

ECONOMICS AND INNOVATION MANAGEMENT FOR THE NEW SPACE ECONOMY

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Objectives

- Overview and definition of space economy
- Market Overview
 - Space value chain: upstream and downstream
 - Space agencies
 - Italian companies
 - Measuring the space economy
 - Entrepreneurial environment
- Space applications and technologies
- Focus on Earth Observation and related services
 - EO demand trends
 - EO supply trends
 - EO institutional trends
- Technological drivers and new business model
- Key take aways
- Readings and materials

Overview and definition of space economy

Definition

OECD

Handbook on Measuring the Space Economy

The space economy is the full range of **activities and the use of resources** that create and provide value and benefits to human beings in the course of exploring, understanding, managing and utilising space.

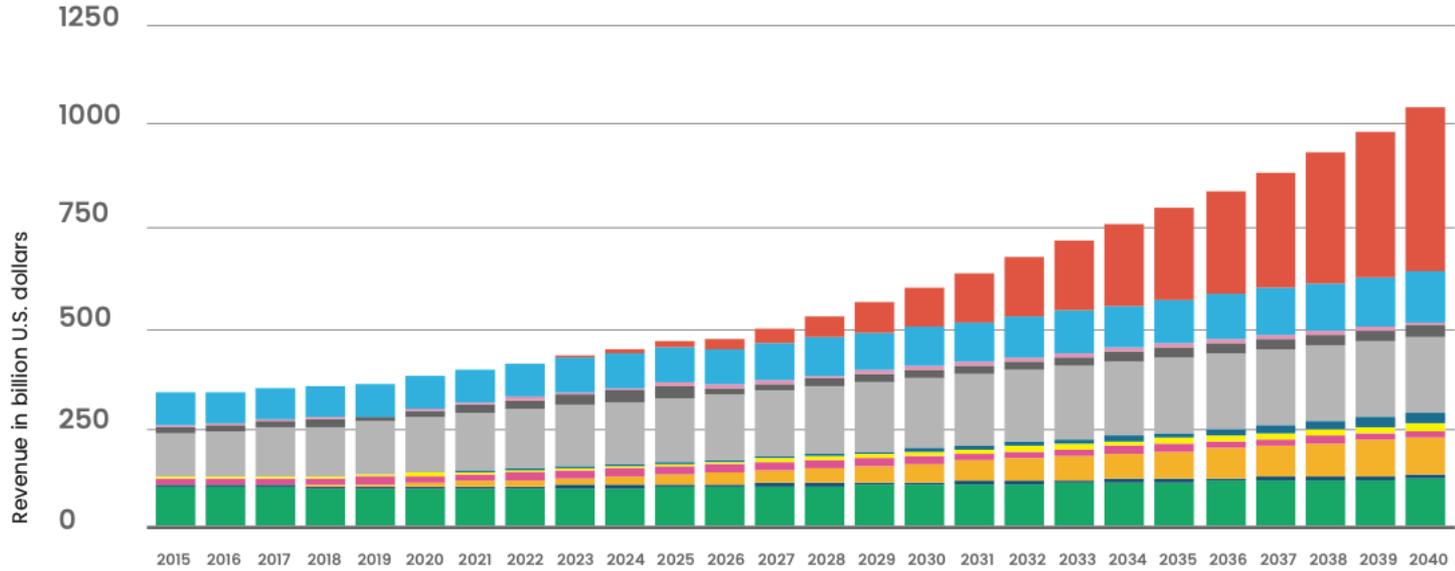
It includes all **public and private actors** involved in developing, providing and using space-related products and services, ranging from:

- research and development and the scientific knowledge generated by such activities
- the manufacture and use of space infrastructure (ground stations, launch vehicles and satellites)
- space-enabled applications (navigation equipment, satellite phones, meteorological services, etc.).

It follows that the **space economy goes well beyond the space sector itself**, since it also comprises the increasingly pervasive and continually changing impacts (both quantitative and qualitative) of space-derived products, services and knowledge on economy and society.

OVERVIEW AND DEFINITION OF SPACE ECONOMY

Global space economy revenue, 2015-2040

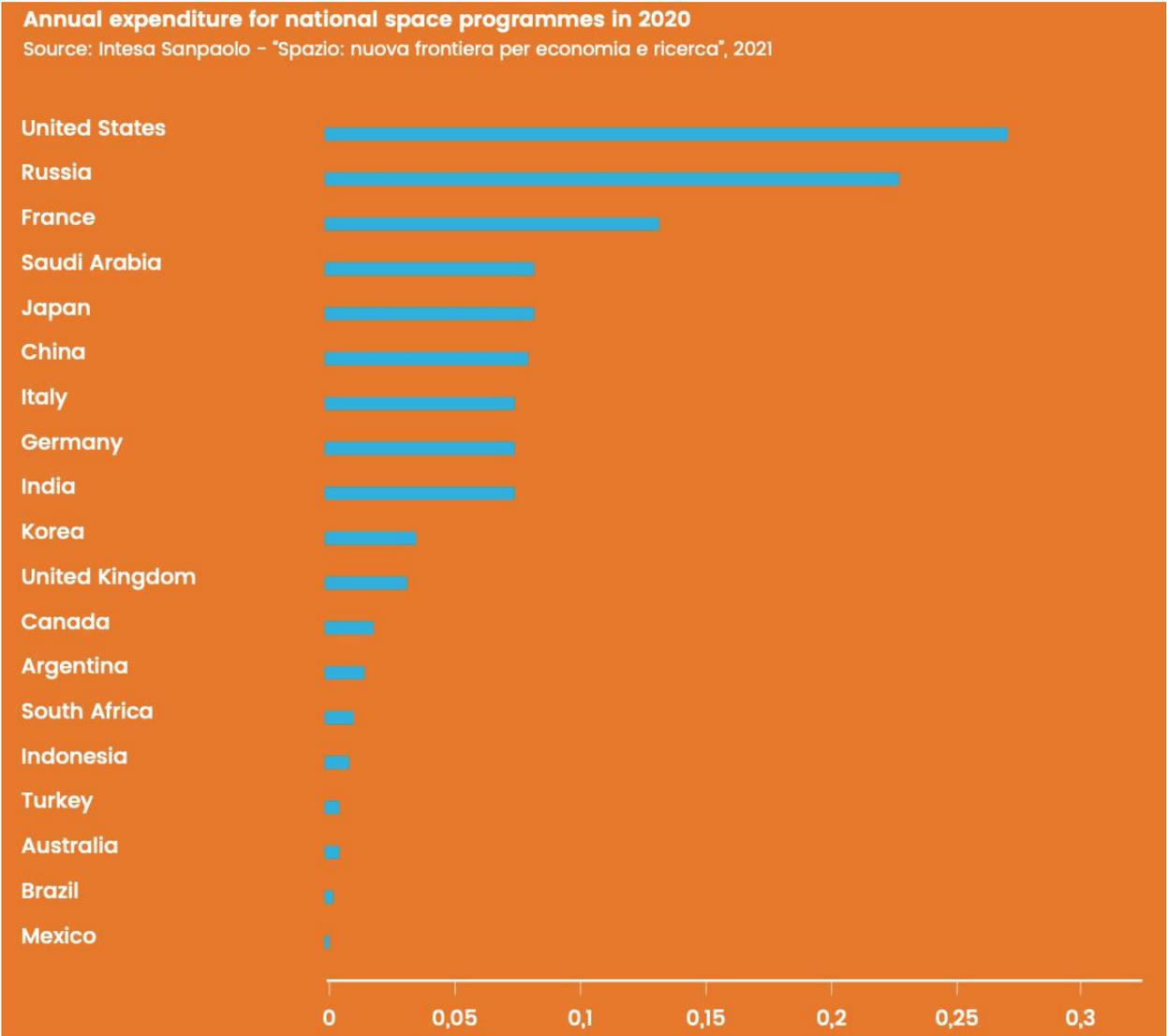


- Consumer TV
 Consumer Radio
 Consumer Broadband
- Fixed Satellite Services
 Mobile Satellite Services
 Earth Observation Services
- Ground Equipment
 Satellite Manufacturing
 Satellite Launch
- Non Satellite Industry
 Second Order Impacts

Second-order impacts (i.e., additional turnover generated in other sectors from the use of space technology or services) are expected to reach 100 billion dollars in 2030 and 411 billion dollars by 2040, accounting for about 40% of the value of the entire Space Economy.

**Spaceteq, Intesa Sanpaolo Innovation Centre (2022)*

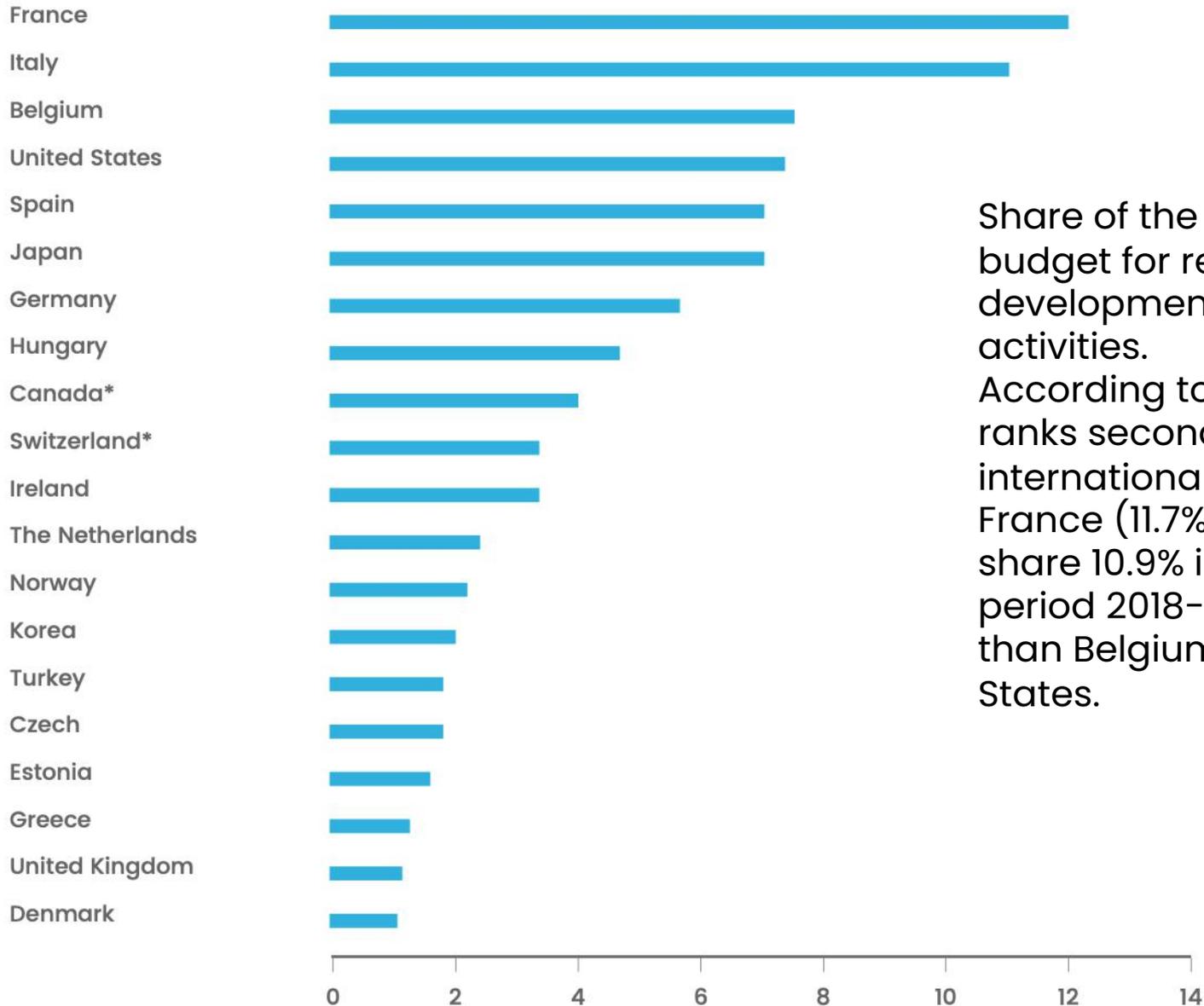
OVERVIEW AND DEFINITION OF SPACE ECONOMY



In 2020, the average ratio of government space budgets to GDP in the G20 countries was 0.05%, with the United States and the Russian Federation leading the way with 0.2%, while Italy invested 0.069% of GDP

**Spacotech, Intesa Sanpaolo Innovation Centre (2022)*

Government spending on space R&D



Share of the government budget for research and development spent on space activities.

According to the OECD, Italy ranks second on the international scene right after France (11.7%), with an average share 10.9% in the two-year period 2018-2019, higher than Belgium and the United States.

All: 2018-2019
* Latest availabilities for Canada and Switzerland are 2016 and 2015

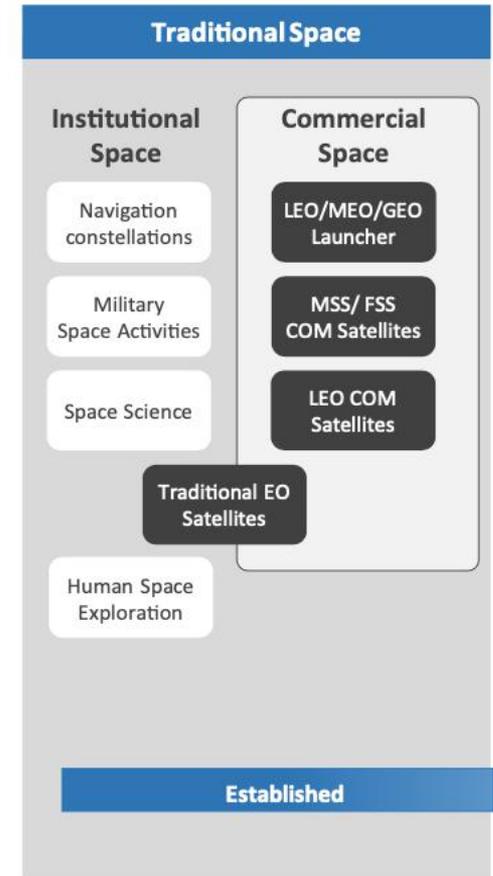
From traditional to new space

The global space economy grew by an average of 6.7 percent annually between 2005 and 2017. With about a quarter of this amount attributed to government budgets and three-quarters to commercial revenues.

The overall space economy consists of:

- revenue-generating commercial space activities
- government investments in space.

Governments were the driving forces in the 20th century (e.g. the Apollo programme, International Space Station (ISS) and the Global Positioning System (GPS)), commercial activities are now setting the pace.



Low Earth orbit (LEO), medium Earth orbit (MEO), geostationary orbit (GEO), Fixed Satellite Services (FSS), Mobile Satellite Services (MSS), Earth Observation (EO)

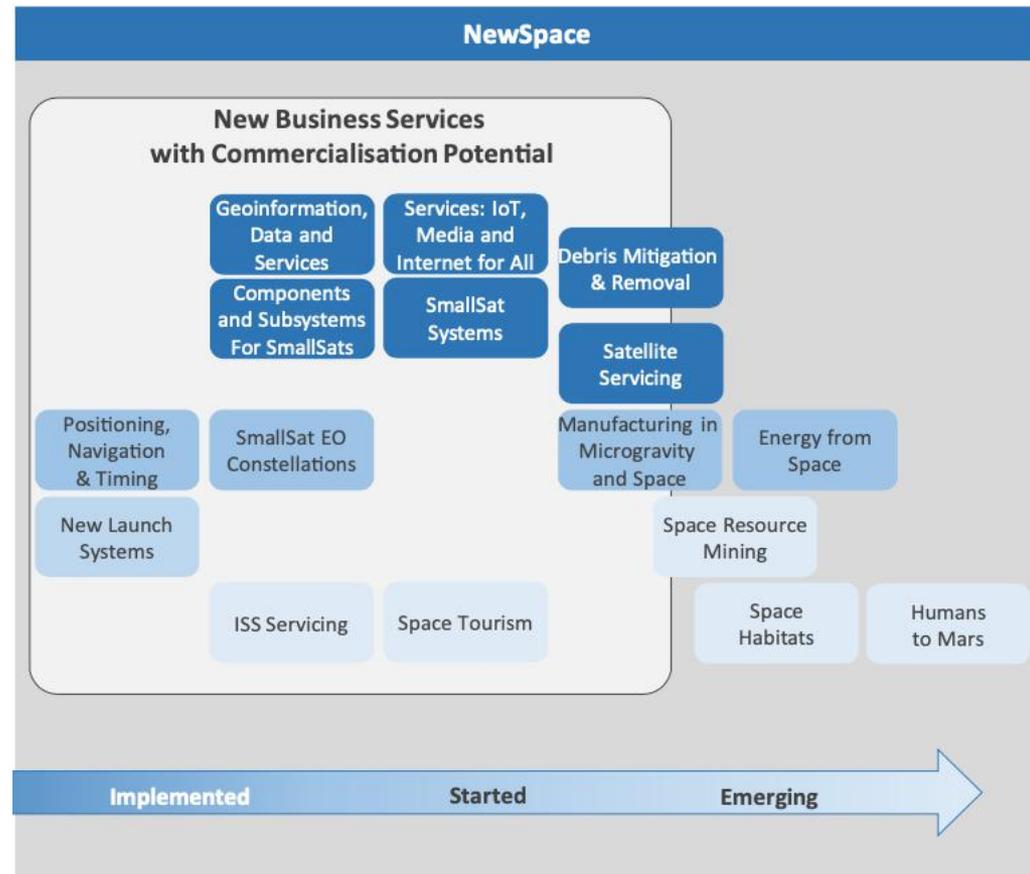
From traditional to new Space

New entrants have brought new opportunities for innovation in products, services and processes.

The commercialization of space will intensify in the coming years.

The so-called "NewSpace" trend is based on technological and business model innovations that enable **cost reductions, new products and services, and an expanded customer base.**

Innovations will bring increased returns for companies and investors, resulting in the start of a new wave of commercial activity in the space sector.



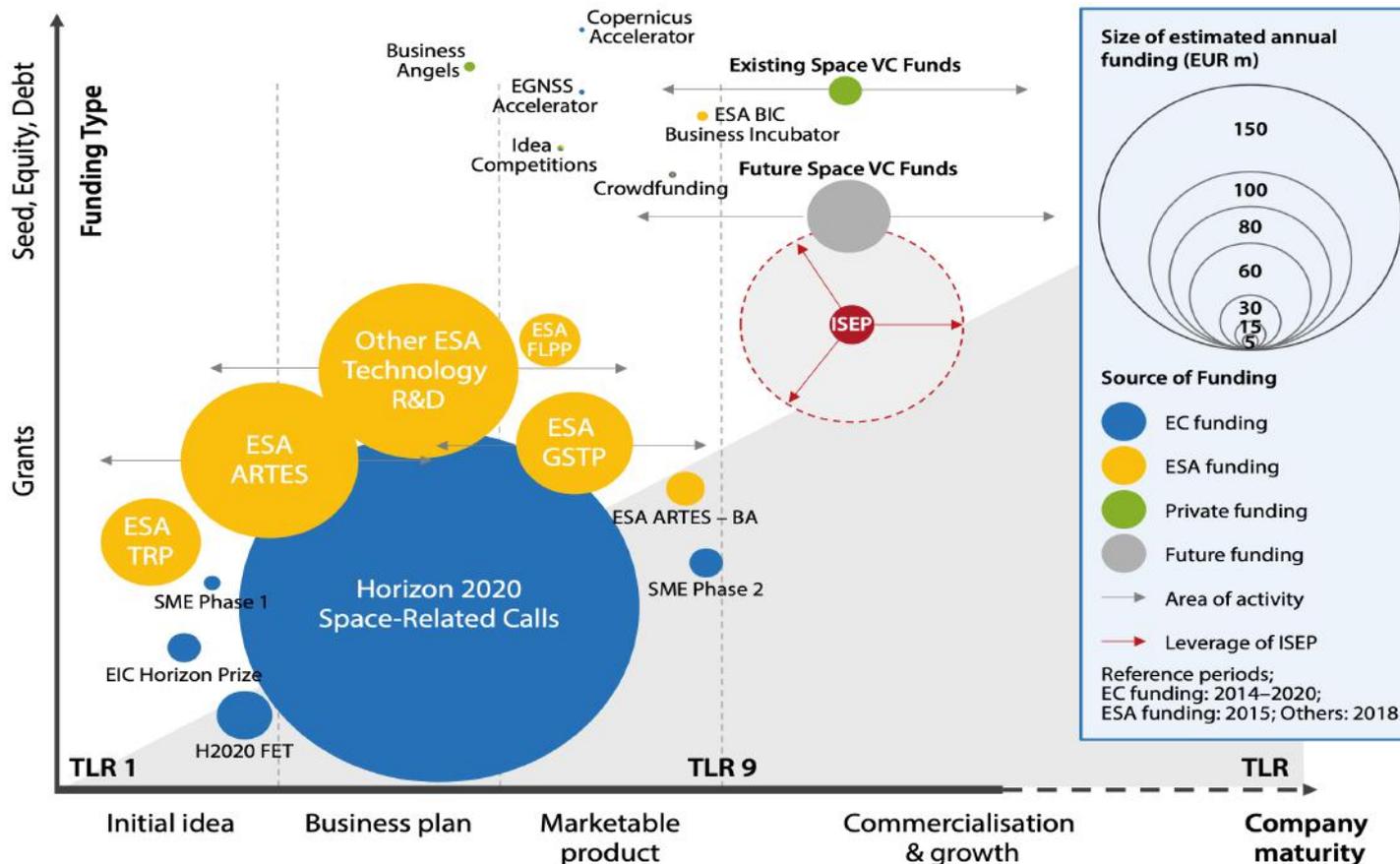
**The Future of the European Space Sector. How to Leverage Europe's Technological Leadership and Boost Investments for Space Ventures, European Investment Bank (2019)*

TRL | Technology readiness levels



Funding landscape in Europe: for supporting NSE

- Seed-stage support mechanisms have successful programmes: the European Space Agency (ESA) Business Incubator and Acceleration Centres and the Copernicus Start-Up Programme;
- The total volume of early-stage investments is still small and rather fragmented;
- Compared to general technology, space companies have a delayed inflection point, a higher capital requirement and lack of market maturity.



InnovFin Space Equity Pilot (ISEP), implemented by the EIF (European Investment Fund) to support space SMEs and mid-caps, under the Single EU Equity Financial Instrument. ISEP will provide access to risk finance for innovative enterprises in the space sector.

Public Budget in Europe

The EU Space budget is based on the contribution of EU Member States. Nevertheless, **each EU member state has its own national budget for space activities**, together with a possible **contribution to the European Space Agency (ESA)** in addition to the EU Space Programme



European Commission

Multiannual Financial Framework (MFF) (2021 – 2027)

EUR 14.8 Bn

EU Member States (EU MS) (27)

- | | | | | | | | | |
|---------|-------------|----------|----------|---------|----------------|----------|-----------|------------|
| | | | | | | | | |
| Austria | Belgium | Bulgaria | Croatia | Cyprus | Czech Republic | Denmark | Estonia | Finland |
| | | | | | | | | |
| France | Germany | Greece | Hungary | Ireland | Italy | Latvia | Lithuania | Luxembourg |
| | | | | | | | | |
| Malta | Netherlands | Poland | Portugal | Romania | Slovakia | Slovenia | Spain | Sweden |

Budget distribution among the EU Flagship Programmes



9.01 Bn



5.42 Bn

**Govsatcom
SSA**

0.44 Bn

*Main Trends & Challenges in the Space Sector, PWC (2020)

Public Budget in Europe



European Space Agency (ESA)

ESA Ministerial Space+19: Budget 2020 – 2024
(including EUR 12.5 Bn over the period 2020 – 2022)

EUR 14.4 Bn

ESA Member States (MS) (22) + 3 countries with specific agreements with ESA



Budget distribution among the main space domains

Earth Observation	Space Transportation	Space Exploration	Space Science	Telecom.	Basic Activities	Others (space safety, Navigation, Technology, etc.)
2.54 Bn	2.24 Bn	1.95 Bn	1.67 Bn	1.51 Bn	0.8 Bn	3.69 Bn

Main MS's contributors to ESA overall budget (% of overall ESA budget over the period)



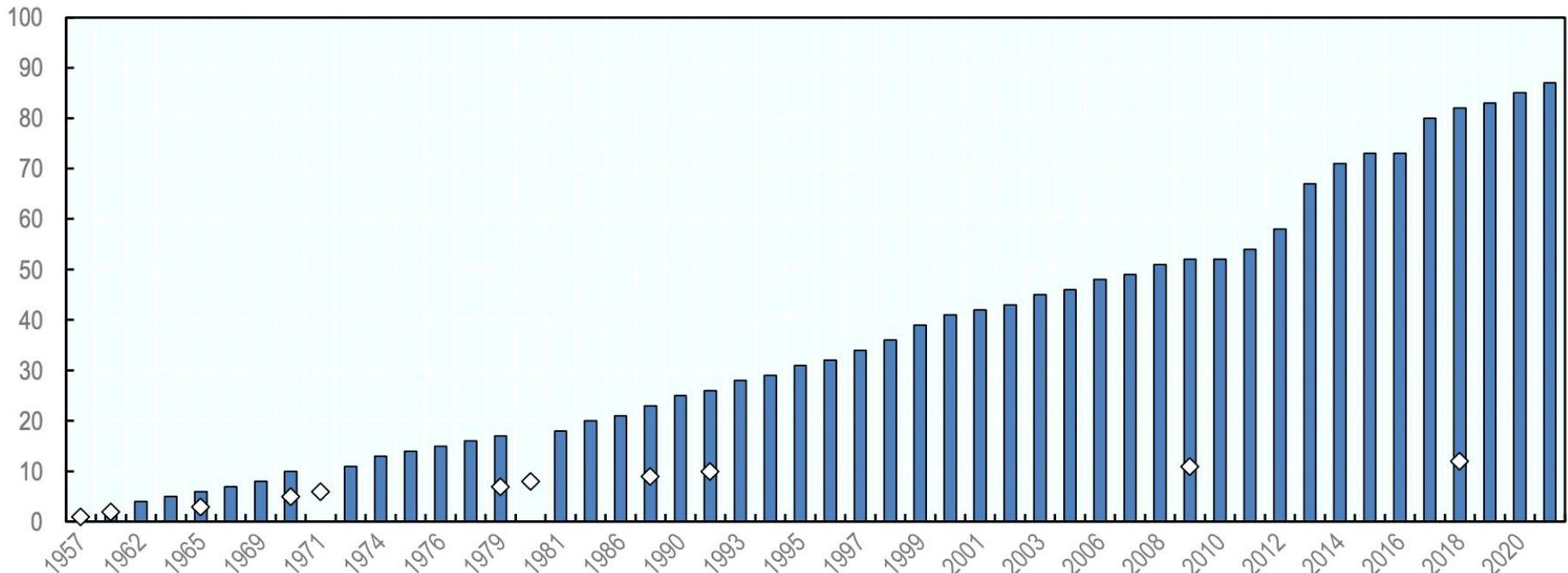
Global governmental space actors

More government actors pursuing different objectives are engaged in space activities than ever before. Since the launch of Sputnik in 1957, more than 80 countries have registered a satellite in orbit. The rate at which new countries are launching satellites to orbit has increased over the last decade. Number of countries with a satellite in orbit (launched via a third party or independently).

■ First satellite in orbit

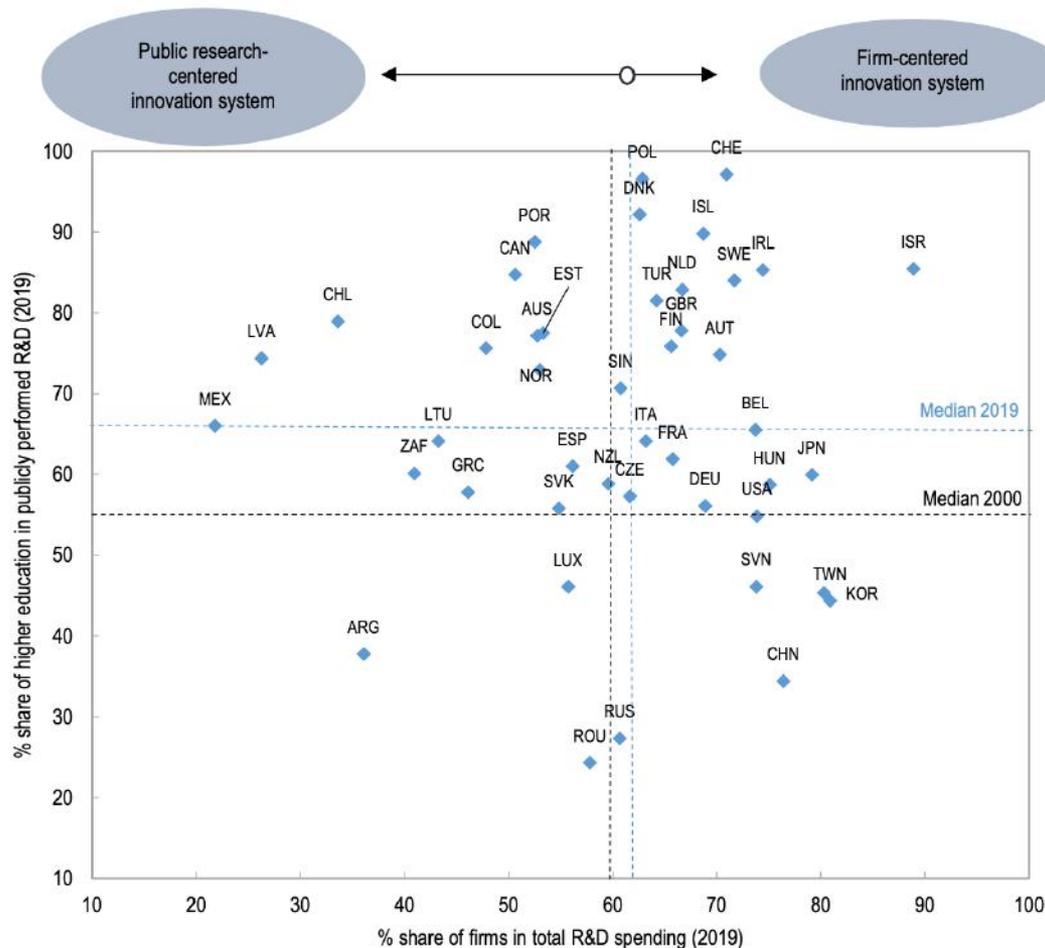
◇ First independent orbital launch

Number of countries



Global governmental space actors

The space domain follows a similar dynamic of the national innovation ecosystem with an increasing role of private R&D expenditure and an increase in public contribution to R&D through higher education



The figure tracks the shares of gross domestic R&D expenditure (GERD) by the business enterprise sector and compares it to the share of expenditure in the government and higher education sectors performed by HEIs. Median values for 2000 and 2019 indicate a trend towards more R&D performed by non-government actors.

MARKET OVERVIEW | Main segments

UPSTREAM

Scientific and technological foundations of space programmes, production and manufacturing of space infrastructure.

Fundamental and applied research; scientific and engineering support; dedicated ancillary services (e.g. insurance); supply of materials and components; design and manufacturing of space equipment and subsystems; integration and supply of full systems; space launch

DOWNSTREAM

Daily operations related to space infrastructure and ground-based activities that directly rely on space products/services (satellite technology, signals or data) to exist and function

Operations on space and ground infrastructure; supply of devices, products and services supporting consumer markets (e.g. GPS-enabled devices, set-top boxes, selected GIS, satellite television broadcast)

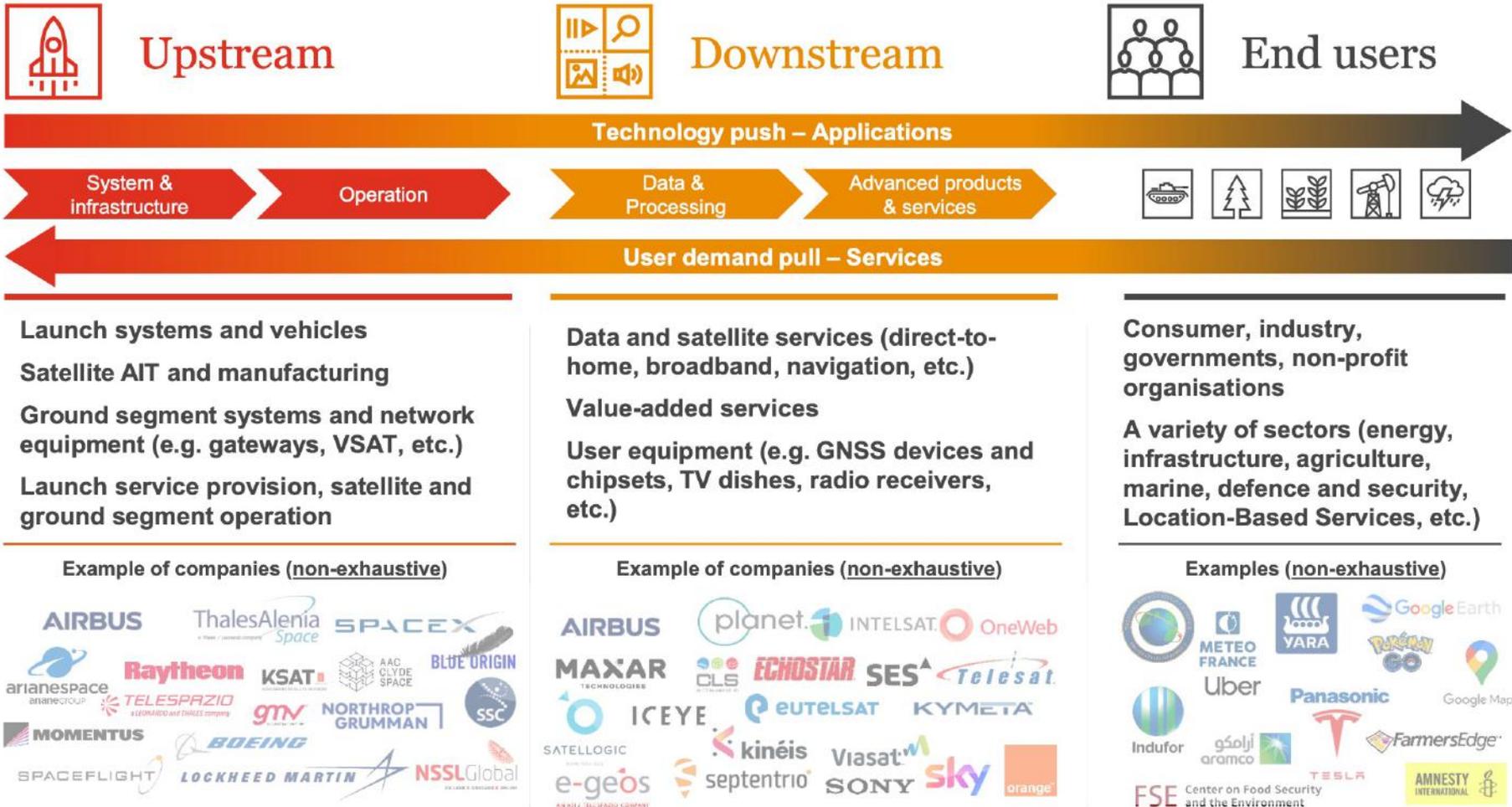
SPACE-DERIVED

or induced activities in other sectors

New activities in various economic sectors that derive from or have relied on space technology transfers

Activities/products/services derived from space technology, but not dependent on it to function (e.g. ad-hoc space technology transfers in the automotive or medical sectors)

MARKET OVERVIEW | Main segments



MARKET OVERVIEW | Space Agencies

- The role of space agencies is vital for the development of aerospace technologies and activities.
- Since the early 2000s, more than 30 new space agencies or offices have been established on all continents and in both high and lower-income economies.
- ESA (European Space Agency) is an international agency tasked with coordinating the space activities of its European member countries. The initial idea was to create a new actor with the technological, financial and long-term planning capabilities needed to be able to advance Europe as a space power.
- ESA's 22 members include European countries that are not part of the EU, such as Norway, Switzerland, and Canada.

MARKET OVERVIEW | Space Agencies

Economy/region	Organisation name	Responsible department/ministry	Year of creation
People's Republic of China	China National Space Administration (CNSA)	Ministry of Industry and Information Technology (MIIT)	1993
Europe	European Space Agency (ESA)	Intergovernmental organisation	1975
France	French Space Agency (CNES)	Ministry of the Economy, Finance and the Recovery	1961
Germany	German Aerospace Center (DLR)	Federal Ministry of Economic Affairs and Climate Action	1969
India	Indian Space Research Organisation (ISRO)	Department of Space	1969
Israel	Israeli Space Agency (ISA)	Ministry of Science and Technology	1983
Italy	Italian Space Agency (ASI)	Ministry of University and Research	1988
Japan	Japan Aerospace Exploration Agency (JAXA)	Ministry of Education, Culture, Sports, Science and Technology (MEXT); Cabinet Office	2003
Korea	Korea Aerospace Research Institute (KARI)	Ministry of Science and ICT	1989
Russian Federation	State Space Corporation Roscosmos	State corporation	1992
United States	National Aeronautics and Space Administration (NASA)	Independent government agency	1958

THE GLOBAL SPACE INDUSTRY



MARKET OVERVIEW | Measuring the Space Economy

- Space is not recognised as a category in international standards of industrial classification. Therefore, **worldwide market sizing studies differ in definition, coverage and methodology**. This makes it difficult to compare the results in global estimates.
- The **boundaries between space and non-space activities are often blurred**, leading to different ways of assessing the overall space economy. This is specifically critical when setting the boundary between the downstream space industry and end-user economy: as the analysis moves down the value chain, the **assessment of the direct causal relationship** (called paternity) **between the space industry and the benefits brought to end-users become complex to isolate and accurately measured**. Indeed, benefits derived from space tend to only represent a tiny part of the value created for end-users.
- Given the above, when considering global and regional figures related to space market sizing, **it is extremely important to understand what they encompass in their perimeter**.

MARKET OVERVIEW | Measuring the Space Economy

Sources

Market estimate

Notes on the assessed perimeter and granularity



USD 371 Bn
(2020)

- **Upstream (USD 23 Bn):** launch services; satellite manufacturing
- **Midstream (USD 40 Bn):** ground infrastructure & operations; fleet ops
- **Downstream (USD 226 Bn):** consumer equipment, space services
- **Institutional budgets (USD 82 Bn):** research & science; space exploration; military; etc.

Source: PwC, 2020



USD 423.8 Bn
(2020)

- **Commercial revenues (USD 336.9 Bn):**
 - Space infrastructure (USD 119.2 Bn);
 - Space products & services (USD 217.7 Bn);
- **Governmental spending (USD 86.9 Bn).**

Source: Space Foundation, 2020



USD 366 Bn
(2019)

- **Satellite Services (USD 123 Bn):** telecommunications, remote sensing, science & national security;
- **Ground Equipment (USD 130.3 Bn):** network & consumer equipment;
- **Government Space Budgets & Commercial Human Spaceflight (USD 95 Bn):** non-satellite industry;
- **Satellite Manufacturing (USD 12.5 Bn);**
- **Launch Industry (USD 4.9 Bn).**

Source: Bryce, 2019



USD 298 Bn
(2019)

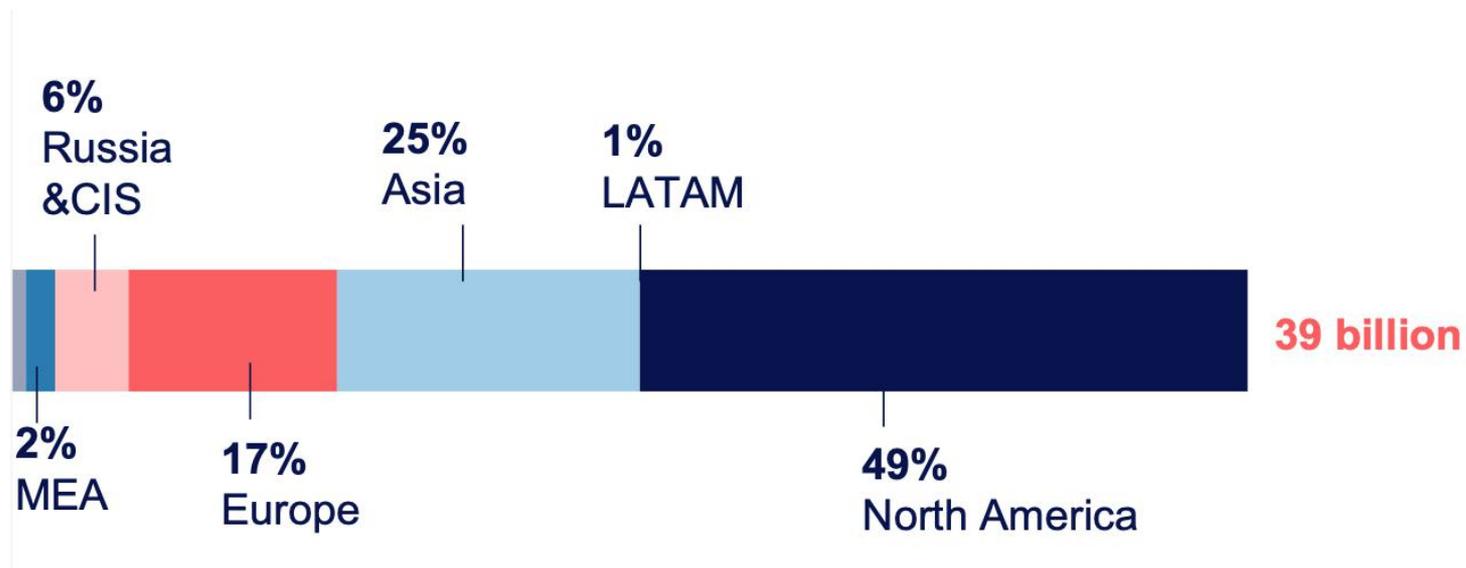
- This figure refers to **commercial satellites revenues only:**
- **Upstream (USD 8 Bn):** satellite manufacturing, satellites launch, ground equipment manufacturing;
 - **Downstream (USD 290 Bn):** satellite operation, services.

MARKET OVERVIEW | Upstream by regions

The key upstream players of the industry are in the North American, European and Asian regions. They are supported by domestic institutional demand and by mature national/regional commercial market.

2022 global space market by region - Upstream

In USD



LATAM: Latin American
MEA: Middle East and Africa

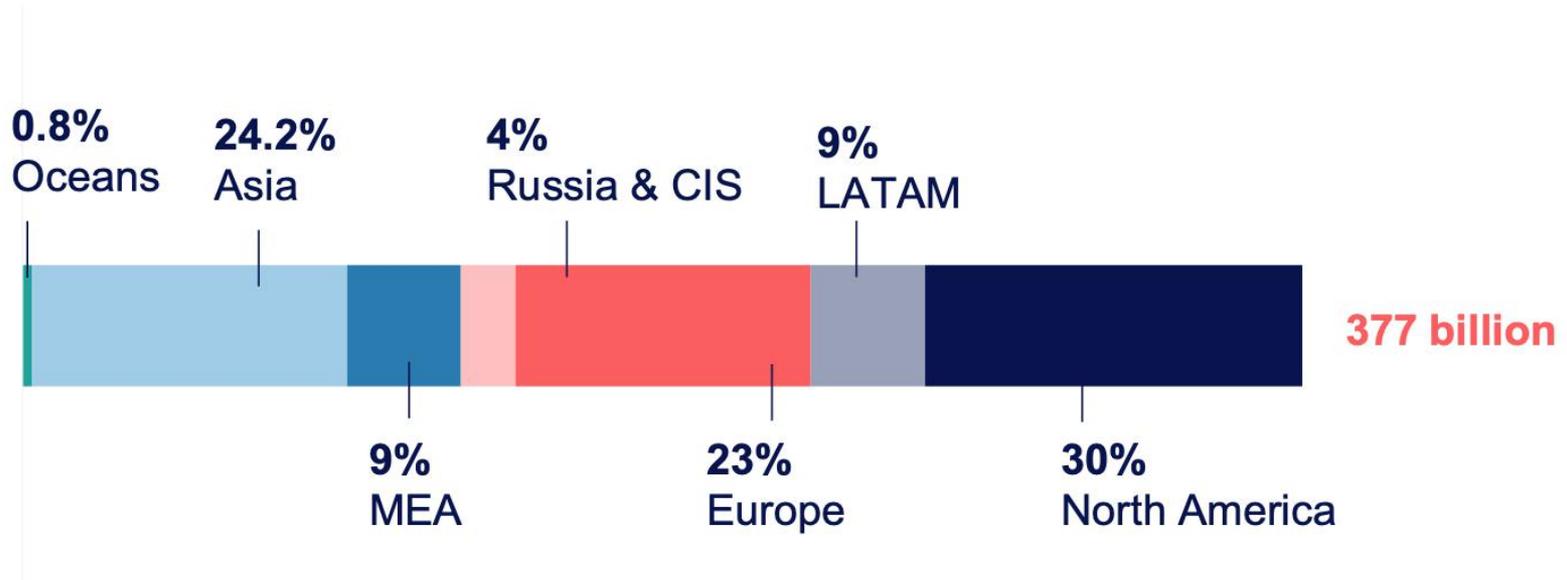
MARKET OVERVIEW | Downstream by regions

The downstream market is more equally distributed due to its “mass market” nature but does not require important upfront financial efforts and/or government contracts to be sustainable.

The downstream market’s growth is correlated with two major factors: demographic evolution and the regional standard of living evolution. Those two factors drive the need for connectivity and navigation services. The need for broadband connectivity is also driven by the ambition of the different governments to reduce the digital divide through development programs financing satellite connectivity.

2022 global space market by region - Downstream

In USD



**Space economy report, Euroconsult (2022)*

MARKET OVERVIEW | Upstream by client types

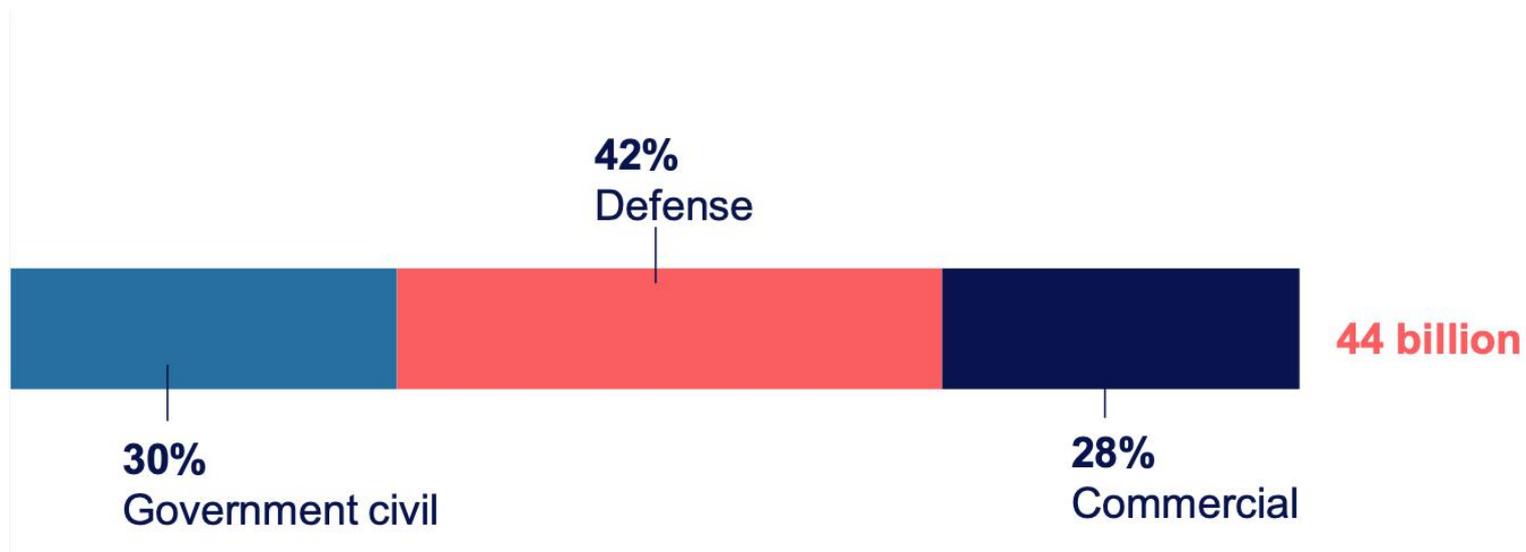
Commercial clients, influenced by constellation projects, represent high volume in the number of satellites but low price.

Civil government actors tend to favour their national industry whenever possible while focusing mostly on nonprofitable activities such as science, navigation and exploration.

Defense actors tend to represent a very low volume but with a high value. (Note that the defense segment is largely driven by the U.S. budget, which is used to develop state-of-the-art technologies and to ensure their leadership).

2022 global space market by client types - Upstream

In USD



MARKET OVERVIEW | Downstream by client types

The downstream industry has quite a different landscape, dominated by commercial activities.

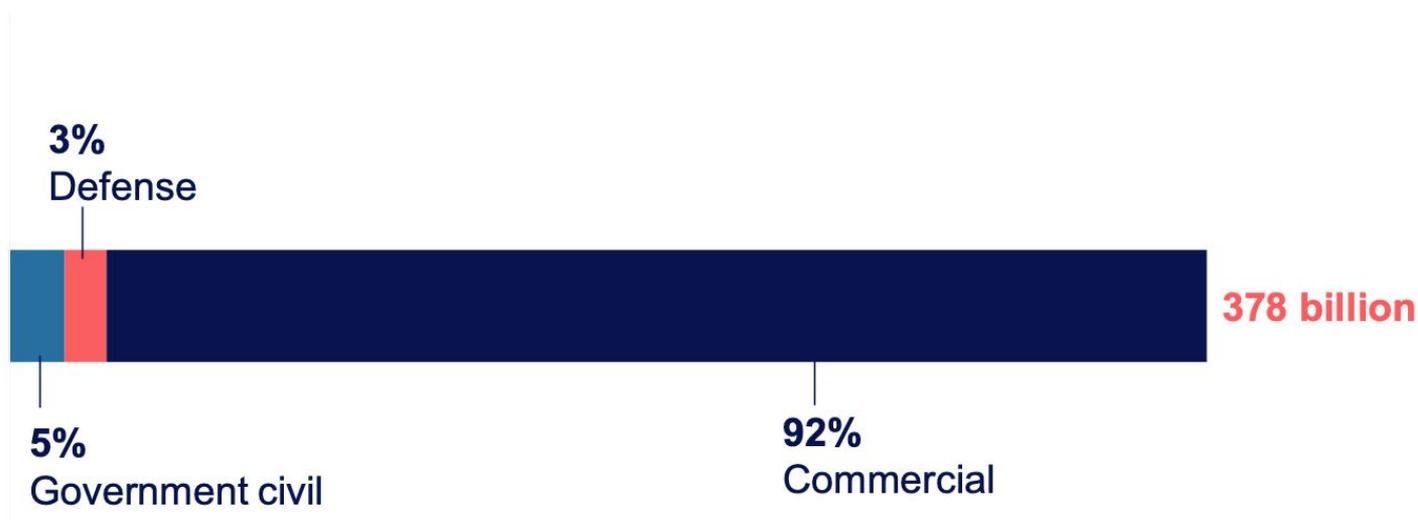
Private companies and private end users are the main customers of satellite signals, driven by the mass market nature of the B2C downstream satnav and satcom markets.

Defense actors tend to contract to the private sector-specific tasks, especially for satellite imagery.

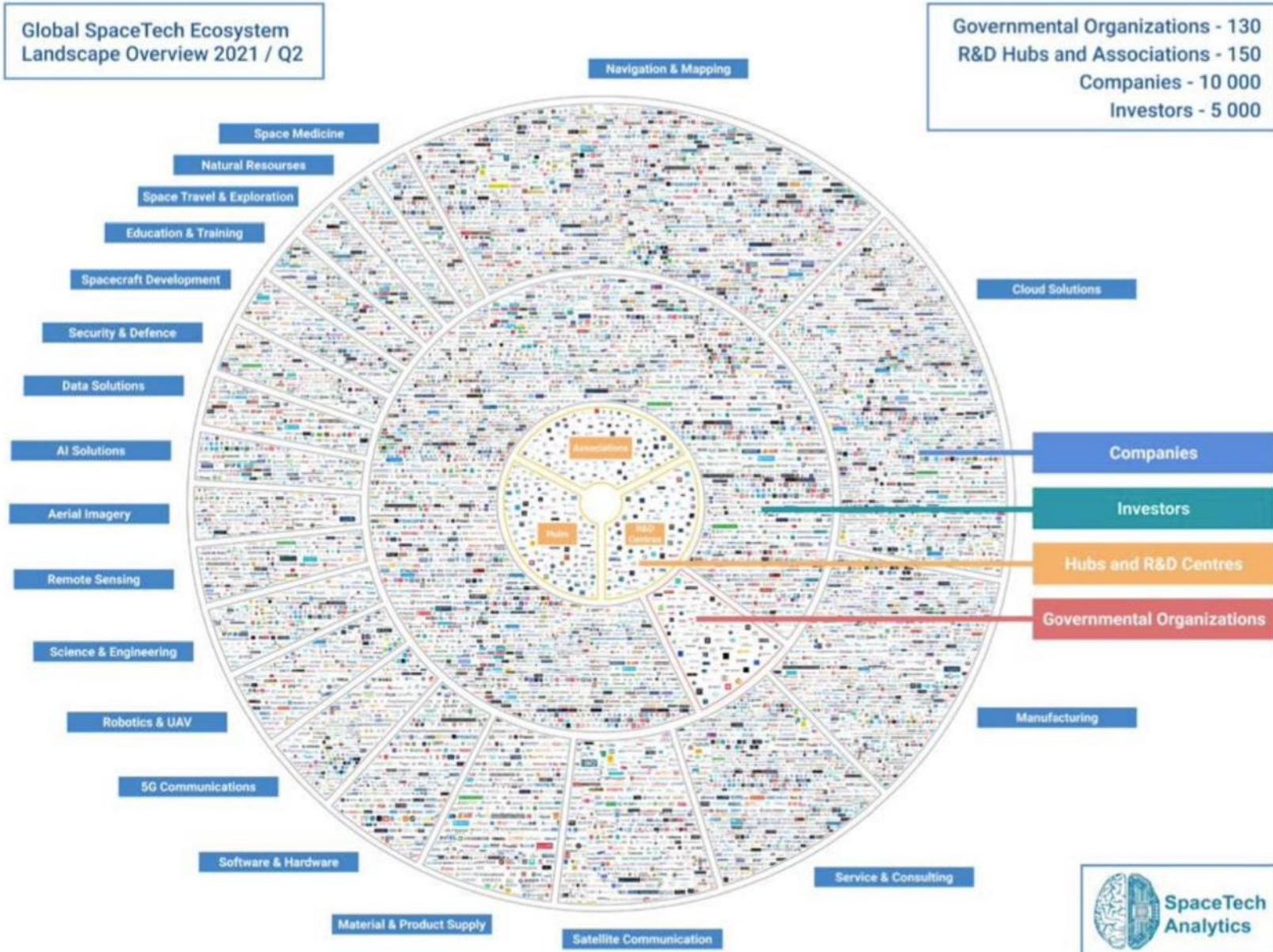
Civil government spending is driven by the ordering of satellite systems for Earth observation or security applications.

2022 global space market by client types - Downstream

In USD



MAIN GLOBAL PLAYERS



MARKET OVERVIEW | Entrepreneurial environment

- Growing number of new space-related startups in EU and US founded in the last 10Y and emergence of first specialised investment funds
- Initiatives at national and European level to sustain entrepreneurship
- Still limited development of the segment in EU:
 - Presence of **funding hurdles**
 - Upstream focused startups face **long development cycles**
 - Difficulties in the **integration in the space value chain** (certification and procurement models)
 - Lack of **follow-on finance** and few IPOs in the sector in EU can reduce exit expectations for early-stage investors

MARKET OVERVIEW | Entrepreneurial environment

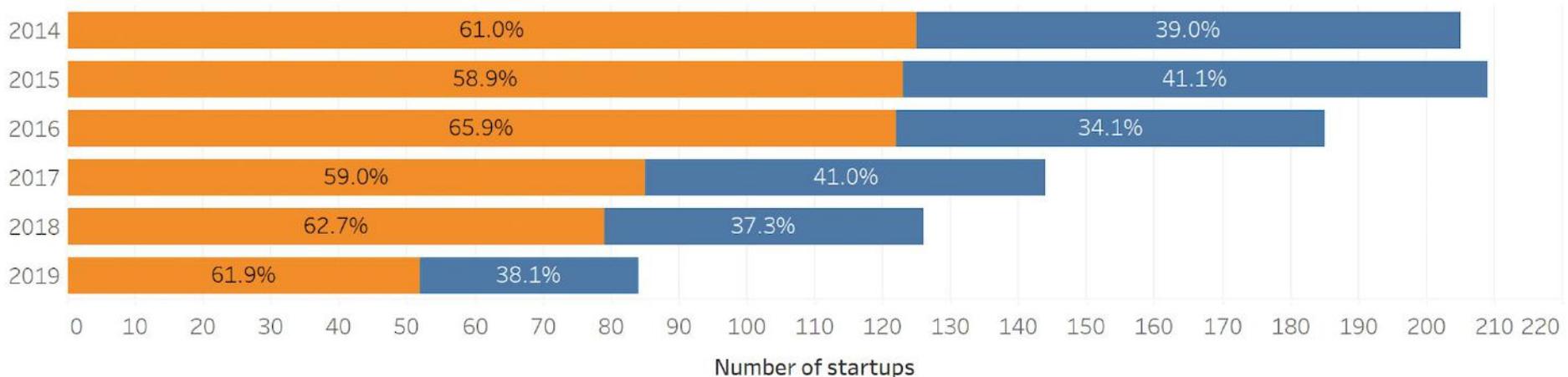
crunchbase pro

Analysis of data on Aerospace startups (products/services) **funded since year 2014 with HQ in Europe or US** and disclosed data on investment rounds

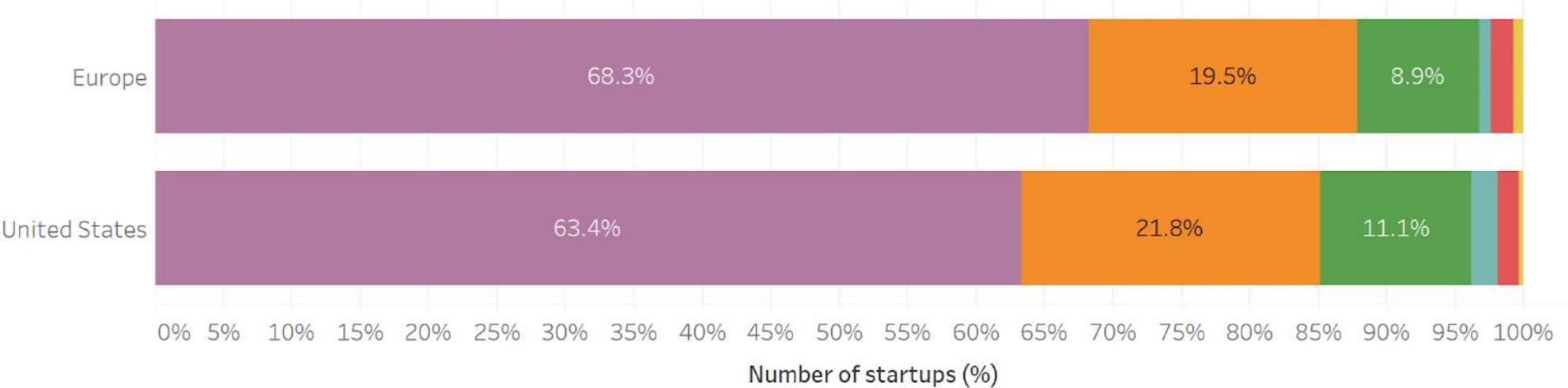
Geographical area

Europe

United States



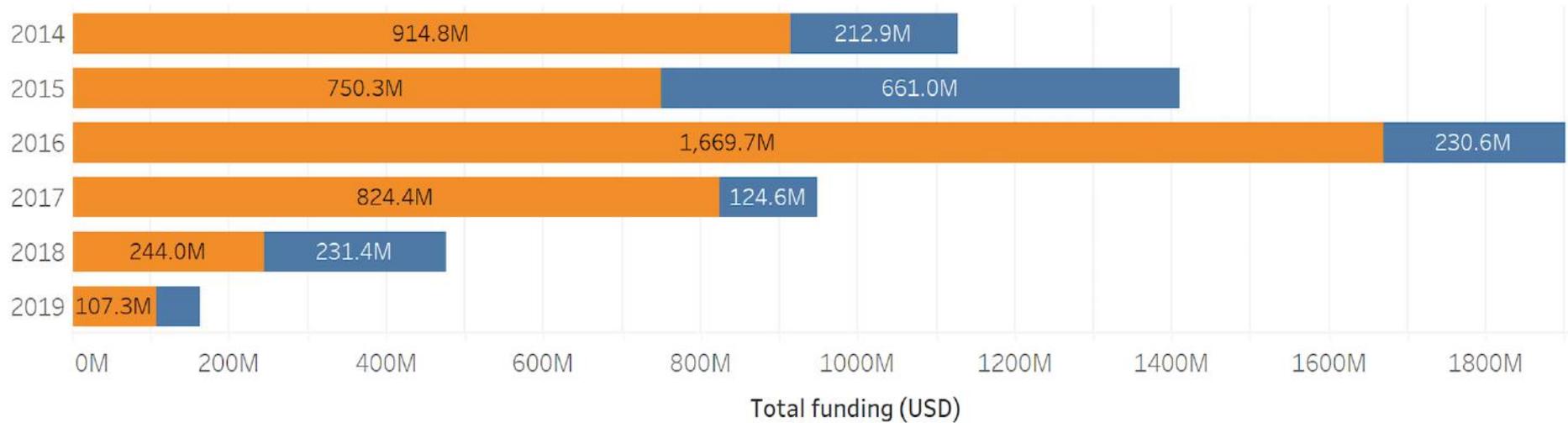
MARKET OVERVIEW | Entrepreneurial environment



Funding Status

- Private Equity
- IPO
- Late Stage Venture
- M&A
- Early Stage Venture
- Seed

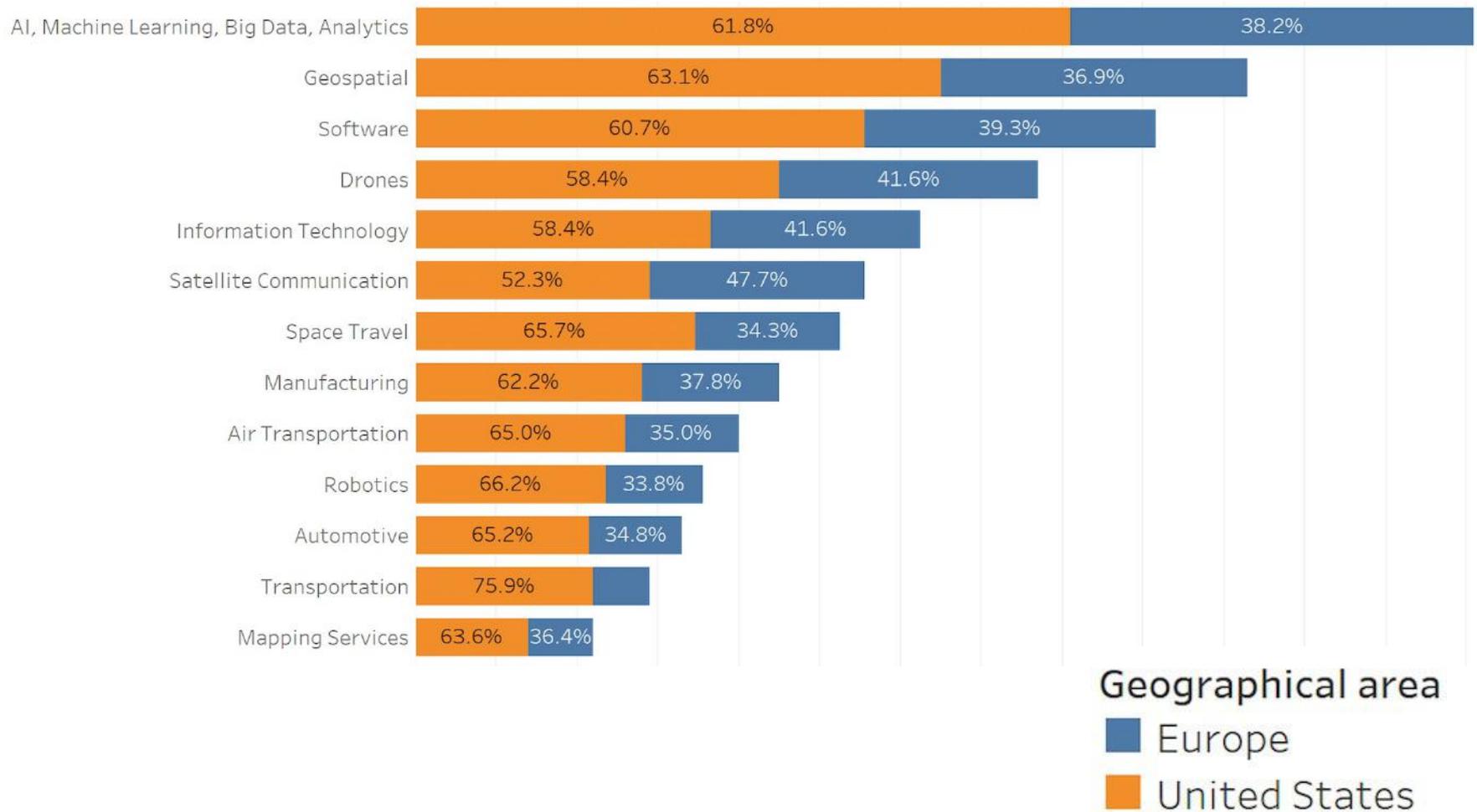
MARKET OVERVIEW | Entrepreneurial environment



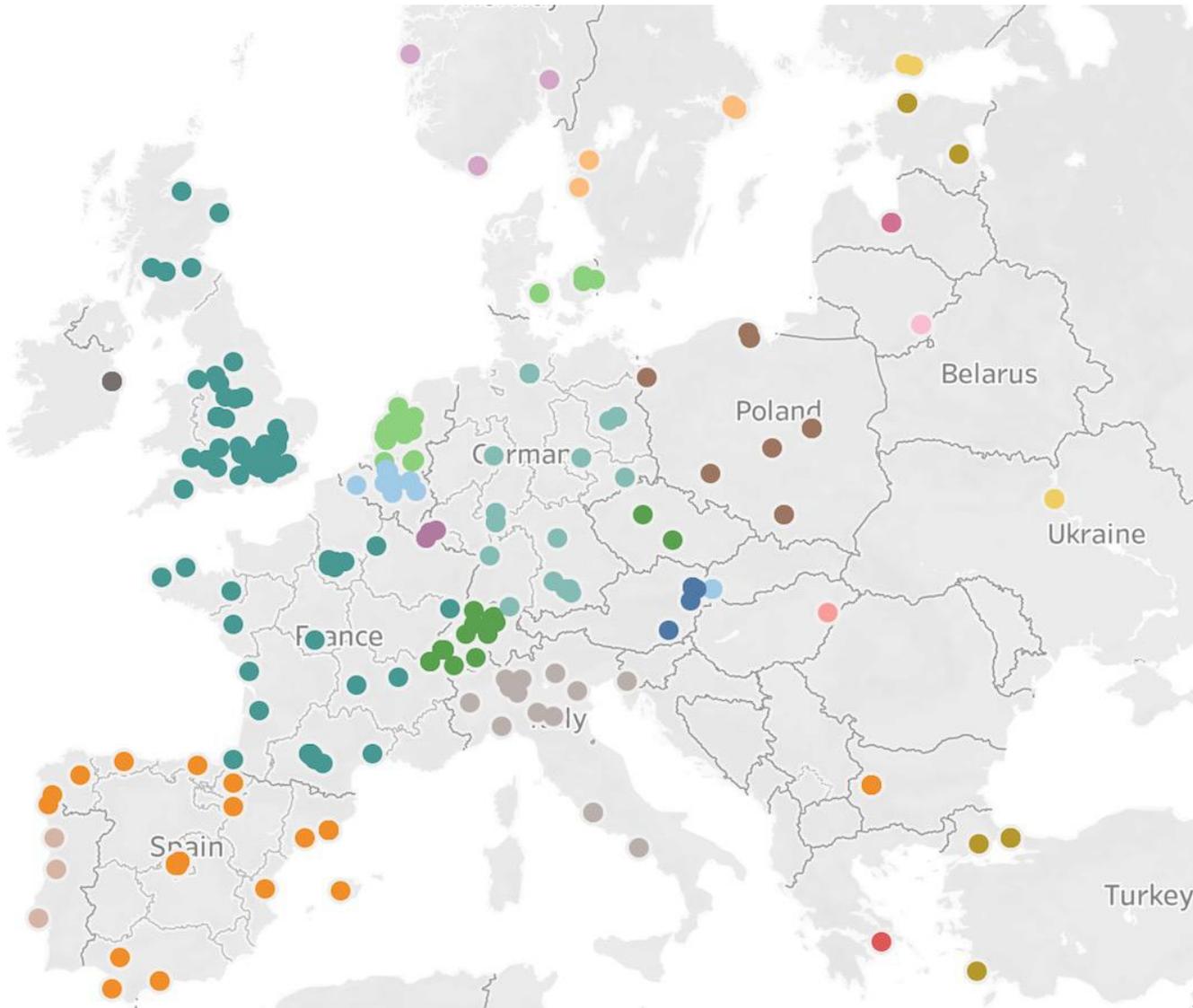
Geographical area

- Europe
- United States

MARKET OVERVIEW | Entrepreneurial environment



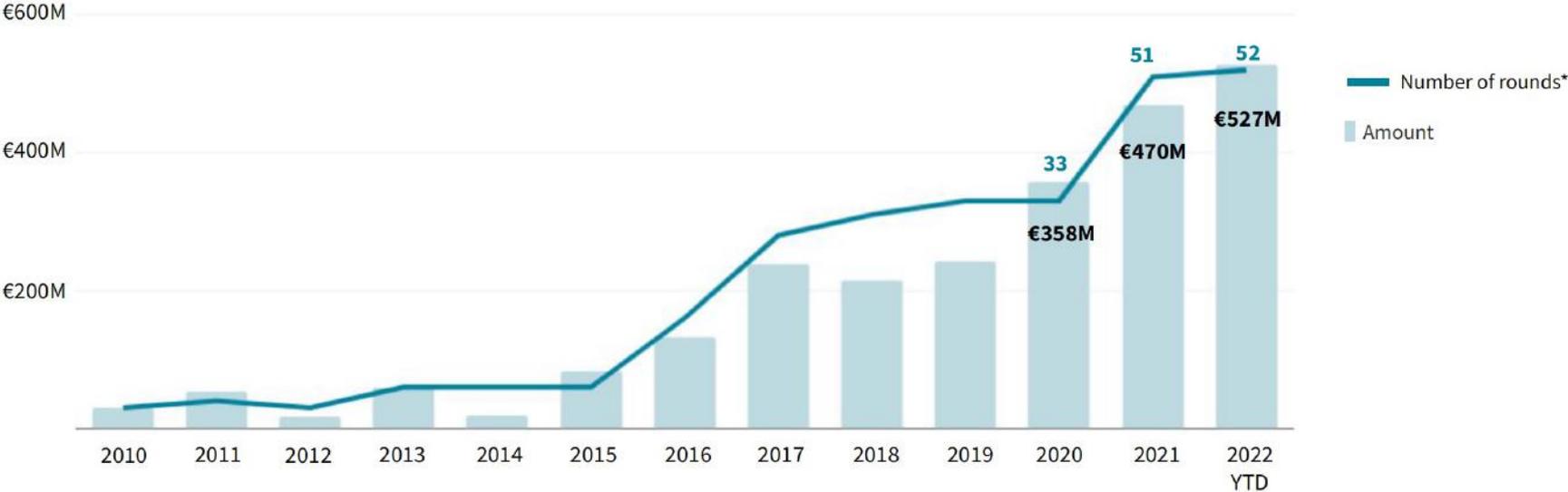
MARKET OVERVIEW | Entrepreneurial environment



- Overall comparable dynamics EU/US
- Reflection of strong tech capabilities in the EU system in aerospace
- Convergence of AI, ML and aerospace
- Issues on funding channels for growth in EU

MARKET OVERVIEW | European Entrepreneurial environment

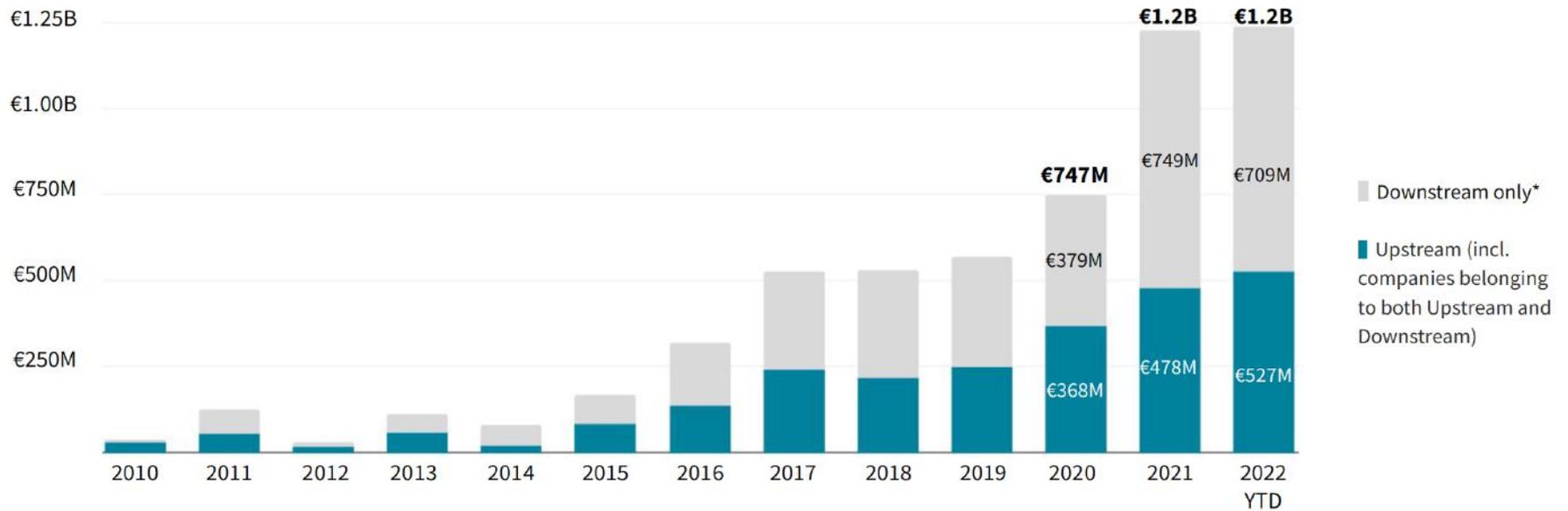
VC funding in European Upstream Space Tech startups & scaleups, excluding megarounds (€100M+)



MARKET OVERVIEW | European Entrepreneurial environment

VC funding in Space Tech startups & scaleups, excluding megarounds (€100M+)

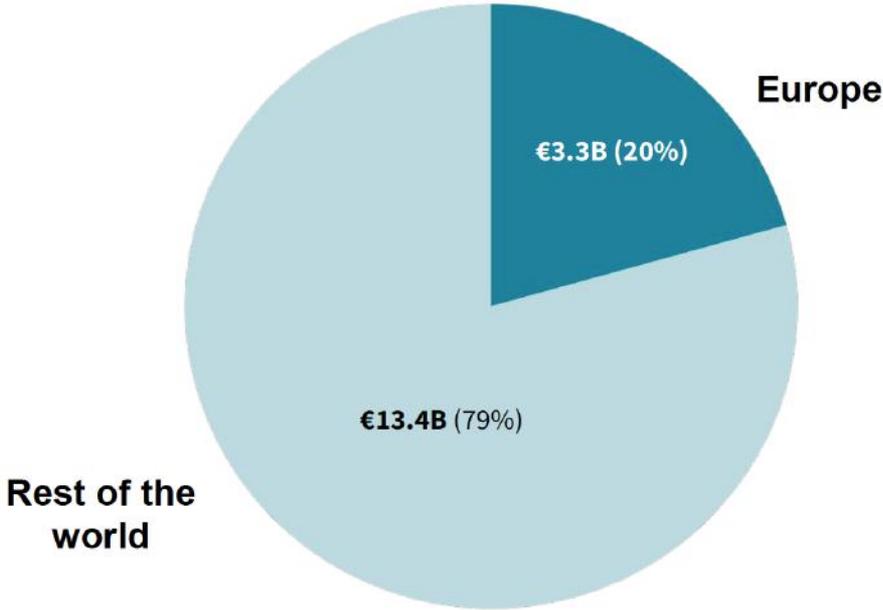
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MARKET OVERVIEW | European Entrepreneurial environment

Europe accounted for 20% of the global VC investment in Upstream Space Tech in 2020-2022.

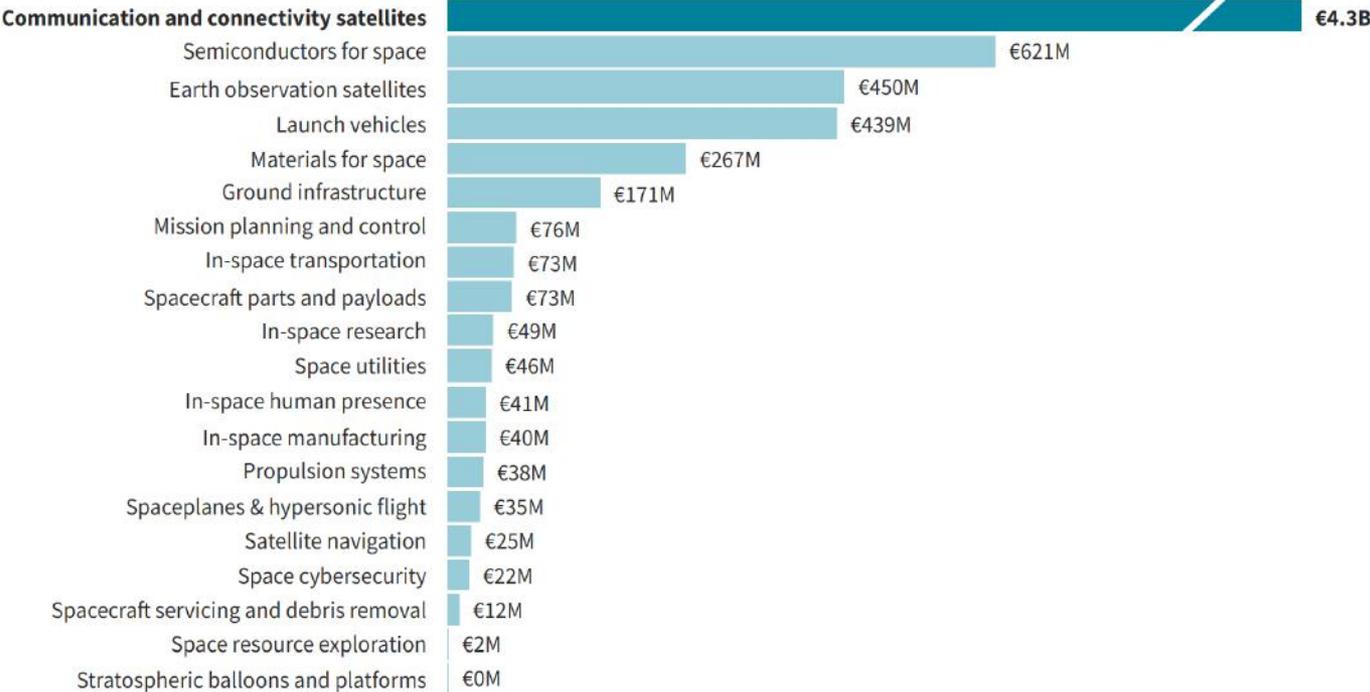
VC funding in Upstream Space Tech by startup HQ location (2020-2022), including megarounds (€100M+)



MARKET OVERVIEW | European Entrepreneurial environment

Communication and connectivity satellites have been the most funded segment in Upstream Space Tech in Europe, followed by Semiconductors for space.

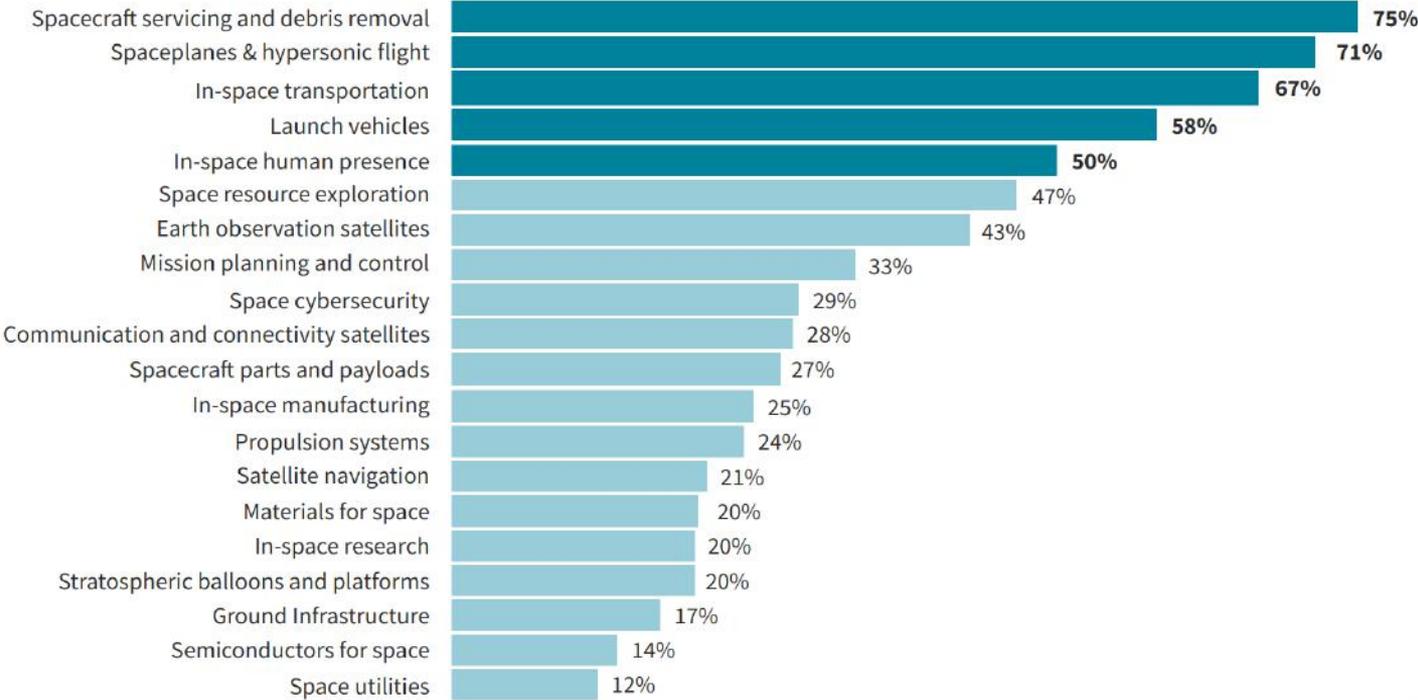
VC funding in Upstream Space Tech segments in Europe (2016-2022 YTD)



MARKET OVERVIEW | European Entrepreneurial environment

Spacecraft servicing and debris removal, spaceplanes & hypersonic flight, in-space transportation, launch vehicles and in-space human presence are emerging segments in Upstream Space Tech.

% of startups established after 2018 by Upstream Space Tech segment in Europe



MARKET OVERVIEW | European Entrepreneurial environment

Exits in European Space Tech are slowly ticking up in 2021-2022, with notable SPAC IPOs of Lilium and Arqit and acquisitions such as StormGeo and Deveryware.

Number of European Space Tech exits by type

[» view online](#)



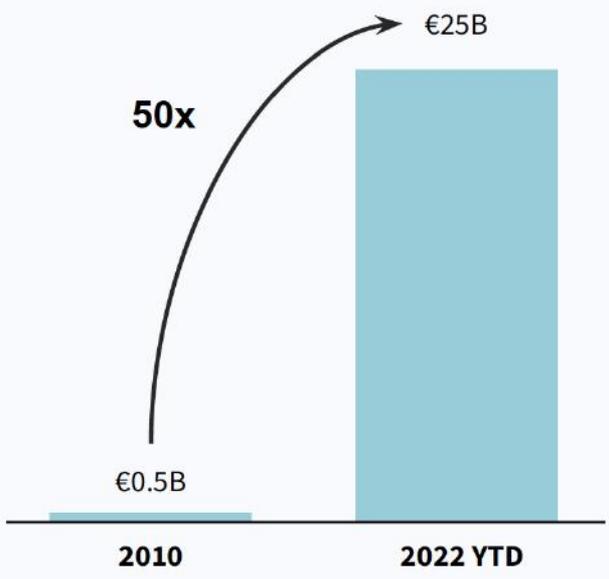
Largest exits in European Space Tech, Upstream and Downstream

<p>Downstream</p> <p>LILIUM</p> <p>Electric vertical takeoff and landing jet Germany €3.0B SPAC IPO, 2021</p>	<p>Upstream</p> <p>ARQIT</p> <p>Post quantum cryptography powered by satellites UK €1.3B SPAC IPO, 2021</p>	<p>Upstream & Downstream</p> <p>OneWeb</p> <p>Low Earth orbit satellite communications UK €909M Acquisition, 2020*</p>
<p>Downstream</p> <p>OCTO</p> <p>Telematics and data analytics for insurance Italy €405M Acquisition, 2014</p>	<p>Downstream</p> <p>StormGeo</p> <p>Weather intelligence and data science solutions Norway €396M Acquisition, 2021</p>	<p>Downstream</p> <p>SEQUANS</p> <p>5G/4G cellular IoT connectivity solutions France €314M IPO, 2011</p>
<p>Downstream</p> <p>DEVERYWARE</p> <p>Investigation technologies enabling global security France €100M Acquisition, 2022</p>	<p>Upstream (*)</p> <p>HUBS</p> <p>On-demand manufacturing platform Netherlands €255M Acquisition, 2021</p>	<p>Upstream (*)</p> <p>IDQ</p> <p>Quantum-safe security and quantum sensing Switzerland €59M Acquisition, 2018</p>

MARKET OVERVIEW | European Entrepreneurial environment

Meanwhile, the combined enterprise value of privately owned Space Tech startups in Europe has grown to €25 billion, up 50x from 2010.

Combined enterprise value of privately owned Space Tech companies in Europe



Most valuable private European Space Tech startups & scaleups

Upstream & Downstream (*) OneWeb Low Earth orbit satellite communications UK Valuation: €3.1B	Upstream & Downstream ICEYE Earth observation satellite operator Finland Valuation: €495–742M	Downstream KINEXON Sensor networks and edge computing solutions Germany Valuation: €473–709M
Downstream TRUPHONE IoT connectivity platform UK Valuation: €469M	Upstream Isar aerospace Next generation sustainable launch vehicles Germany Valuation: €455M	Downstream DESCARTES Parametric insurance using satellite imagery France Valuation: €436–655M
Downstream OCTO Telematics and data analytics for insurance Italy Valuation: €405M	Upstream & Downstream kinéis IoT connectivity technology France Valuation: €400-600M	Downstream what3words Geolocation solution provider UK Valuation: €320-480M

MARKET OVERVIEW | European Entrepreneurial environment

Investors in European space tech

Preferred round	Core space tech investors	VCs active in space tech, bot Downstream and Upstream
Series B+		
Series A		
Seed		
Pre-Seed (accelerators & incubators)		

MARKET OVERVIEW | European Entrepreneurial environment

UK, France, Germany and Finland are the key hubs for Upstream Space Tech in Europe.

The UK boasts the most valuable Upstream space tech startup ecosystem. Its biggest player - OneWeb - with its €3.1B valuation, takes up nearly 60% of the entire ecosystem value.

Excluding OneWeb, UK runs 4th after France, Germany and Finland by the total amount raised in 2021-2022 YTD.

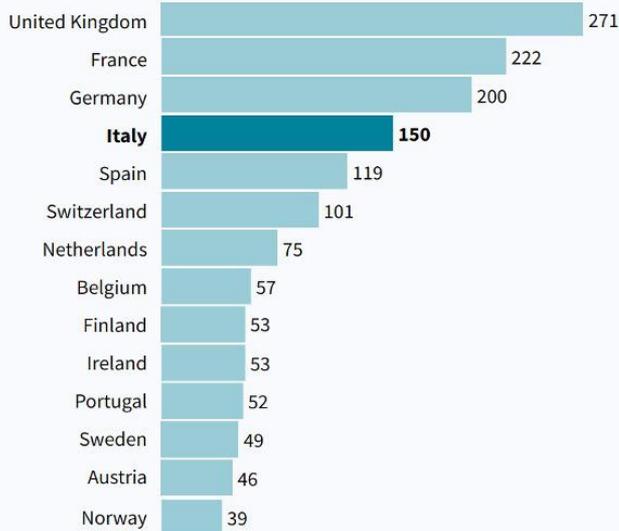
Among the biggest space tech ecosystems, UK and Finland have the highest % of VC funding going to Upstream Space Tech.

	Combined EV of privately owned Upstream space tech startups & scaleups	Amount invested in Upstream space tech; 2021-2022 YTD	Amount invested in Upstream space tech as % of all VC; 2021-2022 YTD
United Kingdom	OneWeb (€3.1B) €5.3B	OneWeb (€1.9B) €2.0B	3%
France	€1.7B	€181M	<1%
Germany	€995M	€170M	<1%
Finland	€885M	€170M	5%
Switzerland	€866M	€70M	<1%
Netherlands	€585M	€42M	<1%
Ireland	€471M	€15M	<1%
Spain	€383M	€80M	1%
Belgium	€284M	€42M	2%
Italy	€253M	€28M	<1%
Austria	€225M	€0M	0%
Poland	€172M	€31M	4%
Denmark	€94M	14M	<1%
Luxembourg	€88M	€13M	3%
Sweden	€78M	€12M	<1%
Portugal	€62M	€6M	<1%
Bulgaria	€60M	€10M	10%
Estonia	€48M	€8M	<1%
Norway	€13M	<€1M	<1%
Czech Republic	<€1M	€0M	0%

MARKET OVERVIEW | European Entrepreneurial environment

Italy ranks 4th in Europe by number of Space Tech startups ...

Number of Space Tech startups by startup HQ, founded after 2000



... but only 11th by VC funding in Space Tech startups.

VC funding in Space Tech startups by startup HQ 2016-2022 YTD

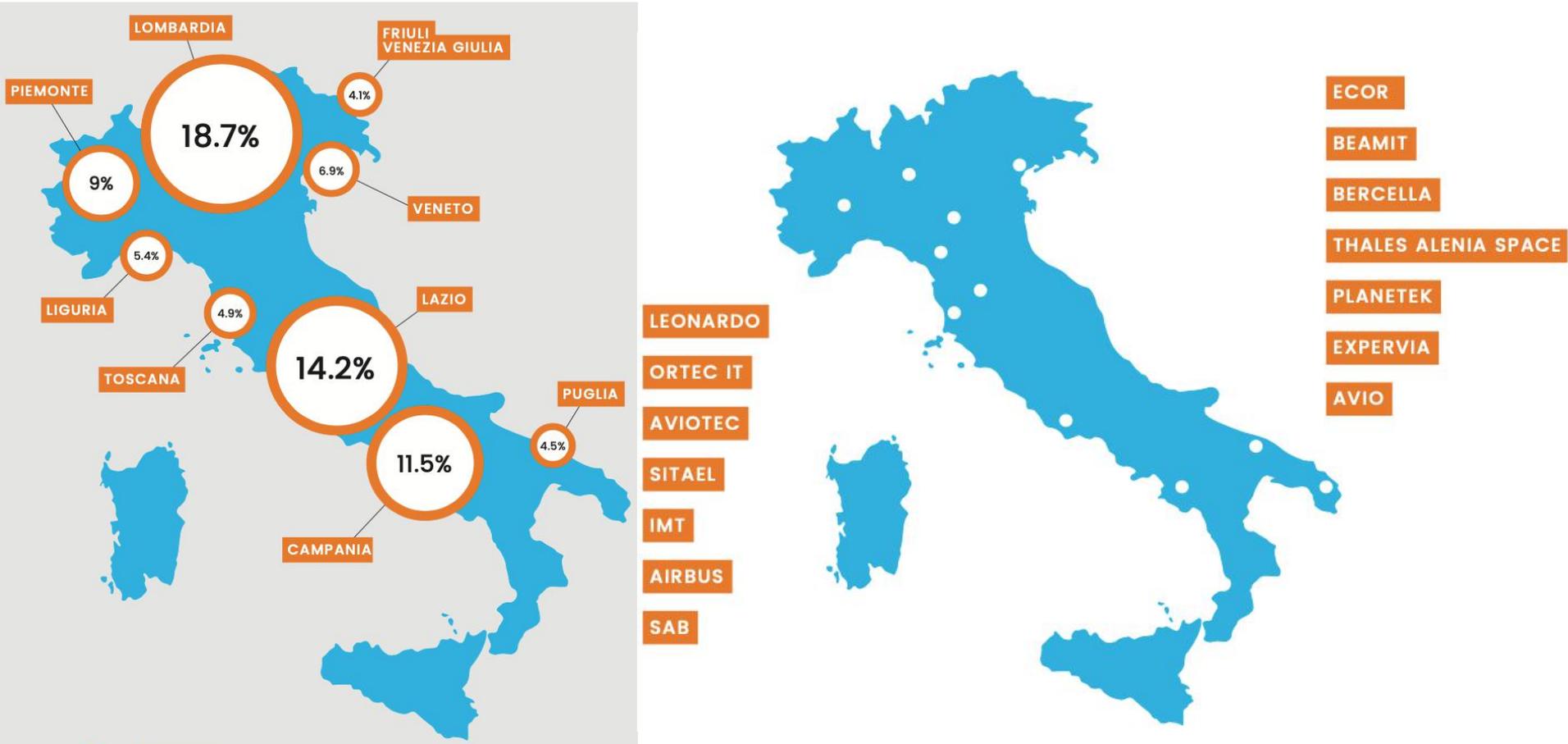


ITALIAN SPACE INDUSTRY



MARKET OVERVIEW | Italian Entrepreneurial environment

Main Italian aerospace companies



*Spacetechn, Intesa Sanpaolo Innovation Centre (2022)

MARKET OVERVIEW | Italian Entrepreneurial environment

Earth observation	APPLICATION DOMAINS
Satellite navigation	
Telecommunication	
Space transportation, launch and re-entry services	
Human spaceflight and microgravity (incl. International space station, cis-lunar gateway, etc.)	
Integrated applications, security services and others (incl. IoT, cybersecurity)	
Observing the universe, science and robotic exploration	
Space situational awareness and in orbit servicing (incl. Debris, near earth objects, space weather)	
Materials, structures, thermo-mechanical, mechanisms and others (e.G. Additive manufacturing)	

Electronics, photonics, optics, integrated sensors and cryogenic components (incl. Quantum technologies)	ENABLING TECHNOLOGIES
Software, data management and signal processing (incl. Big data and AI)	
Technologies for space transportation	

MARKET OVERVIEW | Italian Entrepreneurial environment

- 9** Application domains and enabling technologies
- 23** Italian Aerospace clusters
- 27** Start-ups
- 81** Small and medium enterprises
- 305** Large companies



OUR PRODUCTS

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cloudy_CHARLES ☰

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speedy_SKYLAR ✨

Delay Tolerant Networks for your constellation mission

[Discover more](#)

INFINITE WAYS TO AUTONOMY

CHANGE HOW YOU INTERACT WITH SPACE. PIONEERING AI SOLUTIONS FOR THE SPACE INDUSTRY.

MARKET OVERVIEW | Start-ups AIKO

Company profile

AIKO S.r.l. is an innovative deep-tech company with a unique mission: “Introducing Artificial Intelligence to space, to catalyze the evolution of space systems towards smarter, more autonomous and more efficient satellites” AIKO is a deep tech company, delivering state of the art Artificial Intelligence solutions for flight and ground software with the goal of enabling autonomous space missions. AIKO has active contracts, collaborations and partnerships with many european institutions and companies, including European Space Agency and the European Commission.

AIKO has been the first European company to publicly announce the in-orbit demonstration of Deep Learning algorithms, in October 2019.

Founded in 2017 in Torino and registered in the list of innovative Italian companies, since May 2017 is incubated in I3P (www.i3p.it), one of the most important public incubators in the world (15th worldwide in 2014, 1st worldwide in 2019). AIKO business focuses on the development of Artificial Intelligence software for space applications, targeting automation of operations, support to operators and advanced mission autonomy. Key areas of expertise are Machine and Deep Learning, Knowledge-Based Systems and embedded software design applied to space missions, in the domains of autonomous decision-making, payload data information extraction, failure detection, and mission replanning. AIKO is composed of a team of highly skilled researchers and engineers, boasting years of experience in space programs, including two small satellites launched and operated, publications on international journals and congresses and collaborations with some of the most prominent research institutes, such as ESA, NASA JPL, and MIT. Since June 2018, AIKO is part of the NVIDIA Inception Program, a program reserved for startups that have Artificial Intelligence as the core competence and focus. The program nurtures dedicated and exceptional startups who are revolutionizing industries with advances in AI and data science. AIKO has secured both private and public funding, including investment from VC involved in the field of Artificial Intelligence.



Contact

Business Name

AIKO srl

Data di costituzione

2017

Head quarters

Corso Castelfidardo, 30/A

Turin

TO | 10129

MARKET OVERVIEW | Start-ups AIKO

Products | Services | Applications | Technologies

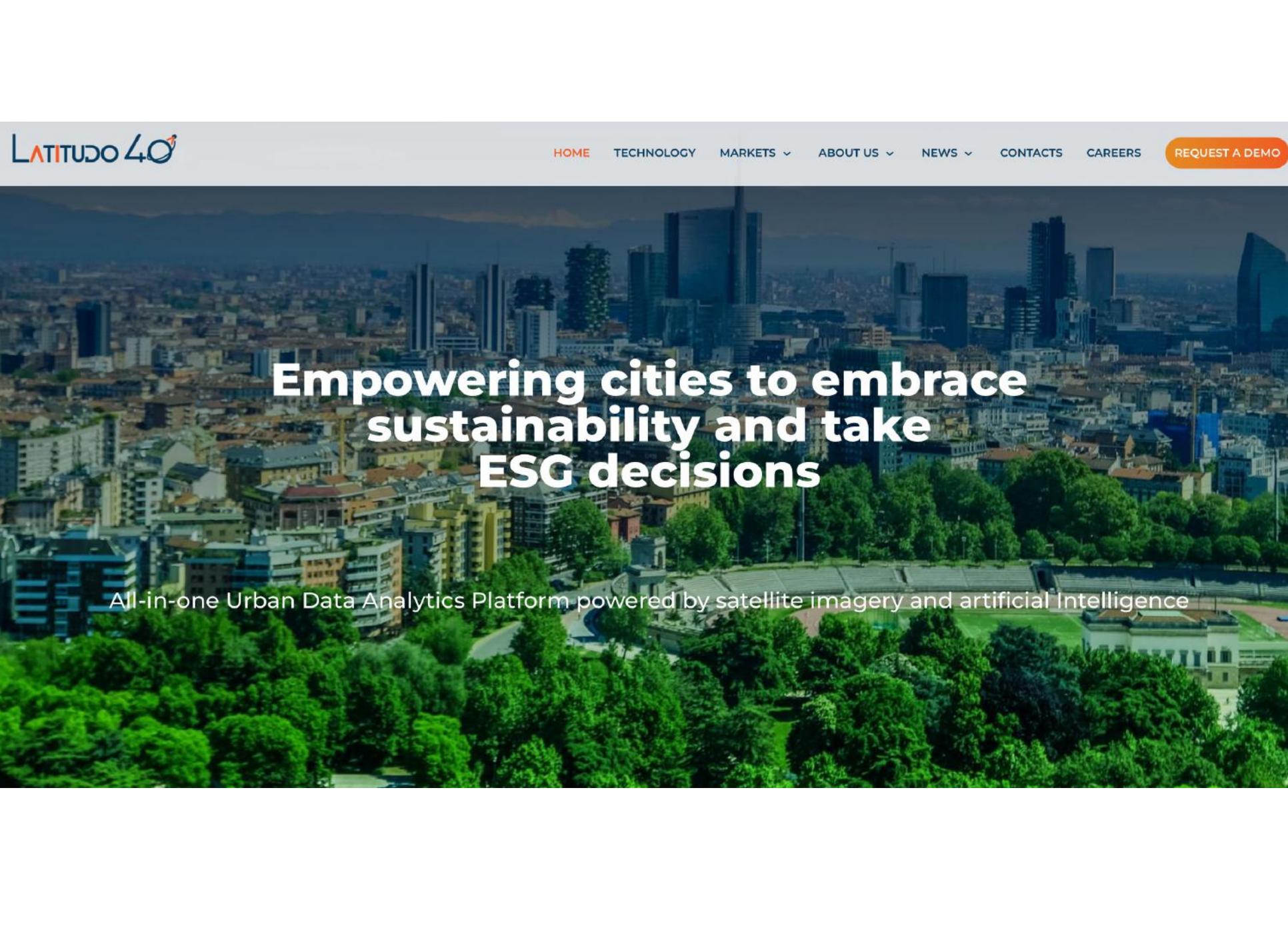
AIKO provides state of the art technology and expertise in four distinct domains related to the design and development of Artificial Intelligence for space missions:

State of the art AI-enabled automation: AIKO main product, MiRAGE (Mission Replanning through Autonomous Goal generation) is an AI-based ground and flight software designed to enhance the autonomy level of a spacecraft. MiRAGE is currently at TRL6, and features several AI technologies interacting, such as Deep Learning and Knowledge-Based Systems. The technology enables state of the art functionalities in mission operations automation, such as goal generation and management, event and failure detection including prediction, and mission re-planning, performed by analyzing on-board telemetry and payload data and generating an operations schedule that adapts to the events monitored. MiRAGE enables E4 mission autonomy on spacecraft.

Deep Learning and AI on the edge: AIKO unique expertise involves developing and deploying state of art AI to edge devices, including recent releases of AI accelerators. Among the applications developed by AIKO, and compatible with integration on onboard computing platforms, there are: cloud detection and segmentation, terrain and urban detection and segmentation, ship detection, predictive maintenance and failure prediction, attitude and position estimators for Rendez-Vous manoeuvres, and more.

Complex automation algorithms: autonomous decision-making algorithms, advanced planning, goal reasoning and goal management. AIKO develops algorithms that enable spacecraft coordination, cooperations and interaction.

AI for safety-critical applications: in addition to the expertise in quickly and reliably integrating state of art technologies upstream, AIKO expertise is growing in the field of verification and validation of AI for safety-critical applications, both in the field of supervised AI and in the field of robust and explainable AI.

An aerial photograph of a city, likely Madrid, showing a dense urban landscape with a mix of modern glass skyscrapers and older buildings. In the foreground, there is a large, lush green park with many trees and a large stadium-like structure. The sky is clear and blue.

Empowering cities to embrace sustainability and take ESG decisions

All-in-one Urban Data Analytics Platform powered by satellite imagery and artificial Intelligence

MARKET OVERVIEW | Start-ups LATITUDO40

Company profile

Latitudo 40 has created the easiest and fastest platform to turn satellite imagery into geospatial information to support everyday decisions.

Products | Services | Applications | Technologies

We have integrated in a single platform all the technologies necessary to create, manage and use applications of spatial geoanalysis. EarthAlytics automates the entire workflow, from the automatic selection of data sources, based on the final application, to the analysis with automatic processing blocks based on artificial intelligence, up to the representation on an internal GIS and with intuitive information dashboards.



Contact

Business Name

Latitudo40 srl

Data di costituzione

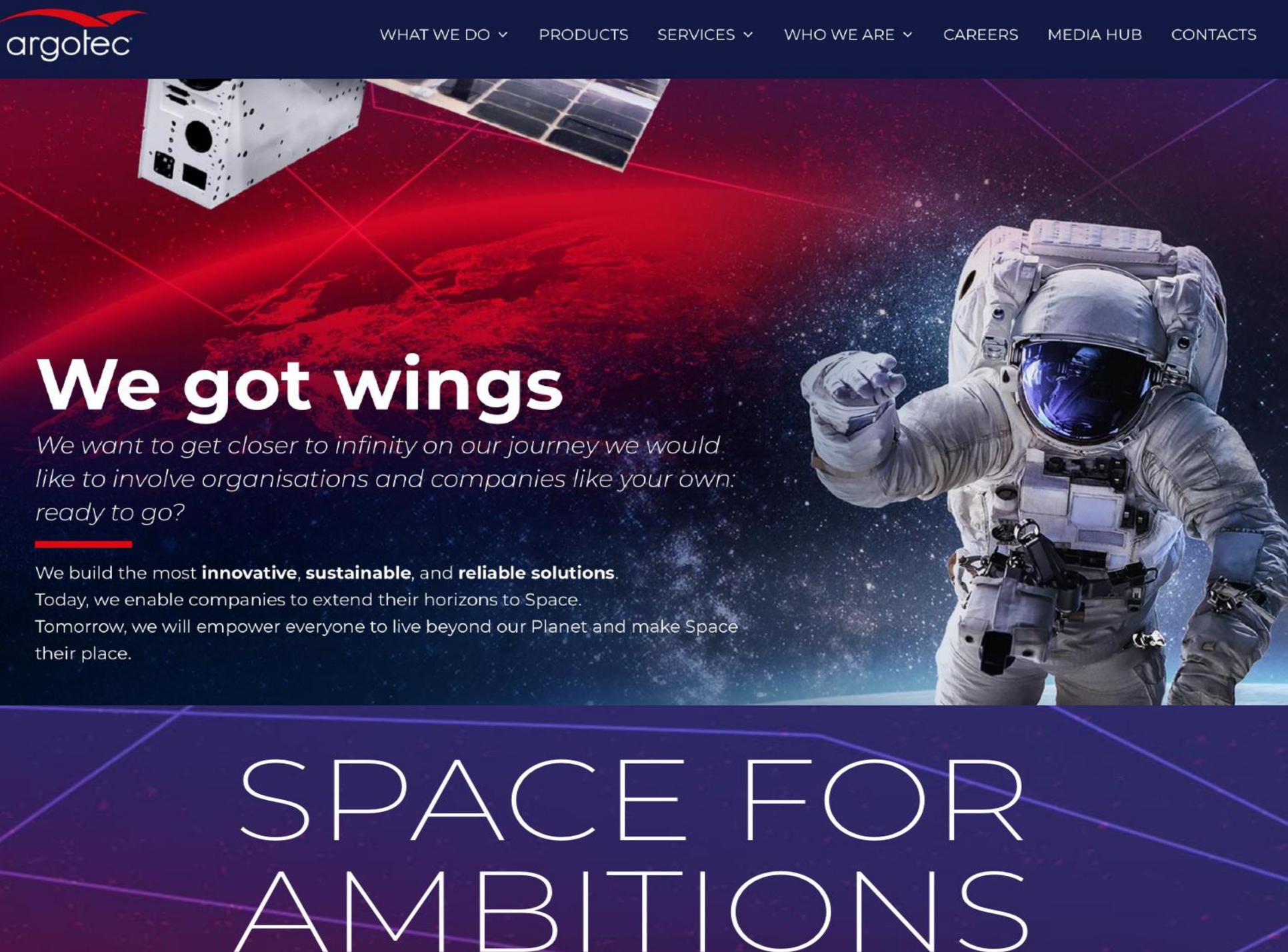
2017

Head quarters

Via Gianturco, 31/C

Naples

NA | 80138



We got wings

We want to get closer to infinity on our journey we would like to involve organisations and companies like your own: ready to go?

We build the most **innovative, sustainable, and reliable solutions**.

Today, we enable companies to extend their horizons to Space.

Tomorrow, we will empower everyone to live beyond our Planet and make Space their place.

SPACE FOR AMBITIONS

MARKET OVERVIEW | SMEs ARGOTEC

Company profile

Argotec is an aerospace engineering company founded in 2008 in which research, innovation, and development involve various fields with a focus on small satellite platforms and human space flight. The first one regards the development of microsatellites able to work in deep space supporting both robotic exploration and inter-planetary telecommunications; in this area, intense research and development activities are oriented to design compact and reliable technological solutions including the usage of Artificial Intelligence for autonomous operations. The second direction includes the development of technological solutions in order to improve and to support the life and the comfort of future space explorers.

Argotec is a UNI EN 9100:2018 and UNI ISO EN 9001:2015 certified company, and it is compliant with the ECSS and NASA standards framework. Moreover, the company has the experience, the tools and the laboratories needed to perform in-house all of the activities required for the design, integration and testing of space systems (e.g. a Clean Room that guarantees cleanliness standard at an ISO 5 level, a Thermal Vacuum chamber, etc).

Since the beginning, the company has always collaborated with the main international space agencies such as the Italian Space Agency (ASI), the European Space Agency (ESA) and NASA. It had promoted the development of innovative technologies which involved universities, research centres and other companies with skills and different backgrounds. This has been substantially translated into partnerships with companies coming from fields other than aerospace. It allowed the realization of innovative systems in order to obtain several patents and international awards.



Contact

Business Name

Argotec srl

Head quarters

Via Cervino, 52

Turin

TO | 10155

MARKET OVERVIEW | SMEs ARGOTEC

Products | Services | Applications | Technologies

Argotec's activities follow the full in-house concept that includes design & development, integration, qualification and operations services. The company is equipped with electronic, thermal and mechanical laboratories, two Mission Control Centres (one of which connected to NASA DSN), a Thermal Vacuum Chamber and a Clean Room that guarantees cleanliness standards according to an ISO 5 level. Argotec makes available the company's facilities to other companies as well as universities and research institutions that are interested in integration activities requiring high levels of quality and environmental monitoring.

Argotec has the internal expertise to develop microsatellite platforms from the concept to the design, assembly, integration, testing and in-orbit operations. These platforms are designed to operate in Deep Space for Exploration Missions and as part of Telecom constellations: they are equipped with highly reliable and rad-hard electronic components while they guarantee large room for payload allocation (2U for the 6U version and >4U for the 12U version) and an integrated propulsion system. Argotec is also working on advanced algorithms based on Artificial Intelligence to increase the capabilities of the platform during on-orbit autonomous navigation. This feature helps the satellites to handle off-nominal events by executing a series of complex tasks without the involvement of the Ground Segment.

Argotec's Avionics Unit designs and tests space-capable electronic systems. It operates at every level of the development process; its heritage spreads from LEO applications flown on the ISS to systems designed for deep-space. Usually, both hardware and software are designed internally by our team aiming for optimal implementation. As for the hardware side, the core products include Power Conversion and Distribution Units, On-Board Computers and deep-space transponders. From the software perspective, the Unit works on FPGA, Robust IP Cores, whole On-Board Software solution and AI-based control algorithms.

Argotec develops and supports the development of payloads for human space flight and space exploration. The company deals with the following HW and SW payload activities: design, development, assembly, integration, testing, on-orbit operations, logistic and safety support. Argotec has recently awarded a 3-year service contract (UTISS) to support the Italian Space Agency to fly payloads on-board the ISS. In the frame of this contract, Argotec is in charge of supporting the management of the Italian ISS resources, interfacing the experiments Principal Investigators and Payload Developers and overseeing the safety evaluation of all Italian payloads. Furthermore, Argotec coordinates the technical team supporting the payload development and supports the payload manifesting process and qualification process leading towards a safe and efficient delivery, utilization and recovery of the payload.



Nanoracks is using space to improve life on Earth

Our history at Nanoracks is in providing commercial access to space for [small research payloads](#). Our future is in owning and operating private [space stations](#) and [platforms](#). As Nanoracks continues to always meet our growing customer needs in orbit, we're also leaping into new territory that will allow us to use our unique access to space to mitigate space debris and bring tangible changes to life on Earth, from [water scarcity](#) to [climate change](#).

[OUR VISION >](#)

MARKET OVERVIEW | SMEs NANORACKS

Company profile

Nanoracks Space Outpost Europe srl is an Italian company based in Turin, Italy. The company is part of XO Markets Holdings Inc., the world's first commercial space company, encompassing Nanoracks LLC, DreamUp, Nanoracks Space Outpost Europe (Nanoracks-Italy), and Nanoracks UAE.

Nanoracks is internationally known as the single largest commercial user of the International Space Station, having successfully launched into space over 1000 payloads for customers in over 30 countries and generating revenues in excess of \$50 million since its establishment.

Nanoracks is the world leader concerning space accessibility, mainly thanks to the Space Act Agreements stipulated with NASA for use of the ISS. In addition, the company is active in India and China, and is currently involved in the early phases of the new moon initiatives. Furthermore, the company is heavily interested in emerging non-ISS platforms, e.g. free-fly capabilities.

Nanoracks is already an affirmed reality capable of creating space research hardware at efficient price points and, thanks to the accrued experience and leadership acquired over the years, is currently pursuing the goal of becoming the market leader in utilization of the space environment for enabling groundbreaking research in the fields of life sciences, biopharma, and agriculture.

Overall, Nanoracks is poised for a period of rapid growth due to several factors, namely:

- The continuation of the ISS for another decade, allowing for better leverage of the over \$40 million in assets already invested in the ISS as of today.
- The company's growing international reputation and space value chain footprint, further corroborated by the new investments from Voyager Space Holdings Inc., makes so that Nanoracks is uniquely positioned to take advantage of the explosive growth happening throughout the space sector.

In the future, Nanoracks is looking to expand its business activities by working closely with the existing realities present in the territories of their three main hubs (Italy, the US, and the UAE) partnering with them to translate their products and services to the space sector.



Contact

Business Name

Nanoracks Space Outpost Europe srl

Head quarters

Via Ettore de Sonnaz, 19

Turin

TO | 10121

MARKET OVERVIEW | SMEs NANORACKS

Products | Services | Applications | Technologies

Nanoracks can offer affordable and prompt space access services to everyone. Its target market customers are Education entities (e. g. school, universities, etc.), the Science Community and both Space and non-Space

technology developers. The main services offered are:

- Satellite deployment, ranging from 1U CubeSat to MicroSat, to LEO;
- Science & Technology Payloads to be installed on internal and external platforms, e. g. sub-orbital crafts, ISS, LEO and beyond;
- Educational programs concerning space-related fields.

The Nanoracks facilities in Space are:

- LEO ISS - Internal Payloads: NanoLabs, Nanoracks Frame-3, and the proprietary Plate Reader, Microscope, and MixStix;
- LEO Satellite Deployment: ISS CubeSat Deployment, ISS MicroSat Deployment, External Cygnus Deployment, Other space vehicles (Indian PSLV, SpaceX Falcon 9, etc.);
- LEO ISS External Platform: Nanoracks External Platform, Bishop Airlock.

Nanoracks has already deployed over 250 satellites (ranging from 1U to Microsat) and delivered over 1000 payloads to space and is closely following the new opportunities offered by new endeavors venturing beyond LEO, primarily in CisLunar space and to Mars. All of these will be commercially driven and procured by customers as services provision request.

In December 2020 the Nanoracks Bishop Airlock was attached to the Tranquility module of the ISS. The airlock was entirely self-funded and will serve as a way to deploy small satellites and expose payloads to the space environment to conduct scientific research over its properties.

As of 2021, the company is also launching the DreamCoder 2.0, a collaborative development and programming environment in Python for the use of an electronic board equipped with 12 sensors both on Earth and on board the International Space Station.



Defining Agile Space

Our Commitment

To deliver your mission success story.

Optimized solutions from concept to launch

Tyvak is transforming access to space by providing end-to-end, cost effective space systems using agile aerospace processes and accelerating on-orbit success.

We specialize in spacecraft development, launch services and on-orbit operations to deliver small satellites for critical missions across a variety of applications in LEO, GEO and beyond Earth orbit, and vehicle classes, including nanosatellites and microsatellites.

MARKET OVERVIEW | SMEs TYVAK

Company profile

Tyvak International SRL is one of the operating groups and the first international branch of Terran Orbital Corporation. Terran Orbital teams are leading innovators and providers of nanosatellites and microsatellite space vehicle products that target advanced state-of-the-art capabilities for government and commercial customers to support operationally and scientifically relevant missions.

Tyvak International represents the most advanced and vertical integrated offer in the market of small space vehicle products and services. The proprietary technology and know-how, based upon the continuous progress in the miniaturization of semiconductors, enable to develop, design and commercialize small satellites platforms faster and cheaper with respect to traditional satellites systems. This also provides considerable opportunities to exploit the space more effectively and profitably.

Founded in 2015, Tyvak International has executed considerable space engineering projects, from mission concepts and feasibility studies to Nanosatellite development and integration, launch integration services and procurement of launch opportunities, on orbit operations for commercial and institutional customers at international level. The company has established partnerships with important stakeholders of the Aerospace Industry such as SMEs, Large System Integrators (LSI), Research centers and Universities. Tyvak International executes R&D programs with several of them focused on breakthrough technologies which will contribute in the next future to foster the company's growth.

Tyvak capabilities include mission & system design, software and hardware manufacturing, assembly, integration & verification, mission services, launch integration & insurance services, on orbit operations. The company's growth strategy included the partnership with local universities, research entities and advanced technology suppliers, in the Italian and European regional areas. Tyvak will maintain control of integration processes and will expand as needed in response to advanced space mission needs in the European framework.



Contact

Business Name

Tyvak International srl

Head quarters

Via Orvieto, 19

Turin

TO | 10149

MARKET OVERVIEW | SMEs TYVAK

Products | Services | Applications | Technologies

PRODUCTS - Tyvak Product Line includes Phoenix, Trestles and Mavericks satellite solutions meeting the needs of high performance nano- and micro-satellite missions. Tyvak designed its platforms to provide cutting-edge capabilities with inherent design flexibility to accommodate missions requiring S/Cs from 5 to 300Kg. All platforms offer: High Power, efficient electrical power distribution and management, custom and high-power solar array design; Advanced Thermal management; Precision attitude knowledge and control (next generation Star Tracker and reaction wheel assembly); Advanced fault handling and autonomous FDIR; Radiation-tolerant avionics; High communication data rates; Miniature Deployable Mechanisms and Structures; Reliable and high throughput links (incl. high-gain X-band, S-band and UHF antennas); Configurable multi-mission components and bus; Custom mission operations design; Flawless integration with existing ground networks.

MISSION SERVICES Tyvak critical role in nanosats development-and-launch activities affords the ability to provide its customers with a robust portfolio of consulting services. Mission Development and Analysis: mission design, compatibility and feasibility analysis, system engineering support and industry/application market research; Spacecraft Analysis and Development at system and subsystem level, requirements development and analysis,

system engineering support; Integration and Test Support including integration process and procedure development and analysis, test plan development and test services. In Orbit Operations, Ground station development and third-party integration, frequency management and filing.

The Launch Integration Services is a unique turn-key solution offered by Tyvak. Tyvak understands the unique challenges to get a customer satellite integrated with the right launch vehicle and mission to ensure success. To get the objective Tyvak provides its customer with System Engineering Support, including integration of complex s/c subsystems, vehicle ICD, safety and Mission Assurance; Assembly and Integration: custom deployment system design, fabrication and flight certification, s/c to-deployer integration, launch vehicle integration; System Testing of s/c system performance (environmental, shock, vibration, thermal, thermal vacuum) by aerospace test standards; Launch coordination and operations including selection of international launch opportunities, regulatory processes management and satellite on-orbit operations; Launch & Satellite Insurance characterized by competitive rates and favorable payment terms, simple process and contract, financial risks reduction analysis, to cover the full cost of launch/satellite in case of unexpected launch failure.

APPLICATIONS Tyvak small satellites provide an advantage over larger, more traditional and expensive satellites due

We connect you to space.

GROUND SEGMENT AS A SERVICE

[Play Video](#) 

MARKET OVERVIEW | SMEs LEAF SPACE

Company profile

Leaf Space operates, and continues to develop, a solid and reliable distributed ground station infrastructure to provide effective ground segment-as-a-service solutions and enable full exploitation of space data. The company has a vision of being the leading provider of such services in order to drive expansion and sustainability of the space ecosystem and downstream applications.

Leaf Space's proprietary concept is focused on providing satellite connectivity as-a-service, to support clients with their satellite operations by managing and procuring the entire ground segment system through a complete set of services. These include time-shared access to ground, customized communication solutions, ground station procurement, consultancy, and backup services.

Leaf Space aims to provide the most easy-to-use, flexible, cost-effective, and operationally solid ground segment solutions to reliably support satellites in LEO and MEO along all lifecycle phases. Focus is put on highly scalable interfaces and operations, while continuously iterating according to NewSpace market needs in terms of new verticals (Launch Vehicles, HAPS) in addition to satellite and constellation operators.

The company's infrastructure is globally distributed and utilizes both 3.7-meter and 3-meter parabolic dishes used for both S-band and X-band operations, while Yagis are used for UHF and VHF respectively, implementing commercial high datarate receivers in combination with Leaf Space baseband processing software.

https://www.youtube.com/watch?v=obBG_U4JXF4 - Ground segment as-a-service - This webinar provides an overview of turn-key solutions, services and products offered by Leaf Space to the global space market.

<https://www.youtube.com/watch?v=Mkfedlfttil> - Ground Station Network cost structure: build or outsource? - This webinar provides a comprehensive look at a data-driven make-or-buy analysis for the ground segment and the benefits from adopting a Ground-Station-as-a-Service strategy.

<https://www.youtube.com/watch?v=lo6crhTYS0E> - Cybersecurity Solutions for Satellite Operators - This webinar covers the importance of secure space communications and cybersecurity, in terms of regulation and technology for NewSpace.



Contact

Business Name

Leaf Space srl

Head quarters

ComoNext via Cavour, 2

Lomazzo

CO | 22074

MARKET OVERVIEW | SMEs LEAF SPACE

Products | Services | Applications | Technologies

Leaf Space provides complete Ground Segment services for the New Space market.

Leaf Line is a unique multi-mission ground segment as-a-service solution, completely owned and operated by Leaf Space. A network of 12 ground station sites (at regime, in Q4 2020) and a strong software infrastructure are the base of the service, which can manage and optimize requests from different users. The GSs time is shared between different customers and missions using a high efficiency scheduling algorithm, optimizing the GSs use while satisfying the customer's constraints. From the operations point of view, Leaf Space will carry out all the activities and management of the ground segment, therefore the customer will have the important advantage of focusing more on his own core business. To interact with the Leaf Line network, our customer can use a dedicated API and a real-time data transfer interface through which a proprietary control centre or ground segment manager software can be integrated.

Leaf Key is an exclusive Ground Segment as a Service solution created for satellite operators and space service providers who need a custom and dedicated way to operate their space assets.

Based on a similar technology and infrastructure as Leaf Line, Leaf Key is tailored on the mission needs both from the performance and operations point of view. The deployment of the network backbone follows the development plan of the customer constellation, guaranteeing the right performance at the right time.

In addition, Leaf Key can be paired with Leaf Line to balance peak loads or to increase the support to the customer's mission.

From the operations point of view, Leaf Space carries out all the activities and management of the ground segment, therefore the customer will have the important advantage of focusing more on his own core business. To interact with the dedicated network, customers can use an API and a real-time data transfer interface through which a proprietary control centre or ground segment manager software can be integrated. Leaf Space also provides LEOP (launch and early operations phase), anomaly resolution, back-up, capacity boost, consultancy services and ground station provision for New Space market players.

SPACE EXPLORATION

Exploring space is an opportunity not only to discover new worlds and build advanced technologies, but to work together toward a larger goal irrespective of nationality, race, or gender.

MARKET OVERVIEW | Large Corporation ALTEC

Company profile

ALTEC (Aerospace Logistics Technology Engineering Company), a public-private company owned by Thales Alenia Space Italy (63,75%) and the Italian Space Agency (36,25%), is the Italian center of excellence for the provision of engineering and logistics services to support operations and utilization of the International Space Station and the development and implementation of planetary exploration missions. ALTEC is based in Turin and has liaison offices at NASA and ESA. ALTEC services include: engineering and logistics support, astronauts training, support to in orbit experiments, operations, processing of scientific data, development and management of the ground segment of space programs and the promotion of space culture. ALTEC collaborates on large international projects defined in the context of the programs of the Italian and European Space Agencies. Participation in the programs developed for the International Space Station is the core business of the company and indicates the strong commitment to promote the development of technological innovation and scientific knowledge. ALTEC, working closely with NASA centers in the exchange of sensitive data, as part of the bilateral agreement ASI-NASA, takes the value of a prestigious international showcase of Italian industrial excellence. ESA's designation of ALTEC as the Operations Control Center for the "EXOMARS Rover" acknowledges the company's operational capabilities in the context of European research and innovation.

Products | Services | Applications | Technologies

- Human Space Flight support Services to the ISS
- Planetary Mission Exploration
- Scientific Data Management and Processing
- Re-entry, Payload and Nano-Satellite Mission Control Center
- Space Commercialization



Contact

Business Name

ALTEC SpA

Head quarters

Corso Marche, 79

Torino

TO | 10146



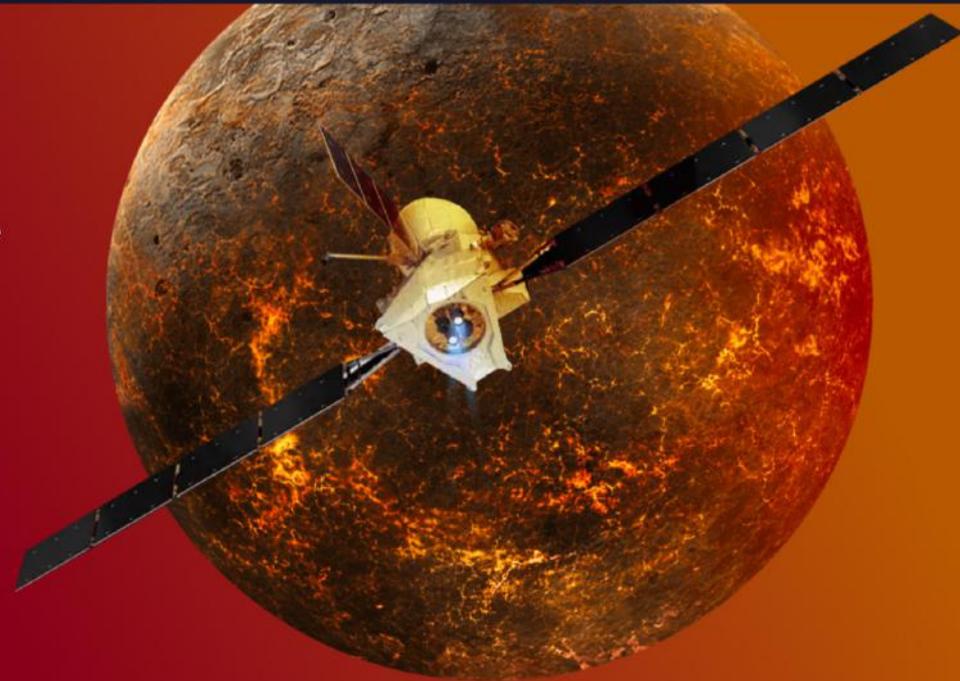
SPACE TO

Explore

- A pivotal partner in numerous international sciences and space exploration missions across the Solar System
- The world leader in orbital infrastructures
- A top industrial partner onboard Lunar Gateway and Axiom commercial space station

Learn more

Discover all →



Secure & defend

Travel & navigate

Explore

Observe & protect

Connect

MARKET OVERVIEW | Large Corporation THALESALENIA SPACE

Company profile

THALES ALENIA SPACE, joint venture between Thales (67%) and Leonardo (33%), is a key European industrial player in Space Telecommunications, Earth Observation, Navigation, Science, Exploration of the Solar System and beyond. With over 40 years of unrivaled experience, the Company is the natural partner to countries willing to expand their Space programs and invest in the Space Economy. Governments, Space Agencies, private companies count on THALES ALENIA SPACE as global system integrator to design, test, manufacture cost-effective Space-based systems and technological solutions. Our spacecrafts and payloads are a worldwide benchmark for: civil, military and dual use missions, telecom constellations, high-resolution radar and optical sensors, connections and positioning, environmental monitoring, human spaceflight, planetary robotics, scientific probes, space transportation vehicles, flexible payloads, altimetry, meteorology. THALES ALENIA SPACE also teams up with TELESPAZIO to form the parent companies' SPACE ALLIANCE, which offers a complete range of systems, services and space data.

THALES ALENIA SPACE ITALIA SpA is the Italian component of THALES ALENIA SPACE operating on four sites: Roma, Torino, L'Aquila, Milano. Since 1970s the Company has designed, manufactured, integrated, tested, operated and delivered over 200 satellites and innovative space systems, fundamental applications for sustainability of Earth: Remote sensing, Telecommunication, Navigation, Space Science and Exploration. THALES ALENIA SPACE ITALIA SpA as one of the top historical players worldwide, collaborates with the leading international space industries and the most prestigious agencies, as: NASA, ESA, ASI. It offers cutting-edge space technology to commercial and institutional customers around the world: Systems design for Human Spaceflight and Robotic Exploration, Pressurized living compartments, Earth Reentry Vehicles, Scientific Probes, Spacecrafts and Constellations assembly, integration and testing; Earth observation radar, Navigation systems, Telecoms Defence Satellites; High revisit small sat Constellations; Digital payloads and Equipments for platforms and payloads of all the above applications. THALES ALENIA SPACE ITALIA SpA acts as catalyst of the national Space Economy supporting win-win collaborations with SMEs and StartUps.

MARKET OVERVIEW | Large Corporation THALESALENIA SPACE

Products | Services | Applications | Technologies

- Space for earth care
- Space for smart mobility
- Space for security
- Space to live in



Contact

Business Name

Thales Alenia Space Italia SpA

Head quarters

Via Saccomuro, 24

Rome

RM | 131

AVIO BUSINESS

WHAT WE DO

Avio designs, develops, produces and integrates space launchers.

The company develops and produces **solid and liquid fuel propulsion systems** and **payload adapters**.

Avio is leader in research and development of new materials and **equipment for space applications**.

MARKET OVERVIEW | Large Corporation AVIO

Company profile

Avio SpA, the Colleferro Rome-based leading Company in Space Transportation Systems, has been working in the space segment for more than 50 years.

Thanks to the Ariane and Vega programs, we have acquired knowledge and expertise to design, manufacture, test and integrate not only solid / liquid fuel propulsion engines for space and defense applications, but also a complete Launcher System, i.e. Vega and its upcoming evolutions Vega C / Vega E.

AVIO is a public Company listed on the Milan Stock Exchange since April 2017 (70% of free floating, 4% Management share), we are nearly 1000 people working in Italy, France and French Guiana, successfully running propellant, filament-wound structures and stage integration plants as well as operating the Vega launch pad at CSG, Kourou.





+600 M €

2021 Revenues



+3000

People



+60

Years of experience



15

Countries of presence



13

Companies worldwide

Italy

Telespazio has its General Headquarters in Rome, the company has also an office in Naples and it's present with its Space Centres in **Fucino** (Abruzzo), **Lario** (Lombardy) and **Scanzano** (Sicily). In Italy, Telespazio counts on its joint venture **e-GEOS**, present in Rome and in the **Matera Space Centre** (Basilicata).

[Read more](#) →

WEBSITES

[e-GEOS](#) →



MARKET OVERVIEW | Large Corporation TELESPAZIO

Company profile

Telespazio works to bring Space closer to Earth, benefitting citizens, institutions and companies in a variety of sectors ranging from design and development of space systems to management of launch services and in orbit satellite control; from Earth observation to integrated satellite communication, navigation and localisation services, and through to scientific programmes.

Its open innovation approach, together with the cross-contamination of different operational domains and a constant focus on issues of environmental sustainability, allow Telespazio to operate in sectors that will become increasingly important in the years to come: from communication and positioning services for the Moon to management and monitoring of satellites and other orbiting objects (Space Domain Awareness), and creation of advanced in orbit services and satellite operation of drones and unmanned vehicles.

Moreover, using innovations such as artificial intelligence and machine learning to process big data from satellites, Telespazio is in the front lines of development of space applications capable of improving people's lives on our planet and helping to win the great challenges of our times, such as the effects of climate change.

Telespazio is a joint venture between Leonardo (67%) and Thales (33%) and one of the world's biggest suppliers of satellite solutions and services. Telespazio is based in Rome and counts 3000 employees in nine countries through its various subsidiaries and joint ventures. Telespazio is present in France - Telespazio France; in Belgium - Vitrociset Belgium; in Germany - Telespazio Germany, GAF and Spaceopal (a joint venture with the German Space Agency DLR), in the United Kingdom - Telespazio UK; in Spain - Telespazio Ibérica; and in Romania - Rartel. The company operates in South America - Telespazio Brasil and Telespazio Argentina. In Italy, it can count on e-GEOS, a leader in geoinformation services 20% owned by the Italian Space Agency.

With know-how acquired over 60 years in the business, an international network of space centres and teleports, the participation in space programmes such as Galileo, EGNOS, Copernicus and COSMO-SkyMed, Telespazio serves the market as service provider and large mission integrator, offering services for the upstream, midstream and downstream segments to help space missions achieve their goals.

MARKET OVERVIEW | Large Corporation TELESPAZIO

Products | Services | Applications | Technologies | Contact

- Satellite communications
- Geo information
- Satellite system and operations

Business Name

Telespazio SpA

Head quarters

Via Tiburtina, 965

Rome

RM | 156

Point of Contact

Roberto Petronio

Head of External Relations and
Communication

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MARKET OVERVIEW | Piedmont space cluster

Piedmont region Space Tech ecosystem

Startups & scaleups (selected names)

Orgosat, Felfil, aviotec, SB STRATOBOTIC, Nanoracks, OPTIMAD, argotec, waterview, AIKO, DIGISKY

Incubators & accelerators

enne3, I3P, eesa, il Takeoff, INCUBATORE 2i3T, business incubation centre, STARTER

Educational & research institutions

Politecnico di Torino, UPO, Links, INRiM, UNIVERSA DI TORINO, INAF

Technology leaders

ThalesAlenia Space, Tyvak International, LEONARDO, Avio Aero, MEGATEC AVIATION GROUP, ALTEC, Collins Aerospace, Aegitech S.r.l., PRIMA INDUSTRIE

Government & non-profit institutions

EASALRI, DAP, CTE NEXT, P.



SPACE APPLICATIONS AND TECHNOLOGIES



SPACE APPLICATIONS AND TECHNOLOGIES

The different uses or applications of space activities evolve constantly as space technologies become increasingly embedded in systems and services used in routine activities. Using well-recognised definitions and experiences from different countries surveying their space economy, the most common space activities are the following:



Satellite communications



Earth observation



Positioning and navigation



Space exploration



Science



Space transportation



Space technologies

SPACE APPLICATIONS AND TECHNOLOGIES

- **Satellite communications:** The development and/or use of satellites and related subsystems to send signals to Earth for the purpose of fixed or mobile telecommunications services (voice, data, Internet, and multimedia) and broadcasting (TV and radio services, video services, Internet content).
- **Earth observation (EO):** The development and/or use of satellites and related subsystems to measure and monitor Earth, including its climate, environment and people.
- **Positioning, navigation and timing:** The development and/or use of satellites and related subsystems for localisation, positioning and timing services. Navigation is used for air, maritime and land transport, or the localisation of individuals and vehicles. It also provides a universal referential time and location standard for a number of systems (Global Navigation Satellite Systems-GNSS).
- **Space exploration:** The development and/or use of crewed and uncrewed spacecraft (including space stations, rovers and probes) to explore the universe beyond Earth's atmosphere (e.g. the Moon, other planets, asteroids). Included in this sector are the International Space Station and astronaut-related activities.

SPACE APPLICATIONS AND TECHNOLOGIES

- **Science:** The category includes a range of scientific activities including space science, i.e. the various scientific fields that relate to space flight or any phenomena occurring in space or on other planets (e.g. astrophysics, planetary science, space-related life science, space debris tracking); and space-related earth science, i.e. the various science fields that use space-based observations to study the physical and chemical constitution of the Earth and its atmosphere (e.g. atmospheric science, climate research).
- **Space transportation:** The development and/or use of launch vehicles and related subsystems. This includes launch services, government and commercial spaceports, space adventure rides, as well as “last mile” and logistics services for transportation between orbits,
- **Space technologies:** The category may include specific space system technologies that are used in various space missions, such as space nuclear systems (power, propulsion), solar electric propulsion, etc.

SPACE APPLICATIONS | EO market segments



Agriculture – Modern farming relies on EO data and information for sustainable nutrient management, restoring soil health and the preservation of biodiversity. A major trend in the field is the increased use of EO as an input for smart analytics for optimising agri-tech solutions.



Aviation and Drones – Traditionally, EO has enabled the monitoring of volcanic ash clouds and hazardous weather, as well as helping aviation identify preventative maintenance in response to particulate matter. In combination with GNSS it is expected to help accurately understand and reduce the impact aviation has on the environment.



Biodiversity, Ecosystems and Natural Capital – EO helps to progress our understanding of the health of ecosystems and existing and potential stressors therein, thus paving the way towards more concrete and effective measures against ecosystem and biodiversity loss. While most of biodiversity assessments are still done on-site, the use of EO in the field is growing.



Climate Services – The role of EO in climate services is well-established and contributes with invaluable data for climate modelling. The integration of EO with innovative technologies and the number of policies requiring close monitoring are set to further boost the market of EO applications related to climate resilience and adaptation.



Consumer Solutions, Tourism and Health – EO-enabled health apps focusing on air quality and UV monitoring are finding traction in the market. Sustainable and safer tourism is enabled by EO e.g. by providing insights about wave conditions and water quality.



Emergency Management and Humanitarian Aid – EO is providing a full picture needed for context-aware emergency responses, ranging from preparedness and early warning to rapid mapping and post-event analysis.

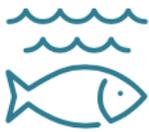


Energy and Raw Materials – EO related to renewable production is mainly linked with the planning and operation monitoring phases, while for raw materials, EO can have an important role in all stages of the mining cycle from exploration, discovery and development, to production and reclamation. EO data also has great potential to support novel energy solutions, such as power-to-x solutions in post-production phases, contributing to a greener future.

SPACE APPLICATIONS | EO market segments



Environmental Monitoring – Various environmental parameters obtained by EO data contribute to an increasing number of international, regional, and local policies related to, or impacting, the environment. This is expected to drive the growing demand for EO data and applications in the sector.



Fisheries and Aquaculture – Dedicated EO services and products bring value-added in the fisheries and aquaculture segment providing insights in salinity, temperature, water quality etc., greatly improving fisheries and aquaculture outputs. As the importance of aquaculture grows, a major trend is the increasing use of EO products and services in the field.



Forestry – EO is becoming an extremely valuable tool in monitoring and maintaining the sustainability of forests. From carbon monitoring to battling deforestation and degradation, EO is contributing to conservation in this area. A key trend emerging in the forestry industry is the use of EO in monitoring carbon offsetting practices.



Infrastructure – EO supports the various stages of the infrastructure life cycle, from site selection to post-construction infrastructure health monitoring. Thanks to its capacity to deliver information on risk exposure and future impacts of climate change, EO should increasingly contribute to the design of more resilient and sustainable infrastructures.



Insurance and Finance – EO data is used to compute parametric products benefiting both finance and insurance stakeholders. Risk and claim assessments based on EO data brought increased granularity in risk selection and pricing for insurers.



Maritime and Inland Waterways – Thanks to EO, and in synergy with GNSS, applications such as ship route optimisation contribute to a more efficient means of maritime transport. This optimisation also leads to reduced emissions as well as safer means of navigation, leading to net benefits for the industry and society.



Rail – EO contributes to the overall safety of the railway network by providing railway infrastructure managers with information on risk exposure in relation to vegetation encroachment, landslides and floods. In the future, thanks to its capacity to detect millimetre-scale ground movements, EO should also play an increasing role in the monitoring of track deformation and infrastructure health along the track.

SPACE APPLICATIONS | EO market segments

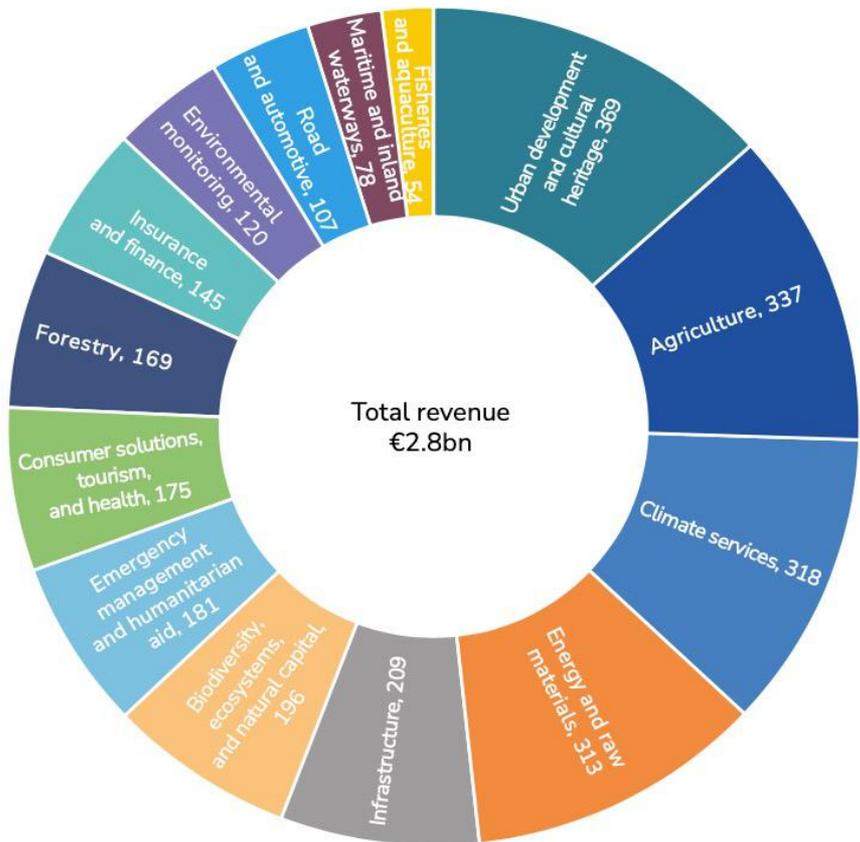


Road and Automotive – Whilst the use of EO is rather new and innovative, applications such as driving comfort have greatly benefited from global EO data, contributing to road safety.



Urban Development and Cultural Heritage – A key enabler for healthier cities, EO assists officials, developers and citizens with the monitoring of air quality, light pollution and mapping of green areas as well as the preparation of urban planning in general. EO will contribute to novel solutions related to smart and sustainable cities.

Distribution of revenue by segments (€m, 2021)



SPACE APPLICATIONS | EO demand world map



	European Union (EU27)			
	2021		2031	
	Value	%	Value	%
Data revenues (€ m)	82	15.4	117	14.6
Value-added service revenues (€ m)	342	15.3	664	14.2

	Global	
	2021	2031
	Value	Value
Data revenues (€ m)	536	797
Value-added service revenues (€ m)	2,236	4,662

	Russia & Non-EU27 Europe (Non-EU27 Europe)			
	2021		2031	
	Value	%	Value	%
Data revenues (€ m)	47	8.8	65	8.2
Value-added service revenues (€ m)	161	7.2	327	7.0



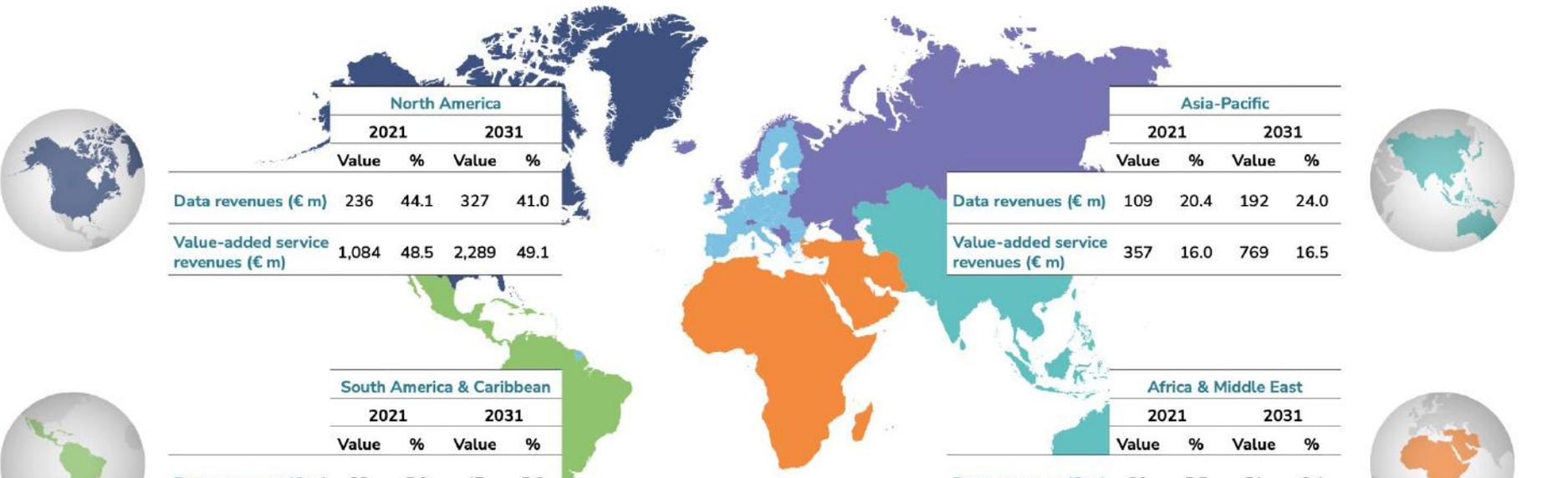
	North America			
	2021		2031	
	Value	%	Value	%
Data revenues (€ m)	236	44.1	327	41.0
Value-added service revenues (€ m)	1,084	48.5	2,289	49.1

	Asia-Pacific			
	2021		2031	
	Value	%	Value	%
Data revenues (€ m)	109	20.4	192	24.0
Value-added service revenues (€ m)	357	16.0	769	16.5



	South America & Caribbean			
	2021		2031	
	Value	%	Value	%
Data revenues (€ m)	32	5.9	47	5.8
Value-added service revenues (€ m)	136	6.1	278	6.0

	Africa & Middle East			
	2021		2031	
	Value	%	Value	%
Data revenues (€ m)	29	5.5	51	6.4
Value-added service revenues (€ m)	156	7.0	334	7.2



EO data and EO value-added service revenues are separated. Data revenues from financial transaction between an EO Data Provider and a user. Value-added service revenues are further along the value chain and arise from a transaction between an EO Products and Services, or Information Provider (that uses free and/or commercial input data) and an end-user.

*EUSPA EO and GNSS Market Report (EUSPA, 2022)

SPACE APPLICATIONS | Key EO performance parameters

Firstly, different types of sensors utilize different EO **technologies**:

- Optical or thermal** sensors are payloads monitoring the energy received from the Earth due to the reflection and re-emission of the Sun's energy by the Earth's surface or atmosphere.
- Radar sensors**. Most of these sensors send energy to Earth and measure the feedback from the Earth's surface or atmosphere, enabling day and night monitoring during all-weather conditions.

The second essential parameter in EO is the **sensor resolution**:

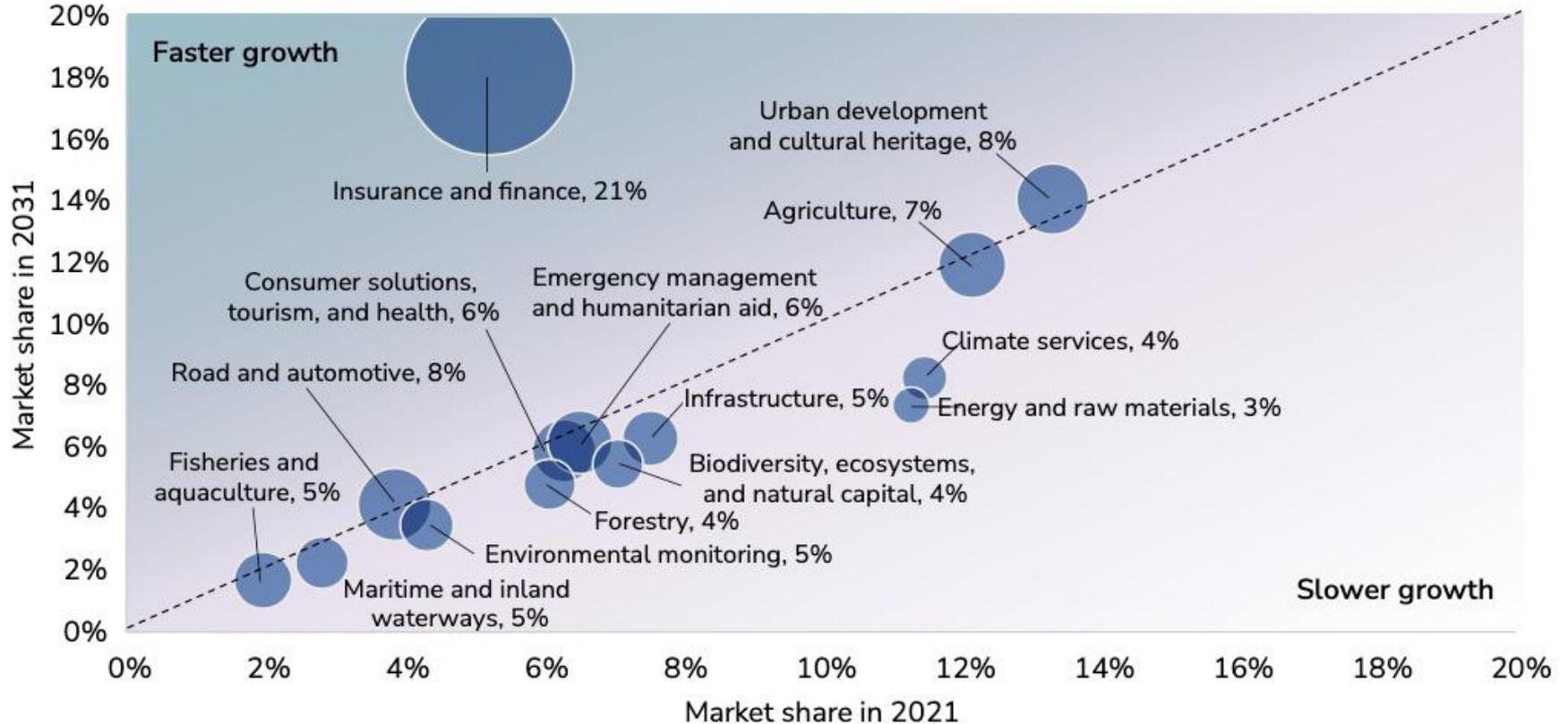
- Spatial resolution** defines the size of the pixels analysed by the sensors.
- Temporal resolution** defines the frequency at which the data is acquired for a defined area.
- Spectral resolution** defined by the width of the spectrum bands.

The last key parameters considered for remote sensing techniques is the **coverage**.

- In-orbit infrastructures offer a global coverage with a single spacecraft, while aerial or in-situ sensor coverage is local. Orbital geometry however limits the frequency of fly-by over a same location (typically once per day to once every few days) while local monitoring allows a higher persistence, from a new acquisition every few hours down to near real time.

SPACE APPLICATIONS | EO market segments

Segment's market share in 2021 and 2031



TRENDS | EO demand trends

Recent trends are stimulating the demand for EO data while strongly impacting the price of such data, allowing a steady growth for EO-based products & services

Increasing availability of EO data

- **Vertical integration of traditional actors** (e.g. Airbus, Maxar, etc..) aiming at building synergies between upstream and downstream activities
- New entrants focusing on **large-scale constellation of small satellites** or focusing on the analytics side of the activities, attracting very large private investments

- Strong pressure on EO data price
- Raising interest/awareness for EO-based products & services, indirectly stimulating demand for EO data

Democratisation of the use of EO

- Responding to new developments in cloud and computing power, **new delivery models, based on API (i.e. APIfication)**, are being developed by the entire market
- New delivery models responding to **client needs** to facilitate **access to data, data discovery** and to offer access capacity to **very large volumes of data at low cost** (i.e. for EO BDA companies)
- New models enable to switch to **subscription** and **volume-based business models**

- Strong increase in demand for large volume of data (especially for medium and high resolution optical data)
- Commoditisation of basic analytics (e.g. objects counting, change detection, etc..)
- Unlocking new use cases based on scalability

Advancements in data fusion capabilities

- **Strong and rapid progress** in **capabilities to fuse large volume of heterogeneous data sources** (i.e. data with different format), including satellite data with other sources of data (e.g. mobile data, social media data, images, video, text, statistics, financial data, etc.)
- **Explosion of large Big Data Analytics (BDA) market**, on which EO data offer an interesting additional source of data

- Stimulation of the demand in EO data
- New opportunities with large BDA companies consuming large volume of data
- Growing interest for insight-based analytics exploiting heterogeneous data sources

New emerging analytics markets

- Low-cost imagery, cloud storage and cloud computing stimulate the emergence of a **fast growing EO Big Data Analytics (BDA) market**, attracting large private capital
- The growth of such a market will **stimulate demand in EO data**, driving prices down, notably for:
 - **Long archives of EO data** to perform change detection over time for very specific region, especially for Medium Resolution (MR) and High Resolution (H),
 - Continuous monitoring of very specific AOIs.

- Strong growth in demand for EO data, with recent important interest in high and very high temporal revisit (i.e. daily and sub-daily)
- Strong pressure on archive prices for MR and HR EO data

TRENDS | EO supply trends

The changing and growing competition and the impacts of digital trends on EO data distribution business models are reshuffling the EO supply-chain



Changing market dynamics

- Large volumes of EO data freely available from open source programmes such as Copernicus or Landsat
- Development of large scale EO small satellite constellations
- Growing interest from governments to build their own EO capacities
- Ground Segment as a Service (GSaaS) offers turnkey solutions to EO satellite operators that wish to avoid investing in dedicated infrastructure, while benefiting from fast and secure data download and processing

- Reduction of barriers to entry for new comers
- Strong pressure on EO data price
- Raising interest and awareness for EO-based products & services, indirectly stimulating demand for EO data



New delivery models

- Access to low-cost cloud storage capabilities and powerful low-cost computing power through cloud services (AWS, Microsoft Azure, Google Cloud, etc.)
- Availability of open source tools & analytics facilitating experimentation and utilization by non-technical users
- Important public investments, especially in Europe by the EU and ESA, to support dissemination of EO knowledge (e.g. online free trainings, universities classes, etc.)

- Strong increase in demand for large volume of data (especially for MR and HR optical data)
- Commoditisation of basic analytics (e.g. objects counting, change detection, etc..)
- Unlocking new use cases based on scalability



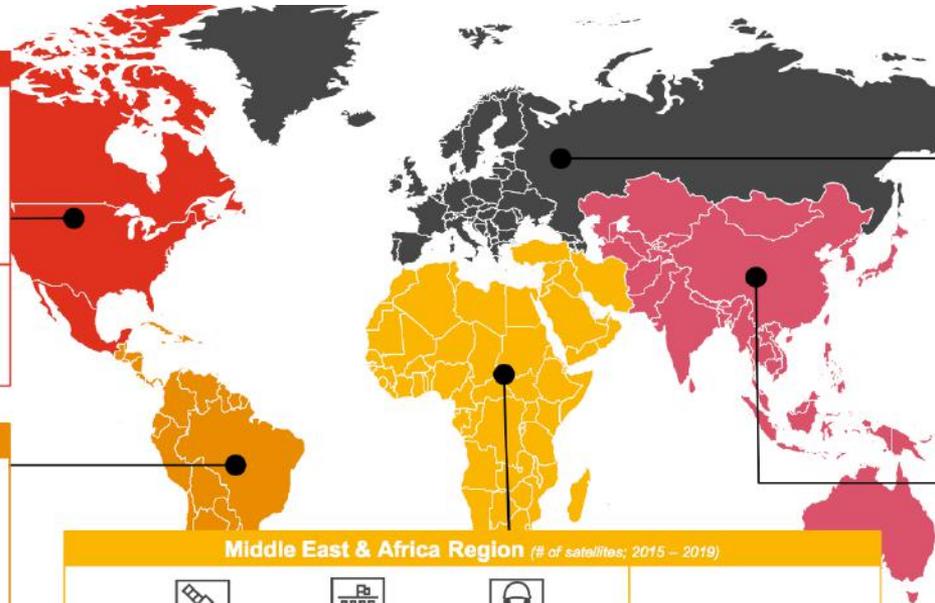
New distribution channels

- Switch from direct distribution channel (i.e. selling EO data directly to end-users for expert communities/analysts and/or EO downstream actors) to vertical specialist Value-Added Services (VAS)
- Raising interest from end-users to access diversified sources of data into one stop-shop digital marketplaces bringing together different datasets (EO and non-EO), but also sometime VAS and computational capacity, under one subscription (e.g. SkyWatch, UP42, Arlula, etc.)

- Stimulate demand in EO data
- New opportunities with large BDA companies consuming large volume of data
- Growing interest for insight-based analytics exploiting heterogeneous data sources

TRENDS | EO institutional trends

Over the period 2015–2019, 180 institutional satellites have been launched globally, including ~30% of military assets



North American Region (# of satellites; 2015 – 2019)

Space agencies' satellites 4	Other institutional satellites (civilian) 5	Military satellites 10
---------------------------------	--	---------------------------

Major large-scale open data program

Landsat Program
Joint programme between

South American Region (# of satellites; 2015 – 2019)

Space agencies' satellites 2	Other institutional satellites (civilian) 2	Military satellites 1
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No large scale open data programme for this region

Middle East & Africa Region (# of satellites; 2015 – 2019)

Space agencies' satellites 9	Other institutional satellites (civilian) 5	Military satellites 3
---------------------------------	--	--------------------------

No large scale open data programme for this region

European Region (# of satellites; 2015 – 2019)

Space agencies' satellites 13	Other institutional satellites (civilian) 8	Military satellites 11
----------------------------------	--	---------------------------

Major large-scale open data program

Copernicus Programme
Owned & managed by With technical support from

Asia-Pacific Region (# of satellites; 2015 – 2019)

Space agencies' satellites 30	Other institutional satellites (civilian) 45	Military satellites 32
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Major large-scale open data program

Gaofen Program
Owned & managed by



The figures displayed here refer to institutional satellites only (i.e. civilian & military). They do not include educational satellites (i.e. satellites owned by research centres, universities, etc.)

TRENDS | Agriculture

The use of digital technologies in farm management and across the agricultural sector is helping to address several challenges for farmers, agricultural cooperatives, key decision makers and governments.

At the micro level, EO allows farmers to remotely monitor the performance of their crops and reduce their usage of inputs such as fertilizers.

At the macro level, EO provides vast amounts of rich data which public authorities and economists can use to better inform their analysis and decision making.

GNSS delivers huge value to the sector by helping farmers precisely guide machinery and track their livestock, ensuring farm operations remain as efficient as possible.

EO and GNSS allow stakeholders to better understand the sector, efficiently address its needs and help in guiding it towards a sustainable future.

Key market trends

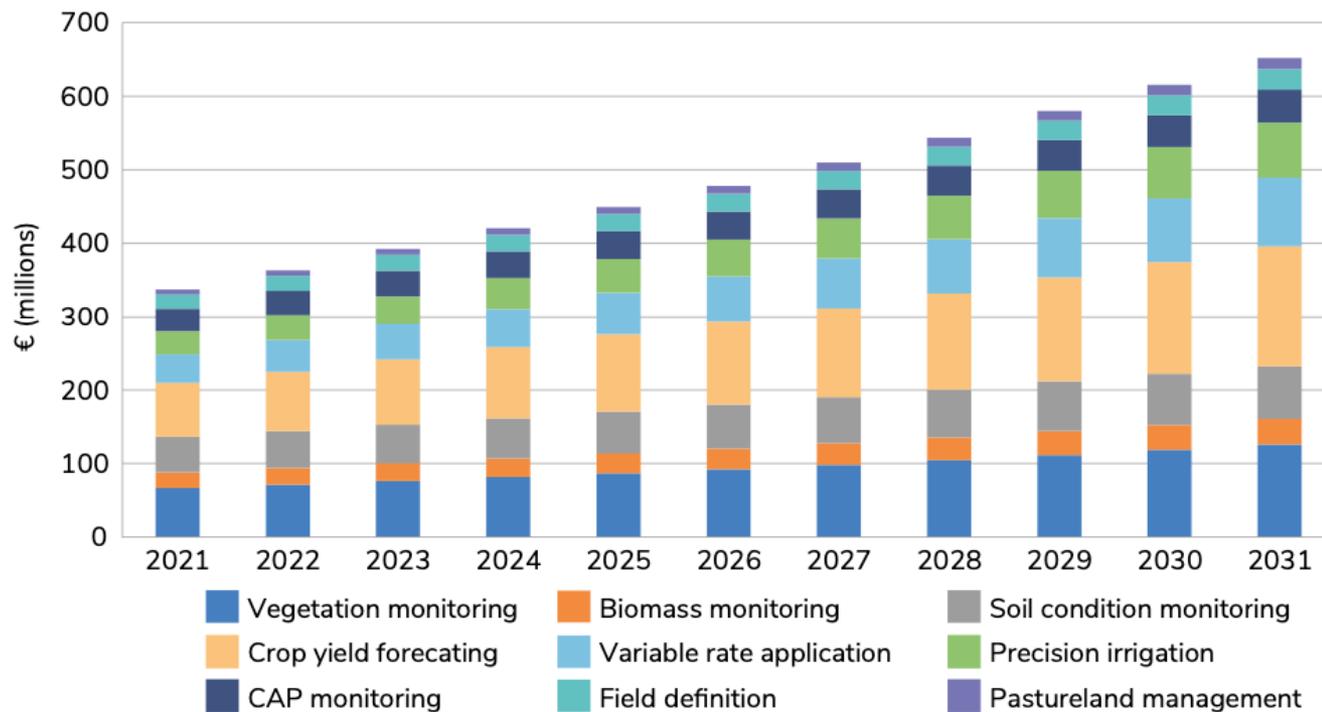
- Major investments into innovative agriculture solutions from venture capitalists and corporate giants will shape the market landscape going forward
- The EU Farm to Fork Strategy, a key component of the Green Deal, will be setting the pace for the adoption of sustainable management practices in Agriculture
- The sustainable management of soils and the preservation of biodiversity require advanced solutions powered by GNSS and EO

TRENDS | Agriculture

New paradigms drive the evolution of food production and land management.

Revenues from EO data and service sales in agriculture are expected to steadily grow in the coming decade, from a combined total across all applications of €337 m in 2021 to €652 m in 2031.

Revenue from EO data & services sales by application



TRENDS | Urban development and cultural heritage

EO and GNSS are invaluable tools for the transition to smart, connected and climate-neutral cities. City authorities, urban planners, real estate agencies, cultural heritage managers and surveyors all use solutions powered by EO and GNSS to perform a wide range of applications.

Earth Observation provides information in support of urban planning, monitoring of informal dwellings, and informing the progress of urban greening. EO-based services provide essential information on air quality in urban environments, measuring particles that might affect the health of citizens and monitoring greenhouse gas emissions. GNSS-based solutions are also used, in conjunction with EO, to accurately survey and map urban areas and to build advanced 3D models of the built environment.

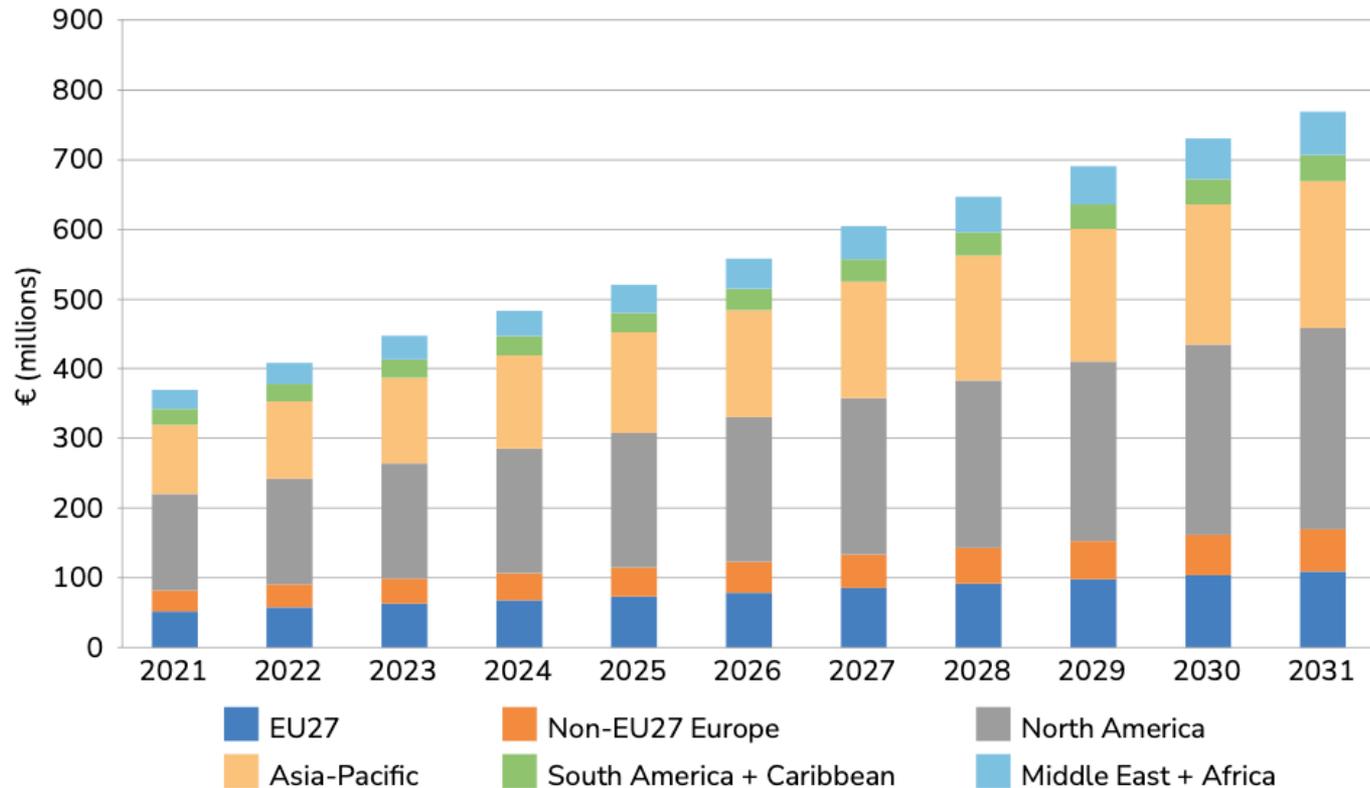
Key market trends

- Achieving climate-neutrality and climate-resilience in cities will require innovative solutions powered by EO data and GNSS services
- Smart cities are increasingly seeking to use EO or GNSS-based solutions to support a wide range of applications
- Digitalisation strategies – the most prominent of which is digital twins – will greatly benefit from EO and GNSS solutions
- Satellite-based technologies provide a fundamental contribution to the preservation and sustainable management of cultural heritage sites

TRENDS | Urban development and cultural heritage

The future market evolution will see increased adoption of EO data in analytics powered by high performance computing and artificial intelligence. The revenues from the sale of EO data and services in 2021 amounted to €369 m, growing year-on-year to expected aggregate revenues of €769 m by 2031.

Revenue from EO data & services sales by region



SPACE APPLICATIONS | WHAT IS GNSS?

Radio Navigation Satellite Services (RNSS) is infrastructure that allows users with a compatible device to determine their position, velocity and time by processing signals from satellites. RNSS signals are provided by a variety of satellite positioning systems, including global and regional constellations and Satellite-Based Augmentation Systems:

- Global constellations i.e. Global Navigation Satellite System (GNSS): GPS (USA), GLONASS (Russian Federation), Galileo (EU), BeiDou (PRC).
- Regional constellations: QZSS (Japan), NavIC (India), and BeiDou regional component (PRC).
- Satellite-Based Augmentation Systems (SBAS): WAAS (USA), EGNOS (EU), MSAS (Japan), GAGAN (India), SDCM (Russian Federation) and SNAS (PRC).

SPACE APPLICATIONS | GNSS demand world map



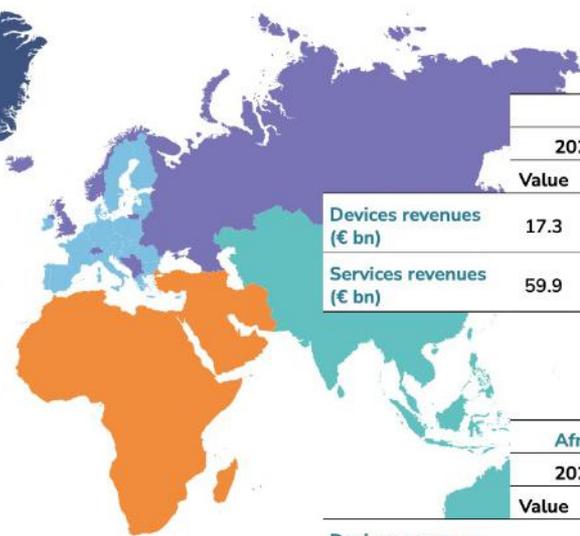
	European Union (EU27)			
	2021		2031	
	Value	%	Value	%
Devices revenues (€ bn)	12.1	25.0	21.6	24.8
Services revenues (€ bn)	27.4	18.2	53.7	13.3

	Global	
	2021	2031
	Value	Value
Devices revenues (€ bn)	48.4	87.0
Services revenues (€ bn)	150.5	405.2

	Russia & Non-EU27 Europe (Non-EU27 Europe)			
	2021		2031	
	Value	%	Value	%
Devices revenues (€ bn)	2.7	5.6	7.6	8.7
Services revenues (€ bn)	7.4	4.9	20.7	5.1



	North America			
	2021		2031	
	Value	%	Value	%
Devices revenues (€ bn)	12.4	25.6	24.0	27.6
Services revenues (€ bn)	35.2	23.4	74.3	18.3



	Asia-Pacific			
	2021		2031	
	Value	%	Value	%
Devices revenues (€ bn)	17.3	35.7	24.0	27.6
Services revenues (€ bn)	59.9	39.8	185.3	45.7



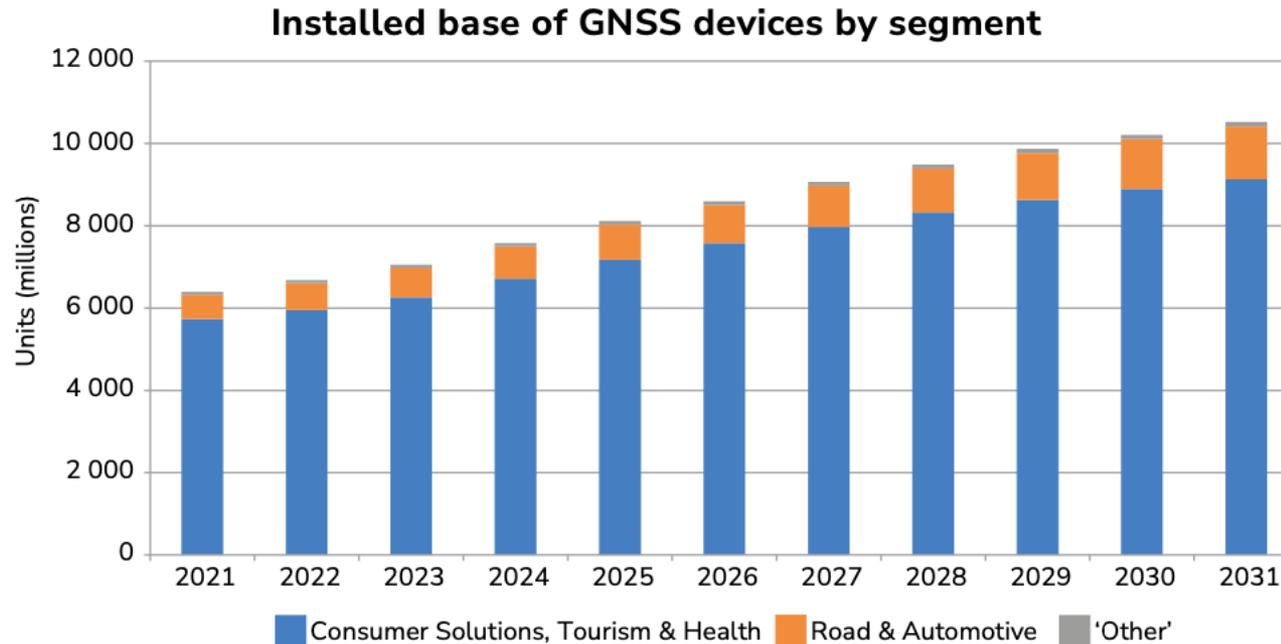
	South America & Caribbean			
	2021		2031	
	Value	%	Value	%
Devices revenues (€ bn)	1.8	3.7	4.5	5.2
Services revenues (€ bn)	7.9	5.2	22.1	5.5

	Africa & Middle East			
	2021		2031	
	Value	%	Value	%
Devices revenues (€ bn)	2.1	4.3	5.3	6.1
Services revenues (€ bn)	12.7	8.4	49.1	12.1



*EUSPA EO and GNSS Market Report (EUSPA, 2022)

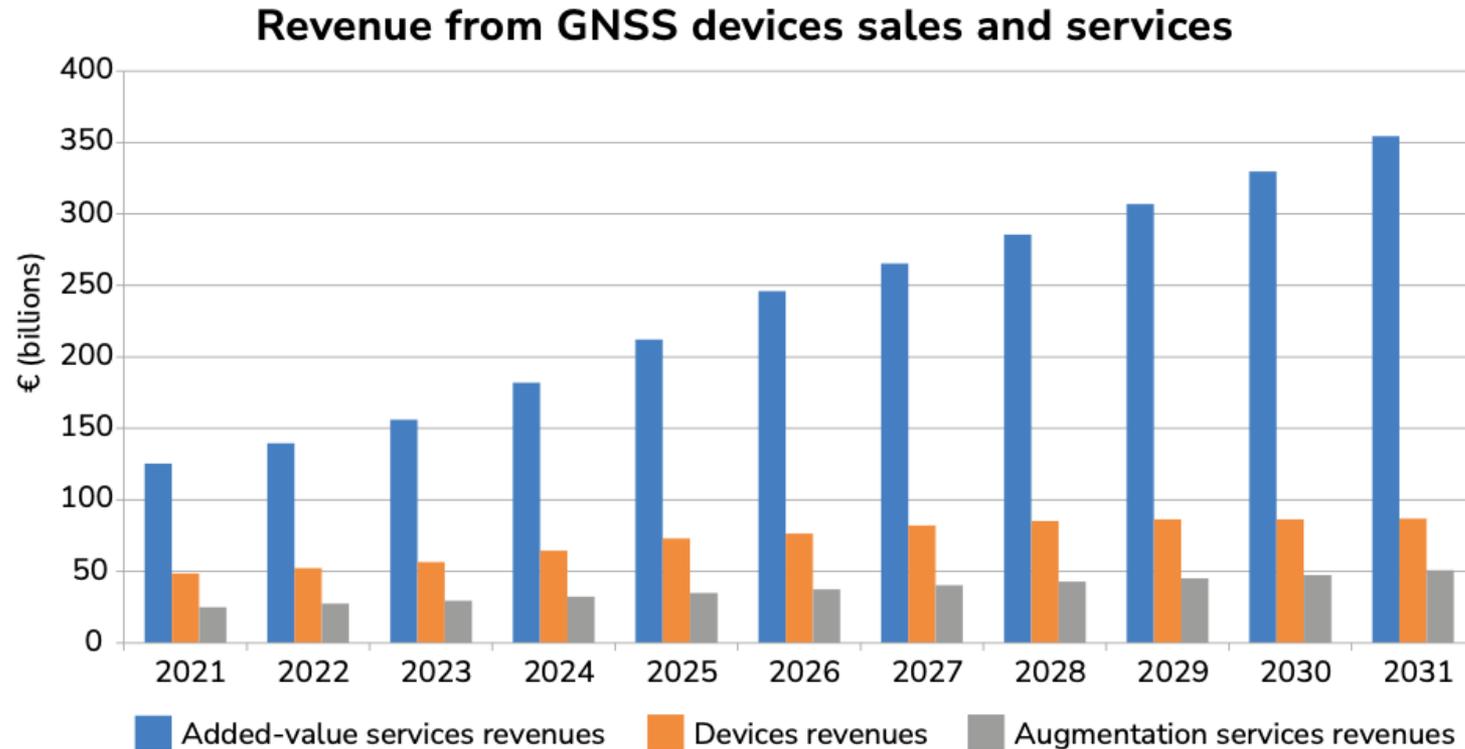
SPACE APPLICATIONS | GNSS



The overall installed base will grow from 6.5 bn units in 2021 to 10.6 bn units in 2031. The Consumer Solutions segment accounts for 89% of global GNSS devices in use for 2021 and 86% in 2031. This drop of 3% in global share over the next decade is mainly influenced by the declining share of smartphones across all GNSS devices as there is a global trend towards extending the useful life of a smartphone, which in turn translates into a decrease in smartphone shipments.

SPACE APPLICATIONS | GNSS

Added-value services account for 72% of the total GNSS revenues in 2031



The global GNSS downstream market revenues from both devices and services will grow from €199 bn in 2021 to €492 bn in 2031.

This growth is mainly generated through the revenues from added-value services. The revenues from GNSS augmentation services are foreseen to grow annually by 7%, doubling their value from €25 bn in 2021 to nearly €51 bn in 2031.

SPACE APPLICATIONS | GNSS market segments



Agriculture – New technologies are pushing the Agriculture sector to new frontiers. GNSS is considered a key driver and enabler for these evolutions, ranging from traditional farming applications to Internet-of-Things, blockchain, Agri-fin tech and value chain management. GNSS-enabled livestock wearables are emerging as an exciting trend which is improving animal welfare.



Aviation and Drones – Global air traffic took a huge hit due to COVID-19 – airlines responded with consolidation of fleets, and older aircraft prioritised for retirement. Meanwhile, standards evolution in navigation and surveillance presses ahead, enhanced by growing demand from increasingly sophisticated drone operations.



Biodiversity, Ecosystems and Natural Capital – In the domain of biodiversity, ecosystems and natural capital, GNSS-beacons are used to geo-locate animals for the purposes of monitoring migrations, habitats, and behaviours. These are becoming more accurate and additional biodiversity applications are emerging (e.g. botanical mapping).



Climate Services – GNSS has limited but important application in the climate services domain. The technology supports a range of geodetic applications that measure properties of the earth (magnetic field, atmosphere) with direct impact on the Earth's climate. GNSS is expected to have an increasing role in the growing market of climate modelling.



Consumer Solutions, Tourism and Health – GNSS finds increasing use in facilitating our daily lives. From context-aware apps monitoring peak visit times to contactless deliveries and personal fitness apps (powered by wearable devices), navigation and positioning information plays a vital role.



Emergency Management and Humanitarian Aid – Estimated to save 2,000 lives a year, the new MEOSAR system of the GNSS-based COSPAS-SARSAT programme relies on the proper use of GNSS-enabled Search and Rescue beacons. On the field, GNSS is a valuable tool to coordinate emergency response and humanitarian aid.



Energy and Raw Materials – Monitoring and management of electricity utility grids heavily rely on GNSS timing and synchronisation, allowing the balance supply and demand and ensuring safe operations. In the domain of raw materials, the increased uptake of augmented GNSS supports site selection, planning and monitoring, as well as mining surveillance activities and mining machinery guidance.



Fisheries and Aquaculture – GNSS plays a vital role for the efficient and effective monitoring of fisheries activities through applications such as VMS and AIS. As the focus on the sustainability of these activities grows, agriculture lands diminish and food demand rises, GNSS applications are themselves seeing higher demand.

SPACE APPLICATIONS | GNSS market segments



Forestry – GNSS is becoming an extremely valuable tool in monitoring and maintaining the sustainability of our forests. Besides precision forestry management, a key emerging trend is the use of GNSS-enabled UAVs and tracking devices help ensure the health of our trees and the efficiency of our timber supply chains.



Infrastructure – GNSS contributes to the proper functioning of Infrastructures operations. It allows a safe and on-time completion of construction work through the provision of high accuracy services and supports the synchronisation of telecommunication networks. With the transition towards 5G, the GNSS Timing & Synchronisation function is expected to play an increasingly critical role in telecommunication network operations.



Insurance and Finance – The financial world relies on GNSS timing and synchronisation for the accurate timestamping of financial transactions. Insurers, on the other hand, are turning towards GNSS-enabled UAVs for a more accurate and faster claim assessment.



Maritime and Inland Waterways – GNSS has shown its versatility providing data insights to monitor global shipping and port activities during the pandemic. Looking to the future, with automation and 5G expected to bring technological advancements in ports, GNSS will continue expanding its role beyond merely providing navigation information.



Rail – GNSS is becoming one of the cornerstones for non-safety related applications (e.g. asset management), whilst future adoption of GNSS for safety-related applications, including Enhanced Command & Control Systems, is expected to increase railway network capacity, decrease operational costs and foster new train operations. Thanks to GNSS taking part in digitalisation, Rail is becoming safer, more efficient and more attractive.



Road and Automotive – Despite the global slowdown of car production and sales, regulation for safer and autonomous vehicles is on track, with GNSS doubtless playing a key role. With In Vehicle Systems remaining the dominant source of Positioning, Navigation and Timing, it is moreover clear that public transport is increasingly adopting GNSS to improve its services.



Space – From using real-time GNSS data for absolute and relative spacecraft navigation, to deriving Earth Observation measurements from it, GNSS has also proven its worth for in-space applications. Driven by the NewSpace paradigm, the diversification and proliferation of space users leads to an increasing need for spaceborne GNSS-based solutions.

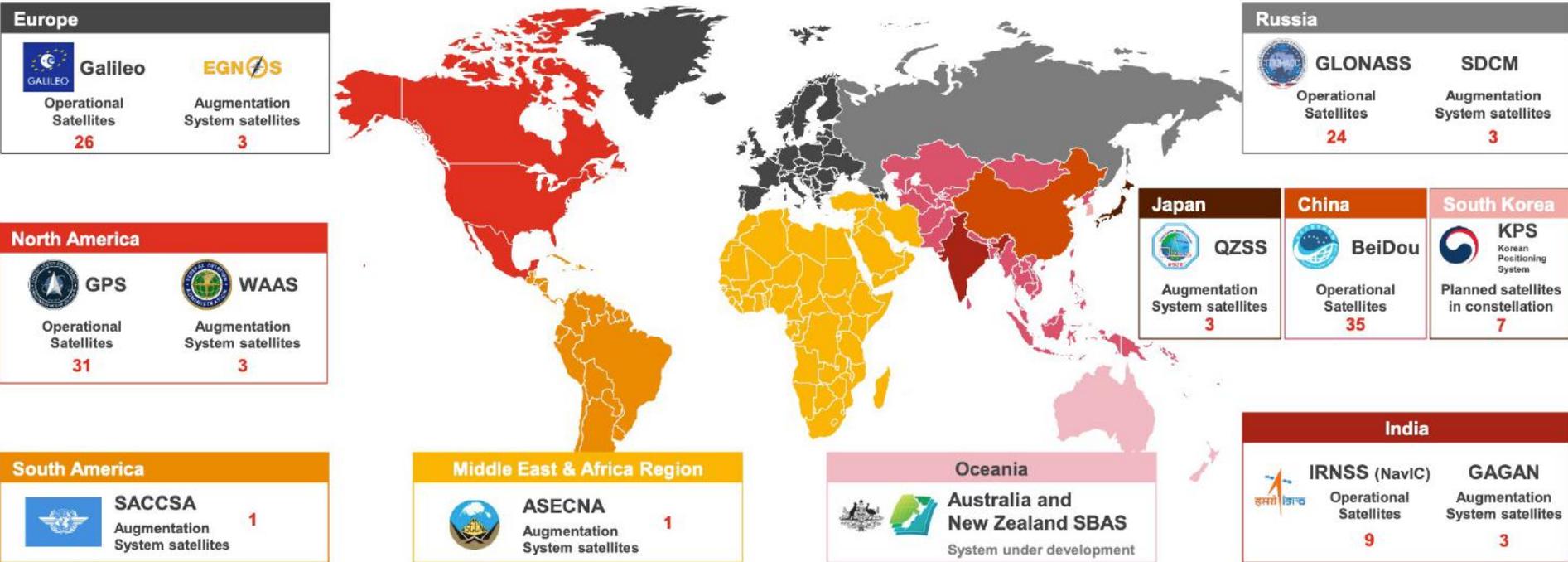


Urban Development and Cultural Heritage – In this field, GNSS-based solutions are used, in conjunction with EO, to accurately survey and map urban areas and to build advanced 3D models of the built environment. With more than 56% of the population already living in urban areas and this number expected to increase, digital solutions powered by GNSS will be needed more than ever support sustainable growth.

SPACE APPLICATIONS | GNSS overview systems

Several GNSS constellations and satellite based augmentation systems provide navigation capabilities around the globe

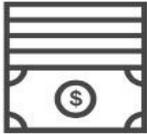
Main GNSS and augmentation systems across the globe



TRENDS | Ground Segment as a Service (GSaaS)

GSaaS contributes to lowering barriers to entry in the space industry

Ground Segment as a Service (GSaaS) concept



Ground segment activities require significant investment

- Ground segment activities require expertise, infrastructure and resources, both human and financial
- Difficult for satellite operators to invest in a wholly dedicated network



Regulation aspects require time and effort

- Licensing needed to build and operate a ground station
- Complex procedures to follow (i.e. lack of clarity/transparency), fees, etc.
- Can cause delays in satellite operators business development



Ground segment services were not adapted to New Space operators

- Costly and complex premium solutions from incumbents adapted for satellite operators with demanding requirements
- New Space satellite operators have different needs (e.g. smaller satellites)

Mutualising ground infrastructure (e.g. ground stations, data storage), GSaaS enables different satellite operators access a single network of ground stations, together with benefits including:

- **Flexibility:** possibility to have on demand or reserved contacts
- **Cost-effectiveness:** pay as you use or subscribe on a monthly/yearly basis
- **Simplicity:** easy-to-use API and interfaces



Switching CAPEX to OPEX, GSaaS allows satellite operators to focus on the core of their business: data

TRENDS | Ground Segment as a Service (GSaaS)

GSaaS current supply and demand

GSaaS supply is made of half a dozen actors...



... supplying services to a variety of users

	Trends in GSaaS users
Mission type	EO, Internet of Things (IoT)
Customer type	Mostly private and some public users
Orbit type	LEO satellites mostly



Non-exhaustive list

GSaaS market perspectives: The customer base could be enlarged

New satellite operators (e.g. military entities, emerging space agencies) and customers with other mission types (e.g. low latency applications, deep space and lunar missions) could contribute to enlarge the GSaaS customer base...

To answer to such customers, the **supply will have to offer adapted services** (e.g. enhanced security, data processing/ analysis, consulting services etc.), notably **leveraging on partnerships and technologies:**

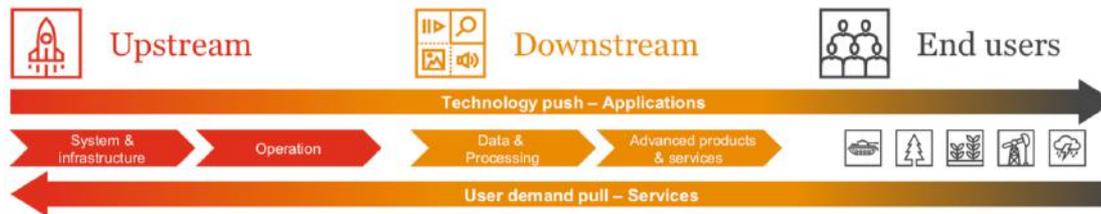
- Partnerships with specialised companies in specific domains (e.g. to offer better security) or with ground suppliers (e.g. to expand ground stations coverage)
- Technologies like Artificial Intelligence, Electronically Steered Antennas, Optical communications and Inter-Satellite Links could enhance satellite communication performance on the ground and in space

TECHNOLOGICAL DRIVERS AND NEW BUSINESS MODEL



TECHNOLOGICAL DRIVERS AND NEW BUSINESS MODEL

Key trends



- Transition from a **tech-driven focus on upstream solution to market pull innovations** for development of new services
- **Enabling role of downstream applications** (data delivery and satellite services, navigation, Earth observation)
- **Reduced costs for accessing space** and increasing trend in satellite constellations
- **Digital drive:** AI + ML + cloud opens new business opportunity and an expansion in services
- **Advanced manufacturing:** miniaturization and 3D printing
- Ground segments activities **evolving to a “service” model**

TECHNOLOGICAL DRIVERS AND NEW BUSINESS MODEL

Why industrial space won't be Business as usual ?

- Only very few select nations, investors, and companies will control the new space frontier. They will likely come from the ranks of **early adopters and investors** willing to take the risks necessary to capture substantial rewards.
- Most of Earth's population will not likely benefit from commercial activities in space in the short term. **Early adopters** will reap tremendous **advantage** due to the principle of cumulative advantage which means the *haves* will have more, and the *have-nots* probably won't.
- **High barriers to entry** means only companies, consortia, or countries with deep pockets will play and prosper from their first-mover advantage.
- First-movers who focus on infrastructure will have long term sustainable competitive advantage.

TECHNOLOGICAL DRIVERS AND NEW BUSINESS MODEL

Key trends and leverage factors

Strong complementarities between new space technologies – mostly Earth Observation and Sat Communications – and ongoing macro-trends:

- Complementarity of **space data services and 5G** for applications requiring low latency (new mobility solutions and logistic, finance, smart-cities)
- **Environmental and clean technologies**, and related new business models, will benefit from EO space data fusion with local data (monitoring, forecasting, environmental protection, precision agriculture)
- **Renewable energy technologies** will have increasing benefits from integration in the space value chain
- **Security** and defence system
- Advanced **healthcare research**

TECHNOLOGICAL DRIVERS AND NEW BUSINESS MODEL

Key challenges for business development

- **Standardization** process and issue related to the **regulatory** environment
- Intermediate providers of **data** services (data management/sharing models?)
- Supporting **investments** and acquisition of **skills** required for the integration of new technologies/services in firms operating in different industries

TECHNOLOGICAL DRIVERS AND NEW BUSINESS MODEL

Key challenges for business development

Risk assessment of market segments and business models for five discriminators								
	Launch industry	Satellite manufacturing	Satellite services	Ground equipment	National security	Crewed and robotic space science and exploration	Space tourism (incl. habitation)	Energy, mining, processing and assembly
Product/technology	●	●	●	●	●	●	●	●
Asset intensity	●	●	●	●	●	●	●	●
Demand	●	●	●	○	●	●	●	●
Competitive landscape	●	●	●	●	●	●	●	●
Regulation	●	●	●	●	●	●	●	●
Risk summary	●	●	●	●	●	●	●	●

Table 1: Risk assessment of market segments and business models for five discriminators

Legend: ○—Low Risk ●—High Risk

TECHNOLOGICAL DRIVERS AND NEW BUSINESS MODEL

Key findings

	Key finding	Financing challenges
1	The European space sector experiences funding hurdles similar to those of other tech companies, particularly at scale-up phase	<ul style="list-style-type: none">• Not only is the volume of European VC investment lower, venture capitalists invest with smaller tickets, and growth capital is particularly hard to find• Business loans from commercial banks are nearly inaccessible
2	Companies in both the upstream and downstream sectors of the industry struggle with access to finance, but for different reasons	<ul style="list-style-type: none">• Upstream companies face long development cycles, are capital-intensive and operate in a limited market with many business risks• Downstream companies sell to emerging markets (with predominantly governmental buyers) and to unsophisticated customers
3	Investors do not see the exit opportunity (yet)	<ul style="list-style-type: none">• Large system integrators do not yet have a tradition to invest in external innovation• Investors perceive the lack of exits as a sign of new or failing markets and therefore a risk for financial returns
4	The landscape of space sector support mechanisms is rather fragmented, and procurement is geared towards the traditional value chain	<ul style="list-style-type: none">• Entrepreneurs find it hard to navigate through the different possible funding options• The traditional European upstream space industry is used to a large institutional market of traditional public procurement and R&D grant programmes• Industry associations and entrepreneurs in both the upstream and downstream sectors indicate a lack of public anchor tenants to stimulate the sector

TAKE AWAYS

- The global space economy grew by 6.7 % on average per year between 2005 and 2017, almost twice the 3.5 % average yearly growth of the global economy.
- The industry changed from **technology push to demand pull**
- From a strong public-based industry, the space sector is **opening up to private companies.**
- Public space agencies play an important role in both the US and European space sectors:
 - creating **linkages** between **non-space** innovation systems **and the space innovation system,**
 - coordinating long-term infrastructures with “public good” characteristics, and
 - governing space-involved innovation systems.
- In the global space economy, **satellite** services represent the **largest sector** (about 37%), closely followed by ground-based equipment. Earth observation is the largest user of satellite production and launch services and remains a key driver for the entire sector.

TAKE AWAYS

- From standalone, **high-technology sector**, space is now an enabler for a variety of applications and services.
- Funding for New Space companies comes from a variety of sources. A set of high-profile entrepreneurs—Elon Musk, Jeff Bezos, Richard Branson, Paul Allen, and others—have used their wealth to overcome high fixed-cost barriers to entry, launching companies based on new approaches to the technology and management of space access
- The global value chain is emerging with **more players** and a diversity of business models.
- Space industry includes firms that **do not** brand themselves as **space firms** but as information technology or media companies – where space is one means to deliver their products and services to clients.
- There are **different service providers** at each link in the value chain.
- The key growth area in New Space is in the midstream, where data processing and dissemination and delivery are being conducted by rapidly **growing start-ups**, financed by dot-com billionaires and building new ideas for using EO data.

READINGS AND MATERIALS

“EO and GNSS Market Report” (2022) EUSPA

“The future of the European Space Sector” (2019) European Investment Bank

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“Main trends & challenges in the space sector” (2020) PWC

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