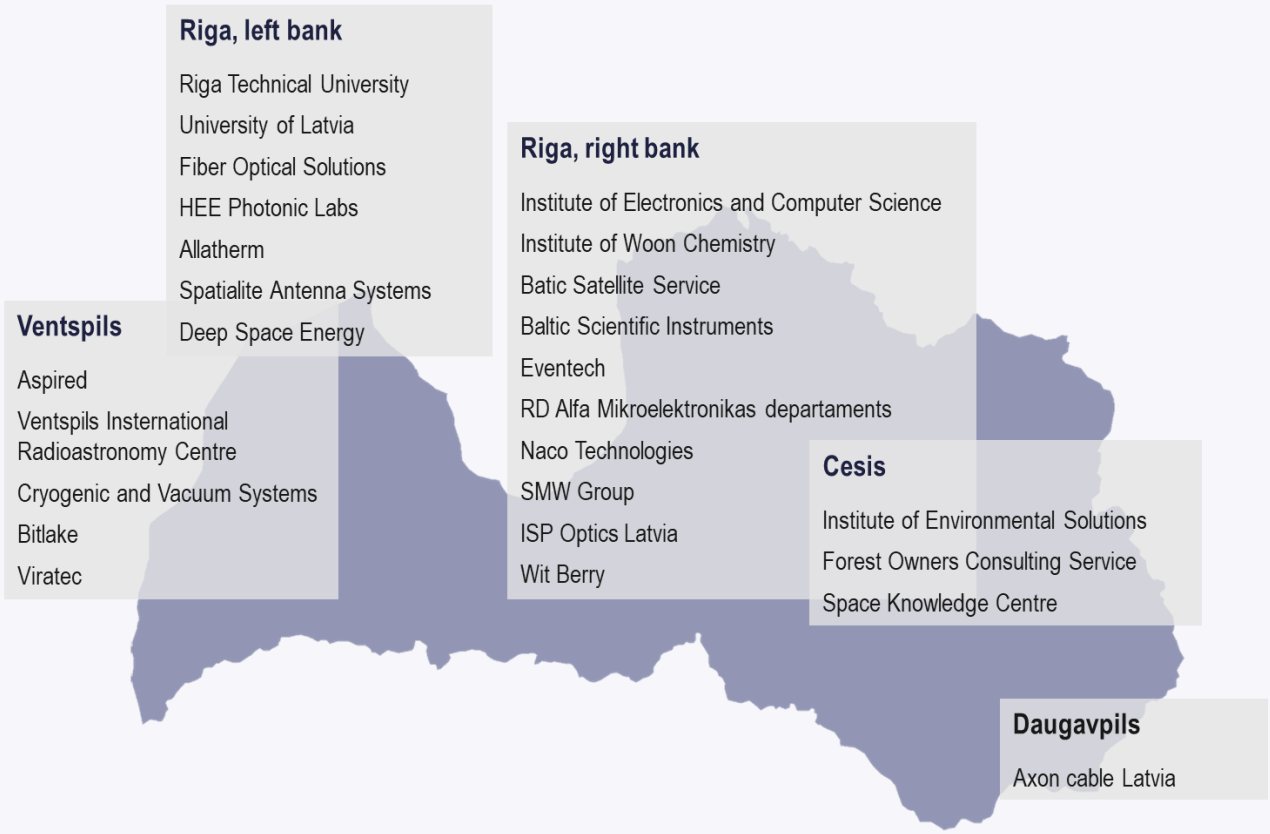
- Rad-Hard electrical and electronic space components and sensors
- Insulation materials for launchers

[12] Developed taking into account the following criteria: funded ESA PECS project, funded Horizon 2020 project, involved in space supply chains

- Earth Observation applications and services
- Space-related ICT downstream solutions
- Event timing devices
- Satellite and space debris laser and radio ranging
- Radiation detection technology
- Fibre optic gyroscopes
- Space resource utilisation capacity building
- Thermal engineering solutions
- Thermal vacuum testing solutions, systems and services
- Cryogenic refrigeration and vacuum systems design and development
- Electric propulsion systems design and development.

Space industry in Latvia is represented mainly by a number of companies such as the Baltic Satellite Service Ltd, Baltic Scientific Instruments Ltd, Eventech Ltd, RD Alfa Microelectronics, Axon Cable Latvia Ltd, Cryogenic and Vacuum Systems Ltd, Fiber Optical Solutions Ltd, Allatherm Ltd, HEE Photonic Labs Ltd, Bitlake Ltd, Naco Technologies Ltd, SMW Group Ltd, Spatialite Antenna Systems Ltd, Viratec Ltd, ISP Optics Latvia Ltd, Deep Space Energy Ltd, Wit Berry Ltd and Forest Owners Consulting Centre Ltd.

Image 1 Landscape of Latvian space actors

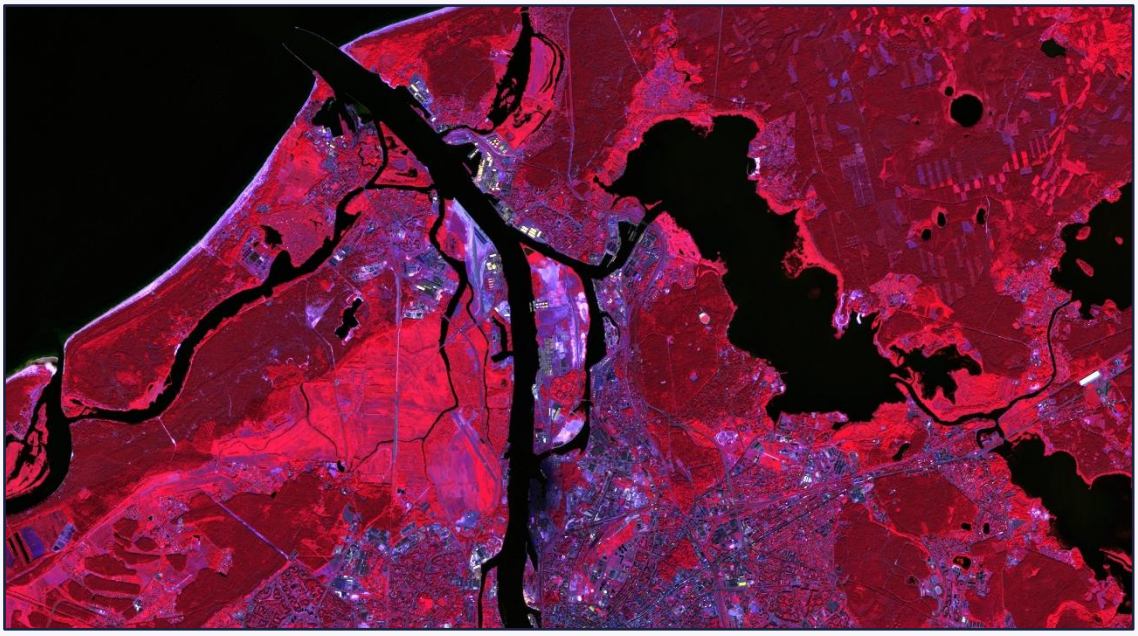


Cooperation with Large System Integrators[13]

A great achievement of the national industry is the establishment of a stable relationship with other European space industries, on a complementarity basis. A number of companies have already developed a stable relationship with Large System Integrators (LSIs), which can provide opportunities for participating in their value and supply chains, leading to a more stable and secure workload as well as involvement in exciting and demanding space development challenges.

The areas in which the Latvian entities have established cooperation with the LSI include the cryogenic insulation of launchers, new integrated circuits, Xenon Refuelling Compressors and Event Timing devices.

[13] Large System Integrators (LSIs) in the space industry specialise in bringing together component subsystems into a whole and ensure that those subsystems function together. The list of space-related LSIs in Europe includes: Airbus Defence and Space SAS, Airbus Defence and Space GmbH, Airbus Defence and Space Ltd, Arianegroup FR, Arianegroup GmbH, Thales Alenia Space France SAS, Thales Alenia Space Italia Spa, and OHB System AG.



Downstream applications

From satellite communication and navigation to Earth imagery, satellite technology improves our daily life in numerous different ways and will play an ever increasingly important role in the operation of government.

Recognising this, good capabilities in Latvia can already be found in the area of EO and remote sensing as satellite data-based solutions in different sectors, development of algorithms for EO applications, satellite imagery analysis etc. Such developments can be used to address regional (e.g. Baltic), European and global common issues and assist in fulfilling a number of EU directives. As such, this is an area where international cooperation, at least on a regional level, could be highly beneficial.

From an end-user's perspective, Latvian public services are already using EO data in several fields to varying degrees and intensity. However, there is a gap in understanding between service-providers and end-users due to the lack of awareness of the specific needs of the relevant user communities and, on the other side, the benefits of the existing space-based services. This asymmetry could eventually generate a mismatch between user demands and the supply from the space sector and is something to be addressed if Latvia is to gain the full benefit of the potential of EO applications and where a strong governmental push to lead by example (e.g. by an early take-up of new satellite data-based services) could give significant advantages.

Moreover, considering that EO data and information delivered by the European Commission through its Copernicus programme is open and free to use and is financed by the European tax payers, this is a cost-efficient and essential opportunity for Latvia to use to develop its value and supply chains.

Climate change

For supranational institutions, such as the European Commission and the European Parliament, and international organisations, such as ESA or United Nations, climate change is among top priorities, which is reflected in their current and future funding initiatives[14][15][16]. This includes a target of 20% of the EU budget to be climate-related[17]. While climate change is a significant challenge, it is also presents a significant opportunity to Latvia to apply its downstream and upstream skillsets, integrated across multiple sectors in society, research and industry to find and apply innovative solutions.

[14] https://climate.esa.int/en/
[15] https://ec.europa.eu/clima/index_en
[16] https://www.un.org/en/sections/issues-depth/climate-change
[17] https://ec.europa.eu/clima/policies/budget_en

4. Space governance

In Latvia, the space governance model is based on shared coordination among several ministries and connected public agencies, recognising the diverse nature of space and its potential role for a number of policies for sustainable growth and innovation.

In 2020, under the supervision of the Ministry of Education and Science, the Latvian Space Office was established. It consists of several governmental professionals to support Latvian entities to secure funding from ESA and EU programmes to develop strategic space technologies.

The functions of the Latvian Space Office are:

- to coordinate the Latvian delegation in ESA;
- to administer the participation in ESA optional programmes and to provide comprehensive support to Latvian entities related to the ESA procurement system;
- to work on operational measures concerning the implementation of this strategy, especially the Latvian Requested Party Activities of ESA;
- to facilitate international collaboration and to promote the Latvian space industry worldwide.

In April 2020, the Latvian Space Policy Working Group was established under the supervision of the Ministry of Education and Science and the Ministry of Economics. It consists of 14 members (representatives of ministries, a cluster representing the private sector and scientific institutions). The main task of the working group is the coordination and governance of space-related programmes and activities at a national and international level. Decisions of the Latvian Space Policy Working Group are recommendatory, and the group aims to fulfil an advisory function to the relevant ministries. The

Minister of Education and Science and the Minister of Economics of the Republic of Latvia both co-chair the group.

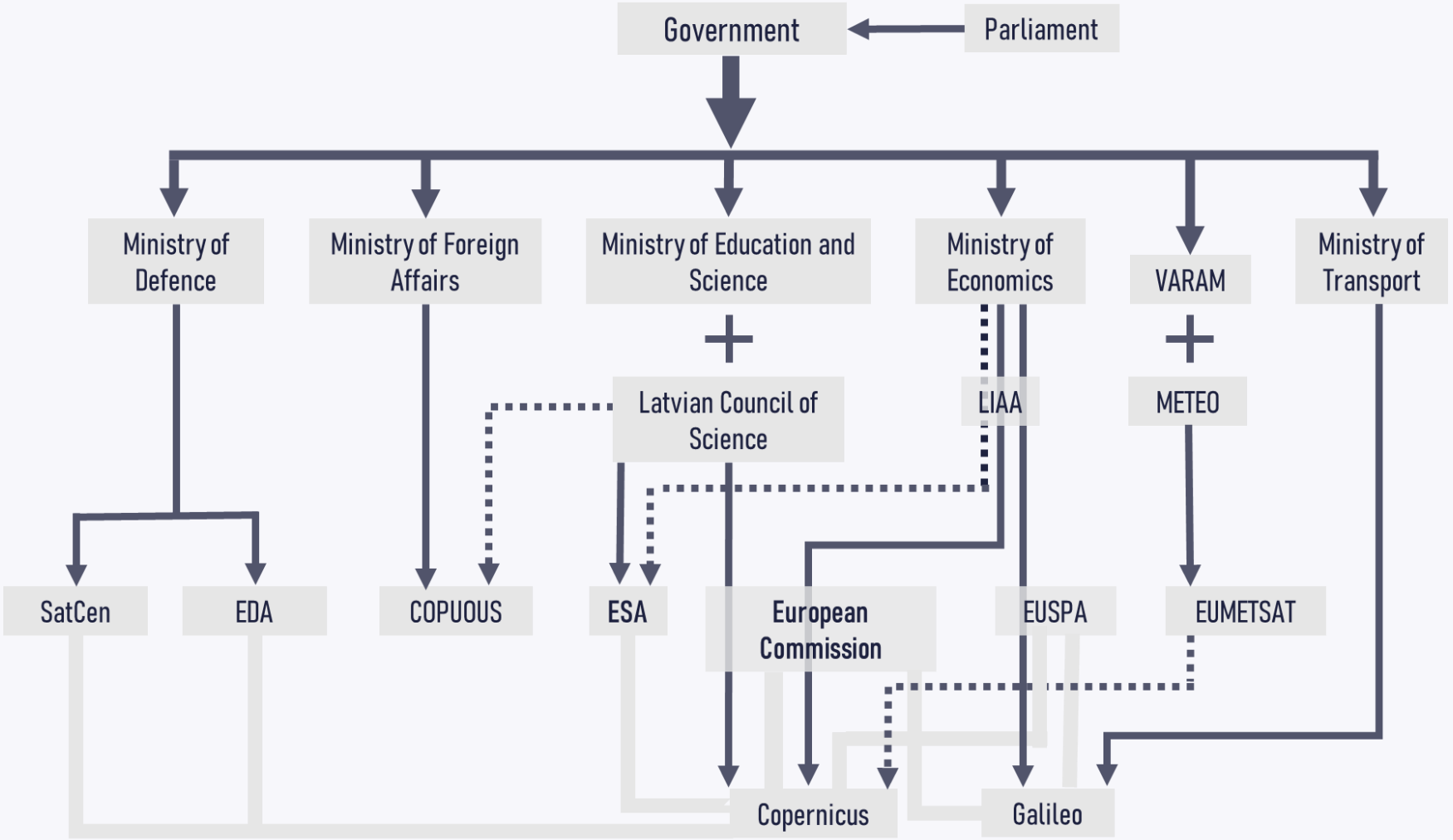
The functions of the Space Policy Working Group are:

- to promote and coordinate the cooperation between Latvia and ESA, including setting up the national delegation to the ESA committees and sub-groups and advising on possible investment directions for the ESA programmes;
- to support the uptake of the EU space programmes, i.e. Copernicus, EGNOS and Galileo, and ensure all applications related to the above technologies are effectively implemented in the management of public administration and economic activity in Latvia;
- to promote and coordinate the participation of research institutions and companies in ESA, EUSPA, EUMETSAT, EU Horizon Europe and other space programmes and institutions;
- to provide recommendations to the Cabinet of Ministers on Latvia's involvement in international organisation structures related to space;
- to promote the inclusion of appropriate space activities in the smart specialisation strategy and synergies with the investment directions of the Structural Funds.

The Ministry of Education and Science is primarily in charge of cooperation with ESA, the Copernicus programme, JIVE, EU SST and partly involved in EUSPA coordination. The Ministry of Economics supports the national space industry in terms of innovation and start-up development, Latvia's participation in ESA and the EU Space programme. The potential relevance of space technology and applications for agriculture, energy, transport, telecommunications, environment, security and defence, etc., is a key factor for many other ministries to be involved in the Latvian space sector coordination.

Effective inter-ministerial collaboration is a pre-requisite for successful implementation of the strategy.

Space governance model in Latvia



5. Visions, goals and activities

Education and skills development

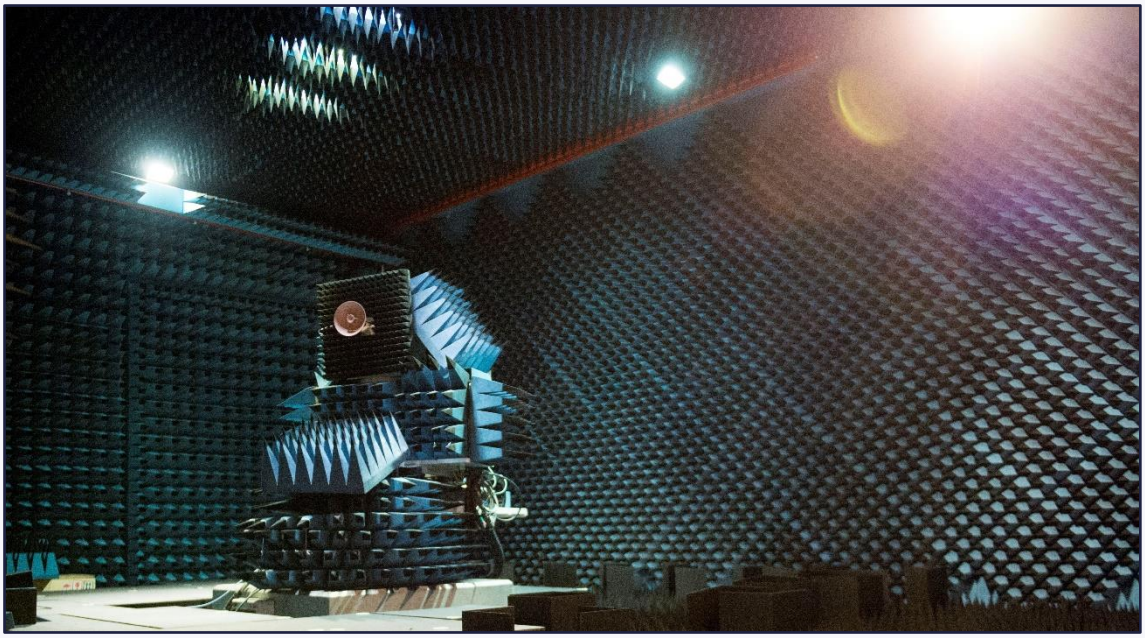
Vision: Latvian higher education institutions ensure the development of an adequate base of expertise and skills in graduates to be able to serve the needs of the space sector in Latvia.

Status and potential: A knowledge-based society requires well-trained scientists and technical experts, which makes it even more important to stimulate the enthusiasm of young people for science and technology at an early stage.

Latvia generally has excellent scientific training, but the students lack space application opportunities. Hands-on experience is the best method to build on the inspirational factor, which is naturally provided by space themes. The basic conditions for Science, Technology, Engineering, and Mathematics (STEM) training are an appropriate educational system, activities with real-world applications, and desirable careers, of which the space sector can make positive contributions due to its multi-disciplinary nature.

To use the human potential effectively, support measures and attractive training opportunities are necessary to lead young people to space science and engineering. There is a need to develop initiatives, facilities and networks for the purpose of raising interest in research, innovation and technology with space as a stimulus. The challenge is to support increased cross-linking and cooperation between organisations and networks that are engaged in attracting young talent to careers in STEM from different perspectives.

Activities	Goals by 2027
EDUCATION. Universities in collaboration with local industrial partners and active space-related non-profits develop hands-on training activities, higher-education courses and lifelong learning programmes to respond to the national space industry need by studying the imbalance between labour demand and supply in space companies. **TRAINEESHIPS.** The Ministry of Education and Science in collaboration with ESA create practical traineeship opportunities and a system for doctoral and master students at ESA technological centres (ESTEC, ESRIN, ESOC, etc.). **TRAINING.** The Ministry of Education and Science in collaboration with ESA organise relevant training courses for various space disciplines in Latvia, delivered by ESA experts (e.g. engineering, standardisation, EO/remote sensing, space communications, Space Situational Awareness, climate science, etc.). **ESERO.** All parties involved in the implementation of the Space Strategy of Latvia actively participate in the European Space Education Resource Office (ESERO) activities to inspire students to engage with space and STEM subjects. **AWARENESS.** All parties involved introduce activities that promote the awareness of companies, scientific representatives and the public about cooperation with ESA, as well as Latvia's potential and experience in the development of space and related technologies, the importance of these technologies and their possible applications.	Sufficient new young employees available to the Latvian space sector that already possess expertise in the fields of interest for the space sector. Such persons having gained a high-quality education in Latvia in the areas of space environment, space engineering, satellite telecommunications, satellite navigation and EO/remote sensing and being aware of the relevant standards (e.g. ECSS). (KPI 1)



Entering space supply chains and international impact

Vision: Latvian businesses and research organisations collaborate with key players in the global space industry to deliver world-class space activities in close cooperation with ESA, with the goal to develop recurring products and services that have great export potential.

Status and potential: Companies in the space sector are faced with high costs of qualification of technologies and processes, as well as long investment cycles, which create barriers to entry into the industry. Both the financial and the technological risks in the space sector are considered to be significant. To overcome these challenges, Latvia should capitalise on the expansion of specific actions in the areas of research and development and help encourage and nurture start-ups. Cooperation, between the industry and research, should be expanded as it is considered to be beneficial to all. Concentration of expertise and a strong focus on specialisation are desirable. Assistance is needed for the industry to obtain ready access to component testing and qualification laboratories and equipment, in Latvia or conveniently nearby. Facilities can be shared among companies, institutes, government entities, or with cooperating laboratories in neighbouring nations.

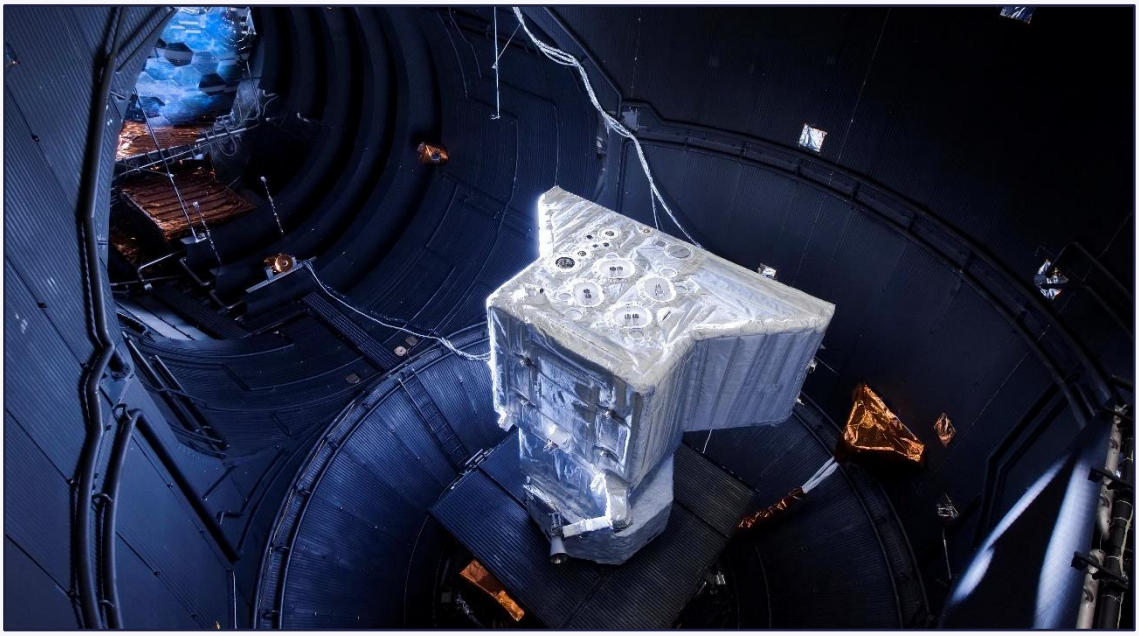
Latvia will seek to increase the number of equipment, instruments, sensors, and components manufactured in Latvia to become flight qualified and gain space flight heritage. The focus shall be on development of recurring products. Furthermore, the international network and visibility of Latvian space industry should be further developed and promoted with a specific view to enabling international co-operations and facilitating international customers for Latvian products and services. The legal and regulatory environment for space activities should be modern and favourable. Another important task is to penetrate commercial space markets and facilitate successful technology transfer to the non-space economy.

Activities	Goals by 2027
MARKETING. All ministries, agencies, enterprises and research organisations involved in the Latvian space sector collaborate to market the country's achievements and potential and promote its visibility internationally.	Latvia is represented by competent individuals in the most important international bodies and expert groups and the space activities of the EU (space programme + research programme) and the ESA, JIVE, EU STT.
TRADE EVENTS. The Ministry of Economics and LIAA provide support to Latvian companies to participate at international space-related events (e.g. IAC, ISD, Toulouse Space Show) focusing on the local community's integration in the global space supply chains.	Latvian companies and research organisations participate in several ESA optional programmes and Latvia's overall return from the ESA's programmes meets the targets of a minimum cumulative return coefficient of 0.95 at the end of 2027. (KPI 2)
START-UPS. The Ministry of Economics and the Ministry of Education and Science create favourable conditions for foundation of new start-ups in the space sector, especially considering the establishment an ESA Business Incubation Centre in Latvia.	Thirty new space sector companies including start-ups have been established or reoriented in Latvia and benefit from the ESA engagement. (KPI 3 and 4)
ONLINE DIRECTORY. The Ministry of Education and Science in collaboration with the Latvian Space Industry Association develop the online directory latviaspace.gov.lv/ to promote the Latvian space industry capabilities to the global space market.	All parties play an active role in enhancing the international visibility of Latvia-based companies and institutes involved in the space ecosystem or possessing technologies with potential applications within the space sector
ENABLING. The Ministry of Economics and LIAA provide support instruments and measures to innovative space companies. LIAA identifies and facilitates international opportunities to utilise Latvian space solutions and space data and encourages investments in Latvia.	Latvian entities have won commercial or scientific contracts with global space industry outside the ESA and EU programmes, totalling at least 9 million euros. Latvian companies have contracts in partnership with Large System Integrators. (KPI 5 and 6)

LEGISLATION. The responsible authorities review Latvia's regulatory framework for licensing the use of radiofrequency spectrum for satellite communication purposes. The laws, regulations and policies will be analysed and amendments suggested so as to create an environment that encourages the development of the space sector, including the private use of satellite spectrum, while safeguarding the interests of Latvia.

ESA PROGRAMMES. The Ministry of Education and Science and the Latvian Space Policy Working Group actively analyse the Latvian industry's success in participation in ESA's programmes and activities. Together with ESA, experts explore possibilities for increased support in terms of training, organisation of events and advice with a view to achieve a successful integration of Latvia in ESA to ensure further development of sustainable and competitive industrial capabilities, and their integration in the space supply chain.

SUPPORT. Ministry of Economics and Ministry of Education and Science collaborating with all parties involved in the implementation of this strategy create a support framework for the Latvian industry in all matters related to ESA, in particular the ESA's procurement, and building up the industrial capacity in the field of space activities.



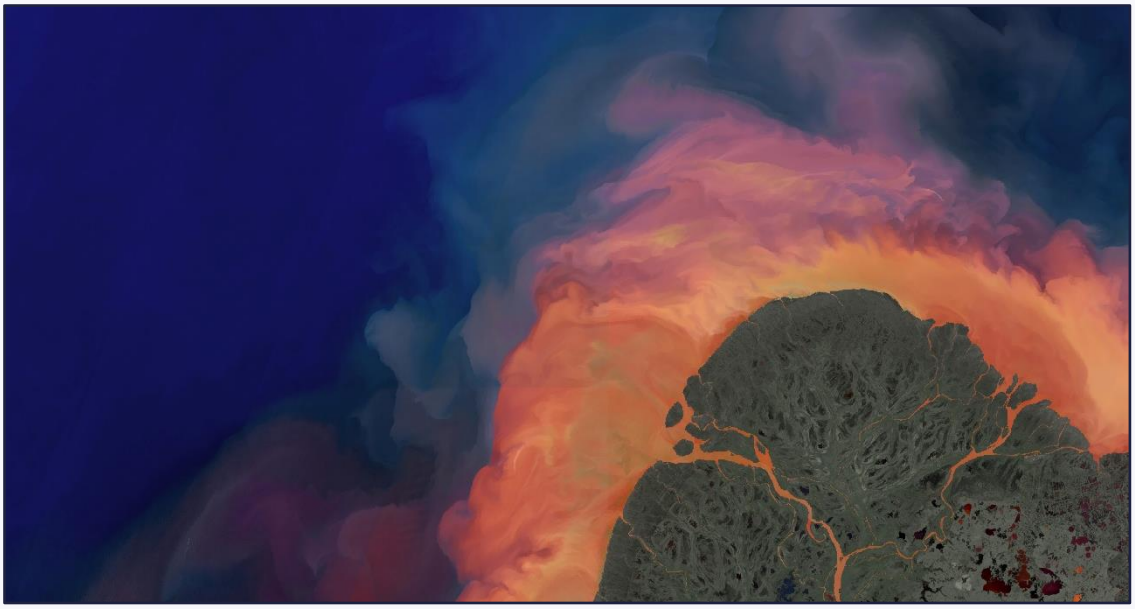
Scientific and engineering research

Vision: Research organisations and universities operating in Latvia participate in leading space projects and generate world-class knowledge in space and related science disciplines.

Status and potential: The space industry supports fundamental scientific research through the availability of direct measurements in space. In addition to the expertise created through the exploration of the universe and the Earth, satellite-based space science drives research, science and industry to technological excellence and innovation.

Today, about 10 Latvian research institutions are significantly involved in international development and research activities in this high-technology field. The space environment (vacuum, high reliability with minimal energy consumption) puts the highest demands on engineering and thus remains a challenging research area. Therefore, the space science also furthers the education and training of future experts. Moreover, space and related topics stimulate the fascination for science, technology and mathematics amongst students.

Activities	Goals by 2027
EU SPACE PROGRAMME. All ministries, agencies, enterprises and research organisations work together to actively influence the success of the Latvian participants in the EU Space Programme in terms of new projects, innovations and new business opportunities in Latvia.	Latvian companies and research organisations double the number of above-the-threshold evaluated project proposals in space topics in Horizon Europe and/or other international programmes such as Interreg Europe, European Defence Fund and others (KPI 7)
NETWORKS. The Ministry of Education and Science and the Latvian Science Council will strengthen the participation in international space and related research partnerships and networks (e.g. the European VLBI network (EVN), JIVE, EU SST).	Latvian researchers are included in the core science team of an ESA science mission, or are key authors of published research papers based on ESA missions or data from ESA spacecrafts (KPI 8)
SSA. The Ministry of Education and Science and the Latvian Science Council support research organisations to participate in Space Situational Awareness related projects or initiatives at the European level (e.g. EU SST)	



Governmental services

Vision: In response to the country's social, economic, and environmental needs, satellite-based services and applications developed and built in Latvia are increasingly integrated within the public sector at local and national level.

Status and potential: Space technology and its applications in the public sector provide valuable contributions to meeting the social needs of our time with a toolbox of innovative technologies, mainly through information on security, emergency and disaster management and resilience, search and rescue, land use and other delivered both independently and jointly by Copernicus (Earth Observation) and Galileo (navigation). Copernicus and Galileo data and information can be used free of charge, but some of this information (e.g. information provided by the Copernicus Emergency Management Service and Copernicus Security Service or Galileo Public Regulated Service are restricted to authorised governmental users).

These services are of enormous economic and security-related strategic interest and should increase the safety of citizens, facilitate decision-making in certain policy areas (such as land use, forestry, energy, land and marine environment management and protection and safety and defence, green economy, etc.) and improve methods and procedures when integrated with other technologies.

Moreover, through the EU Space Programme (i.e. Galileo, Copernicus and EGNOS) and ESA programmes, services could be developed in the areas of navigation (fleet management, transport, agriculture, tourism, search and rescue), climate and climate change forecasts, atmosphere monitoring, marine environment, land cover and land use, security and emergency, etc.

Activities	Goals by 2027
SERVICES. All ministries, agencies and public service organisations (where appropriate) foresee the use of Earth Observation-based services in the respective legislative acts and integrate them into the public sector activities based on added-value and competitiveness.	Sustainable Earth Observation and navigation services that are based on advanced data analytics capabilities are developed and recruited by the Latvian industry in the public sector for various governmental areas. (KPI 9.1)
AWARENESS. All responsible ministries raise awareness of the potential of space applications in the public sector for various governmental areas through the provision of training for junior and senior level specialists and key decision-makers.	Latvian companies operating in non-space markets have integrated and used space-based capabilities into their commercial service portfolio (e.g. civil/geotechnical engineering, consulting engineering, mining services, transport services, infrastructure providers, and financial services). (KPI 9.2)
COOPERATION. All ministries, agencies and public service organisations involved shall assess the need to set up collaboration with the other Baltic states and Nordic countries in the areas of common interest, e.g. – forestry monitoring, inland water and water quality monitoring, snow and ice monitoring, etc.	
EU REGULATIONS. All ministries, agencies and public service organisations involved analyse the need of satellite-based services in implementation of the EU regulations (e.g. water quality, land use, etc.)	

6. Funding

The implementation of this strategy will be mainly funded from the following sources:

- Latvia's annual contributions to ESA programmes;
- through participation in the EU Horizon Europe, EDA, Interreg Europe or other international programmes;
- through relevant national support programmes based upon EU Structural Fund programmes for research, innovation, and start-ups;
- through the allocated national budget of the involved ministries.

This strategy will be updated every two years to ensure that the information and measures to be taken are up to date and to ensure that the Latvian contributions to ESA keep pace with the Latvian industry development. This strategy was updated in 2024. The ministries undertake to advance the further update of the strategy at the level of the Cabinet of Ministers as a sectoral policy planning document.

Minister for Education and Science	**Minister for Economics**
Anda Čakša	**Viktors Valainis**

The document is signed with a secure electronic signature and contains timestamp

Annex I Performance measurement of strategy implementation

The Space Policy Working Group will review the performance of the Space Strategy of Latvia 2021-2027 in achieving its results against the related Key Performance Indicators (KPIs).

The Space Policy Working Group will provide a report to the Minister for Education and Science and to the Minister for Economics every two years, reporting on the performance of the strategy and recommending changes to the strategy, including new KPIs suggested for improved measurement.

Result 1: Sufficient number of Latvian-educated and suitably skilled new workers are available for employment in the Latvian space sector.

KPIs:

1. The number of PhD and Master's students with space-related theses – at least 10 PhD theses and 50 MSc theses defended until 2027.

2. The number of Young Graduate Trainees and International Research Fellows at ESA – at least 10 Young Graduate Trainees and International Research Fellows at ESA until 2027.

3. The number of space-related modules (courses) offered by Latvian universities – at least 7 new or improved space-related modules (courses) offered by Latvian universities until 2027.

4. The number of trainee placements in Latvian space companies – at least 15 until 2027.

Result 2: Latvia's overall return from the ESA's programmes meets the targets – a minimum cumulative return coefficient of 0.95 at the end of 2027.

KPI:

The ratio between the share of Latvia in the weighted value of contracts in ESA programmes and its share in the contribution paid to ESA meets the return coefficient of 0.95 at the end of 2027.

Result 3: At least 15 new companies benefit from the ESA engagement.

KPI:

The number of Latvian companies or research institutions that won a contract in any ESA programme, but had not won any contract during the PECS programme – at least 15 until 2027.

Result 4: At least 15 new start-up or spin-off companies benefit from the ESA BIC engagement.

KPI:

The number start-up or spin-off companies benefit from the ESA BIC engagement, in terms of contracts won, loans or technical support that impact their product development and IPR – at least 15 until 2027.

Result 5: Latvian entities outside the ESA and EU programs have won commercial or scientific contracts with global space industry organisations, totalling at least 9 million euros.

KPI:

The total value of commercial or scientific space contracts won by Latvian entities outside the ESA and EU programmes – at least 9 million euros until 2027

Result 6: Number of space contracts in ESA, EU Space Programme or EDA programmes of Latvian companies in partnership with Large System Integrators.

KPI:

The number of Latvian companies which have space contracts in ESA, EU Space Programme or EDA programmes in partnership with Large System Integrators – at least 10 until 2027.

Result 7: The number of above-the-threshold evaluated project proposals through the EU Horizon Europe programmes in space-related activities are doubled (from years 2021 to 2027).

KPI:

1. The number of project proposals evaluated above the threshold through the EU Horizon Europe programme in space-related activities (from years 2021 to 2027) – at least 40.

2. The number of project proposals financed in space-related activities through the EU Horizon Europe programme or another international programme e.g., Interreg Europe, European Defence Fund or Seal of Excellence or equal national scheme from years 2021 to 2027 – at least 20.

Result 8: Latvian researchers are included in the core science team of at least one ESA science mission and are key authors of at least three published research papers based on ESA missions or data from ESA spacecrafts.

KPI:

1. The number of Latvian researchers included in the core science team of ESA science missions – at least 1 until 2027.

2. The number published research papers by Latvian researchers based on the data from the ESA spacecrafts – at least 3 until 2027.

Result 9: At least five new sustainable Earth Observation or navigation services (applications) that are based on advanced data analytics space data are developed and integrated into the public or private sector and at least five Latvian companies operating in non-space markets have integrated space-based capabilities into their commercial service portfolio (e.g. civil/geotechnical engineering, consulting engineering, mining services, transport services, infrastructure providers, financial services).

KPI:

1. The number of Earth Observation or navigation services (applications) that are based on advanced data analytics of space data developed and integrated and used in the public or private sector – at least 5 until 2027.

2. The number of Latvian companies operating in non-space markets integrated or utilised space-based capabilities into their commercial service portfolio (e.g. civil/geotechnical engineering, consulting engineering, mining services, transport services, infrastructure providers, and financial services) – at least 5 until 2027.

Annex II Information about the images used in the strategy

- Title page: A galaxy on edge (2020) ESA/Hubble & NASA, R. de Jong; CC BY 4.0; Acknowledgement: Judy Schmidt (Geckzilla)
- Executive Summary: Rho Ophiuchi cloud complex (2023) NASA, ESA, CSA
- Context of the strategy - Global trends: Tarantula Nebula – NIRCam (2022) NASA, ESA, CSA, and STScI
- Context of the strategy - European collaborative space programmes: Cosmic smokescreen (2022) ESA/Hubble & NASA, ESO, O. De Marco; CC BY 4.0 Acknowledgement: M. H. Özsaraç
- Participation in international space programmes: Persian gulf (2022) Copernicus Sentinel-2 imagery, processed by Angelina Bekasova using Sentinel Hub
- Science: Riga, Latvia (2022) Copernicus Sentinel-2 imagery, processed by Angelina Bekasova using Sentinel Hub
- Industry: Ariane 5 liftoff (2020) John Kraus
- Downstream applications: Rīga, Latvija (2018) Copernicus Sentinel-2 imagery, processed by Angelina Bekasova using Sentinel Hub
- Climate change: Sediment runoff in the Baltic Sea near Ventspils (2022) Copernicus Sentinel-2 imagery, processed by Angelina Bekasova using Sentinel Hub
- Space governance: Webb's View of the Molecular Cloud Chameleon I (2023) NASA, ESA, CSA, and M. Zamani (ESA/Webb); Science: M. K. McClure (Leiden Observatory), F. Sun (Steward Observatory), Z. Smith (Open University), and the Ice Age ERS Team
- Education and skills development: Rising sea temperatures threaten tiger shark populations (2022) European Union, Copernicus Sentinel-2 imagery
- Entering in the space supply chain and international impact: Copernicus Sentinel-6 on display (2019) ESA - S. Corvaja
- Scientific and engineering research: Bepi before space (2020) ESA–A. Le Floch
- Governmental services: Yukon river delta, Alaska (2022) Copernicus Sentinel-2 imagery, processed by Valters Žeižis using Soar
- Funding: Solar Orbiter liftoff (2020) ESA - S. Corvaja

Images have been modified (cut).