NEW SPACE PORTUGAL

SPACE EO GUIDE

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NOVA SCHOOL OF BUSINESS & ECONOMICS

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I.

What you'll find in this Guide

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Who is this Guide for

This Space EO Guide aims to help organisations effectively navigate the intricate landscape of market, business, technical, legal and regulatory opportunities and challenges associated with Earth Observation (EO). It serves as a practical tool to assist organisations in the development, manufacturing, launching and operation of EO satellites, dissemination of EO data and value-added services (VAS) and purchase of EO data and VAS.

This EO Guide is useful for:

- Satellite operators wishing to launch and operate EO satellites
- EO satellite manufacturers and integrators
- EO component and service suppliers
- EO data providers
- EO value-added service (VAS) providers
- End users of EO data and VAS across all market segments, as indicated in Figure 2

Other stakeholders may also find this Space EO Guide useful, including:

- Launch operators
- Investors
- Space agencies and regulators

This Guide covers all stages of the EO value chain and data lifecycle, as indicated below.

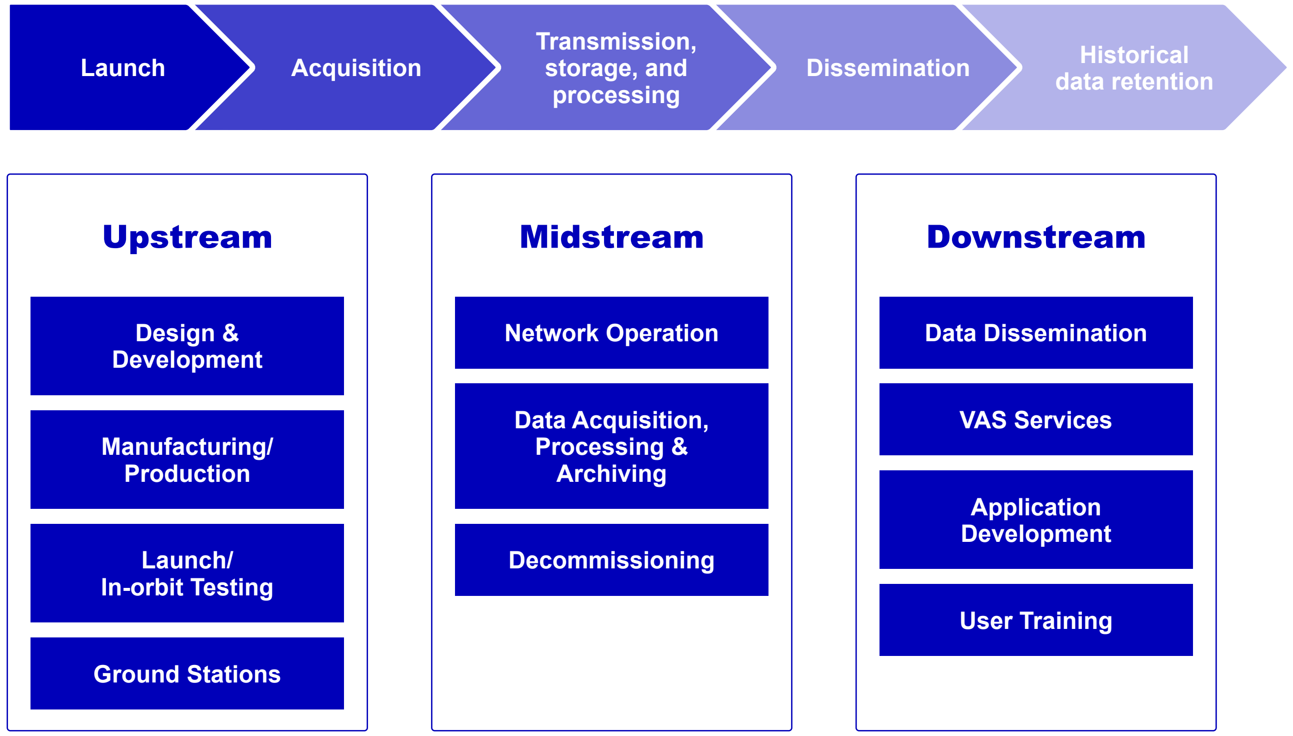

Figure 1 — EO value chain and data lifecycle.

Figure 2 — Market segments that can benefit from this EO Guide.

By providing structured guidance, this document supports organisations in identifying and reflecting on the key opportunities and concerns throughout the EO value chain, through practical questions and recommendations.

Ultimately, this EO Guide empowers organisations in the acquisition, dissemination, and purchase of EO data and VAS, responding to the growing procurement of such data and services, including in light of the Sustainable Development Goals (SDGs) and Environmental, Social and Governance (ESG) concerns.

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How to use this Guide

This Guide is divided into three main chapters covering the main stages of the EO value chain:

- **Upstream**
- **Midstream**
- **Downstream**

The Guide comprises a set of questions on market, business, technical and legal topics. **To help you navigate through the questions, each of them is marked accordingly by a tab system:**

MARKET & BUSINESS	TECHNICAL	LEGAL & REGULATORY

Throughout the Guide, some icons will also guide you to choose what to read:

This icon indicates a short suggestion or advice

This icon indicates that the topic is being developed in more detail

This icon indicates that a nugget of information is being provided

You can read the entire Guide to get a complete overview of the main market, business, technical and legal topics impacting EO, or you may choose to read only the Chapters, questions or matters that interest you most.

By using this Guide, you will be able to:

- Understand the main market opportunities in EO;
- Determine the technical features of your satellites, data or service on the basis of the current market needs and requirements;
- Assess the best financing sources and business models for your EO activity;
- Understand the main legal and regulatory rules that may apply to your activity, and ensure legal compliance — with a focus on EU law;
- Understand the benefits of using EO data in your activity;
- Understand the types of questions you should be asking.

By using this Guide, you will become better equipped to develop your EO activity in a successful and compliant manner.

Beyond this Guide

This EO Guide is complemented by a dedicated platform, where you can find comprehensive information on EO, covering market, technical, social, policy and legal topics.

Remember to check the platform, as it contains further information that can be useful for your business.

This Space EO Guide was developed as part of the New Space Portugal initiative (NSP), a flagship private project for satellite EO that is being developed under the Portuguese Recovery and Resilience Plan. Its aim is to transform and develop the Portuguese space sector, both upstream and downstream, through the design, development and production of satellites, as well as through the expansion of products and services, especially value-added offers. For more information on the NSP, please visit https://www.newspaceportugal.org/en.

Under the NSP initiative, a set of Research Studies on EO has been undertaken, aimed to:

- Understand the challenges and opportunities arising from the creation, acquisition, and dissemination of EO data;
- Contribute to the creation, in a systematic way, of new and innovative legal, policy, economic, social and technological approaches, scenarios, models and methodologies;
- Promote, through the work undertaken, the creation, acquisition, processing, dissemination and use of EO data and its underlying systems;
- Raise awareness in the Portuguese, European and international community of the opportunities and challenges of EO and for the EO sector.

This Guide is one of the outputs of the Research Studies on EO.

II.

Upstream

RELEVANT STAKEHOLDERS

- Satellite operators (public and private)
- Manufacturers and integrators
- Component suppliers
- End users
- Launch operators
- Upstream investors
- Space agencies and regulators

WHAT IT IS

Upstream is the beginning of the EO satellite lifecycle and includes everything necessary for satellite development, construction, and launch.

MARKET & BUSINESS

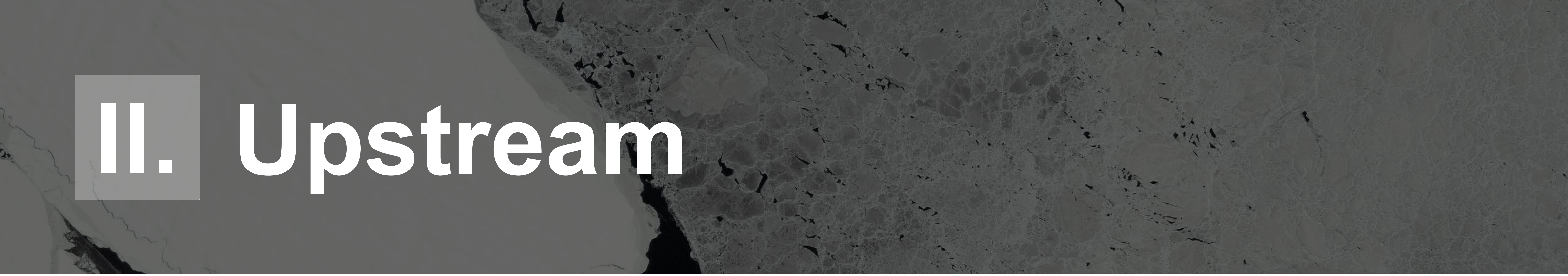
From an economic perspective, the upstream segment represents the most capital-intensive phase of the EO value chain, requiring significant investment in research and development (R&D), infrastructure, and highly specialised manufacturing. While high upfront costs and long development timelines can pose barriers to entry, this stage is often supported by national space budgets and public-private partnerships. Upstream investment is increasingly being viewed as a strategic economic asset that can stimulate industrial innovation and create spillover benefits across adjacent sectors.

TECHNICAL

From a technical perspective, this includes the design, manufacturing, and integration of sophisticated instruments, the preparation and execution of the satellite's launch, and the intricate operations involved in the satellite's functional deployment. This stage also includes the construction and preparation of ground stations to receive the data that the satellite will transmit back to Earth.

LEGAL & REGULATORY

From a legal and regulatory perspective, the upstream stage requires compliance with a set of regulatory requirements relating to satellite features, as well as with relation to the launch of the satellites and the installation of ground stations. Contractual topics are also paramount here, especially for component acquisition, satellite manufacturing and satellite launch.



II. Upstream

What you'll find in this chapter		Relevant to
MARKET & BUSINESS **LEGAL & REGULATORY**	Demand for EO satellite capacity is rapidly expanding across all market segments – see questions 1.1 and 1.2 to know the expected increase and demand across sectors, and how policies and laws are playing a role in creating demand	
TECHNICAL	To respond to this demand, the design and deployment of satellites must take into account a set of essential technical features that must also consider real-world needs – see question 1.3 to know key features and common user needs	
LEGAL & REGULATORY	Satellites must also be designed and manufactured to be legally compliant – see question 1.4 to know applicable legal requirements, and question 2.4 to see other aspects to consider, notably IP and import/export	
MARKET & BUSINESS	Several business aspects must also be considered from the very beginning, including what organisational model to implement, which revenue streams to adopt and the financing and funding mechanisms you can resort to – see questions 2.1, 2.2 and 2.3 for guidance on these points	
LEGAL & REGULATORY	Contractual topics for satellite development and manufacturing must also be carefully tackled – see question 2.5 for a set of main aspects to be considered	
MARKET & BUSINESS **TECHNICAL**	The launch of the satellite must take into account the features of the launchers and financial issues – see question 3.1 on the current launcher offer and questions 3.2 and 3.3 on technical and financial aspects to consider when selecting a launcher	
LEGAL & REGULATORY	Legal requirements for satellite launch, as well as main aspects to consider in a launch services contract, must also be taken into account – see questions 3.4 and 3.5 on this topic	
TECHNICAL **LEGAL & REGULATORY**	Finally, the technical features and legal compliance of the ground segment are also points to be considered – see questions 4.1 and 4.2 on this matter	

STEPS TO BUILDING AND LAUNCHING YOUR SATELLITE

Principles	Actions
Feasibility First	1. Before committing to satellite development, a thorough **feasibility study** is essential to evaluate technical feasibility, cost-efficiency, market potential, revenue model, and regulatory alignment. This step helps de-risk large capital investments and ensures that upstream EO projects are economically justified and strategically positioned within broader space and industrial goals. TIP Begin with the end in mind. Prepare a list of potential clients for the data or services you intend to provide and consult with them in your satellite plans from the start.
Funding Fit	2. Following this, the right **funding mechanisms** with terms and conditions acceptable to the mission should be pursued.
Needs Match	3. Design and manufacture of the satellite should then take into account the needs and requirements identified. **Mission requirements** should be defined and, based on that, the system and subsystem architecture need to be determined, ensuring the design is validated. After the mission is defined, it is necessary to assemble the satellite following all necessary functional testing.
Launcher Alignment	4. To choose a launcher, it is necessary to consider the compatibility with the satellite's/mission specifications (e.g. mass, targeted orbiter and desired scheduling) as well as the reliability of the launcher. These factors must be balanced within the constraints of the available budget.
Compliance Diligence	5. The necessary **regulatory approvals** (licences, frequencies, orbital slots, and launch authorisations), as well as **contracts** with suppliers, service providers (including insurance providers) and partners, should be concluded. Legal requirements, notably on safety, resilience and environment, should be complied with. Applicable standards, best practices and guidelines should also be taken into account.
Operational Assurance	6. After a successful launch, early operations begin to ensure that all the systems are carefully activated and tested, and that the mission requirements are met. After this, the payloads are activated and calibrated and their output is validated.
Operational Readiness	7. With early operations completed, the satellite is ready for data collection and processing, and commercial operations may begin.

Satellite operators (public and private) — Component suppliers — Launch operators — Space agencies and regulators — Manufacturers and integrators — End users — Upstream investors

UPSTREAM

1. Satellite demand and features

What is the demand for EO satellite data and what requirements should EO satellites meet to respond to that demand — and why?

RELEVANT TO

MARKET & BUSINESS

1.1. WHAT IS THE CURRENT AND PROJECTED DEMAND FOR EO SATELLITE CAPACITY, AND HOW DOES PORTUGAL FIT INTO THIS LANDSCAPE?

The satellite industry is experiencing a transformative phase driven by a surge in demand for satellite-based data and services across various sectors. Advancements in satellite functionality, alongside decreasing operational costs, serve as catalysts for market growth, facilitating broader service offerings and increased market penetration.

Over the next decade, the global EO satellite launches are projected to nearly triple as the manufacturing market grows by 40% and the value of the launch market increases by 55%.

Global Satellite Market

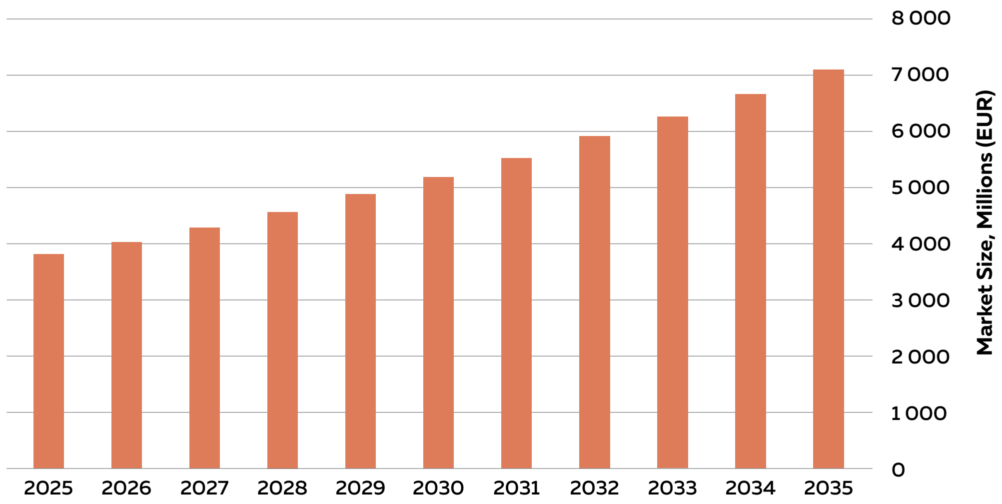


Figure 3 — Global Satellite Market (data from press release: *Novaspace: Earth Observation satellites set to triple over the next decade, 11 July 2024*).

Europe's demand for EO satellite capacity is rapidly expanding, driven by climate monitoring, security requirements, and commercial applications like agriculture and infrastructure.

Portugal, though a smaller player, is carving out a strategic niche — leveraging its Atlantic positioning, strong academic base, and initiatives like the Atlantic Constellation to contribute micro- and nanosatellite capabilities. As Europe pushes for greater autonomy and resilience in EO infrastructure, Portugal is emerging as a dynamic player in the upstream EO sector, with successful launches of the AEROS MH-1 and ISTSAT-1 in 2024 and of Prometheus-1 and its first commercial satellite, PoSAT-2, in 2025.

The country has also recently licensed its first commercial spaceport in the Azores. Portugal is supported by its national Space Strategy 2030, which aims to attract €2.5 billion throughout 2020-2030 to the industry, with a 50/50 balance between public and private sectors. While still maturing, Portugal's coordinated approach positions it as a promising hub across upstream, midstream, and downstream sectors, as well as EO services, infrastructure, and research in the European market.

RELEVANT TO

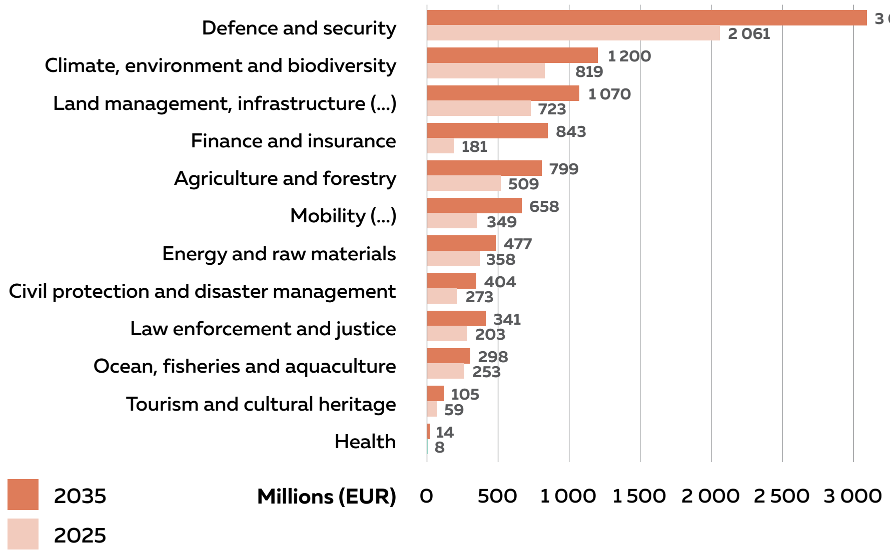
MARKET & BUSINESS

LEGAL & REGULATORY

1.2. WHAT IS THE CURRENT AND PROJECTED DEMAND FOR EO DATA?

Satellite imagery demand is rapidly gaining traction as organisations across various industries recognise its immense value and potential. This growing demand is driven by several factors, including advancements in EO technologies, lower data costs, innovative technologies, customised applications, and open data policies, as well as by their increasing use to respond to current challenges, such as climate change, disaster management and response, and urban planning and smart cities.

Currently, the largest EO market is the Defence and Security market, poised to reach over €3 billion by 2035. Civilian EO markets are dominated by Climate, Environment, and Biodiversity; Land Management, Infrastructure, and Urban Development; and Agriculture and Forestry in 2025. However, the Finance and Insurance sector is set to overtake Agriculture and Forestry for third place by 2035.



EO Market Size in 2025 and 2035

Figure 4 — EO market size of various market segments in 2025 and 2035 (data from: *New Space Portugal, WP 9.1 Fundamental Research and WP 9.2 Industrial Research: Developmental Research Studies on Earth Observation*).

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Finance and Insurance is also the commercial EO market with the highest compound annual growth rate (CAGR), as shown in Figure 5 below, with Agriculture and Fisheries with a substantial CAGR as well. Ocean, Fisheries and Aquaculture, and Mobility, show a relevant CAGR as well.

EO Market Segment Growth Data (2025 - 2035)

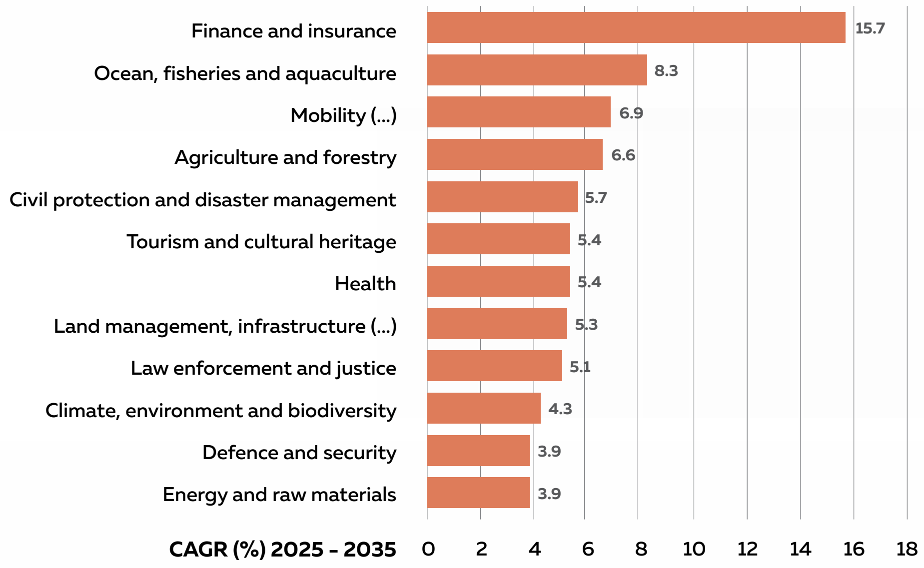

Figure 5 – Global EO Market segment growth (data from *New Space Portugal WP 9.1 Fundamental Research: Developmental Research Studies on Earth Observation*).

Market needs may also result from **policy and legal requirements**. Indeed, an increasing number of policies and legislation at the EU level – though not demanding the use of EO data – is highlighting its use as an important instrument for legal compliance or to achieve the goals of various policies and laws. This is the case, for instance, of policies and legislation in Climate, Environment and Biodiversity, Energy and Raw Materials, Agriculture and Forestry, Ocean, Aquaculture and Fisheries, Health, among others.

NUGGET

- The European Climate Law, the EU Strategy on Adaptation to Climate Change, the General Union Environment Action Programme to 2030, and the EU's Biodiversity Strategy for 2030, make express references to EO data, as does the Nature Restoration Law.
- The use of satellite images is addressed in relation to methane detection monitoring (EU's Strategy to reduce methane emissions and Regulation on methane emissions reductions), and in relation to the identification and monitoring of sites, notably in the Communication on Critical Raw Materials Resilience and in the Critical Raw Materials Act.
- The Farm to Fork Strategy expressly mentions space-based solutions for achieving several of its goals, as does the New EU Forest Strategy for 2030. In addition, certain provisions of the Common Agricultural Policy (CAP) refer to satellite data: the Regulations relating to the financing, management and monitoring of CAP refer to the use of agro-meteorological information and satellite data. The proposed Regulation on a monitoring framework for resilient European forests, and the proposed Soil Monitoring Law, also expressly refer to EO, as does the EU Deforestation Regulation.
- The updated EU Maritime Security Strategy and its Action Plan refer to the use of EO for maritime surveillance, marine environment monitoring and climate change. The legal provisions on monitoring methods for the good environmental status of marine waters also mention that satellite-based surveillance data may be used by EU Member States to identify the source of significant acute pollution events.

RELEVANT TO — TECHNICAL

1.3. WHAT TECHNICAL FEATURES SHOULD BE CONSIDERED IN ORDER TO RESPOND TO THIS DEMAND?

When designing and deploying upstream EO infrastructure, several technical features must be considered. These features determine the quality, usability, and timeliness of the EO data products that downstream services rely on.

Key aspects include:

- Sensor and Payload Capabilities;
- Satellite Platform and Orbit Design;
- Data Handling and Transmission;
- System Reliability and Scalability.

While the previous aspects outline the essential technical features to consider in the upstream segment, it is equally important to connect these features to the real-world needs they are designed to address. End users – from environmental agencies and urban planners to disaster response teams and climate scientists – require EO systems that are tailored to their operational contexts.

TIP

Maintain early and ongoing engagement with end users throughout satellite design and manufacturing, translating their needs into precise technical requirements and validating design choices with user feedback and real performance criteria.

KNOW MORE

KEY TECHNICAL FEATURES

SENSOR AND PAYLOAD CAPABILITIES	
Spatial resolution	Level of detail captured, ranging from sub-meter for urban monitoring to tens of meters for regional studies.
Spectral coverage	Selection of spectral bands (visible, near-infrared, thermal, radar, etc.) tailored to applications such as vegetation monitoring, maritime surveillance, or disaster response.
Radiometric sensitivity	Ability to detect subtle differences in reflectance or emission, essential for accurate scientific analysis.
Temporal resolution (revisit time)	Frequency of data acquisition over the same area, crucial for dynamic phenomena like deforestation, crop growth, or flood monitoring.
Swath width and coverage	Breadth of the ground area observed per pass, influencing coverage efficiency.

SATELLITE PLATFORM AND ORBIT DESIGN	
Orbit type	Sun-synchronous for consistent lighting conditions in optical imagery.
	Geostationary for continuous monitoring of a fixed area.
	Low Earth Orbit (LEO) constellations for high revisit rates.
Constellation size and configuration	More satellites enable higher revisit frequency and global coverage.
Platform stability and pointing accuracy	Ensures sharp images and accurate geolocation.
On-board autonomy	Advanced tasking, processing, and anomaly detection reduce dependency on ground control.

DATA HANDLING AND TRANSMISSION	
On-board data processing	Pre-processing (e.g., compression, calibration, cloud detection) to reduce data volume and enable near-real-time delivery.
Downlink capacity and ground segment connectivity	High-rate communication channels to ensure timely transfer of large data sets.
Latency considerations	Especially critical for emergency management and defence applications.
Data security and encryption	Protecting sensitive or strategic EO data from unauthorised access.

SYSTEM RELIABILITY AND SCALABILITY	
Redundancy and fault tolerance	Mitigating risks of sensor or platform failures.
Scalability	Designing systems flexible enough to integrate new satellites, sensors, or partners as needs evolve.
Lifetime and maintenance	Extending mission duration through robust design and potential servicing options.

Examples of common user needs and the corresponding upstream technical features that can be implemented to meet them. This illustrates how strategic choices in satellite payloads, orbital design, data handling, and system reliability directly translate into usable, timely, and impactful EO data.

USER NEED	RECOMMENDED UPSTREAM TECHNICAL FEATURES
High Detail/ Precision Monitoring (e.g. landcover, vegetation classification)	▪ High spatial resolution sensors (submeter to ~10 m) ▪ Multispectral and NIR bands for vegetation and land use mapping
Frequent Updates (e.g. timeseries, crop growth, deforestation)	▪ Satellite constellations designed for high revisit frequency (every few days or better) ▪ Wide swath instruments for greater coverage per pass
All Weather/ Day Night Access (e.g. flood events, disaster response, maritime surveillance)	▪ Synthetic Aperture Radar (SAR) sensors ▪ Cband or Xband SAR for the balance of resolution and coverage
High Accuracy/ Subtle Change Detection (e.g. ground deformation, infrastructure monitoring)	▪ SAR interferometry (InSAR) ▪ High radiometric sensitivity ▪ Precise orbit control for cm-level accuracy
Wide Area Environmental Coverage (e.g. vegetation health, atmospheric monitoring, climate services)	▪ Medium to coarse resolution optical/thermal sensors (30–300 m) ▪ Wide swath (>150 km) ▪ Thermal infrared bands for land surface temperature
Rapid Response/ Near-Real-Time Needs (e.g. emergencies, security, defence)	▪ Low-latency downlink and multiple ground stations ▪ Onboard preprocessing (compression, cloud detection) ▪ Automated priority tasking for emergencies
Detailed Spectral Information (e.g. pollution detection, mineral mapping, water quality)	▪ Hyperspectral sensors with ≥100 bands ▪ High spectral resolution (<10 nm) ▪ Radiometric calibration for accuracy
Long-Term Consistency & Continuity (e.g. climate change monitoring, trend analysis)	▪ Sun synchronous orbit for consistent illumination ▪ Stable calibration and radiometric quality control ▪ Overlapping mission lifetimes for data continuity

RELEVANT TO

LEGAL & REGULATORY

1.4. WHAT ASPECTS NEED TO BE CONSIDERED TO ENSURE SATELLITES ARE LEGALLY COMPLIANT?

Satellites must be designed and manufactured in a manner that ensures compliance with the applicable legal requirements. The application of these legal requirements needs a case-by-case assessment.

NUGGET

- Applicable laws are mostly national space laws, which establish a set of conditions for licensing of space operations.
- Not all countries have national space laws, but those that do usually apply to the launch and return of space objects, as well as their command and control, whether performed by national operators or in national territory. Other activities may also be covered: e.g., operation of spaceports, collision avoidance services, or EO data dissemination.
- More than one space law may apply to the same operator. In this case, the operator needs to comply with all applicable laws.
- The proposed EU Space Act brings forward a set of harmonised requirements to space operations. It applies to EU space operators and to third-country operators. The proposal requires all EU countries to subject space activities by EU space operators to authorisation. Third-country operators, in turn, are subject to EU registration.

Some requirements that may have to be taken into account in the design and manufacture of satellites include:

- Technical capabilities;
- Security and resilience requirements;
- Environmental requirements;
- Data requirements.

TIP

Create a checklist of all legal requirements that apply to serve as guidance for your technical teams or as necessary to include in contracts with suppliers. These may include not only those resulting from space laws, but also from other laws, such as on cybersecurity, resilience, data, environment and product safety, among others. Keep clear and complete documentation and maintain regular communications with competent authorities to reduce compliance risks and avoid legal setbacks.

KNOW MORE

KEY LEGAL REQUIREMENTS

TECHNICAL CAPABILITIES

The technical features of the satellites may impact the applicable legal requirements. Notably, EO satellites with certain characteristics (e.g., certain spatial, temporal and spectral resolutions, location accuracy and coverage) may face stricter requirements aimed at ensuring national security and are thus the ones usually subject to existing dedicated EO laws.

NUGGET

- The EU does not have a harmonised law for EO. In 2014, it presented a proposal for a Directive on EO, but it was withdrawn.
- Some countries have approved autonomous dedicated EO laws: this is the case, for instance, of the US, Canada, France, Germany and Japan. However, countries with laws regulating space activities, even if not dedicated specifically to EO, also apply to EO satellites, and thus shall be taken into account by EO space operators.

SAFETY REQUIREMENTS

The features of the satellites relevant for ensuring their safety may need to be described in the request for a licence, including, for instance, control systems or dangerous substances such as radioactive, explosive or toxic substances. Compliance with certain technical requirements may also be required, such as those related to designing and manufacturing satellites to ensure their trackability or manoeuvrability.

NUGGET

- The proposed EU Space Act contains a set of requirements for the safety of spacecraft. Some of the requirements do not apply, however, to certain research and education spacecraft.
- Safety requirements applicable to satellites — or, more correctly, to their components — may result from non-space laws. For instance, product safety laws establish specific requirements for machinery and radio equipment, and there are also specific provisions for chemicals (e.g., paints, sealants, fire protection, which may be used in the space industry). These requirements need to be complied with by manufacturers, importers, and distributors as a condition for placing products/chemicals in the EU market. Not all laws, however, apply to the space sector: a notable exception includes products intended for use solely in space (e.g., the EU legal framework on batteries and on electrical and electronic equipment (EEE)).

SECURITY AND RESILIENCE REQUIREMENTS

Cyber resilience (as well as physical resilience) is an increasingly relevant topic, with space laws progressively establishing requirements for satellites to ensure their resilience and effective technical control. This may include ensuring that satellites are designed, manufactured, and tested with resilience in mind. Specific measures may be established, for instance, when it comes to tamper-resistant design, shielded components, cryptography and encryption, fail-safe mechanisms, redundancy, and inventory tracking and tagging. Supply chain security is also an increasingly relevant topic, with operators often having to ensure that their critical supply chains are secure. Security and resilience should thus be taken into account in a security-by-design and by-default approach.

NUGGET

- The proposed EU Space Act contains requirements aimed at ensuring the resilience of space infrastructure, notably in risk management and incident reporting.
- Other cross-sector cybersecurity and resilience provisions remain applicable. With more relevance herein, there are dedicated provisions to ensure the cyber-resilience of products with digital elements, applicable to their manufacturers, importers and distributors.
- An increasing number of national space frameworks address cybersecurity for space assets. For instance, the US Space Policy Directive-5 contains cybersecurity principles for space systems, whilst the UK Space Agency has approved a Cyber Security Toolkit.

ENVIRONMENTAL REQUIREMENTS

Satellites may have to be designed and manufactured to ensure certain environmental sustainability requirements are met. The most relevant of these are measures to ensure space debris mitigation. Laws may refer to existing guidelines and standards: e.g., ISO – International Organisation for Standardisation, the Space Debris Mitigation Guidelines from IADC – Inter-Agency Space Debris Coordination Committee – or the Space Debris Mitigation Guidelines from UNOOSA – United Nations Office for Outer Space Affairs. Laws may also detail the features that must be met (e.g., for reliability of design, for limiting accidental fragmentation, for end-of-life disposal). Other environmental aspects, such as light and radio pollution, may also be addressed. Storage of hazardous materials, as well as waste management obligations, may also apply.

NUGGET

- The proposed EU Space Act establishes environmental requirements for spacecrafts, including on space debris mitigation.
- Eco-design requirements aimed at reducing the environmental footprint of products may also be relevant for the EO lifecycle. In this regard, and as stated by the EU ecodesign framework, as space technologies operate in extreme conditions, applicable ecodesign requirements for space products should balance sustainability considerations with resilience and expected performance. Future requirements may thus be approved in the EU in line with the above.

DATA REQUIREMENTS

Space laws — especially those specifically regulating EO — may contain data requirements impacting the features of the satellite/space system, for instance, when it comes to storage of data acquired by the satellite or the instructions to the satellite.

NUGGET

- The proposed EU Space Act addresses data topics that may impact the features of the satellite, notably the requirement that the flow of observation data be tracked from its generation by a satellite to its incorporation into the first space service making use of that data.
- Cross-sector data laws may also impact the features of satellites. For instance, personal data requirements (e.g., lawfulness and transparency, data minimisation, storage limitation) may require satellites to ensure, from the beginning, the implementation of privacy-enhancing technologies (PET), such as anonymisation or encryption of data, or the adoption of lower resolution features for certain types of data collection. Data sharing legislation may also end up impacting decisions on the features of satellites: for instance, in the EU, high-value datasets — notably geospatial, EO and environment, and meteorological — held by public sector bodies must meet certain attributes, e.g., on resolution, granularity, coverage, frequency (see also question 8.5). As a result, satellite operators wishing to provide such data to public entities may need to ensure that their satellites are able to respond to such requirements.

Compliance with **standards, guidelines and best practices** is also an important aspect to consider, including those from ISO, ITU, GSOA (Global Satellite Operators Association), ECSS (European Cooperation for Space Standardisation), CCSDS (Consultative Committee for Space Data Systems) and EARSC (European Association of Remote Sensing Companies). Compliance with standards may be mandatory under national law, a best practice and/or required by clients.

TIP

Define the standards, guidelines, and best practices to follow, and classify them according to topic, field of application and nature (mandatory or not).

NUGGET

- In the EU, compliance with harmonised standards and common specifications may lead to a presumption of conformity with applicable legal requirements. This occurs, for instance, with relation to product safety, resilience and sustainability, AI and for certain aspects, in the proposed EU Space Act.
- European Harmonised Standards are European standards developed by a recognised European Standards Organisation: CEN, CENELEC, or ETSI. A harmonised standard is created following a request from the European Commission to one of these organisations.

II.

UPSTREAM

2. Satellite development and manufacturing

What should be considered when developing and manufacturing EO satellites?

RELEVANT TO

MARKET & BUSINESS

2.1. WHAT ARE THE DOMINANT ORGANISATIONAL MODELS FOR EO SATELLITE OPERATORS IN EUROPE?

In Europe, EO satellite operators employ a mix of organisational models, reflecting diverse funding structures and end user demands. A dominant organisational model includes full ownership (a vertically integrated satellite operator), where satellite operators develop and control their own satellites/constellations to sell imagery or analytics services. Players in the EO satellite market also include component or subsystem suppliers who specialise in satellite parts without manufacturing the complete satellite. This can be a good way to enter the market without facing the full capital demands of a fully vertically integrated satellite operator.

Finally, while partnerships between public and private entities (notably PPPs) are a well-established organisational model in Europe's telecommunications satellite sector, they remain relatively rare in EO due to fragmented demand, shorter satellite lifespans, and the perception of EO data as a public good. However, emerging commercial players and regional initiatives – such as Portugal's Atlantic-focused programmes – may open new opportunities for public-private partnerships in EO tailored to specific public needs.

TIP

Start with the organisational model in mind, making sure it aligns with your strategic goals, business activities and culture, with adequate flexibility to accommodate growth impacts to the business' governance and organisation.

KNOW MORE

CURRENT UPSTREAM EO ORGANISATIONAL MODELS FOR COMMERCIAL SATELLITE OPERATORS IN EUROPE

ORGANISATIONAL MODEL	DESCRIPTION	ADVANTAGES	DISADVANTAGES
Vertically Integrated Satellite Operator	Company designs, builds, launches, and operates its own EO satellite(s)	▪ Full control of the value chain and offerings ▪ Strong IP ownership	▪ High capex ▪ Long development cycles and tech risks ▪ Barriers to entry for industry outsiders
Component/ Subsystem Supplier	Manufactures EO instruments, sensors, or satellite parts for other operators	▪ Lower capital intensity than a full satellite builder ▪ Access to multiple markets (EO, telecoms, etc.)	▪ Less control over the final product ▪ Sensitive to procurement cycles ▪ Less profit margin
Public-Private Partnership Model	Shared ownership or operation between the government/ public entities and a private satellite firm	▪ Shared risk and cost ▪ Access to public funding or markets	▪ Bureaucratic constraints (including public procurement rules) ▪ Conflicting incentives that need to be negotiated

RELEVANT TO

MARKET & BUSINESS

2.2. WHAT ARE THE MOST COMMON REVENUE STREAMS FOR COMMERCIAL EO SATELLITE OPERATORS?

EO operators can diversify revenues through several service and asset-based models. Satellite capacity leasing, where governments or large institutions lease satellite capacity (transponders, bandwidth, or imaging time) from private satellite operators instead of owning assets directly, provides EO operators with predictable, long-term income, while enabling clients to access capabilities without heavy capital investment. Satellite-as-a-Service (SataaS) – a cloud-like model where clients pay for data, analytics, or satellite tasking – goes further by offering flexible, often subscription- or usage-based access, effectively lowering the barrier for smaller players.

For the EO operators, this also requires greater flexibility and innovation when it comes to designing the hardware and operating the service platform, as SataaS will need to cater to a diverse range of clients in an increasingly competitive environment. A related model, Data-as-a-Service (DaaS), focuses on delivering EO imagery and analytics as a packaged service, where clients pay for continuous data feeds or processed insights rather than raw infrastructure.

TIP

Assess market demand, customer preferences and competitor strategies to select the most suitable models for your business and long-term scalability. Ask clients for feedback and pilot different revenue approaches to determine customer-fit and maximise profitability.

Another revenue stream is the hosted payload model, which allows third parties to place their instruments on a commercial satellite platform, reducing launch and operations costs while providing the host operator with an additional revenue stream. Less common, but a rapidly growing subsector, is for EO operators to also generate revenue through Value-Added Services (VAS). These services build on raw data by providing analytics, visualisation platforms, and tailored solutions for end users in sectors like agriculture, insurance, energy, and climate monitoring. Unlike satellite leasing or hosted payloads, which monetise the physical asset, VAS monetises insights – turning commoditised imagery into decision-ready intelligence. This model is becoming increasingly common among EO operators as data alone is less profitable in a crowded market, and clients are increasingly demanding actionable outcomes rather than raw pixels. In fact, VAS is now a key growth area in the EO sector, often combined with DaaS or SataaS models to create integrated offerings that lock in recurring revenue and deepen client relationships. Together, these models illustrate the shift from purely hardware-driven revenues to service-oriented approaches that maximise satellite utilisation and broaden market access.

KNOW MORE

CURRENT REVENUE STREAMS FOR COMMERCIAL SATELLITE OPERATORS

REVENUE STREAMS	DESCRIPTION	ADVANTAGES	DISADVANTAGES
Satellite Capacity Leasing	Available in short and long-term leasing, the EO operator contracts the use of the satellite to third parties for an agreed-upon time	▪ Lower marketing and sales needs after securing clients ▪ Predictable, long-term income ▪ Attractive to larger corporations and governments that can forego large Capex outlays	▪ Difficult to scale as satellite capacity is not easily increased ▪ High dependence on a small number of large clients ▪ Ties revenue to satellite lifespan
Satellite-as-a-Service (SataaS)	Provides satellite capacity or missions on demand for clients	▪ Attractive to government, education, and startup clients ▪ Potential for diversification	▪ High operational complexity ▪ Requires flexibility in design and mission planning ▪ Requires continuous improvement to keep abreast of competitors

Hosted Payload Model	Hosting EO sensors on the mission's satellite (commercial or government)	▪ Lower launch costs for the client and additional revenue for EO operators (win-win) ▪ Expands partnerships with governments & research orgs	▪ Integration and technical risk ▪ Limits flexibility in satellite design/mission ▪ Reliant on external demand for payload hosting
Data Sales and Data-as-a-Service (DaaS) (see also question 8.2)	Owns satellite(s) and sells access to data via API or platform (this can eventually be expanded into other services)	▪ Recurring revenue ▪ Scalable model ▪ Easy client onboarding	▪ Heavy upfront investment ▪ Need for strong data and UX management
Value-Added-Services (VAS) (see also question 8.2)	Provision of analytics, insights, platforms, and sector-specific solutions (e.g., crop monitoring, emissions tracking).	▪ Higher margins than raw data sales ▪ VAS revenue market is growing higher than data sales over time ▪ Differentiates the operator in a crowded market ▪ Expands client base into non-space sectors ▪ Creates ecosystem effects (platform lock-in)	▪ Requires domain expertise and service development beyond space ▪ Higher upfront investment in software, analytics, and marketing ▪ More competitive with non-space tech players (AI, GIS firms)

RELEVANT TO

MARKET & BUSINESS

2.3. WHAT PUBLIC AND PRIVATE FINANCING AND FUNDING MECHANISMS ARE AVAILABLE TO SUPPORT EO SATELLITE DEVELOPMENT?

Securing adequate and appropriate financing is crucial for EO satellite operators to turn innovation into reality and scale their missions effectively. The global satellite financing market, valued at approximately €19.4 billion in 2024, is projected to more than double by 2035, expanding at a healthy CAGR of 8.7%. This growth is being fuelled by rapidly advancing satellite technology — such as miniaturisation, reusable launch systems, and small satellite platforms — which has lowered entry barriers and spurred demand across commercial, defence, and environmental sectors.

Private financing can include **third-party funding** (including loans, commercial paper, notes, bonds), **private equity and venture capital** (including through convertible instruments, that limit dilution until a trigger event occurs), **commercial debt** (such as factoring – whereby a company sells its accounts receivables/invoices to a financial institution at a discount for immediate cash – and sale and lease back of facilities/equipment – whereby a company sells equipment/facilities it owns to a financial institution which subsequently leases it back to it for a rent, with the possibility of the company to acquiring back the asset at the end of the contract for a residual amount), and **raising funds through a public listing**.

Specific funding strategies will vary depending on the stage of business development. Early-stage companies are best served by prioritising public and non-dilutive funding sources, such as government startup grants, research and innovation programmes, and space-focused incubators. These not only provide essential capital without giving up equity but also lend credibility and access to expert networks. As companies mature, mid-stage companies typically turn to private equity financing, including venture capital or private equity, or adopt hybrid models that combine equity investment with continued public support. This enables them to scale operations while leveraging strategic partnerships. Finally, established companies — those with proven technology and revenue streams — may pursue project finance, strategic debt instruments, or even consider public listing to raise substantial capital, diversify investor profiles, and accelerate expansion.

A particularly innovative mechanism in the space sector gaining attention is **space asset securitisation**, which pools revenue-generating satellite assets into tradable financial instruments — unlocking liquidity and enabling capital-efficient scaling[1]. Regardless of the preferred financing tool, companies in the EO sector should carefully weigh the pros and cons before committing to their project.

NUGGET

- Europe offers a range of public and private funding mechanisms focused on scaling capacity and advancing technological capabilities. In terms of public financing, ESA programs such as Copernicus Contributing Missions, ARTES, and FutureEO (for scientific innovation) support mission co-development and payload innovation, particularly for operators and educational institutions with a track record. The European Union provides additional funding through Horizon Europe (mainly grants) and contracts under the EU Space Programme, often favouring companies that contribute to EU strategic autonomy. In Portugal, co-financing is facilitated via Portugal Space and through national grants for science and technology, aligning national priorities with ESA and EU funding calls. Operators can also tap into long-term loans or blended finance from the European Investment Bank (EIB), especially for infrastructure-heavy constellations or dual-use EO systems.

TIP

Actively monitor funding programmes and private sector sources that align with EO technology and services. Ensure that bespoke funding and financing meet your needs and that risk is mitigated, including through the structuring of the funding/financing structure and relevant documentation.

[1] Satellite Financing Market Research Report 2023.

KNOW MORE

FUNDING OPPORTUNITIES FOR UPSTREAM COMMERCIAL EO SATELLITE OPERATORS

FUNDING TYPE	MOST SUITABLE FOR	WHEN TO PURSUE	ADVANTAGES	DISADVANTAGES
Government Grants & R&D Programmes (e.g., ESA, Horizon Europe, national space agencies)	▪ Established companies with industry track record ▪ Startups and scale-ups with respect to specific startup or innovation grants	▪ Early-stage development, technology validation, or strategic capability building	▪ Non-dilutive ▪ Supports innovation ▪ Offers credibility and networking	▪ Competitive ▪ Bureaucratic ▪ Often restricted to predefined objectives
Public Procurement Contracts/ Other long term commercial arrangements that allow for the anticipation of revenue	▪ Established companies with industry track records	▪ When building satellites or infrastructure for government missions (e.g., Copernicus) ▪ When engaging with a customer for a long-term contract that has the financial capacity to anticipate payments	▪ Guaranteed revenue ▪ Stable, long-term funding ▪ Enhances reputation, non-dilutive	▪ High compliance requirements ▪ Rigid deliverables ▪ Low flexibility ▪ No or shared ownership ▪ Usually entails an implicit discount in respect of the amounts anticipated by the customer
Equity Financing (venture capital – VC/private equity – PE)	▪ Startups, scale-ups, and medium-sized enterprises	▪ Scaling the business, building constellations, or entering commercial markets	▪ Access to large capital ▪ Strategic investors can provide expertise/ network	▪ Dilution of ownership ▪ Can come with pressure for fast growth and returns ▪ Small pool of VC/PEs with know-how/risk appetite for true startups in the space sector
Third-party Funding (including loans, commercial paper, notes, bonds)	▪ Medium-large enterprises with financial track records (smaller companies/ companies with less financial track record may be able to access funding at lower amounts)	▪ For mature operators with predictable cash flow and assets (e.g., recurring contracts)	▪ Retain ownership ▪ Relatively fast access once qualified	▪ Requires collateral or guarantees ▪ Interest payments ▪ Not ideal for high-risk projects
Commercial Debt (e.g., factoring, sale and lease back, project finance)	▪ Medium – large enterprises with financial track records ▪ Startups and scale-ups in very particular circumstances (e.g., third party collateral)	▪ For operators with large infrastructure projects or solid creditworthiness	▪ Access to significant capital ▪ Long-term structures possible	▪ High risk of default if revenue projections fail ▪ Complex structuring
IPO/Public Markets (e.g. listing on a stock exchange)	▪ Medium-large enterprises with a competitive P/E ratio	▪ For established companies seeking to scale massively and diversify investors	▪ Large capital influx ▪ Liquidity for early investors	▪ Costly and complex; ▪ Public scrutiny ▪ Pressure for quarterly performance ▪ Equity dilution
Space Asset Securitisation	▪ A financial instrument where revenue-generating satellite assets (or their expected cash flows) are pooled and converted into tradable securities sold to investors	▪ For mid-to-late-stage operators with predictable cash flows ▪ Suitable when large capital is needed but equity dilution is undesirable ▪ Works best in stable markets with strong investor confidence	▪ Unlocks liquidity without selling ownership ▪ Diversifies funding sources beyond traditional debt/equity ▪ Can lower financing costs if investor appetite is strong	▪ Complex structuring and high transaction costs ▪ Relies on predictable, stable cash flows ▪ Exposes operators to financial market volatility

KNOW MORE

RELEVANT TO

LEGAL & REGULATORY

2.4. WHAT LEGAL ASPECTS NEED TO BE CONSIDERED WHEN DEVELOPING AND MANUFACTURING SATELLITES?

In addition to features that satellites must meet to ensure legal compliance, as seen in question 1.4, other legal aspects to be considered during satellite development and design include, notably, ownership/intellectual property, import/export provisions and environmental considerations.

Ownership and Intellectual Property (IP)

The determination of who owns the satellite, as well as who is the rightsholder of the IP rights over it, must be made. Whilst physical components of the satellite can be acquired, IP (notably copyright and patent of satellite components and software), when not developed in-house or by hire, is often licensed and thus remains with the licensor.

TIP

Develop and implement an IP strategy that ensures clarity and guidance in IP ownership, protection and use. Ensure that the IP strategy is multi-jurisdictional whenever activities throughout the satellite lifecycle occur in multiple countries.

Implement transparent governance mechanisms and systems to record and monitor IP use and development. Conduct regular IP audits to identify all potential IP assets, including those arising from collaborative projects, AI developments, and individual contributions.

Implement robust non-disclosure agreements with suppliers, partners, and employees.

The licence must grant the licensee the right to use the licensed item for its activities and for as long as needed, with support and maintenance as required.

For items developed in collaborative endeavours, prior determination of IP ownership is essential to ensure future use is possible as intended by each party and within the limits mutually agreed.

Items integrated in satellites, as well as satellites themselves, may be protected by copyright (software) or by patent when they constitute an invention.

Other routes of protection also exist, such as trade secrets, contracts, or technical measures (the infringement of which may constitute a cybercrime, notably illegal/non-authorised access to information systems, illegal/non-authorised systems interference or illegal/non-authorised data interference).

KNOW MORE

KEY IP ASPECTS

PROTECTION ROUTE	ADVANTAGES	DISADVANTAGES
Copyright	▪ Protects intellectual human creations, including software, against unauthorised uses ▪ Ensures public recognition and attribution ▪ Does not require registration – protection arises from the act of creation ▪ Grants protection for, usually, 70 years	▪ Does not protect AI creations, requiring assessment of human intervention when AI is involved. This may be complex, especially in cases of deep learning and neural networks ▪ Enforcement can be costly and time-consuming
Patent	▪ Protects inventions against unauthorised uses ▪ Grants protection for a period of, generally, 20 years ▪ Ensures public recognition and attribution	▪ Requires public disclosure of invention ▪ If the relevant technical features of the patent application are not well disclosed, the respective claims might be deemed purely mathematical or abstract methods, which are not patentable ▪ The inventor must be a natural person – no patentability without a human inventor. Hence, AI inventions are not patentable. ▪ Enforcement can be costly and time-consuming
Trade secret	▪ Does not require disclosure of information – on the contrary, it protects secrets ▪ Grants protection for an unlimited period of time	▪ Does not protect information made publicly available ▪ The determination of the trade secret holder may be complex for AI-generated information
Contract	▪ Protects confidential information and establishes rules for its use, tailoring obligations to the specific needs of the parties ▪ Provides for liability and remedies in case of breach ▪ Grants protection for the time period established in the contract	▪ Applicable only when there is a contract between the parties ▪ The determination of who is the owner of the information is important
Technical measures	▪ Does not require a specific legal approach by the company ▪ Unlawful access to networks and systems is a crime	▪ Cybercrimes require intention in committing the crime ▪ It may not protect minor cases ▪ The determination of the persons who can grant authorisation for access to systems/data may be complex for AI-generated works | inventions

NUGGET

- Principles and ideas are not protected by copyright. Algorithms, as such, are not copyrightable, though their expression through code is.
- Software is excluded from patentability.

Yet, computer-implemented inventions (CIIs) are patentable. CIIs are inventions that use a computer, computer network, or other programmable apparatus, where one or more features are realised wholly or partially through a computer programme.

- Discoveries, scientific theories, and mathematical methods; schemes, rules and methods for performing mental acts, playing games or doing business; and presentations of information are also excluded from patentability.

Import/export

Legislation providing for the control of the movement of dual-use items (as well as military items), among which may be EO satellite equipment/technologies/software, is primarily structured from the perspective of export controls. However, importing countries may still enforce their own regulations and controls for dual-use items.

TIP

Classify the item under applicable law, check if authorisation is required and retain the relevant documentation. Maintain regular contact with the competent customs services to ensure legal compliance.

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KNOW MORE

KEY EXPORT/IMPORT ASPECTS FOR DUAL-USE ITEMS

EXPORT	IMPORT
▪ Exporters must obtain, from the competent national authority, an authorisation to export dual-use items – an Export Authorisation or Licence. For this purpose, exporters must present to the competent national authorities a Certificate of Final Destination accompanied by a Declaration of Final Use. The Certificate of Final Destination is issued by the competent national authorities to the exporter (upon the exporter's request) and sent by the exporter to the final recipient and the competent authority of the importing country for validation. ▪ Dual-use items comprise, for instance, electronics, computers, telecommunications and information security, sensors and lasers, aerospace and propulsion. This includes, for instance, spacecraft (such as satellites), spacecraft buses and spacecraft payloads incorporating certain items such as electronics, telecommunication and information security items, as well as sensors (such as certain sensors designed for remote sensing applications, imaging cameras with certain features; radar systems with certain features such as capable of operating in SAR, ISAR or SLAR radar mode).	▪ Whenever a third country (i.e., a non-EU country) requests it, in order to control their exports, importers or end users (when they are not the same person) must request that the competent national authority validate the Certificate of Final Destination issued by the exporting country. Importers or end users must ask the competent national authorities to confirm that the importing country is the final recipient of the dual-use items and that these items are not used for purposes other than those for which they were imported, nor transferred in any way, modified or replicated, without the express authorisation of the competent authorities of the exporting country. The Certificate of Final Destination must be accompanied by a Declaration of Final Use issued by the competent national authority and signed by the importer and the end user of the dual-use items (when they are not the same person) attesting that the end user is aware of the legally possible end-use acts of dual-use products in the country. ▪ Whenever a third country requests it, in order to control their exports, importers must also request that the competent national authority issue an International Import Certificate.

Environmental considerations

Environmental obligations notably related to emissions, energy consumption, water consumption and discharge, and waste management, may apply during the manufacturing of the satellite (and further upstream, to suppliers of materials and equipment for satellites).

NUGGET

Under EU law:

- Enterprises that consume energy above a certain threshold (more than 85 TJ of energy over the previous three years) must implement an energy management system 11 October 2027 at the latest. In addition, enterprises with an average annual consumption higher than 10 TJ of energy over the previous three years, which do not implement an energy management system, are required to perform energy audits (starting 11 October 2026) and draw an action plan on the basis of the recommendations arising from those energy audits.
- Manufacturers of computer and communications equipment (which may be incorporated in satellites) are subject to a title of emissions to the air (TEAR), to emission limits and to the obligation to monitor their emissions.
- Operators manufacturing electrical and electronic equipment (not exclusively designed to be sent into space) are subject to specific waste management obligations, in addition to general waste obligations that apply to any waste producer.

RELEVANT TO

LEGAL & REGULATORY

2.5. WHAT CONTRACTUAL ASPECTS NEED TO BE CONSIDERED FOR THE DEVELOPMENT AND MANUFACTURE OF SATELLITES?

TIP

Make sure that supply contracts are coordinated among themselves (as applicable) and with the launch services contract – for instance, ensuring that timeframes are aligned. Likewise, dates of delivery need to be coordinated with the timeframes for obtaining the required frequencies and orbital slots.

The development and manufacturing of EO satellites may require a variety of contracts – from acquisition or licensing of items (components and software) to services agreements, notably by a manufacturer or integrator. Contracts for satellite procurement may also be the contract of choice for purchasers wishing to acquire the entire satellite. Often, especially for more complex and lengthy contracts, tendering procedures or requests for proposals (RFP) may be issued, with predefined specifications and a draft contract, which may nevertheless be subject to negotiation and several stages of offers, including a best and final offer (BAFO).

Several key aspects should be reflected in the contracts, from the exact description of the item or service being provided, to risk transfer, SLAs, liabilities and insurance, parties should make sure that the contract meets their objectives, that appropriate mechanisms to deal with breach exist and that legal compliance is not jeopardised.

NUGGET

- To the extent that an operator wishes to acquire an operational satellite, transfer or acquisition of a satellite or its critical components requires authorisation by the competent authority in some countries. This is usually the case of satellites already operational in outer space, which have been duly licensed and registered.

KNOW MORE

KEY CONTRACTUAL TOPICS — CONTRACTS FOR ITEMS/SERVICES AND/OR SATELLITE PROCUREMENT

THE ITEMS/SERVICES BEING PROVIDED, SUPPLY AND ACCEPTANCE

The items or services being provided need to be detailed, with an indication of the date of delivery. In more complex contracts, a detailed delivery schedule with milestones is defined, including provisional and final acceptances. The use of Incoterms (e.g., DDP – Delivery Duty Paid, DAP – Delivery at Place, or CIF – Cost, Insurance and Freight) may be used to determine the parties' responsibilities in international trade transactions for physical items.

Training and knowledge transfer, as well as support and maintenance services, are often required as well. Currently, maintenance is limited to over-the-air services until in-orbit servicing becomes feasible. Optimisation services may also be relevant: depending upon the timeframe for satellite development, optimisations as a result of the technological, regulatory and/or business evolution of the client may be required.

NUGGET

In satellite manufacturing contracts:

- Services may include, in addition to the manufacturing itself, the shipping of the satellite to the launch site, pre-launch services (such as assembly, integration, installation, verification, testing, repair, and assistance with integrating the satellite into the launcher) and in-orbit testing to assess satellite conformity.
- Final acceptance of the satellite depends on the exact services contracted: for instance, it may be done upon shipping of the satellite to the launch site, upon its arrival at the launch site, at ignition, in orbit, or other milestone agreed by the parties. Final acceptance in orbit may occur when the manufacturer is under the obligation to perform in-orbit testing to assess conformity.

TRANSFER OF OWNERSHIP AND RISK

The date of transfer of ownership and risk of the (non-licensed) item is typically determined in the contract, often upon final acceptance by the client confirming all obligations have been met by the supplier (see above on final acceptance). This is also the moment the risk of the item is transferred to the client.

WARRANTY FOR THE CORRECTION OF DEFECTS OR NON-CONFORMITIES

A warranty period is often established, during which the supplier is required to address the non-conformities at no additional cost and may also be required to provide optimisation services at no cost. Specific provisions for spare parts may be established.

NUGGET

- Provisions on spare parts may be less relevant once the satellite is launched. However, they remain relevant up until that moment, especially in light of the timeframe it may take to complete a satellite. It may also become relevant once in-orbit servicing becomes widespread.

SLAS

Breach of the agreed SLAs may lead to penalties. Penalties may be construed as a pre-estimate of loss or damage (liquidated damages clauses) or be punitive, intended to compel the supplier to comply.

Credits/rewards may also be envisaged in favour of the supplier (cost-plus-incentive-award-fee model).

LIABILITY, INDEMNIFICATION AND FORCE MAJEURE

The liability of the parties, including possible caps or exclusions of liability, is also addressed in the contract. It is important to note that caps or exclusions of liability may not be permissible in certain cases (e.g., intentional acts, gross negligence) under mandatory law that may apply to the contract.

Liability does not apply in case of force majeure situations.

NUGGET

- In satellite manufacturing contracts, delays may allow the client to apply not only penalties, require compensation for damages or terminate the contract, but can also allow the client to require the payment of potential compensations that it has to pay to the launch provider due to the need to reschedule the launch as a result of delays at the manufacturing stage.

INSURANCE

Insurance obligations may cover general liability insurance, professional liability insurance and product liability insurance, sufficient to cover the supplier's obligations under the contract.

INTELLECTUAL PROPERTY AND LICENCES

NUGGET

- Licence conditions need to be determined when it comes to rights granted, covering types of use, purpose, territory, term, beneficiaries and users.
- In the case of software, an escrow agreement may also be required by the client, with a view to ensuring that the source code of the software is deposited in a third-party and made available to the client in certain conditions (e.g., insolvency of the supplier).

The ownership of IP over pre-existing items and items developed for the client under the contract needs to be addressed. Usually, pre-existing items (background IP) remain with the supplier, whilst the foreground IP belongs to the client.
Yet, to the extent that the use of the foreground IP requires the background IP, then a licence to its use is necessary.

OTHER RELEVANT PROVISIONS

NUGGET

In satellite manufacturing contracts:

- Changes to the satellite during manufacturing are especially relevant given the longer times for manufacture and technical evolutions that may occur in the meantime. It is also important to address cases where a legal change impacts the contract.
- Incentive payments may be foreseen, typically tied to the satellite's in-orbit performance and longevity. Payback clauses may also be established if certain performance metrics are not met during the lifetime (or warranty period) of the satellite.
- The right to terminate for breach may be especially relevant if delays impact the ability to launch the satellite or the filing of frequencies.

Provisions on reports and audits, changes and additional services, personnel and premises, price and payment, security and personal data, confidentiality, term and termination, assignment, representations and warranties, export control, governing law and dispute resolution, are also essential. When it comes to assignment, restrictions may be especially important to prevent transfers to competitors or entities with financial or regulatory concerns.

Longer, more complex contracts often require the definition of a governance model, with committees and regular meetings.
The tasks of the committees, including those related to escalation processes, are a point to be carefully addressed in contracts.

II.

UPSTREAM

3. Satellite launch

What should be considered for launching EO satellites?

RELEVANT TO

MARKET & BUSINESS

3.1. WHAT IS THE CURRENT LAUNCHER OFFER IN THE MARKET?

The current launcher market offers a broad and evolving range of options, from heavy-lift providers like SpaceX (Falcon 9) and Arianespace (Ariane 6) to small satellite launchers such as Rocket Lab, Firefly, and Europe's emerging micro-launchers like PLD Space (Spain) and ISAR Aerospace (Germany).

Depending on technical (e.g. weight restrictions, launch frequency), economic (e.g. price per kg, transport, insurance), and legal reasons (e.g. country laws, regulations, sanctions), certain launchers will be more suitable for a specific mission than others.

KEY LAUNCHERS OFFER

PROVIDER	ABL Space	Aevum	Arianespace	Astra Space	Blue Origin
Country	United States	United States	Europe	United States	United States
Vehicle	▪ RS1	▪ Ravn	▪ Ariane 1, 3, 4, 5, 6 ▪ Soyuz-2 ▪ Vega ▪ Vega C	▪ Rocket 3, 4	▪ New Glenn ▪ New Shepard
PROVIDER	**Firefly**	**ISAS**	**ISRO**	**ISAR**	**JAXA**
Country	United States	Japan	India	Germany	Japan
Vehicle	▪ Alpha	▪ M-V	▪ GSLV-I, II, III ▪ PSLV, XL ▪ SSLV	▪ Spectrum	▪ Epsilon ▪ H-2, 2A, 2B ▪ SS-520

PROVIDER	KAIST	KARI	Mitsubishi Heavy Industries	NASA	Northrop Grumman
Country	South Korea	South Korea	Japan	United States	United States
Vehicle	▪ Naro-1	▪ KSLV-2	▪ H-2A, 3	▪ Abort Test Booster ▪ Black Brant XII ▪ SLS ▪ Saturn V	▪ Antares ▪ Minotaur1 ▪ IV Pegasus
PROVIDER	**PLD Space**	**Relativity Space**	**Rocket Lab**	**SpaceX**	**U.S. Air Force**
Country	Spain	United States	United States and New Zealand	United States	United States
Vehicle	▪ Miura1 ▪ Tianlong-2 ▪ Vikram	▪ Terran 1, R	▪ Electron ▪ Neutron	▪ Falcon 9, Heavy ▪ Starship, Prototype ▪ Super Heavy	▪ Thor-Agena D ▪ Thor-Delta, B, M
PROVIDER	**Ukraine**	**United Launch Alliance (ULA)**	**Virgin Galactic**	**Virgin Orbit**	
Country	Ukraine	United States	United States	United States	
Vehicle	▪ Dnepr	▪ Atlas V ▪ Delta II, IV, IV Heavy ▪ Vulcan	▪ Spaceship Two	▪ Launcher One	

RELEVANT TO

TECHNICAL

3.2. WHAT ARE THE MAIN TECHNICAL ASPECTS TO CONSIDER WHEN SELECTING A LAUNCHER?

From a technical perspective, it is important to consider several technical aspects in order to ensure the selection of the appropriate launch vehicle for planning a mission that aligns with the expectations of the satellite operator. These technical aspects include:

- Launch vehicle capabilities;
- Launch schedule;
- Technical expertise;
- Reliability of launcher;
- Safety record;
- Customer service and support.

The assessment of these aspects must be done in light of the satellite technical specifications, the information on which is also relevant to ensure successful launch and deployment: Satellite Mass (Weight); Satellite Dimensions; Centre of Gravity (CG); Inertial Properties; Orbit Parameters; Payload Fairing Constraints; Electrical Interfaces; Mechanical Interfaces; Thermal Characteristics; Payload Separation Mechanism; Environmental Constraints; Communication and Data Interface; Mission Objectives.

TIP

Ensure early engagement between the satellite operator and the launch services provider to prevent technical incompatibilities and timeline setbacks.

KNOW MORE

KEY TECHNICAL ASPECTS FOR LAUNCHER SELECTION

ASPECT	CONSIDERATIONS
Launch vehicle capabilities	The launch provider must have launch vehicles that can meet the mission requirements, including payload capacity, orbit requirements, and launch location.
Launch schedule	The launch provider must have availability to launch the rocket within the desired timeframe for the mission. Also consider contractual flexibility for rescheduling or delays.
Technical expertise	The launch provider must have the technical expertise to support the mission, including launch vehicle design, integration, and launch operations.
Reliability of launcher	Low risk of technical failure based on a history of prior mission success.
Safety record	The launch provider must have a strong safety record, with a demonstrated ability to safely launch rockets and protect both the payload and the public.
Customer service and support	The launch provider must provide excellent customer service and support to ensure a successful mission.

KNOW MORE

KEY SATELLITE TECHNICAL SPECIFICATIONS FOR SATELLITE LAUNCH AND DEPLOYMENT

ASPECT	CONSIDERATIONS
Satellite Mass (Weight)	The total mass of the satellite, including all subsystems, payloads, and propellants. This information is critical for selecting a launch vehicle with the appropriate payload capacity.
Satellite Dimensions	The physical dimensions of the satellite, including its length, width, and height. This helps determine if the satellite can fit within the payload fairing of the chosen launch vehicle.
Centre of Gravity (CG)	The satellite's centre of gravity location. Knowing the CG is vital for proper payload integration and achieving the correct launch vehicle balance.
Inertial Properties	Detailed information about the satellite's moments of inertia (MOI), which include values for roll, pitch, and yaw axes. These properties are crucial for accurate trajectory calculations during launch.

Orbit Parameters	Desired orbital parameters, including altitude, inclination, and eccentricity. This information helps in selecting the appropriate launch vehicle and planning the trajectory.
Payload Fairing Constraints	Specific requirements related to the satellite's integration within the launch vehicle's payload fairing. This includes any restrictions on payload fairing size, shape, and interface points.
Electrical Interfaces	Details about the satellite's electrical interfaces, including voltage requirements, power consumption, and connector types. This information ensures proper electrical integration with the launch vehicle.
Mechanical Interfaces	Specifications regarding the satellite's mechanical interfaces, such as attachment points, latching mechanisms, and separation systems. These details facilitate secure integration with the launch vehicle.
Thermal Characteristics	Information about the satellite's thermal properties, including temperature limits, thermal coatings, and thermal control subsystem specifications. This aids in ensuring the satellite's thermal stability during launch.
Payload Separation Mechanism	Description of the satellite's payload separation mechanism or deployment method, which is used to release the satellite from the launch vehicle once in orbit.
Environmental Constraints	Any specific environmental requirements or constraints associated with the satellite, such as shock and vibration tolerances, thermal cycling limits, and storage conditions.
Communication and Data Interface	Information about the satellite's communication systems, data transmission protocols, and frequency bands used for telemetry, tracking, and command (TT&C).
Mission Objectives	Clear understanding of the satellite's mission objectives, including the type of mission and the specific goals it aims to achieve.

NUGGET

- **Regulatory and Compliance Requirements are also essential in launcher selection:** any regulatory approvals or compliance requirements that pertain to the satellite, especially for international missions or sensitive payloads, need to be considered. See question 3.5 on this topic.

RELEVANT TO

MARKET & BUSINESS

3.3. WHAT ARE THE MAIN FINANCIAL ISSUES TO CONSIDER WHEN SELECTING A LAUNCHER?

For EO satellite operators, key financial considerations include launch cost per kilogram, ride-share vs. dedicated launch trade-offs, insurance premiums, schedule reliability, and access to desirable orbits. While ride-share missions are more cost-effective, they may come with delays or suboptimal orbital insertions. In contrast, dedicated or small launchers offer more control but at higher per-kg costs. Operators must also factor in payment terms, currency exposure, and potential launch failure risk, which can significantly impact project cash flow and insurance strategies.

TIP

Evaluate the total cost (including base price, insurance, integration, risk-sharing clauses) and check for required prepayments, price changes or discounts. Always include a margin for unexpected costs in your budget.

KNOW MORE

KEY FINANCIAL CONSIDERATIONS FOR LAUNCHER SELECTION

	CHARACTERISTICS	MAY BE RIGHT FOR YOU IF	MAY NOT BE RIGHT FOR YOU IF
Rideshare	▪ Lower launch and overall mission cost ▪ Launch frequency can be variable, unpredictable, and availability can be limited on unusual orbits ▪ Has to adapt to primary payload's mission parameters ▪ Risk: High insurance premiums due to less mission control and higher risk of orbital debris	▪ You are a startup or early-stage constellation provider with limited cash flow ▪ You have a small payload under 1000kg (ideally under 830kg for a Falcon 9 launch) ▪ You have some flexibility with launch timeline and orbital insertion (especially with popular orbital insertion route)	▪ You have a large payload, namely above 1,500kg ▪ You have very specific mission parameters for your satellite (orbit type, inclination, etc.) ▪ You have a tight and inflexible schedule ▪ Your mission has a very low risk tolerance technically and/or financially
Dedicated Launcher	▪ Higher launch costs ▪ High mission control: can choose launch site, timing, orbit type, and inclination ▪ Larger payload range (from small sats to several tonnes) ▪ Risk: Lower risk for insertion accuracy, but total insured value is higher since launch is more expensive	▪ You have a precision EO mission ▪ You have high-value payloads, with low tolerance for orbital debris risks ▪ You have larger operational satellites, particularly over 1500kgs ▪ You have higher financial capacity, and cash flow in particular, usually in the millions of dollars	▪ You do not have sufficient cashflow, potentially in the millions of dollars ▪ Your payload is under 850kgs and can tolerate some timing and orbital insertion variance ▪ Insurance could offset the mission risks that come with using ride share (i.e. payload is not mission critical)

RELEVANT TO

LEGAL & REGULATORY

3.4. WHAT ARE THE MAIN ASPECTS THAT SHOULD BE REFLECTED IN A LAUNCH SERVICES CONTRACT?

The growth of spaceports and launchers is leading to a more diverse range of contracts in the market, including in light of the increase in offers for launching small satellites and satellite constellations. This means that contracts for satellite launch can be varied, with different contract terms and arrangements. Yet, a launch services contract typically contains a set of provisions, ranging from the description of the services provided (launch, pre-launch and/or post-flight activities) to the schedule of launch, modifications, liability, insurance and satellite registration.

TIP

Ensure that the services comprised in the launch services contract are duly coordinated with the satellite manufacturing contract, as some tasks could be assumed by the manufacturer or require cooperation between both providers.

Remember that the choice of the launch date needs to be assessed by the purchaser, not only taking into account the timeframes for satellite manufacturing, but also in light of the timeframes for obtaining the required frequencies and orbital slots (see question 3.5 on this topic).

KNOW MORE

KEY CONTRACTUAL TOPICS – LAUNCH SERVICES CONTRACT

THE SERVICES BEING PROVIDED, THE PLACE AND THE DATE OF LAUNCH

The service may include not only the launch itself, but also pre-launch activities and post-flight activities.

NUGGET

- Pre-launch activities may include, for instance, receipt, storage and inspection of the satellite at the launch site, processing if required (assembly, integration, installation, verification, testing, repair, and integration of the satellite in the launcher) and departure activities (such as position craft for departure and verification of systems readiness).
- The conduct of the flight includes traffic and flight activities, from flight command (control of flight, tracking of flight, termination/abortion as required) to range control activities and data processing (tracking, telemetry, surveillance and weather data).
- Post-flight activities are also relevant and include, for instance, post-flight processing and analysis, and debriefing.

LAUNCH SITE, SCHEDULE AND MODIFICATIONS

The spaceport where the launch is to occur, as well as the date of the launch, are also foreseen contractually. The publication by the launch provider of its launch schedules allows purchasers to identify launching slots that can be used.

Modifications to the launch date may occur, either due to the launch provider's decision, or due to factors impacting the purchaser. For instance, postponements may occur due to weather conditions, technical constraints or others (such as Government priority), or due to delays in satellite delivery. In such a case, and without prejudice to other rights that the parties may exercise as determined in the contract, a new launch date may be determined or agreed upon. Conditions for the new launch date can be established in the contract – for instance, the launch provider offers the next available launch slot at no additional cost.

CHANGES AND ADDITIONAL SERVICES

Procedures for change requests and additional services may also be established – e.g., for launches of additional satellites. It is also important to address cases where a legal change impacts the contract.

LIABILITY, INDEMNIFICATION AND FORCE MAJEURE

The liability of the parties, including possible caps or exclusions of liability, are addressed also in the contract.

Liability does not apply in case of force majeure situations.

NUGGET

- It is common for launch services contracts to include cross-waivers of liability, releasing the other party from liability for damages. However, it is important to note that caps or exclusions of liability may not be permissible in certain cases (e.g., intentional acts, gross negligence, liability for death or personal injury) under mandatory law that may apply to the contract.

KNOW MORE

INSURANCE

Insurance is typically foreseen as an obligation of the launch provider against total or partial loss of the satellite. Depending upon the services provided by the launch provider, it may include pre-launch (up to ignition) and launch insurance (up to separation).

To the extent the parties are subject to the obligation to have third-party liability insurance (see question **3.5** on this topic), they may have, depending upon the laws that apply, to liaise on the coordination of insurance against damages caused by the satellite but as a result of the launcher, and vice versa.

SATELLITE REGISTRATION

The contract may establish who has the obligation to register the satellite at the UN (see question **3.5** on this topic). This may be particularly effective when the parties are States.

To the extent the registration obligation is based on the UN Registration Convention, compliance with this obligation requires the relevant State to be a party to such Convention.

OTHER RELEVANT PROVISIONS

Provisions on price and payment, security and personal data, confidentiality, term and termination, assignment, representations and warranties, export control, governing law and dispute resolution are also essential.

RELEVANT TO

LEGAL & REGULATORY

3.5. WHAT LEGAL OBLIGATIONS NEED TO BE MET TO LAUNCH SATELLITES?

TIP

Obtain the necessary licences and insurance ahead of schedule and regularly assess compliance with applicable laws. Maintain regular communication with competent authorities to reduce compliance risks and avoid legal setbacks.

The launch of satellites requires compliance with a set of legal requirements, notably on:

- Licence for the launch operation;
- Registration of the space object;
- Assignment of frequencies and orbital slots;
- Insurance;
- Safety, resilience and environmental requirements.

KEY LEGAL REQUIREMENTS

LICENCE

The launch of space objects is usually subject to a national licence in countries with national space laws (see above 1.4). Indeed, the launch of space objects often requires a licence.

NUGGET

- The licence for launching may be required, depending upon the applicable law, not only to the launch provider, but also to the satellite operator. For instance, in Portugal, the launch of a satellite requires a launch licence by the satellite operator. In the UK, the orbital operator licence covers the procurement of the launch.
- An increasing number of laws establish specific approaches to facilitate the launch of constellations of satellites, of small satellites and of scientific/research satellites. This is the case, e.g., of Portugal and, for some cases, of the proposed EU Space Act.

REGISTRATION

Satellites need to be registered in the UN for those countries that are party to the UN Registration Convention. States not party to the Registration Convention may still make such registration notably under the 2007 UN Recommendations on enhancing the practice of States and international intergovernmental organisations in registering space objects. This usually translates, at national level, in the establishment of an obligation for space operators to register their satellites in a national registry, with such registration then being reflected in the UN registry under the applicable international rules and done by the national competent entity.

NUGGET

- UN registration is done by the launching State – the State that launches or procures the launch, or from which territory or facility a space object is launched. This registration is for space objects launched into Earth orbit or beyond.
- National registration may demand registration from operators beyond the conditions of the UN Registration Convention, e.g., registration of space objects launched below orbit. This is the case, e.g., of Portugal.

FREQUENCIES

Satellites need frequencies to operate, as well as orbital slots (namely GEO). This is regulated at ITU level with a view to ensure efficient use of spectrum, avoid harmful interference and secure international protection for networks. However, operators need to go through the competent national authority in order to obtain the required frequencies/slots.

Alternatively, operators may negotiate with entities to whom the frequencies/slots have been assigned to use/share them.

NUGGET

- Spectrum fillings at ITU follow a predetermined process so that radio frequencies and orbital slots can be used. This process typically comprises (i) the submission of information (Advance Publication Information – API – which is then published in the BR IFIC International Frequency Information Circular), (ii) coordination with previously filled satellite networks to ensure there is no interference, as applicable, and (iii) notification (where the frequency and orbital slot are recorded in the MIFR Master International Frequency Register).
- The operator has 7 years from the day the application was filed with the ITU to operate the satellite.
- There are also specific procedures for non-geostationary satellite constellations in specific bands and services with a view to avoiding “warehousing” of spectrum and orbital resources: 10% of the constellations have to be deployed within 2 years from the end of the current period for bringing into use (the seven years), 50% within 5 years, and deployment shall then be complete within seven years.
- The BR International Frequency Information Circular (BR IFIC) provides information on the frequency assignments submitted by administrations to the BR for updating the Master International Frequency Register and Plans. The BR IFIC is published once every two weeks by the BR.

ITU process for satellite networks not subject to coordination

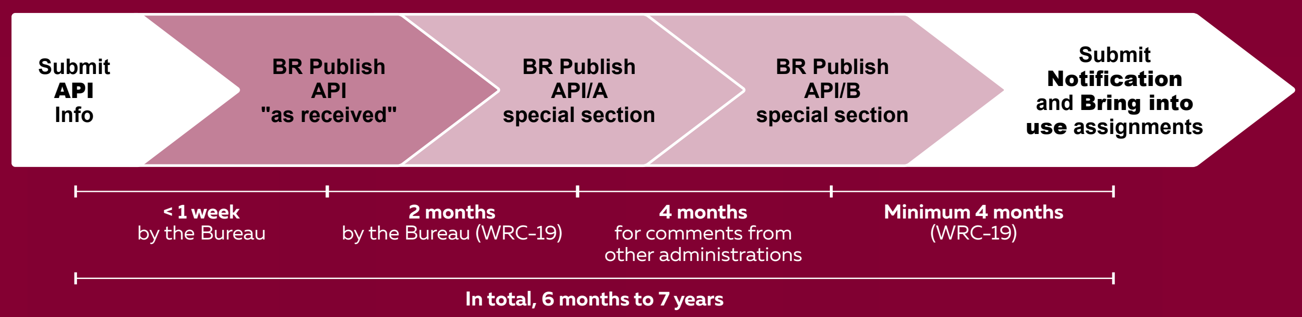

Figure 6 — Chart of the overall regulatory procedure for non-geostationary satellite networks.

From 1.1.2021, for all satellite networks not subject to coordination:
- time between receipt and publication of API is reduced from 3 to 2 months;
- time between publication of API and earliest receipt of notification is reduced from 6 to 4 months.

INSURANCE

Countries with national space laws require operators to obtain insurance to respond to the launching risk: third-party liability insurance, to cover damages to third parties caused by the satellite or launcher. Insurance requirements may vary, e.g., from a fixed amount to an amount calculated on the basis of the mass of the space object or the maximum probable damage. Liability for damages under the law by the operator is often limited to the insured amounts.

NUGGET

- Mandatory insurance typically covers the activities subject to licence, typically the launch itself and, increasingly, re-entry. Pre-launch insurance is not often required.
- Waivers or reductions of the insured amount may be allowed in certain cases, such as for small space objects, research operations, or operations with reduced risk. Portugal allows such waivers and reductions.

SAFETY

Safety requirements for launch established in law usually apply to the launch operator, which shall describe the safety measures in its request for a licence, including, for instance, when it comes to identification of risks in soil and flight (including casualty risk (including casualty risk thresholds) and safety zones; risk measures, procedures and systems; organisational processes for safety, among others. A safety plan is usually required.

NUGGET

- The proposed EU Space Law contains a set of requirements for the safety of launch operations.
- Coordination with air traffic and space situational awareness services is usually required to ensure the safety of launches. Airspace closures and hazards are communicated via NOTAMs (Notice to Airmen) so that flight paths can be adjusted in advance if necessary.
- Passage through foreign airspace for launches has been generally acknowledged, though advance notification is generally expected due to safety and national security reasons.

SECURITY AND RESILIENCE

NUGGET

- The proposed EU Space Act contains requirements aimed at ensuring the resilience of space infrastructure used for carrying out launches, notably on risk management and reporting of incidents.
- An increasing number of national space frameworks address cybersecurity for the networks and systems used for launches. This is the case, e.g., of Portugal, the UK and the US.

The security and resilience of the networks and systems used for launches are a topic increasingly reflected in space laws. Within this scope, the launch operator often needs to ensure the security and resilience of the infrastructure it uses for launches, perform risk assessments, detect and monitor incidents, and manage the risks arising therefrom. Reporting of incidents may also be required.

ENVIRONMENTAL REQUIREMENTS

NUGGET

- The proposed EU Space Act establishes environmental requirements for space activities, including for launch.
- Requirements arising from the general environmental legal framework also apply to launch activities: for instance, they may be subject to an environmental impact assessment (EIA) procedure, considering their dimension, location and potential significant effects on the environment.

Again, environmental requirements for launch established in law usually apply to the launch operator, covering identification of risks derived from the launch operation and mitigation/ minimisation measures, including of space debris (e.g. disposal of launch vehicles, minimisation of fragmentation). Space laws may also require launch operations to undergo environmental impact assessments to identify and manage environmental risks (e.g., emissions, noise, water contamination, habitat disruption). A debris mitigation plan is usually required. Hazardous materials' storage, as well as waste management obligations, may further apply.

II.

UPSTREAM

4. Ground segment

What should be considered with relation to the ground segment?

RELEVANT TO

TECHNICAL

4.1. WHAT ARE THE MAIN TECHNICAL ASPECTS THAT SHOULD BE CONSIDERED FOR THE ADEQUATE DEVELOPMENT OF THE GROUND SEGMENT?

The ground segment consists of ground-based elements necessary to control, monitor and commercially exploit the mission. As such, it should be developed according to the following main considerations:

- Rely on standard and open-source components when possible.
- Leverage the know-how and expertise from previous Earth Observation projects and studies.
- Create an integrated system that can be operated with the minimum number of personnel and as automatically as possible.
- Implement an open and flexible architecture to ensure its expandability and its portability to future missions, as well as its integrability with external applications.

The ground segment needs to interact with both the Space Segment (sending telecommands and receiving telemetry and payload data) and the Data Segment (exchanging schedule information, such as new captures or modifications in the plan, and sending the payload data once downloaded from the satellite).

THE GROUND SEGMENT ARCHITECTURE SHOULD BE COMPOSED OF THE FOLLOWING ELEMENTS:

Mission Control Centre (MCC)	Commands, controls and plans the mission, monitors satellite performance, and requests and retrieves data as necessary.
Ground Station Data Storage and Network	Provides live connectivity to the MCC for commands and telemetry, and temporarily stores data to be retrieved by the MCC.
Monitoring and console	This tool is shared with the Data Segment and it is responsible for checking the status and performance of the rest of the elements.

KNOW MORE

NUGGET

- These elements shall function by working together or even being geographically separated. Some of them may be operated by different parties, such as the high and low-rate antennas, which could be managed by different ground station providers.

RELEVANT TO

LEGAL & REGULATORY

4.2. WHAT ARE THE MAIN LEGAL REQUIREMENTS FOR THE GROUND SEGMENT?

Space laws may address the space system as a whole, and thus considerations above indicated for the satellites would also apply to the ground segment, without prejudice to the specificities arising from their different nature — such as dedicated provisions for physical security or environmental protection (e.g., environmental impact assessment or similar for the installation of the ground segment, management of hazardous material and waste, mitigation of noise).

NUGGET

- The proposed EU Space Act applies to space infrastructure, covering the space and ground segment, with many of its provisions applicable thereto (e.g., on resilience, on data processing). Other cross-sector cybersecurity and resilience provisions continue to apply in certain cases to operators of ground-based infrastructure, owned, managed and operated by Member States or by private parties, that support the provision of space-based services.
- National EO laws apply to remote sensing systems, which are usually defined as comprising not only the satellites and ground stations for their command (Germany), but also the facilities to receive, store, pre-process (US), process and distribute raw data from the satellites (Canada).

Nevertheless, an additional aspect to be considered relates to possible necessary authorisations for the installation of the ground segment — notably receiving antennas. In addition to spatial planning laws, usually electronic communications laws establish the conditions for licensing radiocommunication stations and corresponding frequencies, as well as the obligations of the licensees, such as maintaining the stations in good working conditions, using them only within the assigned frequencies and allowing access by competent authorities.

NUGGET

- Laws may provide for radioelectric licence exemptions for certain ground stations meeting certain requirements — e.g., receive-only ground stations operating in certain frequency ranges, which shall nevertheless be operated on a non-interference, non-protection basis, i.e., they must accept interference from licensed operators and cannot cause harmful interference themselves.
- Specific provisions on product safety may also apply, especially those related to radioelectric equipment and electromagnetic compatibility. Rules on the cyber resilience of products with digital elements are also relevant. These provisions require the products to meet the legal requirements as a condition for their placement on the market. In the EU, even those rules not applicable to products incorporated into or specifically designed to be incorporated into equipment designed to be sent into space (e.g., the EU legal framework on batteries and on electrical and electronic equipment (EEE) – see question **1.4** above), are still relevant for the ground segment of a satellite system.

III.

Midstream

RELEVANT STAKEHOLDERS

- Satellite operators (public and private)
- EO data providers
- Space agencies and regulators

WHAT IT IS

The midstream phase is pivotal in the EO satellite lifecycle, linking the upstream and downstream activities.

MARKET & BUSINESS

From a financial and economic perspective, the midstream stage centres on maximising asset performance over its operational life while managing end-of-life obligations. Strategically, efficient midstream management can reduce the total cost of ownership, enhance return on investment (ROI) through longer revenue-generating service periods, and protect future business viability by maintaining a compliant and sustainable orbital environment.

TECHNICAL

From a technical perspective, this stage starts with the satellite in orbit systematically capturing Earth observation data.

LEGAL & REGULATORY

From a legal and regulatory perspective, the midstream stage requires compliance with a set of regulatory requirements relating to the command and control of satellites, as well as with relation to EO system decommissioning. The protection of the data acquired by the satellite is also an essential topic.

III. Midstream

What you'll find in this chapter		Relevant to
MARKET & BUSINESS **TECHNICAL**	Satellite command and control must take into account a set of technical and economic considerations – see question **5.1** on this topic	
LEGAL & REGULATORY	Likewise, a set of legal requirements must be complied with in satellite operation – see question **5.2** to know the applicable legal obligations	
TECHNICAL	The acquisition, processing and archiving of satellite data follow a set of key stages aimed to transform raw signals into usable products – see question **6.1** on the key phases of the EO midstream workflow	
LEGAL & REGULATORY	To ensure EO data can be exploited, its protection is essential – see question **6.2** to know the different routes that can be used to protect EO data	
TECHNICAL **LEGAL & REGULATORY** **MARKET & BUSINESS**	Satellite decommissioning is an essential stage of the satellite lifecycle, with technical, economic and legal considerations applying – see questions **7.1** and **7.2** to understand the main aspects to consider, and the main legal obligations that apply	

Satellite operators (public and private) · EO data providers · Space agencies and regulators

STEPS TO OPERATE, EXPLOIT AND DECOMMISSION YOUR SATELLITE

Principles	Actions
Continuity Care	**1.** Perform **routine operations**, including health monitoring, attitude/orbit control, calibration and communications. Ensure system continuity and anomaly detection, whilst making sure the system remains operational and secure throughout its lifecycle.
Data Stewardship	**2.** **Acquire, process and archive EO data** in a manner that ensures their usefulness, including when it comes to features such as accuracy, security, traceability, interoperability and reproducibility. Further ensure legal compliance in data acquisition and processing, as well as that the data is duly protected.
Economic Sustainability	**3.** Periodically **assess and control OPEX**, balancing it with the expected ROI to ensure the economic sustainability of the operation.
Retirement Plan	**4.** **Decommission the satellite** in a manner that mitigates risk, taking also into account data preservation, financial aspects and potential reputational risks.
Compliance Diligence	**5.** Comply with the **applicable legal requirements** (licences, registrations, insurance, safety, resilience and environmental requirements), and take into account applicable standards, best practices and guidelines.

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III.

MIDSTREAM

5. Satellite command and control

What requirements should be met with relation to command and control operations of satellites?

RELEVANT TO

TECHNICAL | MARKET & BUSINESS

5.1. WHAT ARE THE MAIN TECHNICAL AND ECONOMIC CONSIDERATIONS FOR SATELLITE OPERATION?

TIP

Prioritise system operationality, reliability and redundancy, with regular testing of contingency plans.

Command and control operations must take into account a set of aspects, namely:

- Uplink Systems;
- Telemetry downlink systems;
- Ground contact planning;
- Anomaly detection and management plans;
- System continuity;
- Security standards.

KNOW MORE

KEY ASPECTS FOR CONTROL AND COMMAND

ASPECT	CONSIDERATIONS
Uplink Systems	Frequency band compatibility, adequate link margin for worst-scenario conditions, encryption and authentication factors to prevent unauthorised access and existence of backup transmit chains and antennas to ensure redundancy.
Telemetry downlink systems	Receiver sensitivity in order to maintain a robust link with the telemetry channels and error detection/correction systems, and monitor for detecting interferences or anomalies in downlink channels.
Ground contact planning	Ensure reliable antenna tracking and prioritising time-critical operations.
Anomaly detection and management plans	Predefined procedures for common anomalies and to return the satellite to safe mode.
System continuity	Ensure redundancy and backups at separate facilities for disaster management and backup network access in case of outages. Secure remote access protocols and ensure timestamping of commands and telemetry.
Security standards	Compliance with access control, audit trails and regulatory requirements (see also question 5.2).

TIP

Balance the OPEX with the expected ROI by conducting periodic OPEX budgeting without sacrificing longer-term quality, delivery, contractual, or legal obligations. This will ensure the overall health and economic sustainability of the operation.

From an **economic perspective**, command and control activities represent ongoing operational expenditures (OPEX), including staffing, ground segment maintenance, software maintenance, and regulatory compliance, with value creation tied to extending satellite lifespan, optimising data output, and minimising service downtime.

RELEVANT TO

LEGAL & REGULATORY

5.2. WHAT LEGAL ASPECTS SHALL BE CONSIDERED IN THE COMMAND AND CONTROL OF SATELLITES?

The command and control of satellites must comply with applicable legal requirements. These include notably:

- Licence of the command and control operation;
- Registration;
- Insurance;
- Safety, resilience and environmental requirements.

TIP

Obtain the necessary licences and insurance ahead of schedule and regularly assess compliance with applicable laws. Check the application of standards, best practices and guidelines (see question 1.4 on this topic). Maintain regular communication with competent authorities to reduce compliance risks and avoid legal setbacks.

KNOW MORE

KEY LEGAL REQUIREMENTS

LICENCE

Command and control of space objects in outer space is typically subject to licence in countries with space laws.

NUGGET

- The licence for command and control is required from the satellite operator. Some countries establish approaches to facilitate obtaining the licence for launch and the licence for command and control – this is the case of Portugal, whereby operators can obtain a joint licence covering the launch and command. Other countries include both the procuring of the launch and the operation of the satellite in the licence – this is the case of the orbital operator licence in the UK.
- Countries with dedicated EO laws typically contain specific requirements the operation of EO satellites shall meet as a condition for obtaining a licence – see question **1.4**.
- Some laws establish specific approaches to facilitate the operation of constellations of satellites, of small satellites and of scientific/research satellites. This is the case, e.g., of Portugal and, in some cases, of France or the proposed EU Space Act.

REGISTRATION

National space laws may require the registration of the satellite even if the country is not the launching State (see question **3.5**), and the registration of events occurring during the lifetime of the satellite.

NUGGET

- For instance, under Portuguese law, space objects whose command and control are performed by operators licensed in Portugal must be registered in the national register. Likewise, the end of the useful life of the satellite, and any incident or serious accident suffered by the space object, shall be registered therein.

INSURANCE

Countries with national space laws require operators to obtain insurance, as seen in question 3.5. In this scope, insurance may be legally required for in-orbit operations as well, though not all countries make such requirement. Again, insurance requirements may vary from a fixed amount to an amount calculated on the basis of the mass of the space object or the maximum probable damage. Liability for damages under law by the operator is often limited to the insured amounts.

NUGGET

- Mandatory insurance typically covers the command and control of the satellite aimed to protect against compensation claims caused by satellites in orbit, such as debris or collisions. It may also cover end-of-life – passivation and disposal. Countries with such requirement include Portugal and the UK.
- Waivers or reductions of the insured amount may be allowed in certain cases, such as for small space objects, research operations, or operations with reduced risk. Portugal allows such waivers and reductions.

SAFETY REQUIREMENTS

Though safety requirements established in law also impact the features of the satellites, as seen in question 1.4, most safety legal requirements relate to operational aspects associated with the command and control of the space object/satellite. This is usually connected with ensuring the safety of the satellite in orbit (including by mitigating possible collisions), through lifecycle risk assessments. This may require the subscription of collision avoidance/ space situational awareness services. A safety plan is also usually required.

NUGGET

- The proposed EU Space Act contains a set of requirements for the safety of the operation and control of space objects, notably with relation to collision avoidance.
- Safety requirements may extend to the systems and processes used for command and control, with a view to ensuring certain functionalities are met (e.g., issuance of instructions and reception of telemetry data) and the quality of such systems and processes. Portugal is an example of this.

SECURITY AND RESILIENCE REQUIREMENTS

NUGGET

- Risk management and incident notification are to be required from space operators under the proposed EU Space Act.
- Security and resilience requirements may be extended to the infrastructure used for command and control (e.g., Portugal). Measures may include those necessary to prevent unauthorised access to the satellite, command systems or data; encryption of communications; and definition of security clearances for personnel.
- Security requirements for data acquisition and archiving may also be established, including for data command uplinks and for data downlinks. Some countries with national EO laws (see question **1.4**) have enshrined specific requirements in this respect, such as for the protection of the commands given to a remote sensing satellite, as well as to protect raw data and the remote sensing products produced from raw data (e.g., Germany, Canada, US).

Again, though security and resilience requirements established in law also impact the features of the satellites, as seen in question 1.4, most legal requirements relate to operational aspects associated with the command and control of the space object/satellite. In this respect, the operator may be required to perform risk assessments, detect and monitor incidents, and manage the risks arising therefrom. Reporting of incidents may also be required. The development of a cyber strategy for the networks and systems used for command and control can also be a legal obligation.

ENVIRONMENTAL REQUIREMENTS

NUGGET

- The proposed EU Space Act establishes environmental requirements for space activities, including the operation and control of space objects, notably for debris mitigation and light and radio pollution.
- EO national laws (see question **1.4**) may contain dedicated provisions on environmental protection (e.g., Canada).

Environmental requirements are central when it comes to the command and control of satellites, including with relation to fragmentation, failure and end-of-life. In this respect, space laws may require the set-up of operational procedures for environmental/debris control, satellite disposal and failure response with environmental impacts. A debris mitigation plan is usually required.

III.

MIDSTREAM

6. Data acquisition

What requirements should be met with relation to data acquisition?

RELEVANT TO

TECHNICAL | LEGAL & REGULATORY

6.1. HOW IS EO DATA ACQUIRED, PROCESSED AND ARCHIVED?

EO data only becomes useful when raw satellite signals are systematically transformed into traceable, calibrated, and interoperable products. This requires a midstream workflow that is both technically rigorous and aligned with long-term preservation goals. The process typically advances in well-defined phases, from data ingestion and pre-processing through successive processing levels, archiving, and validation.

KEY PHASES OF THE EO MIDSTREAM WORKFLOW

PHASES	PURPOSE	KEY ACTIONS	STANDARDS/ FORMATS (MOST COMMON)
1. Data Ingestion	Bring raw EO data from satellites into ground systems with full traceability.	▪ Capture acquisition time, geolocation, sensor configuration; ▪ Enrich with metadata.	ISO 19115, OGC metadata specs.
2. Pre-Processing	Prepare raw data for standardised processing.	Sensor calibration, cloud/artefact masking, georeferencing and multi-sensor fusion.	CEOS preprocessing guidelines.
3. Processing Level 1	Correct sensor and geometric distortions.	Radiometric calibration, orthorectification and accurate geolocation.	CEOS Level 1 definition.
4. Processing Level 2	Convert corrected imagery into geophysical variables.	Generate vegetation indices, SST, soil moisture, etc.	Standard EO algorithms.
5. Processing Level 3	Aggregate and harmonise variables over space/time.	Produce mosaics, temporal composites, regional/global datasets.	Monitoring standards.

KNOW MORE

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KEY PHASES OF THE EO MIDSTREAM WORKFLOW

6. Archiving	Preserve processed EO datasets securely and durably.	▪ Use open, stable formats; ▪ Ensure redundancy, storage migration, and integrity checks.	GeoTIFF, NetCDF, HDF5.
7. Cataloguing & Discoverability	Make EO data findable and interoperable.	Maintain searchable metadata, provide APIs, portals, dashboards.	ISO 19115, OGC services.
8. Validation & Version Control	Ensure accuracy and transparency in midstream products.	Compare with ground truth, track reprocessing history, publish version logs.	QA/QC frameworks.
9. Documentation	Enable reproducibility and user trust.	Document all processing steps, tools, parameters.	Mission-specific documentation standards.

TIP

Implement transparent, well-documented data management practices at every stage, ensuring data traceability, accuracy, interoperability, and reproducibility for both current and future users.

Applicable laws may also establish requirements impacting data acquisition and processing, for instance when it comes to storage of data acquired by the satellite or of the instructions to the satellite (see also question 1.4).

NUGGET

- The proposed EU Space Act addresses data topics, notably the requirement that the flow of observation data be tracked from its generation by a satellite to its incorporation into the first space service making use of that data.
- Cross-sector data laws are also relevant. For instance, personal data requirements (e.g., lawfulness and transparency, data minimisation, storage limitation) impact how data is collected and processed, such as when it comes to the implementation of privacy-enhancing technologies (PET), such as anonymisation or encryption of data. Data sharing legislation is also relevant: for instance, in the EU, high-value datasets – notably geospatial, EO and environment, and meteorological – held by public sector bodies must meet certain attributes, e.g. on resolution, granularity, coverage, frequency. As a result, satellite operators and data providers wishing to provide such data to public entities may have to ensure that they are able to respond to such requirements.

RELEVANT TO

LEGAL & REGULATORY

6.2. HOW IS EO DATA PROTECTED?

EO data can be broadly protected by copyright or, under EU law, by the sui generis right over databases. Whilst copyright protects intellectual human creations, the sui generis right protects qualitatively and/or quantitatively substantial investment in either the obtaining, verification or presentation of the contents of a database. What is protected here is not, unlike copyright, creativity, but the content of the database as a whole, regardless of whether the individual contents of that database are protected by copyright or another right. The sui generis right is an originality of the EU, and not a right recognised in most other countries.

Where protection through copyright or the sui generis right is not possible, other routes of protection exist, such as contracts or technical measures (the infringement of which may be a cybercrime, notably illegal/non-authorised access to information systems, illegal/non-authorised systems interference or illegal/non-authorised data interference). Unfair competition could also be envisaged as a route for protection.

TIP

Ensure that your IP strategy contains guidance on the use of technical instruments that may negatively impact the protection of EO data (e.g., AI creations).

Implement robust echnical measures against unauthorised use (e.g., traceability mechanisms such as through DLT/blockchain, encryption, metadata).

See also question 2.4.

KNOW MORE

KEY LEGAL PROTECTION ASPECTS

PROTECTION ROUTE	ADVANTAGES	DISADVANTAGES
Copyright	▪ EO data can, in principle, be protected by copyright, especially analysed data and, in some cases, processed data ▪ Ensures public recognition and attribution ▪ Does not require registration – protection arises from the act of creation ▪ Grants protection for, usually, 70 years	▪ Protection of raw data (and even of initially processed data) is arguable ▪ Protection of processed data depends upon the existence of human creative intervention ▪ Protection when AI is involved may require a complex assessment of the level and nature of human intervention ▪ AI creations are not protected ▪ Enforcement can be costly and time-consuming

Sui generis right	▪ Protects the investment on a database ▪ Grants protection for a period of, generally, 15 years ▪ Ensures public recognition and attribution	▪ Only protects against the extraction and/or re-utilisation of the whole or of a substantial part of the contents of that database, or against repeated and systematic extraction and/or re-utilisation of insubstantial parts ▪ It does not protect investment in creating the data, only in obtaining it, which may impact EO databases ▪ Public bodies cannot exercise the sui generis right to prevent re-use of data ▪ It is not recognised worldwide
Contract	See question **2.4**	
Technical measures	See question **2.4**	
Unfair competition	▪ To the extent use of data is done with an unfair result or purpose as prohibited by law, then it could be argued that such unauthorised uses of data are unfair competition	▪ Such a route of protection seems to be relevant only in very limited cases, as it takes into consideration not the data itself, but how it is being used

MIDSTREAM

7. Satellite Decommissioning

What should be considered when decommissioning an EO satellite network?

RELEVANT TO

TECHNICAL | MARKET & BUSINESS

7.1. WHAT ARE THE MAIN TECHNICAL AND ECONOMIC ASPECTS TO CONSIDER AT THE DECOMMISSIONING STAGE?

It is fundamental to plan a satellite's decommissioning before launch in order to maintain long-term sustainability in space by mitigating space debris and managing the end-of-life of space assets responsibly. To ensure that the procedure is performed in a way that minimises risks to other space assets and future missions, the following should be considered:

Lower Earth orbits (LEO)

For lower Earth orbits (LEO), where the majority of Earth observation satellites operate, the preferred method of decommissioning is to lower the satellite's orbit so that it will re-enter the Earth's atmosphere and burn up. This is often achieved by using the satellite's remaining fuel to perform a de-orbit burn, which reduces its altitude and accelerates its natural orbital decay. For satellites without propulsion capabilities, external mechanisms such as robotic arms, sails, or tethers may be used to induce a controlled de-orbit.

Higher Earth orbits

For satellites in higher orbits, such as geostationary Earth orbit (GEO), the approach is different due to the impracticality of atmospheric re-entry. Instead, satellites are typically moved into a higher "graveyard" orbit, well above the operational geostationary belt. Here, they pose less risk to active satellites and are left in a stable orbit that minimises the likelihood of collision and the generation of space debris.

In addition to the above, **data preservation and ceasing of monitoring** shall be ensured: all communication and monitoring should be ceased. The focus then shifts to data preservation and archival, ensuring that the valuable data the satellite collected over its lifetime continues to be available for future analysis and research.

From a **financial perspective**, decommissioning introduces both cost liabilities and risk management considerations, as operators must budget for safe disposal or orbit relocation (per space debris mitigation guidelines) and potential insurance or penalty costs for non-compliance. The insurance or non-compliance costs will vary according to satellite type, size, planned decommissioning method, as well as the legal decommissioning obligations from the country in which it is registered (see question **7.2**).

TIP

With decommissioning, consider not only financial aspects, but also long-term reputational risks of non-compliance, which, while less financially tangible in the short-term, are likely to impact future revenues through loss of partnerships, funding opportunities, and even staffing prospects.

RELEVANT TO

LEGAL & REGULATORY

7.2. WHAT ARE THE MAIN LEGAL ASPECTS TO CONSIDER AT DECOMMISSIONING?

The decommissioning stages of a satellite are also subject to legal requirements in countries with space laws. Though these requirements may concern the features of satellites to ensure their safe and sustainable end-of-life (see question **1.4**), they may also relate to operational and procedural aspects. In this regard, conditions may be established for satellite removal with a view to ensuring debris mitigation and the future use of orbits. This may require the subscription to collision avoidance services.

NUGGET

- The proposed EU Space Act contains a set of requirements for the safety of the operation and control of space objects, which covers re-entry.
- Some countries establish time limits for removal once the satellite lifetime is over (this is the case of the US, which requires new LEO satellites (from 29 September 2024) to be disposed of within 5 years after mission end.

TIP

Throughout the decommissioning process, keep regular engagement with bodies such as the IADC and adhere to debris mitigation standards, best practices and guidelines. See also question 1.4.

Moreover, general environmental rules may apply, such as to waste resulting from the return of items in an EO system, namely from the landing of those items and materials which do not incinerate upon re-entry into the atmosphere. Though there may not be a specific dedicated legal framework covering these situations, the sustainability aspects related to the deposition of waste from equipment that is not retrieved for subsequent re-use, either on land or at sea, must be considered. In this context, waste management obligations, as well as environmental impact assessments, may be applicable depending on the law applicable.

IV.

Downstream

RELEVANT STAKEHOLDERS

- EO data providers
- VAS providers
- End users
- Downstream investors
- Space agencies and regulators

WHAT IT IS

The downstream phase is where the focus is on the exploitation and application of the processed data.

MARKET & BUSINESS

From an economic perspective, this stage is about getting the processed data and value-added products into the hands of those who can use them. Public entities often provide datasets with open data policies, whilst commercial entities often tailor them to industry-specific needs and provide consultancy and analytical services.

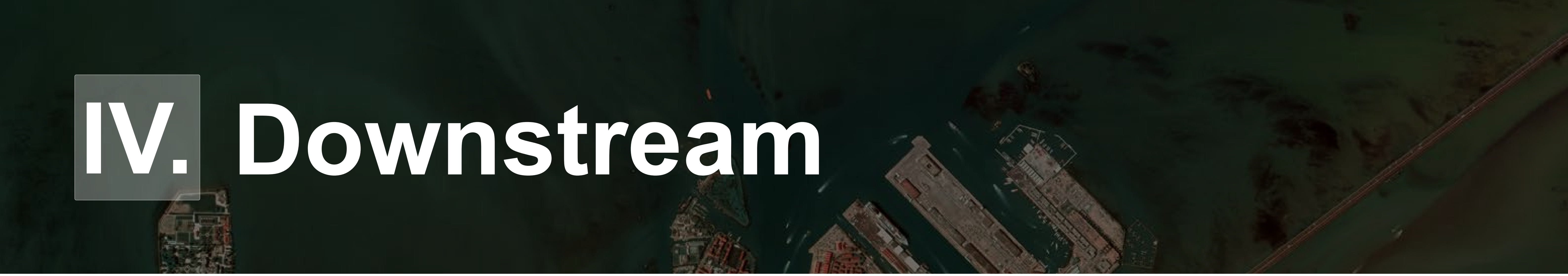
This phase also involves the development of business models and strategies for the dissemination of satellite data and derived products. It can include establishing licensing agreements, creating subscription-based or pay-per-use access to satellite datasets, and developing custom applications tailored to specific industry needs.

TECHNICAL

From a technical perspective, this stage involves advanced analytical techniques applied to the data received from the midstream phase, including feature extraction, classification, and thematic mapping. Utilising machine learning and artificial intelligence, these processes unearth complex patterns and insights, which are essential for creating information products. These products and insights lead to the development of applications and services that cater to a wide array of sectors.

LEGAL & REGULATORY

From a legal and regulatory perspective, the downstream stage may require compliance with legal conditions for EO data dissemination. However, even in the absence of such conditions, there are typically legal requirements for data sharing and export, as well as for data marketplaces. Contractual topics are also paramount for data dissemination and VAS provision.



IV. Downstream

What you'll find in this chapter		Relevant to
MARKET & BUSINESS	Demand for EO VAS services is growing, with greater demand compared to raw data – see question **8.1** to know the expected increase and demand across sectors. See also questions **1.1** and **1.2** for satellite capacity and EO data demand	EO data providers, VAS providers, End users
MARKET & BUSINESS	Several business models and revenue streams exist, depending on operations, target markets and value propositions. Diverse pricing models can also be adopted, with various financing and funding models being available – see questions **8.2**, **8.3** and **8.4** for guidance on these points	EO data providers, VAS providers, End users, Downstream investors
LEGAL & REGULATORY	The dissemination of EO data and provision of EO services is subject to a set of obligations, from those arising from EO laws to requirements established in data laws – see question **8.5** to understand the obligations that may apply to you	EO data providers, VAS providers, End users, Space agencies and regulators
LEGAL & REGULATORY	Contractual topics for data and VAS provision must also be carefully tackled – see question **8.6** for a set of main aspects to be considered	EO data providers, VAS providers, End users
MARKET & BUSINESS **TECHNICAL** **LEGAL & REGULATORY**	Finally, the adoption of EO services in non-space sectors faces several challenges – see question **8.7** to understand the key challenges and check some recommendations to overcome them and ensure a successful business	EO data providers, VAS providers, End users, Downstream investors

- EO data providers
- VAS providers
- End users
- Downstream investors
- Space agencies and regulators

STEPS TO LAUNCHING YOUR EO DATA/SERVICES IN THE MARKET

Principles	Actions
Market Map	**1.** Conduct a market and feasibility study: assess demand, map competitors, identify target sectors, and refine your value proposition. **TIP** Involve potential end users from the very start, ensuring fit and validation throughout the process of launching your EO data/ services products.
Capital Path	**2.** Develop a financing strategy: secure funding through grants, venture capital, partnerships, or public programmes to support infrastructure, operations, and scaling. **Note:** steps 2, 3, 4, and 5 can be initiated in parallel.
Data Flow	**3.** Secure data access and build processing infrastructure by establishing reliable EO data sources, whether from own satellite or outside sources (public or commercial) and invest in processing, storage, and analytics capabilities.
Solution Trial	**4.** Launch a pilot project to validate your solution: test with early adopters, gather feedback, and demonstrate both technical performance and commercial viability.
Revenue Approach	**5.** Choose and refine your pricing and business model: decide between subscription, usage-based, or outcome-based models, adapting to client needs.
Compliance Diligence	**6.** Ensure legal and regulatory compliance: address EO-specific regulations, data protection, data sharing requirements, intellectual property, and sectoral requirements. In addition, conclude contracts with data providers and end users: formalise agreements, including licensing, data sharing, and protection of sensitive information.
Smart Insights	**7.** Scale and differentiate through value-added services: combine satellite data with AI, IoT, and ground sensors to enhance insights and build a competitive advantage.

DOWNSTREAM

8. Data dissemination and VAS services

What are the main aspects to take in consideration in EO data dissemination and the provision of VAS services?

RELEVANT TO

MARKET & BUSINESS

8.1. WHAT IS THE MARKET DEMAND FOR EO VAS SERVICES? AND WHAT ARE THE FASTEST-GROWING MARKET SEGMENTS FOR EO-BASED VALUE-ADDED SERVICES?

The global satellite data and services revenue is expected to reach approximately €6 billion by 2033, with the EU accounting for almost €1 billion of that market[2] (see also questions 1.1 and 1.2).

In all downstream markets, there has been a greater demand for value-added services compared to raw data, as existing end users shift towards procuring actionable insights for improved time and cost efficiency and new end users recognise the benefits of incorporating space data and services within their operations.

Within this landscape, the thematic submarkets of Defence and Security; Climate, Environment, and Biodiversity; and Land Management, Infrastructure and Urban Development stand out as the largest EO VAS markets worldwide, and they are expected to remain dominant in the coming decade.

Global Market Demand for VAS (2025 and 2035)

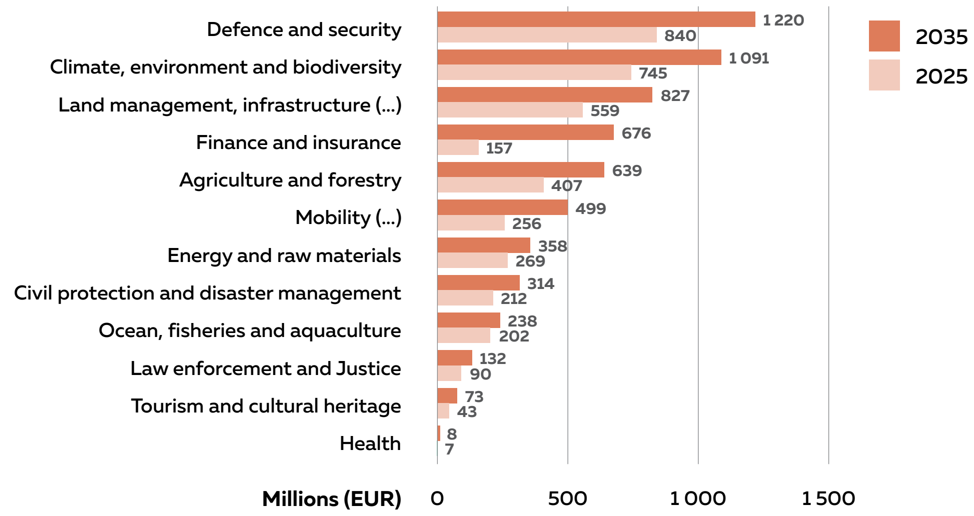


Figure 7 – Global revenue forecasts for EO VAS market (data from: *New Space Portugal WP 9.1 Fundamental Research: Developmental Research Studies on Earth Observation*)

[2] EUSPA Market Report 2024.

Increasingly, providers are enhancing their services by combining satellite imagery with ground-based sensors, IoT platforms, and artificial intelligence, allowing them to tailor insights more precisely to client needs and deliver sector-specific decision-making tools. Importantly, many VAS providers are not satellite operators themselves but operate as analytics, software, or consultancy firms, which means competition in this market is broad and dynamic, drawing in actors from across the tech and geospatial sectors in addition to traditional space players.

RELEVANT TO

MARKET & BUSINESS

8.2. WHAT ARE THE MAIN BUSINESS MODELS AND REVENUE SOURCES FOR EO DATA DISSEMINATION AND PROVISION OF VAS SERVICES?

TIP

**Assess market demand, customer preferences and competitor strategies to select the most suitable models for your business and long-term scalability.
Ask clients for feedback and pilot different revenue approaches to determine customer-fit and maximise profitability.**

The business models and revenue sources of EO programmes and companies vary significantly, reflecting the diversity in their operations, target markets, and value propositions.

The main business models for EO data dissemination and provision of value-added services span both public and commercial approaches.

Public sector models often combine government funding with revenue from data sales, licence agreements, and strategic partnerships that enhance distribution and ensure sustainability.

Commercial models, by contrast, focus on data-as-a-service (DaaS) offerings, including data subscriptions, solution partnerships, data marketplaces, and customised VAS analytics.

Across both domains, partnerships and flexible licensing structures are used to scale up service delivery and enable broader application of EO data.

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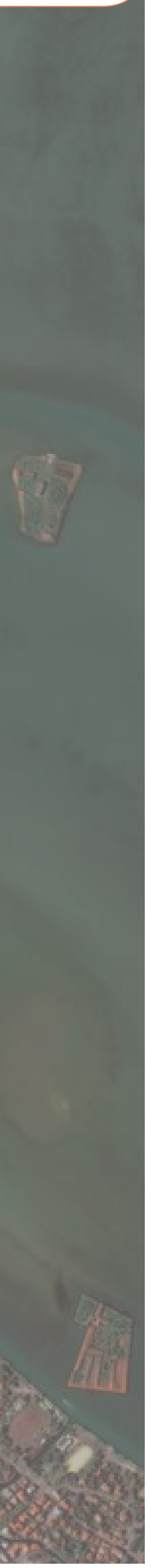


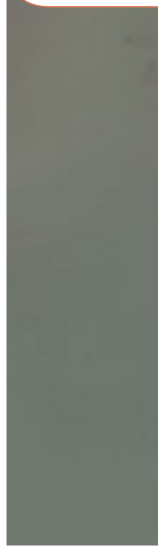
BUSINESS MODELS FOR EO DISSEMINATION

BUSINESS MODEL	DESCRIPTION	ADVANTAGES	DISADVANTAGES
Data (see also question 2.2)			
Data Sales (One-Off)	Selling raw or pre-processed EO data (e.g., imagery, sensor readings) on a pay-as-you-go or licensing-type arrangement	▪ Simple ▪ Revenue can grow with data demand ▪ Low customisation needed	▪ Highly commoditised ▪ Competition from free/open data ▪ One-off sales, not recurring
Data-as-a-Service (DaaS)	Selling raw or pre-processed EO data (e.g., imagery, sensor readings) on a subscription or recurring usage basis, via API or platform	▪ Can be automated at scale ▪ Ability to offer various pricing models ▪ Client lock-in through subscription is possible	▪ Competition from free/open data ▪ Requires technical expertise to set up API/platform and client management ▪ Needs continuous improvement
VAS (see also question 2.2)			
Solution Partnerships	Partnering with domain experts to develop EO-based applications and insights	▪ Access to new markets ▪ Leverages partner credibility and expertise ▪ Can drive co-innovation	▪ Complex coordination ▪ Revenue-sharing reduces margins ▪ Time-consuming deal cycles
Data Processing/ Consulting (One-Off)	Transforming raw EO data into analytics-ready or value-added data on a once-off basis	▪ High growth market ▪ Adds value beyond raw data ▪ Higher margins for tailored insights	▪ Requires technical expertise ▪ Needs continuous improvement ▪ Cannot be automated at scale and requires highly specialised experts
VAS API	Transforming raw EO data into analytics-ready or value-added data on a subscription basis	▪ High growth market ▪ Adds value beyond raw data ▪ Can be automated at scale ▪ Flexible pricing models	▪ Requires technical expertise ▪ Needs continuous improvement
System Integration Services	Embedding EO insights into customer systems and workflows	▪ High switching cost for client (sticky model) ▪ Tailored for high impact	▪ Labour-intensive ▪ Hard to scale as each client will need strong convincing

The provision of data and VAS can, in addition, be done through several means, notably direct provision or through resellers/marketplaces.

MEANS OF DATA/VAS PROVISION

KNOW MORE



MEANS	DESCRIPTION	ADVANTAGES	DISADVANTAGES
Direct provision	Provision of EO data (raw or processed) directly to the user, including through dedicated online graphical user interfaces (GUI)	▪ Direct relationship with the customer ▪ Full ownership of the sales process ▪ Full retention of revenues (no commission, fees, etc.)	▪ Requires a dedicated and specialised salesforce ▪ Requires extensive marketing practices to acquire new customers ▪ Scaling is limited by company marketing and sales
Resellers and Marketplaces	Hosting a platform to aggregate and sell EO data from multiple sources	▪ One-to-many revenue model ▪ Ecosystem growth potential ▪ Scalable digital product	▪ Needs a critical mass of users and suppliers ▪ High upfront investment ▪ Competition risk

RELEVANT TO

MARKET & BUSINESS

8.3. PRICING — HOW ARE EO SERVICES PRICED ACROSS SECTORS — AND WHICH PRICING MODELS (SUBSCRIPTION, USAGE-BASED, OUTCOME-BASED) ARE GAINING TRACTION?

For **end users**, determining average prices for EO products is challenging due to the wide range of variables influencing cost. Pricing can vary significantly based on the satellite and image provider, the spatial resolution, whether the data is archival or newly tasked, the size of the scene, market demand for the area, and the volume of images ordered. Publicly listed prices are often only indicative, with final costs frequently negotiable through direct contact with providers. The pricing structure can also adapt to the specific business case; for instance, long-term applications such as wildfire monitoring may secure lower rates or alternative models compared to pay-per-image arrangements. Additional fees may apply for value-added services such as image processing, urgent satellite tasking, or specific delivery formats including physical hard drives. Conversely, discounts are often available for low-demand areas (e.g., open ocean) or bulk orders spanning extended periods, reflecting the dynamic and context-dependent nature of EO data pricing[3].

In terms of pricing types for **providers**, EO services use a range of models tailored to client needs, data types, and sector-specific

[3] ESA Newcomers Earth Observation Guide.

applications. **EO data and service providers** are not limited to one pricing type but can also offer their customers a range of possible choices. Traditionally, licensing and pay-as-you-go pricing dominated the market, particularly for raw satellite imagery[4]. However, the shift toward more integrated and analytical services has led to the growing adoption of subscription-based models, where users pay for continuous access to data feeds or platform services that offer actionable insights. This model is particularly prevalent in agriculture, environmental monitoring, and infrastructure management. Usage-based pricing – where fees are determined by the volume of data consumed or frequency of access – is gaining traction among smaller enterprises and research institutions that require flexibility and value cost-effectiveness.

More recently, outcome-based pricing is emerging in sectors like insurance, carbon monitoring, and precision agriculture, where clients pay based on measurable results (e.g., improved yields, verified emissions reductions)[5]. While this has its challenges in the EO services market, as not all providers or partners may be willing to adopt this model, the broader trend of data and service provision indicates that it may soon feature more widely in downstream EO markets.

Nevertheless, as EO data becomes increasingly commoditised, value-added services and actionable insights – rather than raw imagery – are becoming the key drivers of pricing strategy across sectors.

TIP

Align the pricing model with your objectives, market positioning, and target customer segments. Ensure that it is transparent, flexible, and responsive to both market demand and evolving cost structures.

Regularly review and adapt pricing based on feedback and changing competitive or regulatory environments to sustain both accessibility and revenue goals.

KNOW MORE

PRICING MODELS

PRICING MODEL	ADVANTAGES	DISADVANTAGES
Licensing/ Pay-as-you-go	▪ Familiar and widely used ▪ Suitable for raw imagery needs ▪ Flexibility for one-time or occasional use	▪ Can become costly for clients with frequent use, making providers less competitive ▪ Limited in terms of added services or insights
Subscription-based	▪ Continuous access to data and platforms ▪ Ideal for ongoing monitoring needs ▪ Predictable costs for client budgeting	▪ May not suit users with sporadic or low data needs ▪ Potentially underused by small clients
Usage-based	▪ Cost-effective for smaller enterprises ▪ Flexible and scalable with demand ▪ Encourages efficient data use	▪ Harder to predict monthly revenues ▪ May discourage frequent use due to cost concerns
Outcome-based	▪ Aligns provider incentives with client results ▪ Suitable for results-driven sectors (e.g., insurance, agriculture)	▪ Difficult to define and measure outcomes ▪ Not all providers are willing to adopt this model as not all factors are within their locus of control

[4] Demystifying satellite data pricing: A comprehensive guide – Geoawesome.
[5] Xaas outcome-based pricing | Deloitte Insights.

KNOW MORE

RELEVANT TO

MARKET & BUSINESS

8.4. HOW CAN COMPANIES IN THE EO DOWNSTREAM SECTOR ACCESS FINANCING AND FUNDING AND SCALE THEIR BUSINESSES IN PORTUGAL OR THE EU?

See question 2.3.

RELEVANT TO

LEGAL & REGULATORY

8.5. WHAT LEGAL ASPECTS NEED TO BE CONSIDERED WHEN DISSEMINATING EO DATA OR PROVIDING VAS SERVICES?

Dissemination of EO data – usually, primary data distribution – may be subject to **specific constraints under national laws regulating remote sensing** (see also question 1.4). Often, these laws establish the conditions the data (usually data with certain features such as when it comes to resolution) shall meet so that it can be disseminated, with the main goal of protecting national security. For instance, a prior approval for dissemination may be required, certain measures for data security may have to be implemented, or limitations on data quality may be imposed. An assessment of the sensitivity of the data to determine whether the data can be disseminated or not may also be established (notably based on resolution or coverage). Conditions for data exports may further be foreseen to ensure compliance with national interests. In addition, EO laws may also enshrine shutter control and priority access.

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Even in those countries without dedicated EO laws, **requirements for data dissemination** may exist, which apply to EO data/information as well. This may include, for instance, mandatory rules for data sharing contracts.

TIP

Reflect the requirements for data dissemination arising from applicable law in your internal data management policy. Check the application of standards, best practices, and guidelines (see question 1.4 on this topic), including on data sharing. Ensure training and capacity-building for staff.

POSSIBLE REQUIREMENTS FOR EO DATA DISSEMINATION UNDER EO NATIONAL LAWS

LICENCE/DECLARATION

EO laws may require a licence for data dissemination (e.g., Germany) or a declaration (e.g. France).

CONDITIONS FOR DISSEMINATION

EO laws may impose compliance with certain conditions, notably with the aim of meeting national security interests or international obligations. Other requirements may also apply.

NUGGET

- Canadian law requires that EO data dissemination be done under a legally enforceable agreement that includes measures respecting the security of data or their further dissemination.
- France requires compliance with restrictive measures concerning the dissemination of archived primary data, such as limitations on the technical quality of data concerning specific geographic areas.
- Germany establishes the obligation to perform a sensitivity check to determine the issuance of a permit, which may be conditionally granted through measures such as reduced spatial resolution of data, time delay, and reduced processing quality of the data.

SHUTTER CONTROL

Under shutter control provisions, the State orders the system operator or the data provider to limit or cease the collection, transmission or dissemination of certain types of data (e.g., US, Canada, France, Germany, Japan).

PRIORITY ACCESS

Priority access grants the State the right to require from the system operator or the data provider priority generation or access to certain type of data, such as in emergency situations, for instance threats to national security (e.g., Canada, Germany).

DATA SHARING REQUIREMENTS UNDER DATA LAWS — EXAMPLES

G2B data sharing	Data made available by public entities may be subject to specific requirements for their availability and reuse. Typically, such data must be made available as open data, and in certain cases it must meet certain additional conditions — in the EU, this occurs, e.g., with environmental information, dynamic data and high-value datasets (which include geospatial, EO and environment, and meteorological datasets). Even when data is protected (for instance, by copyright), their access and re-use may be subject to specific conditions as well.
B2B data sharing	Laws may establish specific conditions for data sharing even in B2B relations. For instance, in the EU, the unilateral imposition, by an enterprise on another, of contractual clauses considered unfair is prohibited, and such clauses are not binding. This is the case, e.g., of clauses that exclude or limit the liability of the party that unilaterally imposed the term for intentional acts or gross negligence.
B2G data sharing	Public procurement rules establish in general requirements for the provision of data by the private sector to public entities. Conditions may also exist for the sharing of data in exceptional circumstances, such as for disaster response. The EU addresses such cases.
G2G data sharing	Laws may establish conditions relating to data sharing within the Public Administration and to the interoperability of its systems and data, including through the adoption of open standards. Such topic is also addressed at EU level, with the EU aiming to ensure interoperable public services to facilitate cross-border data exchange.

KNOW MORE

KNOW MORE

What is more, to the extent EO data may contain or reveal **personal data**, legal requirements on the processing of personal data further apply (e.g., purpose limitation, data minimisation).

NUGGET

- This is an increasing risk that EO data may reveal personal data, due to higher resolution, aggregation of satellite data with other data, and the rise of AI. Even if the satellite image itself does not contain identified individuals, it may contain data that, if processed through certain accessible means/technologies or if combined with supplementing information (e.g., drone data, CCTV data, geographical systems data, IoT data, biometric data), allows the identification of individuals. This is the case, for instance, of the contextualization of a satellite image in a certain geographical location such as the image of a person in the garden of the house at a time when it is known only its resident is present.
- Under EU law, to the extent the satellite operator is the one determining the purposes and means (the why and how) of the processing of personal data, it is the data controller and, as such, it is subject to the most demanding obligations. Yet, even if the satellite operator is processing the data to a customer, it is also subject to legal obligations under the General Data Protection Regulation (GDPR).

Data exports may also be subject to constraints under data laws, export control laws, trade restrictions limitations and sanctions regimes.

NUGGET

For instance, under EU law:

- EO data providers must assess applicable sanctions lists, such as those maintained by the UN, EU or US. For this purpose, they must perform screening procedures to ensure compliance in data dissemination.
- EU operators engaged in lawful international trade are protected against the effects of certain extra-territorial sanctions adopted by other countries.
- Re-users of protected publicly held data must take all reasonable technical, legal and organisational measures, including contractual arrangements, in order to prevent international transfer or governmental access to non-personal data held in the Union where such transfer or access would create a conflict with Union law or the national law of the relevant Member State. The re-user is further subject to specific information and contractual obligations if it intends to transfer data to a third country.

Finally, it is important to highlight that specific provisions for **intermediaries of data (such as data marketplaces)** may also exist.

NUGGET

- For instance, under EU law, a set of requirements (including notification) apply to data intermediation service providers established in the EU or offering services within the EU.
- Though the requirements do not apply to data intermediation services that focus on the intermediation of copyright-protected content – which may include, in certain circumstances, EO data (see question **6.2**) – it is arguable whether the purpose is to exclude such situations instead of excluding only the intermediation of more traditional copyrightable works such as music, books or films/videos. Moreover, such marketplaces often also make available non-copyrightable data.

RELEVANT TO

LEGAL & REGULATORY

8.6. WHAT CONTRACTUAL ASPECTS NEED TO BE CONSIDERED FOR DISSEMINATION OF EO DATA AND PROVISION OF VAS?

From a legal perspective, the dissemination of data and provision of VAS is typically made either through end user license agreements (EULA) containing pre-defined contractual terms not subject to negotiation, which may be more common in contracts for in-catalogue data, or through negotiated contracts, such as for off-catalogue data. However, other approaches are possible. Contracts with general terms and conditions (GTC) and particular terms and conditions (PTCs) may also be chosen, with a view to ensuring common terms throughout several orders for data or VAS.

TIP

Ensure user agreements clearly define permissible uses, warranties and liability, with a view to reducing risk and ensuring traceability and accountability.

VAS providers that obtain EO data from a data provider to develop VAS for final customers must be careful not to assume obligations or provide warranties in the contract with the final customer and with relation to the data of the data provider unless the contract with the data provider allows such obligations to be assumed or warranties to be provided.

KNOW MORE

KEY CONTRACTUAL TOPICS – DATA/VAS PROVISION

THE DATA/SERVICES BEING PROVIDED, LICENSING, DELIVERY AND ACCEPTANCE

The data/services being provided need to be detailed, with the indication of the date(s) of delivery, as applicable. Especially in the case of VAS – and, to some extent, for off-catalogue data – acceptance of the deliverables may also be envisaged. Training and knowledge training, as well as support services, may also be included.

NUGGET

- With relation to EO data, the identification and description of the data, including data features, is often made (e.g., volume, quality, granularity, format and data portability in order to avoid data lock-in; whether the data is raw, processed or analysed information; provision of metadata).
- In-catalogue data is often licensed, with the licences indicating the rights granted, covering types of use (including any conditions on modification, transformation, aggregation, re-dissemination, internal uses, and commercial exploitation), purpose, territory, term, beneficiaries and users.
- Off-catalogue data, as well as deliverables of VAS, may belong to the customer as works for hire. Even so, the provider may reserve the right to use such data and deliverables, either for internal purposes or for other commercial offers.

WARRANTIES

NUGGET

- Data, information and services provided under the EU Space Programme, such as Copernicus, are provided with no warranties, in accordance with the Space Programme Regulation.
- In case no warranties are provided, compensation for damages arising from the data or services provided may be unfeasible.

Especially in non-negotiated contracts, data and information are provided "as is", with no warranties with respect to their quality, accuracy, availability, reliability, speed and suitability for any purpose.

However, data provided for certain purposes (e.g., security and defence), as well as negotiated contracts, may contain warranties over the data. Likewise, VAS contracts may have warranties in relation to the deliverables.

OTHER RELEVANT PROVISIONS

NUGGET

- The determination of the party that is required to comply with the legal provisions, notably on personal data, may be especially relevant in case of data/deliverables that may reveal personal data (see question **8.5**).
- The client may be required to implement security measures to ensure the data/ deliverables made available are not cyber-threatened or attacked.
- It is also important to address cases where a legal change impacts the contract.

Provisions on reports and audits, changes and additional services/data, price and payment, security and personal data, confidentiality, liability and indemnification, term and termination, assignment, representations and warranties, export control, governing law and dispute resolution, are also essential (see question **2.5** for some of these topics).

RELEVANT TO

MARKET & BUSINESS | TECHNICAL | LEGAL & REGULATORY

8.7. WHAT ARE THE KEY BARRIERS TO MARKET ADOPTION FOR EO SERVICES IN TRADITIONALLY NON-SPACE SECTORS, AND HOW CAN THEY BE OVERCOME?

Key **business, finance, and economic** barriers to the adoption of EO services in traditionally non-space sectors include high perceived costs, unclear return on investment (ROI), and limited understanding of EO's value proposition. Many potential users – such as in agriculture, logistics, insurance, or energy – may lack awareness of how EO data can be operationalised into cost-saving or revenue-generating solutions, making them hesitant to commit resources.

Additionally, upfront investments in data integration, analytics platforms, or staff training can be deterrents, especially for small to mid-sized firms. The lack of standardised pricing and fragmented service offerings can also complicate procurement decisions.

From a **technical perspective**, the key barriers identified include the need for specific infrastructure in order to use EO products and, in most cases, the need for professionals who are capable of accurately working with satellite data. Adoption of different data standards, and interoperability constraints may also hinder seamless access and integration of EO data. These barriers can limit the practical use of such products and services, especially in sectors with lower technology expertise.

From a **policy and legal perspective**, key barriers include no worldwide regulatory alignment for EO data dissemination, sharing and reuse; limits or strict requirements to data provision; fragmentation relating to ownership over data which may discourage joint and large-scale use of different databases; privacy and personal data concerns; as well as different approaches and complexity of contracts impacting data and VAS commercialisation.

TIP

To overcome these barriers, EO providers could offer clearer, outcome-oriented business cases tailored to sector-specific challenges. Innovative pricing models, such as subscriptions or outcome-based agreements, can go a long way to mitigate perceived risks for new users who may be hesitant to commit to time and resources on new and unproven ways of doing business. Public procurement, subsidies, and demonstration projects – particularly those funded through EU or national programmes – can serve as critical enablers by lowering entry costs and validating commercial use cases across industries.

Measures such as investing in user-friendly platforms, encouraging common or aligned standards, and promoting training programmes and partnerships with academic institutions in order to promote basic EO knowledge, can be a way to overcome these barriers.

To overcome these challenges, data and VAS providers should strive to offer clear contracts with FAQs, provide capacity-building, regularly engage with policy makers and relevant organisations to develop aligned or common approaches, follow best practice and guidelines, and continuously ensure regulatory compliance through robust internal policies, governance and risk management.

V.

How to encourage the development and use of EO

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HOW TO ENCOURAGE THE DEVELOPMENT AND USE OF EO

1. WHY PRIORITISE EO? THE BENEFITS OF A THRIVING DOMESTIC EO SECTOR

Prioritising EO as a national or regional strategy creates a strategic advantage at the intersection of the economy, the environment, security and science.

Domestic EO capabilities provide sovereign access to data critical for monitoring territory (e.g. natural disaster prevention and response), resources, borders, and climate commitments, reducing dependency on external providers. They strengthen national and regional autonomy, responding to calls for greater sovereignty across countries and regions. In the EU, EO capabilities strengthen Europe's position as a global leader, with commercial EO data and services playing an essential role. Commercial EO is vital for fostering a more resilient and diverse economy by enabling access to multiple alternative EO providers.

Economically, a thriving domestic EO s ector drives industrial competitiveness by nurturing satellite manufacturers, suppliers, data processors, and service providers that plug into Europe's fast-growing EO value chain.

EO also offers strong multiplier effects in industries that use EO, including infrastructure and urban development, agriculture and forestry, ocean, fisheries and agriculture, and even finance and insurance, which is set to experience rapid growth in generating EO data and service revenues in the coming decade. Acknowledging the cross-sector role of EO products and services, policy and legislation, both at international, EU and national levels, are progressively highlighting the use of EO to achieve policy goals and to ensure legal compliance.

Furthermore, investments in EO infrastructure and services generate spillovers in AI, geospatial analytics, and digital platforms, helping build a diversified knowledge-based economy.

EO is also useful within the public sector. EO has the ability to improve decision-making efficiency, reducing costs in areas such as agriculture subsidies, urban planning, environmental enforcement, and disaster management. The public sector continues to play an important role as an anchor customer for EO products and services, thus also contributing to a more resilience EO economy.

2. HOW TO SUPPORT A DOMESTIC EO SPACE SECTOR

Supporting a domestic EO sector requires a coordinated industrial, financial, policy and regulatory approach.

From an economic perspective, governments can stimulate growth by investing in anchor demand (e.g., guaranteed annual amount of public procurement of EO data and services), which creates stable revenue streams for local providers and a reassuring market for investors, thus also encouraging competitiveness and innovation.

For EO-related businesses, access to "patient capital" is essential: medium and established EO operators benefit from blended financing models (EU programmes, national innovation funds, and strategic loans) that reduce risk in satellite development and operations, without excessive pressures to turn a profit in the short run.

The development of EO-focused policy approaches is also a central point to consider. This can include comprehensive strategies for space data and services across sectors, regular assessments on their use, and technical guidance and service needs portfolios.

Regulatory frameworks also play a vital role. Clarity, consistency and coordination among laws that apply to the sector are essential, from space laws to data, intellectual property, safety, environmental and cybersecurity laws, including spectrum and export control. Indeed, even when a comprehensive space law exists, other regulatory frameworks remain applicable. The wide range and complexity of laws applicable to the EO lifecycle, as well as the lack of substantial coordination among legislation, raise challenges with the application of certain legal rules considering the specificities of the EO sector. In the EU, this complexity risks being deepened with the EU Space Act. Coordination mechanisms, guidelines and best practices that are both clear and flexible are able to provide certainty to economic operators whilst ensuring that adaptation and modularisation are allowed to respond to different needs and capacities.

A risk-based, result-based framework ensures that businesses operate in a predictable environment that reassures the market of long-term stability, and at the same time is agile enough to keep the market open to new entrants and innovation. Moreover, ensuring that application of common rules (such as those coming from the EU) is consistent across member states (such as through space dedicated guidelines and regular dialogue among competent authorities) will contribute to creating a more competitive space market.

Other instruments are also relevant: capacity-building, grants, tax incentives and regulatory sandboxes, are able to encourage investment in space endeavours and promote R&D.

At the industrial level, building ecosystem partnerships – through clusters, incubators, and links with research institutes – helps companies scale faster and position themselves in international supply chains. This is also important in encouraging the influx of foreign direct investment into the domestic market.

Finally, investing in talent pipelines (STEM education, upskilling in geospatial analytics, AI, and entrepreneurship) ensures a sustainable workforce that can meet the sector's long-term needs. It is therefore also important for domestic labour laws and companies' internal policies to support the retention of skilled staff by ensuring competitive compensation (e.g., bonuses, pension schemes, flexible benefits), employee protections, and visas for highly skilled employees.

3. HOW TO PROMOTE THE USE OF EO IN NON-SPACE MARKETS

The challenge in expanding EO adoption lies in translating technical data into sector-specific value propositions. Non-space markets — such as agriculture, finance, construction, or insurance — do not often see the value in "satellite imagery," but they do see value in risk reduction, efficiency gains, and compliance solutions. Promotion, therefore, requires framing EO services in the language and metrics of end users — taking EO out of EO. This can be achieved by focusing on customised/tailored products and services, and encouraging cross-sector collaborations (e.g., EO firms co-developing tools with agricultural software companies or insurers from the outset for sector-relevant products), as there has been a noticeable shift away from EO data towards value-added services that provide ready-to-use, actionable insights. Other initiatives to promote EO use in non-space markets could include building sectoral demonstrators that showcase tangible ROI and simplifying data access via platforms and APIs that are user-friendly, interoperable and that make access, storage, and payments simple and straightforward.

Authorities, agencies, and industry associations can also play a central role in encouraging increased dialogue between space and non-space actors. By increasing participation of the space sector in non-space groups, forums and networks, ensuring that information on new opportunities in non-space sectors reaches space actors, as well as by promoting coordination and interoperability among data platforms and data spaces, EO products and services are able to increase visibility and lead to further interest in their use. Joint forums, initiatives or even working groups/hubs can also be envisaged to bring together space and non-space actors in a consistent collaborative manner.

At the same time, ensuring coordination of regulatory authorities and agencies from the space sector and other market segments will reduce burdens for both space and non-space actors, creating synergies that facilitate the uptake of EO data.

When it comes to policy and laws, and though they have increasingly acknowledged the role of EO for compliance purposes and as a tool to achieve their goals, references are still scarce in many sector-specific legal acts, even when express acknowledgement of the role of scientific information and data is made. Furthermore, in many cases in the EU, when references to EO data are made, the focus is very often on Copernicus. This highlights a need for policies and laws to better integrate and reference commercial EO data and services to fully leverage their potential in policy and legal frameworks, and, where relevant, assess making EO use a mandatory requirement as it was done, e.g., for positioning, navigation and timing in certain sectors (such as for the eCall system for road vehicles). Regularly monitoring and evaluating the impact of EO data and services across market segments will also contribute to assessing whether other approaches are needed, including in light of geo-strategic and technological evolution.

Financially, governments and industry associations can help reduce adoption barriers through voucher schemes, tax credits, or co-financed pilots that allow non-space actors to trial EO solutions. Standardisation, certification and labelling of EO-based products and services also help increase trust, making it easier for industries like insurance or infrastructure to adopt EO insights as part of their operational processes. Yet, challenges in this field also need to be addressed: duplication of standards; labels and certifications may lead to cherry-picking; race to the bottom; gaps in coverage and lack of comparability. Harmonised approaches, mutual recognition, as well as international and regional cooperation, will ensure standards, certifications, and labels do not develop in an uncoordinated overlapping manner, while ensuring that States' sovereignty, autonomy and security concerns remain respected and protected.

4. HIGH PRIORITY SECTORS FOR THE USE OF EO

Globally, certain sectors have proven to deliver the highest impact from EO adoption. These are sectors that have a combination of large (civilian) market sizes and are projected to experience significant growth in the coming decade. In Europe, such sectors include:

- Climate, environment, and biodiversity — EO enables States and industries to meet climate commitments, track biodiversity loss, and verify emissions reductions, with high demand from public agencies and ESG-focused investors (Largest civilian EO market size, moderate projected growth).
- Land management, infrastructure, and urban development — EO supports urban planning, smart cities, and monitoring of critical infrastructure, reducing maintenance costs and enhancing resilience (Second largest civilian EO market size, moderate projected growth).
- Agriculture and forestry — Precision agriculture, crop monitoring, irrigation optimisation, and pest management offer strong ROI for farmers, co-ops, and agro-industrial players (Third largest civilian EO market size in 2025, fourth largest civilian market size in 2035, strong projected growth).
- Finance and insurance — EO supports investment and lending decisions and enables better ESG compliance and portfolio risk assessment. For insurance, EO enables faster and more accurate underwriting and claims validation for natural disasters, crop losses, and property damage, reducing fraud and improving payout efficiency (Third largest civilian EO market size in 2035, phenomenal projected growth).

These sectors are high-priority targets not only because they generate strong demand for EO insights, but also because they allow EO providers to create scalable solutions with international export potential. Indeed, a key opportunity across all segments lies in building on the synergies between sectors that rely on similar EO data, tools, and monitoring frameworks. This opens up opportunities for leveraging commonalities and synergies to develop products and services that are broadly applicable across end users, thereby further promoting the adoption of EO. Together with the development of frameworks for data sharing (including notably data standards/interoperability) and of institutional cooperation, there is thus an opportunity to align monitoring efforts, reduce duplication, and improve decision-making across sectors that face overlapping challenges and rely on common geospatial evidence.

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VIEIRA DE ALMEIDA

Vieira de Almeida (VdA) is an international corporate law firm with more than 300 lawyers and almost 50 years of history, being the first Portuguese law firm with a dedicated space law sector. VdA has been involved in some of the most relevant space initiatives in Portugal, having also been involved in projects for the EU and ESA, and in African Portuguese-speaking countries. Notably, VdA has advised in the development of national space policies and assisted in the drafting of space laws and the set-up of space governance structures in several countries. VdA also advises space companies on compliance matters such as licensing space operations and registering space objects, as well as on contractual issues. The firm's work with the space industry made VdA the only Portuguese law firm recommended by Who's Who Legal (WWL) "Data Security & Transport - Space & Satellites" global ranking.

VdA is the leader of WP9 of the New Space Portugal project, dedicated to Research Studies on Earth Observation.

VdA is a member of the International Astronautical Federation (IAF) and the International Institute of Space Law (IISL).

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GEOSAT

GEOSAT is the only Iberian Earth Observation Satellite Operator of high and very high-resolution optical satellites, being one of two established very high-resolution optical satellite operators in Europe. It was part of the first truly European VHR coverage of Europe, done solely with European companies and European satellites.

GEOSAT leads the New Space Portugal project and is the operator of the Portuguese component of the Atlantic Constellation, a joint initiative between Portugal and Spain to ensure a revisit over any location on earth under three hours.

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NOVA SCHOOL OF BUSINESS & ECONOMICS

Nova School of Business and Economics (Nova SBE) is one of Europe's leading schools in the fields of economics, finance, and management, internationally recognised for its academic excellence, research impact, and strong connection with the corporate and policy-making worlds. Nova SBE is also committed to capacity building and education in the space economy, offering a Space-themed elective within its Executive Master's in Management program, and an annual "Space for Business" executive education program, developed in collaboration with leading European universities. Building on this educational foundation, Nova SBE will also launch an online Space Economy course in 2026, broadening access to specialised knowledge and strengthening the connection between academia, industry, and policy in the rapidly evolving space domain. Through rigorous research and collaboration with academic, governmental, and industry partners, Nova SBE is helping to position Portugal at the forefront of the European New Space economy – promoting innovation, entrepreneurship, and investment in the space sector.

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CoLAB +ATLANTIC

The Collaborative Laboratory (CoLAB) for the Atlantic (+ATLANTIC), is a non-profit private association comprising 12 Portuguese members (4 enterprises; 3 academic institutions; 1 national laboratory; 4 nonprofit associations of scientific nature or public utility) from different areas of the country and different backgrounds. The latter range from metocean forecasting and climate modelling to data science and Earth Observation (EO)-based services. +ATLANTIC aims at advancing knowledge on the interactions between the Ocean, Atmosphere, Climate and Blue Economy in the Atlantic, with an integrated approach from deep sea to space, with a view to developing a better understanding of the Atlantic system and thus promote blue growth and highly qualified employment.

The CoLAB +ATLANTIC has a multidisciplinary team comprising 30+ members with expertise in the following domains: remote sensing: satellite data processing and modelling; (geospatial data science: spatiotemporal data modelling (including artificial intelligence, machine learning and statistical models) and visualization, specifically focused on coastal regions, atmospheric and ocean processes; numerical modelling: implementation of numerical prediction models (computational fluid dynamics) mostly focused on hydrodynamic processes and their interaction with the atmosphere and coastal regions.

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