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ROOT

Resources for Orientation and Occupational Transition

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EO policy analysis report

D2.1 - EO policy analysis report

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LIST OF ABBREVIATIONS

EO — Earth Observation.

EU — European Union.

ESA — European Space Agency.

EUSPA — European Union Agency for the Space Programme.

CAP — Common Agricultural Policy.

RRF — Recovery and Resilience Facility.

PNRR — Piano Nazionale di Ripresa e Resilienza.

RIS3 — Research and Innovation Strategy for Smart Specialisation.

S3 — Smart Specialisation Strategy.

HCA — Human Capital Agenda.

LTR — Long-Term Space Agenda.

IRIDE — National Italian Earth Observation programme.

ESF+ — European Social Fund Plus.

ERDF — European Regional Development Fund.

AI — Artificial Intelligence.

IoT — Internet of Things.

GNSS — Global Navigation Satellite System.

GOVSATCOM — Governmental Satellite Communications.

STEM — Science, Technology, Engineering and Mathematics.

MOOC — Massive Open Online Course.

ICT — Information and Communication Technology.

SMEs — Small and Medium-sized Enterprises.

CAP — Common Agricultural Policy.

JRC — Joint Research Centre.

AKIS — Agricultural Knowledge and Innovation System.

GIS — Geographic Information Systems.

SSA — Space Situational Awareness.

CDSE — Copernicus Data Space Ecosystem.

EDIH — European Digital Innovation Hub.

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EXECUTIVE SUMMARY

The report provides a structured analysis of the policy landscape shaping Earth Observation (EO) education, innovation, and market uptake in Italy, Portugal, the Netherlands, and Greece. It is designed to support the ROOT project in aligning career guidance and training with EU, national, and regional priorities, while also identifying gaps, barriers, opportunities, and funding directions.

Methodologically, the study combines policy mapping, qualitative policy assessment, automated text analysis, stakeholder interviews, and SWOT analysis. This mixed approach allows the consortium to compare policies across governance levels and to assess how EO and skills are reflected in European and national frameworks.

The findings show that EO is strongly embedded in European policy through the Green Deal, the Digital Decade, the EU Space Programme, Copernicus, and Horizon Europe. However, the report also shows that policy ambition is not yet matched by operational uptake, especially in skills development, training pathways, and workforce integration.

A recurring conclusion is that the main gap is not the absence of policy, but the weak connection between policy, funding, and delivery. Across the four countries, EO-related skills are often recognised in strategic terms, but training, education, and entrepreneurship measures remain limited, fragmented, or insufficiently linked to labour market needs.

At national level, the report highlights different strengths and weaknesses: the Netherlands has a mature EO ecosystem but a disconnect between space and skills policy; Italy has strong alignment with space, green, and skills agendas, but implementation remains uneven and dependent on regional capacity and governance; Portugal is strategically aligned but still faces implementation gaps; and Greece shows strong policy ambition but a thinner skills base and a strong need for retention and reskilling.

Overall, the report concludes that joint EO-and-skills policies are the most effective way to connect technology, workforce development, and market application. It recommends stronger use of existing delivery instruments such as smart specialisation strategies, recovery plans, CAP advisory systems, living labs, and regional human-capital partnerships to turn EO policy recognition into practical training, employment, and innovation opportunities.

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1. Introduction

1.1. Purpose and scope of this deliverable

The purpose of Deliverable D2.1 “EO Policy Analysis Report” is to provide a comprehensive and structured assessment of the policy landscape influencing Earth Observation (EO) education, innovation, and market uptake across the target regions/countries (Italy, Portugal, Greece, Netherlands). The scope of this deliverable encompasses the systematic identification, collection, and analysis of relevant national and regional strategies, as well as their alignment with key European frameworks, including the EU Space Programme, Copernicus, Horizon Europe, and the European Green Deal. The report examines the extent to which existing policy instruments support skills development and workforce integration in both public and private sectors, and identifies existing gaps, barriers, and emerging opportunities affecting EO education and training. In addition, it maps strategic priorities and funding mechanisms, incorporating stakeholder consultations to validate findings and capture forward-looking perspectives. The deliverable ultimately aims to ensure coherence between project activities and broader policy agendas, and to provide evidence-based recommendations to enhance the sustainability, relevance, and impact of EO-related training and innovation actions.

In synthesis, this deliverable aims to:

- Guide ROOT in the development of European EO skills ecosystem
- Align adult careers with labour market needs and future EO innovations
- Support co-creation, development and coordination of Living-Labs
- Better address the engagement of stakeholders

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2. Context and overview of ROOT

2.1. The ROOT project in brief

ROOT (Resources for Orientation and Occupational Transition) is an Erasmus+ Forward-Looking Project that aims to improve the accessibility, quality, and effectiveness of career guidance and counselling for adults, with a particular focus on workers and employers in micro, small, and medium-sized enterprises (SMEs). The project addresses the persistent low participation of adults in training by empowering individuals to make informed decisions about upskilling and reskilling, especially in the context of green and digital transitions. ROOT uses the Earth Observation (EO) sector as a pilot domain due to its strong growth potential, SME-dominated structure, and relevance for emerging skills, while designing solutions that are transferable to other strategic sectors.

To achieve its objectives, ROOT adopts a Living Labs methodology, establishing real-world, regionally anchored pilots that bring together quadruple-helix stakeholders (industry, education and training providers, public authorities, and civil society). Through these Living Labs, the project co-creates and tests innovative career guidance tools, digital and blended services, training resources for career counsellors, and methodologies tailored to adult learners and SME contexts.

ROOT is implemented by a transnational and multidisciplinary partnership that brings together organisations from education and training, research, career guidance, industry support, and policy-oriented networks, reflecting the project's quadruple-helix approach. The project is structured into six interconnected Work Packages (WPs) that cover the full project lifecycle.

2.2. Overview of Work Package 2

Work Package 2 "Engagement and co-creation" focuses on analysing the policy landscape and engaging key actors within the Earth Observation (EO) ecosystem, with the aim of fostering collaboration and co-designing solutions that respond to real-world needs.

The work package is structured around three complementary tasks, each with a clearly defined role:

- **T2.1 - Analysis of relevant policies concerning the Earth Observation landscape in the target regions and related supporting sources/tools**, which analyses the policy landscape shaping Earth Observation (EO) education, innovation, and market uptake, ensuring alignment with regional, national, and EU priorities. The target regions represented in ROOT are Italy, The Netherlands, Portugal and Greece.
- **Task 2.2 – Reaching out to relevant 4 helix stakeholders per each involved country** which strengthens stakeholder engagement by identifying, mapping, and involving key 4-helix actors to ensure EO activities address real regional needs.
- **Task 2.3 – Guidelines for career guidance and living labs design and implementation**, which develops evidence-based guidelines for career guidance tools and living labs, building on policy analysis, stakeholder input, and target group needs.

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2.3 Overview of Task 2.1 – Analysis of relevant policies concerning the Earth Observation landscape in the target regions and related supporting sources/tools

This task analyses the policy landscape shaping Earth Observation (EO) education, innovation, and market uptake to support the development of training programmes and career guidance tools aligned with European, national, and regional priorities. It maps and reviews relevant policies, strategies, and regulatory frameworks, assessing their coherence with key EU initiatives such as the EU Space Programme, Copernicus, Horizon Europe, and the European Green Deal. The study also evaluates existing policy instruments supporting EO skills development, education pathways, and workforce integration, while identifying policy gaps, structural barriers, and emerging opportunities. Stakeholder consultations complement the analysis by validating findings and highlighting future trends and skills needs. In addition, the task maps strategic documents, funding instruments, and investment priorities across the target regions. The final outcome is a set of evidence-based recommendations aimed at enhancing the relevance, sustainability, and long-term impact of EO education, training, and innovation activities.

2.4 Task 2.1 and its relation to the other project activities

Task T2.1 plays a foundational role in shaping the remainder of the project, as it provides the strategic and policy framework that informs the design and implementation of subsequent work packages, in particular WP3 (Career Guidance planning and development), WP4 (Living-labs design and implementation), WP5 (Dissemination and Communication), and WP6 (Exploitation and Impact).

By systematically analysing the policy landscape relevant to Earth Observation in the target regions, including national and regional strategies and their alignment with EU frameworks, T2.1 establishes the evidence base needed to ensure coherence between project activities and broader policy priorities.

Its findings support the development of career guidance content, skills profiles, and training pathways in WP3; they also inform the design and territorial embedding of the Living Labs in WP4, including their alignment with regional human capital strategies and long-term sustainability mechanisms. In addition, the task provides essential input for WP5 by strengthening the project's communication narrative and stakeholder relevance, while in WP6 it contributes to exploitation, policy integration, and impact maximisation by identifying opportunities for uptake, scaling, and follow-up funding.

Overall, T2.1 is not merely a preparatory analytical exercise but a cross-cutting enabling task that underpins the project's strategic coherence, relevance, and long-term impact.

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3. Methodological Framework applied by ROOT for the Policies Analysis

This section provides a description of the overall approach and methodology used to carry out the analysis. The analysis is composed of 5 steps/actions, as detailed in the following chapters. They are:

- Design and use of a matrix for the collection of relevant policies and preliminary statistical analysis;
- Critical assessment and qualitative analysis of policies at EU /global level and at Country level (Italy, Portugal, Greece and Netherlands) starting from strategic and driving documents from the EO sectors (e.g. EU Space Market Report 2026) with a forward-looking perspective and also a focus on funding opportunities;
- Processing of policy documents collected from participating countries through an automated multi-stage text analysis pipeline developed specifically for this study;
- Stakeholders' consultation, carried out through structured interviews to key 4-helix stakeholders per country, aimed at filling gaps of the analysis and derive valuable inputs from experts for the design of career guidance;
- SWOT analysis, aimed at schematizing into a standard format the results from the overall policy analysis and derive inputs to draft final recommendations.

3.1 Matrix for collection and statistical analysis of relevant policies

Within the ROOT project, a policy analysis matrix was developed to identify and assess the main strategic documents, programmes, initiatives, and policy instruments that influence the evolution of the Earth Observation (EO) sector and, more broadly, the development of skills and career opportunities related to space and digital technologies.

The matrix serves as a structured tool for evidence collection and enables the comparison of policy documents across different governance levels (European, national, regional, and global), highlighting both strategic priorities and their implications for education, workforce development, and employment.

The ultimate objective of the analysis is to understand how public policies and sectoral strategies are shaping future skills demand in the EO domain and to identify opportunities and challenges for building sustainable and future-oriented career pathways.

Structure of the Matrix

The matrix was designed to systematically collect information from heterogeneous sources and facilitate subsequent comparative and synthesis activities.

For each policy document, the following information is recorded:

- Policy or strategic document title, identifying the document under analysis;

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- Official source or link, ensuring traceability and verification of the collected evidence;
- Brief description of objectives and target groups, summarising the scope, goals, and intended beneficiaries;
- Governance level, distinguishing between European, national, regional, and global policies;
- Country or territory of reference, where applicable;
- Thematic relevance, classified according to its focus on Earth Observation, Skills, or both dimensions.

The matrix also includes a set of fields aimed at classifying the sectoral area of influence of each policy, with particular reference to:

- Innovation;
- Education and training;
- Market and economic development;
- Agriculture;
- Forestry and natural resource management;
- Urban and territorial planning.

To assess alignment with key European priorities, each document is additionally analysed against a number of strategic frameworks, including:

- EU Space Programme;
- European Green Deal;
- Horizon Europe Missions and Destinations;
- European Data Policies and Data Strategies;
- Pact for Skills.

A further section of the matrix examines the contribution of each policy to three dimensions that are particularly relevant for the ROOT project:

- Skills development;
- Workforce integration;
- Employment opportunities in the public and/or private sector.

Finally, the matrix includes a dedicated field for a preliminary critical assessment, where analysts identify:

- Potential gaps related to EO education and training;
- Barriers to skills acquisition and workforce participation;
- Emerging opportunities for professional development and employment.

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Methodological Approach

The methodology is based on a structured desk research process consisting of two main phases: *document collection and preliminary classification*.

In the first phase, a systematic mapping of policy and strategic documents relevant to the EO sector and skills development was carried out. Sources include European Commission communications, ESA and EUSPA strategies, European programmes, reports from international organisations, national and regional strategies, skills agendas, and policy documents related to the digital and green transitions.

In the second phase, each document was reviewed and classified using the predefined fields included in the matrix. This approach allows predominantly qualitative information to be transformed into a structured and comparable dataset.

The classification process supports:

- The identification of the main policy priorities influencing the EO sector;
- The analysis of links between space strategies, digital transformation, sustainability goals, and skills development;
- The comparison of policy approaches across governance levels;
- The identification of common trends, gaps, and opportunities related to education, training, and employment;
- The provision of an evidence base for subsequent analyses of skills needs and the design of training pathways envisaged within the ROOT project.

The use of a standardized matrix ensures consistency in the analysis, transparency in evidence collection, and replicability of the assessment process. Furthermore, the combination of thematic classification and qualitative evaluation enables a clearer understanding of how existing policies relate to future developments in the EO ecosystem.

As a result, the matrix functions not only as a policy mapping tool but also as an analytical framework for understanding how technological, environmental, and socio-economic transformations are reshaping career opportunities within the Earth Observation sector. The findings generated through this process provide valuable insights for identifying emerging skills requirements and supporting the development of future workforce strategies in the EO domain.

Collection of contributions by the partners

A collection and a pre-analysis of relevant current policies was carried out at National level (Portugal, Italy, Greece, Netherlands) through the matrix above. Reference partners were asked, at first, to validate the matrix template and, in a second stage, to fill it with relevant policies at global, EU, national and regional levels influencing EO domain and the careers in this field with a looking forward perspective.

Policies relevant for the analysis are:

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- National Space strategies (in particular on EO)
- Smart Specialization Strategies
- Skills Strategies and Strategic documents
- EU strategic documents and programmes on Green Deal, Research and Innovation, EU Missions (e.g. climate change adaptation), Data Policies and Skills
- Policies influencing these sectors: innovation, education, market, agriculture, forestry, urban planning

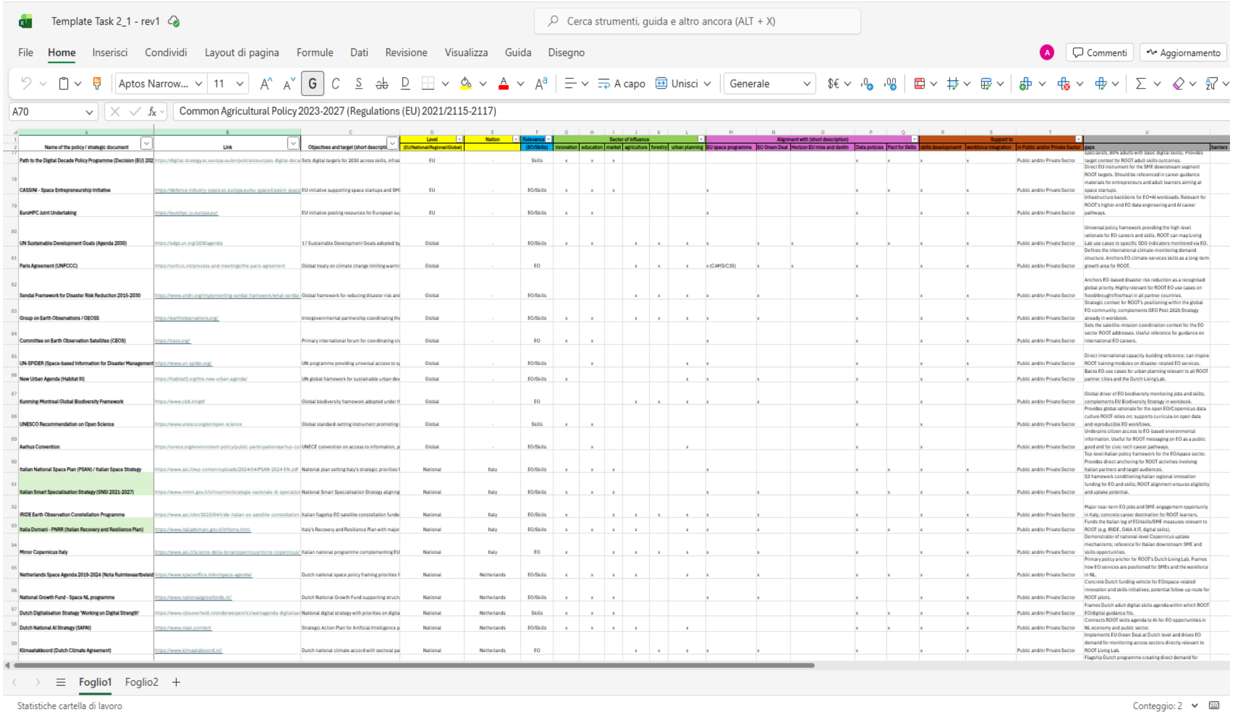

IMAGE 1 – THE TEMPLATE OF THE MATRIX USED FOR CARRYING OUT A PART OF THE POLICIES ANALYSIS

3.2 Critical assessment of EO policies at EU and Country levels

Beyond the collection, mapping, and statistical analysis of the information gathered through the policy matrix, the ROOT Consortium carried out a qualitative assessment of Earth Observation (EO) policies at both European and national levels. This complementary analysis aimed to move beyond the mere identification of policy instruments by examining how policy frameworks shape the evolution of the EO ecosystem, foster innovation, and influence skills development, employment, and market growth.

Drawing on their expertise, knowledge of national contexts, and review of the most relevant policy documents, strategies, and regulatory frameworks, project partners prepared country-specific assessments of the EO policy landscape. The analysis focused on evaluating how existing policies create favourable conditions for innovation, technological development, workforce preparedness, and the acquisition of the competences needed to support the sector's future growth.

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To ensure consistency and comparability across countries, partners selected the most relevant policy documents from the ROOT policy matrix—including both national initiatives and EU frameworks applicable to their context—and analysed four key dimensions: (i) current and emerging trends in EO innovation and technology; (ii) market developments and opportunities across the EO value chain; (iii) existing and future skills gaps that could be addressed through the ROOT project's education and training activities; and (iv) funding opportunities supporting the sector.

The assessment not only identified strengths and weaknesses within the current policy landscape but also explored future challenges and opportunities. By connecting policy priorities with technological developments and labour market needs, it provides evidence on the skills and competences that will become increasingly important for industry, public authorities, research organisations, and service providers.

At the European level, the analysis was complemented by an in-depth review of the EU Space Market Report 2026, which served as the main reference for understanding the evolution of the European space economy and the role of Earth Observation within it. The report provided a strategic perspective on market dynamics, emerging applications, innovation drivers, and future skills requirements, offering a common framework for interpreting and comparing the national analyses.

3.3 Processing through an automated multi-stage text

Policy documents collected from participating countries have been also processed through an automated multi-stage text analysis pipeline developed specifically for this study. Each PDF was extracted and segmented into overlapping text chunks (400 tokens, 80-token overlap) to preserve sentence continuity across page boundaries. In the first stage, chunks were matched against a structured multilingual taxonomy of Earth Observation skills, capacity-building, and downstream uptake keywords covering English, Dutch, Greek, Portuguese, and Italian, reflecting the linguistic diversity of the partner countries. In the second stage, matched excerpts underwent semantic re-scoring using dense vector embeddings generated via the OpenAI text-embedding-3-small model (OpenAI, 2022[1]), with cosine similarity computed against a curated set of 28 multilingual reference sentences describing EO capacity-building contexts.

This two-stage approach, combining exact lexical matching with semantic similarity scoring, ensures both recall (catching domain-specific terminology) and precision (filtering out false positives where policy language superficially resembles EO content without substantive connection). Each excerpt was additionally assigned a commitment strength score based on the frequency and type of modal verbs (ranging from Binding to Aspirational), and a lifecycle stage tag reflecting its position in the policy development cycle, from awareness-raising through to mainstreaming. Embeddings were computed once per document and caught persistently to allow iterative re-analysis without additional API costs.

[1] OpenAI (2022). Text and Code Embeddings by Contrastive Pre-Training. https://cdn.openai.com/papers/Text_and_Code_Embeddings_by_Contrastive_Pre_Training.pdf

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The framework draws on established approaches in semantic document retrieval (Reimers & Gurevych, 2019[2]) and the EO skills taxonomy developed under the Caroline Herschel Framework Partnership Agreement for Copernicus User Uptake (JNCC, 2021[3]). All results were reviewed against a validation schema distinguishing high confidence matches (Valid) from marginal ones (Weak) and irrelevant hits (Not Relevant), providing a transparent audit trail for human review.

3.4 Stakeholders' consultation to fill the gaps

To complement the desk-based policy analysis and validate its findings, a stakeholder consultation process was conducted following **the ROOT 4-helix approach**, ensuring the involvement of key actors from the public sector, academia, industry, and civil society. This approach enabled the collection of diverse perspectives on the current and future role of Earth Observation (EO) skills, education, innovation, and market uptake within national and regional ecosystems.

For each participating country, at least **three relevant stakeholders** were to be interviewed, with efforts made to ensure representation from different helix categories. Potential stakeholders may include public authorities responsible for innovation, digitalisation, education, environment or space policies; universities and research centres active in EO and geospatial education; private companies and industry associations operating in EO-related markets; and civil society organisations, NGOs, or user communities involved in sustainability and digital innovation.

The consultation was carried out through **semi-structured interviews** based on a short set of open-ended questions. This format allowed respondents to freely express their views while ensuring comparability across countries. Interviews were conducted online or in person and lasted approximately 20–30 minutes.

The interviews focused on three key areas:

- Policy relevance and alignment: In your view, how are Earth Observation and geospatial technologies currently reflected in national or regional policies, strategies, and funding priorities?
- Skills needs and barriers: What are the main challenges, gaps, or opportunities related to EO skills development, education, training, and workforce integration in your sector?
- Future trends and recommendations: What actions, priorities, or emerging trends should be considered to strengthen EO capacity building, innovation uptake, and employment opportunities over the next five years?

[2] Reimers, N. & Gurevych, I. (2019). Sentence-BERT: Sentence Embeddings using Siamese BERT-Networks. Proceedings of EMNLP-IJCNLP 2019. https://arxiv.org/abs/1908.10084arxiv

[3] JNCC (2021). Earth Observation Skills Framework Research for the Caroline Herschel Framework Partnership Agreement for Copernicus User Uptake. JNCC Report No. 690. https://data.jncc.gov.uk/data/513a6bfb-b1a3-4809-b6be-2aa464ccb9c9/JNCC-Report-690-FINAL-WEB.pdfdata.jncc.gov

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Interview findings were analysed qualitatively and compared with the results of the policy and strategic document review. The consultation served to validate identified priorities, uncover policy gaps and implementation challenges, and provide forward-looking insights on future skills needs and market developments. Attention was given to areas where stakeholder perceptions diverge from existing policy frameworks, helping to identify opportunities for strengthening the alignment between training initiatives, labour market demands, and broader European policy objectives.

The outcomes of the stakeholder consultation were integrated into the final analysis and inform ROOT recommendations for career guidance.

3.5 SWOT analysis for an overall assessment and final recommendations

The SWOT (Strengths, Weaknesses, Opportunities, Threats) methodology was adopted in the ROOT project as a qualitative tool to support the overall analysis of Earth Observation (EO) policies. Widely used in policy evaluation, SWOT provides a structured way to assess internal and external factors influencing a sector, making complex policy environments easier to interpret.

Its main advantage in ROOT lies in its capacity to integrate evidence from diverse sources, policy documents, regulatory frameworks, funding programmes, and stakeholder inputs into a single, coherent analytical framework. This allows for a clear synthesis of the policy landscape and supports the identification of key trends and priorities.

SWOT also enables a comparative perspective across governance levels (EU, national, regional, and local), helping to highlight alignments, gaps, and inconsistencies among policy instruments that shape the EO ecosystem. In this way, it improves understanding of how different policies interact and affect innovation, skills development, and market uptake.

Another key benefit is its forward-looking nature. By distinguishing strengths and opportunities from weaknesses and threats, SWOT supports the formulation of evidence-based recommendations, particularly in relation to skills development, career guidance, and training needs. It helps identify enabling factors to be leveraged as well as barriers and risks that require targeted interventions.

Within the ROOT methodological framework, SWOT plays an integrative role by consolidating findings from more detailed analytical tools such as policy mapping, document review, and stakeholder consultation. It therefore provides a strategic overview of the EO policy and skills landscape, supporting a coherent, comparative, and action-oriented interpretation of results.

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4. Policies Analysis – Statistical Analysis of the Matrix

A total of 117 policies were identified. Of these, 83 are European or international policies, while 34 are national policies from Italy, the Netherlands, Greece, and Portugal.

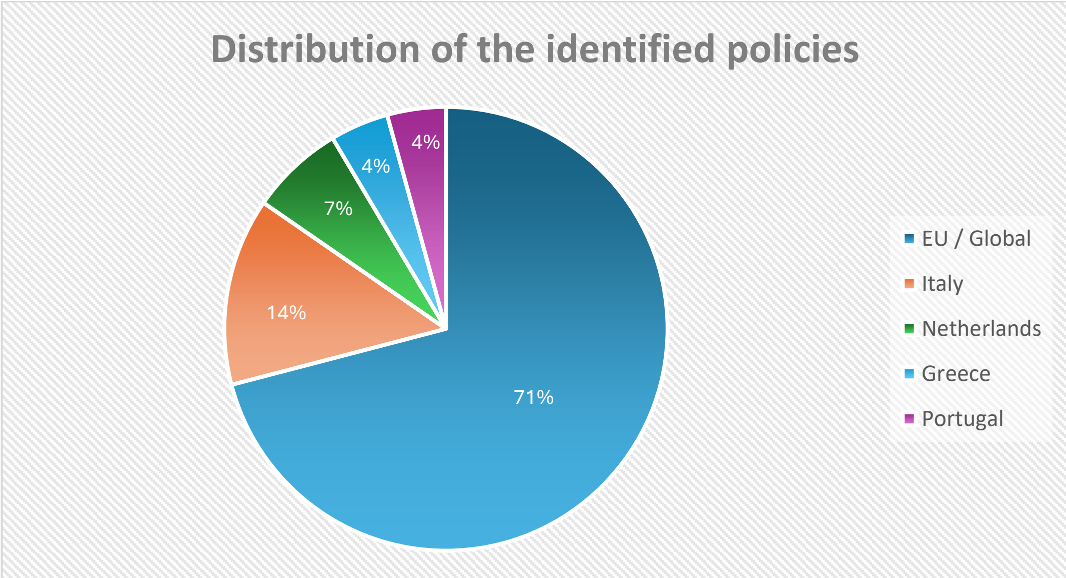

IMAGE 2 – IDENTIFIED POLICIES FOR GEOGRAPHIC AREA

In terms of relevance, 42 policies are EO-related, 35 are Skills-related, and 40 are relevant to both EO and Skills. This shows that there is a substantial overlap between the two policy domains.

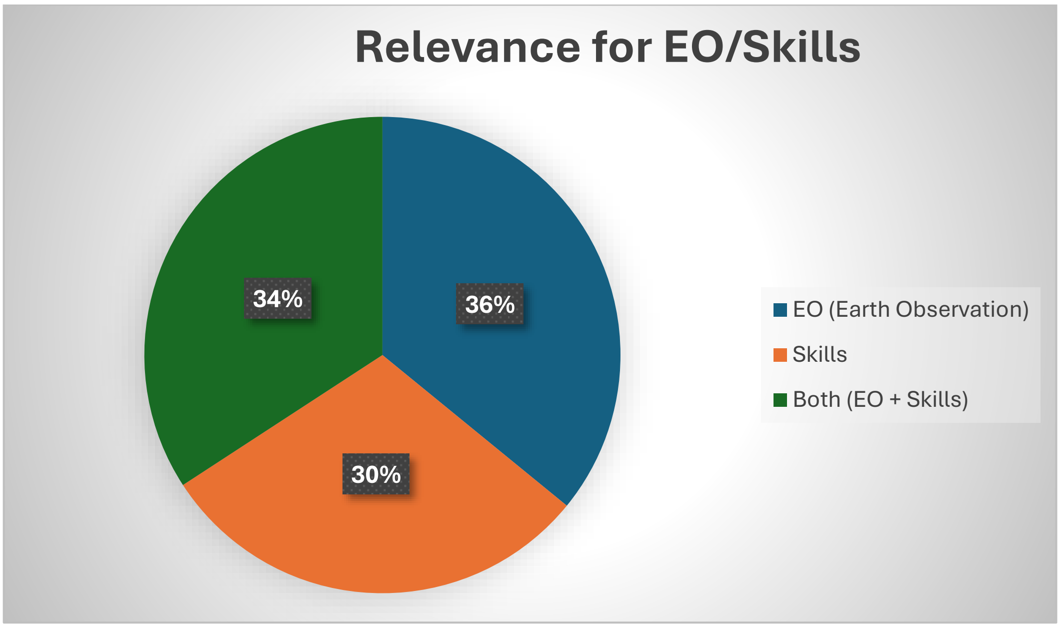

IMAGE 3 – RELEVANCE FOR EO/SKILLS

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The most covered sectors are Innovation, Market, and Education, which appear to be the main policy areas addressed by the corpus. By contrast, Forestry and Agriculture are the least represented sectors.

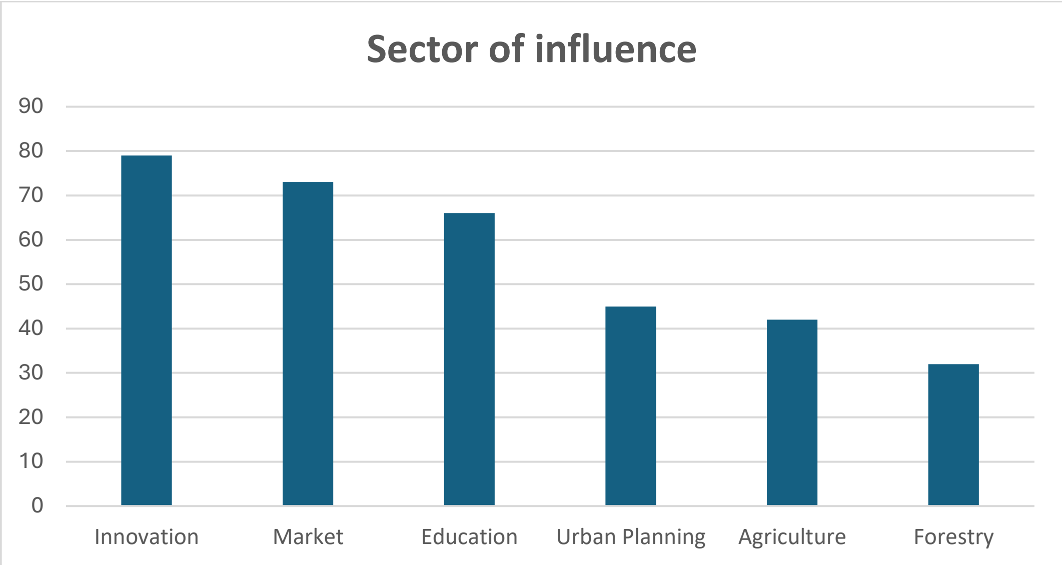

IMAGE 4 – SECTORS OF INFLUENCE

Table 1 shows that EO and Skills influence different sectors in different ways, with a strong overlap in innovation, education, and market relevance.

Policies relevant to both EO and Skills have the broadest profile. They score very highly in innovation and education, both at 82.5%, and also perform strongly in the market at 67.5%. Their influence is more moderate in urban planning at 50%, while it is lower in agriculture and forestry, at 40% and 27.5%. This suggests that combined EO-Skills policies are the most balanced and cross-sectoral.

EO-related policies have a different pattern. They are relatively strong in innovation at 62.8% and in agriculture, forestry, and urban planning, where the values remain above 44%. However, they are much weaker in education, at only 14%. This indicates that *EO policies are more directly linked to spatial, environmental, and application-based sectors than to training or human-capital development*.

Skills-related policies show the opposite pattern. They are very strong in education and market, both at 77.1%, and also quite strong in innovation at 54.3%. But they are much less present in agriculture, forestry, and urban planning, all below 10%. This confirms that *skills policies are mainly focused on people, learning, and competitiveness rather than on territorial or environmental applications*.

Overall, the data suggest that EO policies are more sectoral and territorial, while Skills policies are more human-capital and education oriented. The overlap category is the most balanced, combining innovation, education, and market relevance with wider sectoral reach. This

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means that joint EO-Skills policies may be the most effective for connecting technology, work-force development, and market application across multiple sectors.

Relevance for	innovation	education	market	agriculture	forestry	urban planning
Both	82,5	82,5	67,5	40	27,5	50
EO	62,8	14	44,2	53,5	44,2	51,2
Skills	54,3	77,1	77,1	8,6	5,7	8,6

TABLE 1 - EO/Skills × Sector of Influence (%)

Gaps

The most recurring gap is the lack of applied skills: it is not enough to know what EO is; people also need to know how to use data, tools, workflows, and real-world use cases in practical contexts.

Another gap concerns the link between training, research, and deployment: in several cases, the document shows that results are not transferred effectively to regions, SMEs, and public administrations.

There is also a gap in transversal skills, especially in data stewardship, interoperability, AI, data quality, and the ability to turn EO into decision-making value.

Barriers

Among the most visible barriers are *institutional and sectoral fragmentation*, which makes it difficult to build unified and recognisable training pathways.

Another obstacle is the *difficulty of accessing materials and sources*, explicitly mentioned in some matrix comments, with documents that are not always easy to *download or retrieve.*

Other barriers include *weak interoperability between data infrastructures*, a *limited connection between EO providers and public/private users*, and in some cases the low capacity of SMEs to adopt advanced EO and digital technologies.

Opportunities

The opportunities are very strong, above all because almost all the documents connect EO to major European and national drivers such as the Green Deal, Copernicus, the Digital Decade, the Recovery and Resilient Facility (RRF), space strategies, and smart specialisation.

The matrix also points to a promising area for training in EO + AI + data management + climate services, which could create new professional profiles and new markets.

A key opportunity is the alignment with missions and programmes that use living labs, re-skilling, and capacity building as operational tools, making training directly useful in practice.

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5. Critical Assessment of the Key European Policy Framework for EO

5.1 General EO policy alignment

The policy landscape surrounding Earth Observation positions the sector as a strategic enabler of several major European policy frameworks and strategic agendas.

EO technologies and services play a critical role in supporting the objectives of the **European Green Deal**[4], providing the environmental intelligence needed for climate neutrality, biodiversity protection, sustainable land management, and climate adaptation. Through satellite-based monitoring and evidence-based assessments, EO contributes directly to the implementation of European environmental and climate policies.

EO is also a key component of the EU's **Digital Decade**[5] and **Digital Europe Programme**[6], enabling the use of artificial intelligence, cloud computing, digital twins, and advanced analytics to transform vast volumes of Earth Observation data into actionable information for public and private stakeholders.

In parallel, EO contributes to the objectives of the **EU Space Strategy for Security and Defence**[7] and the broader goal of European strategic autonomy also addressed by the **Vision for the European Space Economy**[8]. By ensuring independent access to critical geospatial information and space-based services, EO strengthens Europe's resilience, sovereignty, and crisis management capabilities.

The sector further supports the **EU Industrial Strategy (Industry 5.0**[9]**)** by stimulating innovation, facilitating the development of downstream markets, enabling new business models, and enhancing the competitiveness of European industries that rely on geospatial intelligence and space-derived data.

EO also plays an increasingly important role in the implementation of the **Union Civil Protection Mechanism**[10] and other European security initiatives. Through rapid mapping, disaster monitoring, infrastructure surveillance, and risk assessment, EO provides essential capabilities for emergency preparedness and response.

Finally, EO contributes to the modernization of public governance in line with the EU's **Data Strategy**[11], **Open Data Directive**[12], and broader digital government initiatives. By equipping public administrations with reliable geospatial intelligence, EO supports evidence-based policymaking, territorial planning, agricultural management, infrastructure development, and public service delivery.

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[4] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

[5] https://digital-strategy.ec.europa.eu/en/policies/europes-digital-decade

[6] https://digital-strategy.ec.europa.eu/en/activities/digital-programme

[7] https://defence-industry-space.ec.europa.eu/eu-space/eu-space-strategy-security-and-defence_en

[8] https://defence-industry-space.ec.europa.eu/document/download/918ee802-a3e5-42ea-91a1-032c7e0ab8a9_en?filename=Communication.pdf

[9] https://research-and-innovation.ec.europa.eu/research-area/industrial-research-and-innovation/industry-50_en

[10] https://civil-protection-humanitarian-aid.ec.europa.eu/what/civil-protection/eu-civil-protection-mechanism_en

[11] https://digital-strategy.ec.europa.eu/en/policies/strategy-data

[12] https://digital-strategy.ec.europa.eu/en/policies/legislation-open-data

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Together, these policy frameworks demonstrate how Earth Observation has evolved into a cross-cutting strategic capability that underpins environmental sustainability, digital transformation, industrial innovation, security, and data-driven governance across Europe.

IMAGE 5 – EARTH OBSERVATION ACTS AS A CROSS-CUTTING ENABLER OF KEY EUROPEAN POLICY OBJECTIVES, SUPPORTING GREEN AND DIGITAL TRANSITIONS WHILE STRENGTHENING RESILIENCE, COMPETITIVENESS, SECURITY, AND EVIDENCE-BASED GOVERNANCE.

5.2 A vision for the European Space Economy

The European Commission's Vision for the European Space Economy outlines a long-term strategy to make the EU a global space leader by 2050. It presents space as a strategic sector and a key driver of competitiveness, resilience, security, autonomy, and economic growth across the wider economy. The document notes that Europe is losing ground in some areas of the global space market because of underinvestment, fragmented regulation, slow procurement, and weak coordination between space, defence, and industrial policies. To address this, the Commission proposes a more integrated approach built on stronger public-private investment, a more unified single market for space, and fuller use of EU systems such as Galileo, Copernicus, EGNOS, and IRIS².

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The vision is organised around six priorities: the single market, research and innovation, industrial readiness, commercialisation, international cooperation, and the development of a skilled workforce.

A skilled workforce is essential to every part of the EU space economy and supports innovation, growth, and competitiveness. The EU, however, risks losing talent because many space professionals seek better career opportunities abroad.

To address this, the Commission wants to attract, retain, and upskill talent through better career paths and reskilling schemes. It also plans to develop space-specific skills intelligence linked to wider EU skills initiatives.

The STEM Education Strategic Plan aims to boost STEM participation by 2030, especially among girls and women. The document stresses that advanced STEM skills are vital for space, defence, cybersecurity, and aerospace. It notes that many SMEs and startups struggle to find the right skills, which slows down innovation.

Vocational education and training providers are expected to play a stronger role alongside universities and research actors. Closer cooperation between education, industry, and research is needed to align training with sector needs.

Overall, the message is that skills are a strategic priority for Europe's future space autonomy and security.

5.3 EU Space Strategy for Security and Defence

The EU Space Strategy for Security and Defence sets the strategic framework for strengthening the European Union's capacity to act in and through space in support of security, defence, and resilience objectives. It focuses on enhancing the protection of EU space assets, improving situational awareness, and ensuring the continuity and security of space-based services that are increasingly critical for both civilian and military applications.

The strategy places strong emphasis on reinforcing Space Situational Awareness (SSA) capabilities, protecting satellite infrastructure from physical and cyber threats, and improving the EU's ability to detect, track, and respond to space-related risks such as debris, collisions, and hostile interference. It also supports closer coordination between civilian programmes, such as Copernicus, Galileo, and GOVSATCOM, and defence stakeholders, ensuring that space services can be used effectively in crisis management, intelligence support, and operational planning.

A key dimension of the strategy is the development of resilient and sovereign space-based infrastructures, including secure communications and early warning systems, which reduce dependency on external providers and strengthen Europe's strategic autonomy. In this context, the strategy directly complements initiatives such as IRIS² and GOVSATCOM, which provide secure connectivity for governmental and security users.

Overall, the EU Space Strategy for Security and Defence positions space as a critical domain for European security policy, linking technological capability with geopolitical resilience and ensuring that space infrastructure can reliably support both civilian protection and defence-related missions.

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The EU Space Strategy for Security and Defence increases the demand for specialised Earth Observation skills by strengthening the role of space assets in security, resilience, and crisis management. As EO becomes more integrated into defence and civil protection systems, there is growing need for dual-use EO analysts capable of supporting both civilian and security applications, as well as security intelligence specialists who can interpret space-derived data for threat assessment and infrastructure protection.

The strategy also drives demand for crisis response experts able to use EO information for rapid emergency and disaster management, and for geospatial intelligence professionals who integrate multi-source satellite data to support operational decision-making. Overall, it reinforces a shift towards a more security-oriented EO workforce combining technical, analytical, and operational capabilities.

5.4 The Green Deal

The European Green Deal is one of the strongest structural drivers of Earth Observation (EO) demand in Europe, positioning climate action and environmental sustainability at the centres of EU policy-making. Climate change mitigation and adaptation requirements are increasingly dependent on high-resolution, timely, and reliable EO data, making satellite-based monitoring a foundational tool for achieving the Green Deal's objectives.

EO supports several key policy areas within the Green Deal framework, including climate adaptation strategies, where it enables risk assessment and resilience planning for extreme weather events, sea-level rise, and ecosystem change. It is also central to the EU Biodiversity Strategy[13], providing essential data for habitat monitoring, ecosystem mapping, and biodiversity loss assessment. Within the Farm to Fork[14] Strategy, EO contributes to sustainable agriculture by enabling precision farming, land-use monitoring, and food system optimisation.

In addition, EO plays a critical role in the Zero Pollution Action Plan[15], supporting the monitoring of air, water, and soil quality across Europe. It is equally important for carbon monitoring systems, which underpin greenhouse gas accounting and climate reporting obligations, as well as forest monitoring, where satellite data is used to track deforestation, biomass changes, and carbon sinks. Finally, EO supports the broader energy transition, enabling planning and optimisation of renewable energy infrastructure such as solar and wind installations.

In terms of skills, the Green Deal is driving a rapidly growing demand for climate intelligence experts, carbon accounting specialists, biodiversity monitoring analysts, and environmental data scientists capable of translating EO data into policy-relevant indicators and operational tools.

However, a significant implementation gap remains: although environmental policies increasingly rely on EO-derived indicators, many public administrations still lack sufficiently trained personnel to operationalise these tools effectively. Strengthening EO literacy and applied analytical skills within government structures is therefore essential to fully leverage the potential of EO for Green Deal implementation.

[13] https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en
[14] https://audiovisual.ec.europa.eu/en/media/video/I-191438
[15] https://environment.ec.europa.eu/strategy/zero-pollution-action-plan_en

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5.5 The EU Digital Strategy

The EU Digital Strategy / Digital Decade and the Digital Europe Programme are key drivers of the EU's digital transformation, strongly influencing the evolution of the Earth Observation (EO) sector. Technologies such as artificial intelligence, cloud computing, automation, and hyper-connectivity are accelerating the uptake and scalability of EO data, enabling faster processing, improved analytics, and more integrated digital services across sectors.

Within this framework, the Digital Europe Programme plays a central role by supporting advanced digital skills development, the creation of European data spaces, the deployment of AI solutions, and the expansion of high-performance computing (HPC) infrastructure. These components are essential for turning large volumes of EO data into actionable insights and for enabling interoperable, cross-sectoral digital ecosystems.

As a result, the EO labour market is increasingly demanding hybrid profiles that combine Earth Observation expertise with digital competencies. Future professionals are expected to operate at the intersection of EO and artificial intelligence, EO and data science, EO and cloud computing, as well as EO and cybersecurity, reflecting the growing convergence between geospatial intelligence and advanced digital technologies.

5.6 Main programmes, funding frameworks and operational systems

5.6.1 The EU Space Programme

The EU Space Programme[16] (2021–2027) serves as the overarching European policy framework for space activities, integrating Earth Observation, satellite navigation, secure communications, and space security capabilities into a single coordinated strategy. It is designed to strengthen Europe's strategic autonomy while enabling downstream markets, including EO-based services, education, and innovation ecosystems.

At its core, the programme is built on several key components. Copernicus provides the Earth Observation backbone, delivering free and open environmental and climate data used for monitoring land, oceans, atmosphere, and emergency situations. Galileo is Europe's global satellite navigation system, offering high-precision positioning and timing services that support transport, agriculture, logistics, and digital applications. Complementing it, EGNOS enhances GNSS accuracy over Europe, improving safety-critical applications such as aviation and maritime navigation.

In the communications domain, GOVSATCOM ensures secure and reliable satellite communications for EU and national authorities, particularly for crisis management and security operations. The future IRIS² will further expand this capability through a sovereign multi-orbit satellite constellation providing resilient broadband connectivity for governmental and commercial use.

[16] https://defence-industry-space.ec.europa.eu/eu-space_en

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Finally, the Space Surveillance and Tracking component, commonly referred to as Space Situational Awareness (SSA), focuses on monitoring space objects and debris to protect satellites and critical space infrastructure.

Together, these elements form an integrated ecosystem that not only ensures Europe's access to space-based services but also creates the data infrastructure, technological foundation, and market environment necessary for the growth of EO education, research, and innovation.

5.6.2 Copernicus

The Copernicus Programme[17] remains the most influential European policy instrument supporting both the uptake of Earth Observation (EO) technologies and the development of EO-related skills. Through its free and open data policy, Copernicus has significantly reduced barriers to access EO information, facilitating innovation, research, and commercial exploitation across a wide range of sectors. The programme is further strengthened by the Copernicus Data Space Ecosystem (CDSE), the ongoing deployment of Sentinel Expansion Missions, thematic data hubs, and a comprehensive portfolio of operational services covering climate change, land monitoring, marine environments, atmosphere, security, and emergency management.

Beyond its role as an operational Earth Observation infrastructure, Copernicus contributes substantially to skills development by providing open access to EO datasets, learning environments, research infrastructures, and real-world data resources that can be readily integrated into higher education curricula, research activities, and professional training programmes. These assets support the development of practical competencies in geospatial analysis, environmental monitoring, data processing, and digital applications, thereby facilitating the emergence of a skilled EO workforce.

Despite these strengths, important challenges remain. Access to data alone does not automatically translate into workforce readiness or effective market adoption. Many organisations, particularly within the public sector and among small and medium-sized enterprises, continue to face difficulties in exploiting EO data effectively.

Key barriers include limited capabilities in data analytics, insufficient expertise in the integration of artificial intelligence and advanced digital technologies, and a shortage of operational EO skills required to transform data into actionable services and decision-support tools. Addressing these gaps will be essential to fully realise the socio-economic benefits of the Copernicus Programme and to support the growing demand for EO-enabled solutions across Europe.

[17] https://eu-space.europa.eu/programmes/earth-observation-copernicus/what-copernicus

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5.6.3 Horizon Europe

Horizon Europe[18] is the European Union's main research and innovation framework and, while not exclusively focused on Earth Observation, it plays a central enabling role in advancing EO-related science, technologies, and applications. It supports a broad spectrum of activities, including EO research, Digital Earth initiatives, and the integration of artificial intelligence in geospatial analysis, which together accelerate the development of more advanced and automated EO capabilities.

Within this framework, Horizon Europe also underpins the development of climate services, Digital Twins, and flagship initiatives such as Destination Earth, which aim to create high-precision digital replicas of the Earth system for modelling, forecasting, and policy support. These initiatives are critical for improving the accuracy, timeliness, and usability of EO data in addressing complex environmental and societal challenges.

In terms of skills development, Horizon Europe has a strong impact on the European EO talent ecosystem. It supports doctoral programmes and advanced academic training, strengthens research careers across universities and research centres, and supports structured collaboration between academia and industry. This interaction is essential for building innovation ecosystems where new EO methods and technologies can be co-developed and tested in applied contexts.

However, a persistent challenge remains in the system. Despite the strong research output generated under Horizon Europe, the transition from research results to scalable commercial services is often limited. Similarly, the absorption of highly skilled researchers into industry remains uneven, creating a gap between innovation production and market deployment. Addressing this bottleneck is key to fully unlocking the potential of Horizon Europe in the Earth Observation domain.

[18] https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en

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6. Analysis of National Policies

6.1 General Framework

6.1.1 Smart Specialisation Strategies

Smart Specialisation Strategies (S3)[19] represent one of the most influential **regional policy mechanisms** shaping Earth Observation (EO) development across Europe. Through place-based innovation priorities, many regions have identified space technologies, digital innovation, environmental monitoring, climate resilience, and agriculture as strategic domains where EO can generate high added value.

Within this framework, **Cohesion Policy**[20] and regional funds are increasingly used to support the emergence of EO innovation hubs, living labs, skills centres, and SME incubation structures, supporting closer links between research, industry, and public authorities. These initiatives help translate EO capabilities into regional economic development and applied solutions tailored to local territorial needs.

However, despite this strong regional engagement, EO skills development under S3 remains highly fragmented, often dependent on short-term project funding cycles. This limits continuity, scalability, and the long-term consolidation of structured training pathways and stable EO talent pipelines across regions.

6.1.2 Regional Digital Innovation Hubs

European Digital Innovation Hubs[21] (EDIHs) are emerging as key enablers of digital transformation at regional level, increasingly supporting the uptake of Earth Observation (EO) applications alongside broader capabilities in artificial intelligence, data analytics, and SME digitalisation. By providing access to technical expertise, testing facilities, and innovation services, EDIHs help companies, particularly SMEs, experiment with and adopt EO-based solutions in areas such as environmental monitoring, logistics, agriculture, and urban management.

A key opportunity lies in their potential role as a bridge between education providers and industry, facilitating the translation of EO skills into practical, market-ready competencies. By connecting training institutions, research organisations, and businesses, EDIHs can support more effective skills matching, accelerate the diffusion of EO technologies, and strengthen regional innovation ecosystems.

[19] https://ec.europa.eu/regional_policy/policy/communities-and-networks/s3-community-of-practice/about_en
[20] https://ec.europa.eu/regional_policy/policy/what/investment-policy_en
[21] https://european-digital-innovation-hubs.ec.europa.eu/home

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6.1.3 National Space Strategies

National Space Strategies are national-level strategic frameworks developed by many EU Member States to strengthen their position within the European space ecosystem. While not EU policies themselves, they are closely aligned with broader EU objectives such as the EU Space Strategy, the Digital Decade, and industrial competitiveness goals, ensuring coherence between national and European priorities.

Across countries such as France, Germany, Italy, Spain, Portugal, Finland, and Luxembourg, these strategies increasingly recognise Earth Observation (EO) as a key driver of economic growth and technological sovereignty. Common priorities include the development of space entrepreneurship, the consolidation of New Space ecosystems, the commercialisation of EO services, and the attraction and retention of specialised talent.

A growing number of strategies also explicitly acknowledge the importance of EO workforce development, supporting skills for satellite applications, geospatial technologies, and downstream data services. However, despite this recognition, most national approaches remain strongly oriented towards industrial competitiveness and innovation capacity, while systematic and long-term workforce planning is still relatively underdeveloped.

6.2 Italy

ITALY
Framing and context
The Italian policy framework offers a supportive context for Earth Observation and space-related initiatives, combining innovation, sustainability, digitalisation, and competitiveness. National and regional smart specialisation strategies, together with the national space policy, the ASI strategic vision, and the new space law, support research, technology transfer, and the growth of the space economy. These are reinforced by the PNRR and the National Sustainable Development Strategy, which promote digital transformation, social cohesion, environmental sustainability, and territorial resilience.
National Smart Specialization Strategy
The Italian National Smart Specialisation Strategy provides the framework for strengthening Italy's innovation capacity and industrial competitiveness through targeted investments in research and technology. It focuses on sectors where Italy has strong scientific and industrial expertise, including aerospace, advanced manufacturing, health, energy, sustainable mobility, agrifood, and the digital economy. The Strategy promotes collaboration among businesses, universities, research centres, and public institutions to accelerate technology transfer and innovation. It encourages greater private investment in R&D, supports SMEs and start-ups, and fosters the development of advanced skills and human capital. The SNSI also addresses structural challenges such as low R&D expenditure, limited venture capital, regional disparities, and fragmented governance. By improving coordination between national and regional policies and leveraging European funding, the Strategy aims to build a more competitive, knowledge-based, and sustainable economy while reinforcing Italy's position in global innovation.

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Regional Smart Specialization Strategies Most Relevant for EO
The Smart Specialisation Strategies (S3) of Liguria, Lazio, Basilicata, Lombardia, Piemonte, Emilia-Romagna, and Puglia share the common objective of strengthening regional competitiveness, innovation capacity, and sustainable growth in line with the European Union's 2021–2027 policy framework. Across all regions, the strategies emphasize the twin green and digital transitions as the main drivers of economic transformation, while promoting stronger collaboration between research institutions, businesses, public authorities, and civil society. Innovation ecosystems are at the core of all strategies, with particular attention to technology transfer, research and development (R&D), digitalisation, and the adoption of advanced technologies. Most regions build upon their existing industrial and scientific strengths - such as advanced manufacturing, ICT, health, life sciences, mobility, and sustainable production -while seeking to diversify their economies and increase resilience. A recurring challenge identified across the strategies is the need to improve private-sector innovation, especially among SMEs, strengthen human capital through digital skills and lifelong learning, and better connect education, research, and industry. Several regions also highlight demographic challenges, including the retention of young talent and the attraction of highly skilled workers. While each region reflects its own economic structure and priorities, together these strategies outline a shared vision of creating more connected, innovative, sustainable, and resilient regional innovation ecosystems capable of supporting long-term economic development and contributing to Europe's broader competitiveness objectives.
National Space Policy Strategic Document
The 2026 National Space Policy Strategic Document (DSPSN) outlines Italy's long-term strategy to strengthen its position as a leading European space power. It identifies space as a strategic domain for economic growth, national security, technological sovereignty and scientific excellence. The strategy focuses on four priorities: advancing research and STEM skills, enhancing the competitiveness of the national space industry, strengthening governance and regulatory frameworks, and expanding international cooperation. It promotes investment in critical technologies such as artificial intelligence, quantum technologies, Earth Observation, telecommunications and space transportation. The document also emphasizes the development of resilient and secure space infrastructures, sustainable space operations, and dual-use civil and defence capabilities. Long-term public investment, innovation, and support for SMEs and start-ups are considered essential to foster growth. Finally, the strategy seeks to increase Italy's influence within European and international space programmes while ensuring greater technological autonomy and resilience in an increasingly competitive geopolitical environment.
Italy's Strategic Vision for Space Activities 2016-25
The ASI (Italian Space Agency) Strategic Vision Document (DVS) outlines Italy's ten-year strategy to strengthen its leadership in the global space sector and support the transition to the New Space Economy. It promotes the development of space-based services and applications by expanding the use of satellite data in areas such as Earth observation, navigation, telecommunications, environmental monitoring, and security. The strategy also prioritizes investment in advanced space infrastructures, including launch systems, exploration capabilities, and secure satellite communications. It emphasizes scientific excellence

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through research in astrophysics, planetary exploration, Earth sciences, and space technologies. Innovation, technology transfer, and support for SMEs and start-ups are key drivers of industrial competitiveness. The DVS also reinforces international cooperation through partnerships with ESA, NASA, and other space agencies. Overall, it provides a long-term framework to foster innovation, economic growth, technological autonomy, and Italy's international role in the space sector.
Italian National Sustainable Development Strategy (SNSvS 22)
The Italian National Sustainable Development Strategy 2022 (SNSvS 2022) provides the overarching framework for implementing the UN 2030 Agenda in Italy and integrating sustainability into all public policies. It promotes a balanced approach to environmental protection, social inclusion, and economic development through the "5 Ps" framework: People, Planet, Prosperity, Peace, and Partnership. The Strategy strengthens policy coherence across national, regional, and local levels while fostering collaboration among public institutions, businesses, academia, and civil society. It emphasizes multilevel governance, stakeholder participation, and evidence-based decision-making. SNSvS 2022 also introduces a comprehensive monitoring system based on measurable targets and indicators to assess progress. Key priorities include climate neutrality, biodiversity conservation, circular economy, innovation, sustainable growth, gender equality, youth empowerment, and resilient communities. Overall, the Strategy positions sustainability as the guiding principle for Italy's long-term development, supporting a resilient, inclusive, and competitive future aligned with European and global commitments.
Regulatory framework for space activities - LEGGE 13 giugno 2025, n. 89 - Disposizioni in materia di economia dello spazio
Law No. 89/2025 establishes Italy's first comprehensive legal framework for regulating national space activities. It introduces a mandatory authorization and supervision system for civilian space operators, ensuring compliance with safety, cybersecurity, sustainability, and international obligations. The law defines clear liability rules and requires operators to maintain adequate insurance coverage for potential damages. It also strengthens Italy's system for registering and monitoring space objects. Beyond regulation, the law promotes the growth of the national space economy through a multi-year National Space Economy Plan and a dedicated Space Economy Fund supporting innovation and commercialization. Special measures encourage the participation of SMEs and start-ups through simplified requirements and public procurement incentives. The legislation also reinforces national security, critical space infrastructure, and secure satellite communications. Overall, the law provides the legal and policy framework needed to foster a competitive, resilient, and sustainable Italian space sector while enhancing Italy's role in the European and global space economy.
Italia Domani – PNRR
Italy’s PNRR is the national recovery plan funded by Next Generation EU. It combines major investments with structural reforms. A central goal is to modernize public administration through digitalisation and cloud services. The plan also digitises justice, records, and key public platforms such as PagoPA, IO, SPID, CIE, and ANPR. It supports business competitiveness through innovation, R&D, and the digital and green transition. SMEs are a major focus, especially for technological upgrading and industrial property protection. The document also invests heavily in sustainable mobility and railway infrastructure. Social inclusion, skills,

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and territorial cohesion are important cross-cutting priorities. Environmental sustainability and climate resilience guide many of the investment choices. Overall, the PNRR aims to make Italy more digital, competitive, green, and resilient.
Comparison with EU policy framework
• **EU Space Programme:** Italian's policy landscape includes dedicated space policy section and frames Italy's space strategy around Earth Observation, telecommunications, satellite infrastructure, resilience, and EU/international cooperation. • **EU Green Deal:** Italian's policy landscape is addressed through the green economy, eco-innovation, circular economy, sustainability, climate neutrality, and resource efficiency priorities. • **Horizon Europe missions and destinations:** indirectly, Italian's policy landscape does not present a detailed mission-by-mission mapping, but it clearly aligns with Horizon Europe-style priorities such as health, climate, mobility, digital, industry, security, and sustainability. • **Data policies:** especially in Emilia-Romagna's Data Valley approach and in the broader emphasis on data, digital infrastructure, interoperability, and evidence-based governance. • **Pact for Skills:** through repeated attention to digital skills, advanced skills, reskilling, human capital, and training systems.
Conclusion
Italian's policy landscape is well aligned at the strategic level with all five EU policy frameworks, but the depth of alignment varies. The strongest and most explicit links are with space policy, the Green Deal, and skills/data policies, while the Horizon Europe link is more thematic than programmatic, meaning it is visible in priorities but not mapped in detail to specific missions or destinations.

6.3 Portugal

PORTUGAL
Framing and context
Portugal's policy framework in research, innovation and space activities has evolved in close alignment with European Union priorities, particularly in relation to the green and digital transitions and the strengthening of research and innovation ecosystems. It reflects strong integration with EU instruments, including Horizon Europe and Cohesion Policy, while also addressing national structural challenges. At EU level, recent policy developments emphasise competitiveness through a more strategic approach to research, development and innovation (RDI), increased investment, improved knowledge valorisation, and stronger links between research, industry and society. Within this context, space and Earth Observation (EO) are increasingly recognised as key infrastructures supporting multiple sectors and enabling the green and digital transitions.
Research and innovation policy
The National Smart Specialisation Strategy 2030 constitutes the central framework for R&I policy in Portugal, defining priorities and guiding the allocation of public and EU funds

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across six domains, including digital and green transitions and natural resources, with space as a component. The strategy adopts a multi-level, participatory governance model, combining national co-ordination with regional implementation and stakeholder engagement through the entre-preneurial discovery process. This ensures alignment with EU strategies and supports policy coherence. However, it also highlights structural weaknesses in the national innovation system, nota-bly: • limited knowledge valorisation; • low business investment in R&D; • weak collaboration between research and industry; • and constraints in skills, digital capacity and lifelong learning. These factors point to a gap between strategic priorities and implementation capacity.
Space and Earth Observation policy
The Portugal Space 2030 agenda positions space as a driver of economic growth and inno-vation. It is structured around three axes: exploitation of space data and services, develop-ment of infrastructures and industrial capabilities, and reinforcement of national capacity through education, research and skills. The strategy recognises the cross-sectoral relevance of space data, including EO, across do-mains such as agriculture, climate monitoring and infrastructure management. It promotes the development of downstream markets and the integration of space-based services into broader economic activities. It also emphasises: • strengthening human capital and STEM education; • promoting international cooperation; and supporting innovation ecosystems linked to space technologies.
Regulatory framework for space activities
Portugal has established a comprehensive legal framework for space activities through Law 16/2019, updated in 2024. This framework regulates access to space activities through li-censing systems, operator requirements and supervisory mechanisms. It aims to facilitate the development of space-related economic activities, attract invest-ment, ensure compliance with international standards, and support research and techno-logical development. By simplifying procedures and clarifying governance, it contributes to positioning Portugal as a competitive environment for “New Space” activities.
Comparison with EU policy framework
Portugal demonstrates a high degree of alignment with EU priorities: Strategic orientation: Consistent focus on green and digital transitions and innovation-driven competitiveness. Policy integration: Strong alignment with EU funding and policy frameworks. Space and EO: Complementarity with EU policies through the promotion of data-driven services. Governance: Adoption of multi-level, stakeholder-based approaches. Portugal can therefore be characterised as a policy-aligned Member State effectively em-bedding EU strategic directions.
Despite this alignment, several structural gaps remain

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<u>Skills and human capital</u> - Challenges persist in developing the skills required for innovation and technological adoption, including low participation in lifelong learning. <u>Knowledge valorisation</u>- The translation of research into market applications remains limited, reflecting weak links between academia and industry. <u>Ecosystem integration</u>- Coordination mechanisms exist, but practical integration across stakeholders remains uneven. <u>Earth Observation uptake</u>- Although recognised in policy frameworks, EO is not fully operationalised as a cross-sectoral component of skills and innovation systems and lacks structured pathways linking data use to workforce development.
Conclusion
Portugal's policy landscape is strongly aligned with EU priorities and supported by a solid institutional and regulatory framework, particularly in innovation and space. However, its effectiveness is constrained by structural weaknesses related to skills, knowledge transfer and ecosystem integration. This highlights the need for initiatives that strengthen skills development and career guidance; enhance connections between stakeholders; and support the uptake of innovation, particularly in emerging areas such as Earth Observation. These gaps mirror challenges at EU level and confirm the importance of targeted actions to bridge the gap between policy ambition and implementation capacity.

6.4 Netherlands

NETHERLANDS
Framing and context
The Netherlands has a well-established Earth Observation (EO) ecosystem built on a combination of European space infrastructure, national investment and a mature downstream industry. ESA's largest establishment, ESTEC in Noordwijk, is a cornerstone of the Dutch space sector and accounts for approximately 40% of direct and indirect employment in the national space economy. Space activities support more than 10,000 jobs in the Netherlands, while public investment in European and national space programmes amounts to approximately EUR 522 million up to 2025. Alongside this industrial and institutional foundation, the Netherlands has developed one of Europe's most mature downstream EO ecosystems, contributing technologies such as the TROPOMI instrument aboard Sentinel-5P and providing open access to satellite imagery through the Satellietdataportaal to stimulate the uptake of Copernicus services. The policy question in the Netherlands is therefore not whether EO matters, but why a country with this infrastructure, this data access, education and training capabilities, and this industrial base still struggles to secure the people who can use it. Dutch policy documents themselves give some answers, as it runs as a thread through the current assessment of the policy documents: ***the space agenda knows it has a talent problem, and the skills agenda does not know it has a space sector.***
Research and innovation policy
Dutch innovation policy is mission-driven and well-endowed. The Top Sectors and their Knowledge and Innovation Agendas organise public-private R&D, while the National Growth Fund channels multi-billion investments into structural earning capacity, including

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AiNed for artificial intelligence, Quantum Delta NL and PhotonDelta. The National Technology Strategy (2024) sharpened this landscape by selecting ten key technologies for 2035, and it is here that EO gains its strongest recognition outside space policy: the strategy names Earth Observation and laser satellite communication as fields where the Netherlands holds breakthrough positions, placing them within 'imaging technologies' alongside the semiconductor and medical-imaging industries. The action agendas that followed mobilised over a thousand organisations behind 53 innovation programmes worth more than EUR 14 billion. What this architecture delivers for EO is legitimacy and adjacency: EO sits, by name, inside the national technology hierarchy, connected to the AI, data-science and photonics value chains on which downstream services depend. What it does not yet deliver is a programme. Unlike AI or quantum, EO has no Growth Fund vehicle of its own, and its recognition in the Technology Strategy has not been matched by an investment line, a gap the space sector's own long-term agenda now seeks to close.
Digital policy
Digital policy gives EO its most favourable operating environment in Europe. The Netherlands ranks among the EU leaders on basic digital skills and connectivity under the Digital Decade, and is introducing digital literacy as a distinct subject in primary and secondary education. The national digitalisation work agenda, the AI strategy (SAPAI) and sectoral visions (e.g., notably the agriculture ministry's digitalisation vision, which explicitly lists satellites alongside sensors and drones as data sources, and foresees digital twins of the North Sea for nature, food and energy policy) together normalise exactly the data-handling capabilities that EO services require. Yet the same Digital Decade monitoring records a persistent shortage of ICT specialists, and it is precisely at this advanced end of the skills spectrum (where geospatial, data-science and domain knowledge intersects) that EO competences sit. The Dutch digital base lowers the entry barrier to EO for adult learners and SMEs more than almost anywhere in the EU; the specialist ceiling above it is where the constraint bites.
Space and Earth Observation
Dutch space policy has been consistently downstream-oriented for over a decade. The strategy 'De ruimte voor het gebruik' committed the country to sustained Copernicus investment on an explicit economic logic, without continued investment, the Dutch market share would erode as other countries stepped up, and diagnosed a problem that remains current: the geo-information sector and the satellite downstream sector grew up separately, under different ministries, and integrating them is a precondition for capturing value from free Sentinel data. The Space Agenda 2019-2024 consolidated the use-oriented approach, and the sector can point to results: Copernicus has generated some 500 petabytes of data, and the number of Dutch users and applications of its services grows year on year, with public bodies such as Rijkswaterstaat embedding remote sensing in operational practice and the CAP Strategic Plan making satellite-based area monitoring the standard instrument for verifying agricultural payments. The Long-Term Space Agenda 'Vanuit de ruimte, voor de aarde' (2024) marks a step change in ambition. Prepared by a commission spanning five ministries, i.e., Economic Affairs, Defence, Infrastructure and Water Management, Foreign Affairs, and Education and Science, and endorsed by the Cabinet in February 2025, it sets six missions to 2035, calls for tripling the sector's turnover, and states plainly that the Netherlands currently fails to meet ESA's

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three-yearly investment norms, requiring a structural increase of at least EUR 60 million per year. It describes space as 'the forgotten backbone of society' and, critically for ROOT, names sufficient human capital as one of the conditions on which every mission depends. Defence adds a second engine of demand: the Defence Strategy for Industry and Innovation 2025-2029 designates space as the fifth operational domain, with Earth observation and laser satellite communication among its priority capabilities. Explicit EO policy in the Netherlands is thus strong and getting stronger. Where EO is merely used rather than made, specifically in water management, climate adaptation, spatial planning, policies rely on satellite-derived information without naming it, which keeps public demand for EO services and skills invisible to the labour market.
Skills and capacity building
The Netherlands has dense, well-established education and training system. Lifelong development is a national programme line, the Growth Fund finances large public-private skills partnerships, and the regions run the most concrete instruments: all four smart specialisation strategies treat human capital as a condition for the transitions, and Zuid-Holland, the province hosting the space cluster, operates a Human Capital Agenda built on binding deals ('deelakkoorden') with employers and education, covering retraining, periodic career check-ups ('loopbaan-APK') and work-to-work transitions. Its 2025-2030 technology-industry action agenda goes further, identifying laser satellite communication among the region's three most promising value chains and pressing for a long-term strategy to attract and retain international talent. None of this education and training system, however, points at EO. The shortage-sector pathways of the regional agendas name ICT, technology and the energy transition, and rather not Earth observation or geo-information. The space policy evaluation concluded that sufficient talent is a standing challenge for the sector, and the JRC's study of the Northern Netherlands identified the underlying mechanism: sectoral lobbies concentrate on filling short-term skills gaps rather than shaping the education of the future workforce. The result is a paradox worth stating bluntly. In the country of ESTEC, an adult seeking guidance towards an EO career will find world-class career-guidance infrastructure and world-class EO infrastructure, and no bridge between them. That bridge, namely, EO career pathways, guidance professionals who know the sector, modular training that lets SME staff upskill without leaving their jobs, is exactly what is missing, and it is missing by omission or lack of focus, not by resistance.
Comparison with EU policy framework
Alignment with EU priorities is high across the board. Climate, water and adaptation policy operationalise the Green Deal; the digitalisation agenda tracks the Digital Decade targets; the Technology Strategy and Growth Fund answer the competitiveness and strategic-autonomy agenda; and the Long-Term Space Agenda positions national investment directly against ESA norms and the EU Space Programme, with Copernicus recognised in sector documents as a key data source for Destination Earth. The regional smart specialisation strategies fulfil the enabling conditions of Cohesion Policy and connect to the Pact for Skills through their human capital partnerships. The asymmetry with the EU framework lies elsewhere: at European level, EO and skills are increasingly joined or binded, through Copernicus user-uptake actions, the EO4GEO blueprint lineage and CASSINI entrepreneurship support, while in the Netherlands the two agendas run in parallel. The country is, in effect,

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better aligned with each EU priority separately than with their intersection, and it is the intersection that determines whether Copernicus data becomes Dutch jobs.
Remaining gaps
The Dutch case yields sharper conclusions, because the strengths are so pronounced that the gaps stand out in contrast: • **EO ambition has outrun EO skills policy**. The Long-Term Space Agenda demands a tripling of sector turnover and names human capital as a condition, yet no education, labour-market or guidance instrument has been tasked with delivering it. • **Public use of EO is invisible as demand**. Water, adaptation, planning and agricultural policies consume satellite-derived information daily without naming EO, so neither learners nor guidance services can see the careers behind it. • **Space policy and workforce policy are institutionally disconnected**. Five ministries carry the space agenda; skills sit with education, social affairs and the provinces; the regional deals that could carry EO pathways, including in the province hosting ESTEC, do not mention them. • **Digital readiness masks a shortage of advanced EO talent**. The Dutch workforce has a solid foundation of digital skills, facilitating the uptake of EO-based services. At the same time, shortages of highly skilled ICT professionals constrain the development and scaling of advanced EO solutions requiring specialised geospatial and data analytics expertise. • **Recognition has not become 'programming'**. EO is named in the Technology Strategy and championed in the space agenda, but unlike AI or quantum it has no dedicated national programme with a human-capital line. For a project piloting EO career guidance like ROOT, in Zuid-Holland, these gaps are not obstacles but an opening. Every component needed for an EO skills ecosystem already exists in the Netherlands, i.e., the data, the cluster, the guidance system, the political mandate, and none of them are connected. ***Connecting them requires no new policy, only the deliberate use of existing ones.*** The analysis in this chapter for the Dutch sector indicates precisely where each connection should be made.

6.5 Greece

GREECE
Framing and context
Greece has established a comprehensive policy framework that supports the country's transition towards a knowledge-based, digital, green and innovation-driven economy. National policies increasingly emphasize research and innovation, digital transformation, climate resilience, Earth Observation (EO), space technologies, skills development and stronger links between academia, industry and public administration.
Greek National Smart Specialisation Strategy 2021-2027
The National Smart Specialisation Strategy (RIS3) 2021–2027 constitutes the principal framework for research and innovation investments. It identifies eight priority domains for national development: Agro-food, Bio-sciences and Health, Digital Technologies, Sustaina-

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ble Energy, Environment and Circular Economy, Transport and Logistics, Materials and Industry, and Tourism and Culture. The strategy promotes knowledge transfer, digital transformation, innovation ecosystems, entrepreneurship, internationalisation and human capital development through the Entrepreneurial Discovery Process (EDP), ensuring that research priorities respond to societal and market needs.
Greece 2.0 Recovery and Resilience Plan
The Greek Recovery and Resilience Plan (Greece 2.0) complements this framework through substantial investments in digital transformation, education, vocational education and training, lifelong learning, research and innovation, smart cities, renewable energy, public administration modernisation, digital public services, research infrastructures and support for innovative enterprises. Recent amendments further reinforce investments in university excellence, research centres, digital skills, labour-force upskilling and reskilling, and the digital transformation of public administration.
Draft National Space Strategy (2025)
The Draft National Space Strategy (2025) reflects the growing strategic importance of the space sector for Greece. It identifies space technologies and services as key enablers of economic growth, scientific excellence, innovation, environmental monitoring, public administration, civil protection and national resilience. Particular emphasis is placed on Earth Observation, satellite communications, GNSS, downstream applications, national EO infrastructure, participation in European space programmes, support for research excellence, development of specialised human resources, and closer cooperation between academia, industry and government.
National Space Policy and Strategic Action Plan (2021)
The preceding National Space Policy and Strategic Action Plan (2021) established similar strategic directions by promoting participation in European and international space programmes, strengthening national space capabilities, supporting research and innovation, encouraging university-industry collaboration, expanding space-related education and STEM activities, developing specialised infrastructure, and promoting entrepreneurship within the national space ecosystem.
National Strategy for Adaptation to Climate Change
Climate resilience is addressed through the National Strategy for Adaptation to Climate Change, which establishes adaptation as a cross-sectoral national priority. The strategy promotes evidence-based policymaking, scientific research, stakeholder participation, monitoring mechanisms and integration of adaptation measures across key sectors including agriculture, forestry, biodiversity, water resources, infrastructure, tourism, transport and urban planning. It also recognises the critical role of Earth Observation, climate monitoring systems and Copernicus services in supporting climate adaptation and informed decision-making.
Comparison with EU policy framework
The Greek policy framework demonstrates a strong degree of alignment with the strategic priorities of the European Union. The emphasis on climate resilience, sustainable resource management, biodiversity protection, renewable energy and environmental monitoring directly supports the objectives of the European Green Deal and the EU Climate Adaptation Strategy.

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Similarly, national priorities related to digital transformation, artificial intelligence, digital public services, digital infrastructure and digital skills closely correspond to the objectives of the Digital Europe Programme and the Digital Decade 2030. Research excellence, innovation ecosystems, knowledge transfer, smart specialisation and stronger collaboration between research organisations and industry are fully consistent with the priorities of Horizon Europe, particularly the clusters addressing Digital, Industry and Space, as well as Food, Bioeconomy, Natural Resources, Agriculture and Environment. The focus on lifelong learning, vocational education, upskilling, reskilling and advanced digital competences is also aligned with the European Skills Agenda, the Pact for Skills, and the European Education Area, which seek to equip Europe's workforce with the competencies required for the green and digital transitions. Finally, the national space policies are closely aligned with the EU Space Programme, supporting wider adoption of Copernicus, Galileo, EGNOS and GOVSATCOM services, increased investment in Earth Observation infrastructure, stronger participation in European space initiatives, and greater uptake of space-based services by public authorities, research organisations and industry.
Conclusion
Overall, the Greek policy framework provides a strong and coherent basis for advancing a knowledge-based, digital, green and innovation-driven economy. The national strategies on smart specialisation, recovery and resilience, space, and climate adaptation are mutually reinforcing and create favourable conditions for research, innovation, skills development, and the uptake of Earth Observation and space technologies. Their clear alignment with key EU policy priorities further strengthens Greece's capacity to contribute to European objectives in competitiveness, sustainability, digital transformation, and resilience. In this context, Earth Observation and space-based services emerge as strategic enablers for evidence-based policymaking, public service modernisation, and long-term socio-economic development.

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7. How Skills Are Addressed Across the Earth Observation Policy Landscape: EU, Netherlands, Greece, Italy and Portugal

7.1 Framing and Context

Every policy landscape examined under Task 2.1 (European, Dutch, Greek, Italian and Portuguese), and processed through an automated multi-stage text, declares that skills are decisive for its ambitions. The European Skills Agenda points to the Recovery and Resilience Facility's EUR 560 billion as 'ample opportunities to fund up- and reskilling actions'. Italy's recovery plan calls reskilling and upskilling 'fundamental to sustaining the green and digital transitions'. Greece's Digital Transformation Bible describes human capital as 'the most important form of intangible capital'. Portugal's Space 2030 strategy builds an entire axis around 'attracting future generations of scientists, engineers and entrepreneurs'. And the Dutch Long-Term Space Agenda names sufficient human capital as a condition on which every one of its six missions depends. On paper, the alignment between what these policies want and what an EO training and career-guidance initiative offers could hardly be better.

Reading the policies closely reveals that they are not talking about the same thing, and mostly not talking to each other. This chapter examines how skills are actually defined, funded and delivered across the five landscapes, i.e., drawing on the strongest passages in more than two hundred documents, from space strategies and CAP strategic plans to recovery plans, digital agendas, smart specialisation strategies and the EU skills acquis, and identifies where the definitions meet, where they diverge, and where the gaps sit that training programmes and career guidance can realistically fill. The pattern found in the Netherlands, a space agenda that knows it has a talent problem facing a skills agenda that does not know it has a space sector, turns out not to be a Dutch peculiarity. It is the standard condition of European EO policy, visible in every country studied and, until very recently, at EU level as well.

7.2 Five landscapes, five definitions of skills

The most consequential finding of cross-country reading is definitional. Each layer of the policy system means something different by 'skills', and the differences determine what each layer can and cannot do for EO.

At EU level, skills are a strategic asset. The Union of Skills organises its entire programme around four verbs - building, upskilling, circulating and attracting talent 'for Europe's competitiveness' - and sets dated, countable deliverables: an Action Plan on Basic Skills, a 2030 Roadmap on digital education, individual learning accounts, micro-credentials, and an EIT commitment to equip one million learners in strategic sectors by 2028. CEDEFOP's skills-transition work adds the analytical foundation, insisting that it is 'increasingly vital to map emerging and future digital skill needs in non-IT occupations', a sentence that describes the EO user community exactly, without naming it.

In the recovery plans, skills are a transition instrument attached to serious money. Italy's PNRR makes binding commitments to mass open online courses for reskilling the public administration and ad hoc digital training for workers in wage-support schemes. Portugal's plan

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funds 'Emprego + Digital', putting company workers through face-to-face reskilling focused on sector-specific digital competences. These are the largest skills investments in any of the four countries, and neither plan (document) contains a geospatial or EO component (reference) of any kind.

In the CAP strategic plans, skills are an operational delivery mechanism. The advisory systems (AKIS) train farmers and, in the Greek plan's words, give innovation intermediaries 'additional training in soft skills, especially communication, networking and innovation-support techniques'. What makes this operationally significant for EO is that the same plans made satellite-based area monitoring the standard instrument for verifying agricultural payments: the CAP is, in practice, Europe's largest involuntary EO user community, training its advisors for everything except the satellite data that now governs compliance.

In the regional smart specialisation strategies, skills are a territorial condition, and this is the layer closest to real delivery. South-Netherlands writes 'skills development throughout the education chain and lifelong learning' into regional labour-market policy as an 'essential framework'; Emilia-Romagna builds skills-intelligence models connecting 'technology foresight and skills foresight'; Zuid-Holland's Human Capital Agenda goes furthest of all, requiring training provision to be 'demand-driven, flexible, modular, innovative, skills- and certificate-oriented' and introducing skills passports with 'one common skills language'. The system for delivering exactly what EO needs, i.e., modular, stackable, employer-linked training, is already in place at regional level. It has simply never been pointed at EO.

And in the national space strategies, skills are a demographic aspiration. Portugal's Space 2030 wants to attract future generations and can cite an FCT study on the economic return of each euro invested in ESA programmes. Greece's national space strategy speaks of human potential almost entirely in aspirational language. The Dutch space documents leave little doubt about the talent problem but, until the Long-Term Space Agenda, without corresponding instruments. The strategies that know most about EO demand control no training supply.

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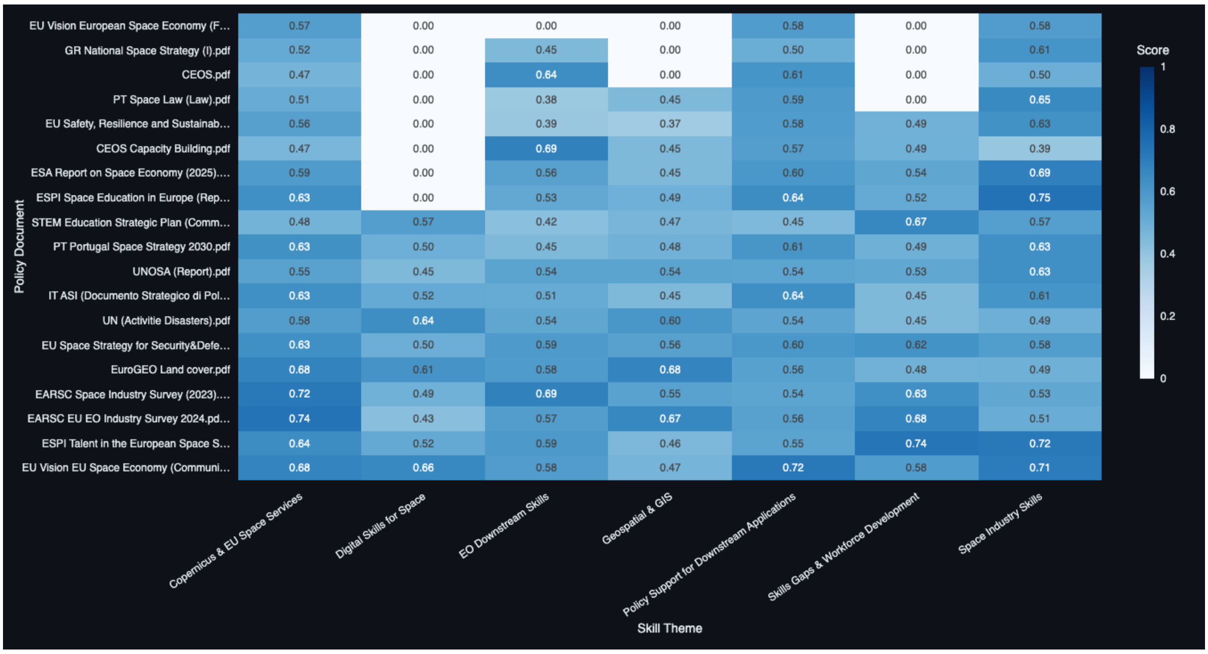

IMAGE 6 – ***HOW THE SEVEN SKILLS THEMES DISTRIBUTE ACROSS THE CAPACITY-BUILDING CHAIN IN THE FULL DOCUMENT COLLECTION. EVEN THE MOST EO-SPECIFIC THEMES - GEOSPATIAL & GIS, COPERNICUS & EU SPACE SERVICES - CONCENTRATE OVERWHELMINGLY IN GENERIC SKILLS FRAMING RATHER THAN IN EDUCATION, TRAINING OR ENTREPRENEURSHIP MEASURES***[22]

7.3 Where the substance sits: follow the money, not the mandate

If the documents are ranked by how much substantive skills content they carry, the result is counterintuitive and important: the policies about EO contribute least, and the policies where EO is merely used or funded contribute most. The extended CAP strategic plans of Italy and Portugal are the densest skills documents in the entire collection; the recovery plans and the EU framework of rules and policies on digital and skills; the dedicated space strategies, despite their subject matter, are comparatively thin. The Netherlands illustrates the point from both sides: its space policy evaluation is one of the few national documents with genuinely strong skills findings, while its heaviest skills commitments sit in the regional innovation strategy for the South and Zuid-Holland's Human Capital Agenda - documents that never mention Earth Observation.

[22] Due to report editing and accessibility the graph includes only top 20 documents. The graphs for full body of documents is available upon request.

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IMAGE 7 – SKILLS-RELEVANT CONTENT BY DOCUMENT ACROSS THE COLLECTION. AGRICULTURAL (CAP) AND RECOVERY (PNRR/RRP) INSTRUMENTS AND THE EU SKILLS ACQUIS DOMINATE; DEDICATED SPACE STRATEGIES CONTRIBUTE COMPARATIVELY LITTLE DESPITE THEIR SUBJECT MATTER[23].

This inversion is the single most practical insight of the cross-country analysis for anyone designing training. The natural instinct is to anchor EO skills initiatives in space policy, because that is where EO is understood. The evidence says the opposite: anchor them where the skills money and delivery machinery already are, e.g., CAP advisory systems, recovery-plan reskilling lines, ESF+ and regional human-capital deals, and bring the EO content to them, because they will not come looking for it.

7.4 Strong words, weak words: who commits, and to what

Not all policy language is equal, and the collection separates cleanly into instruments that commit and instruments that aspire. Roughly two fifths of the genuinely EO-relevant passages carry strong or binding commitment language, and they cluster in three families: the EU framework of rules and policies on skills (the Skills Agenda's funding commitments, the Union of Skills' dated deliverables, the STEM Education Strategic Plan's roll-out of individual learning accounts and micro-credentials), the recovery plans (Italy's binding MOOC and public-administration reskilling commitments above all), and the CAP plans, whose training and advisory obligations are contractual rather than rhetorical. At the other end, the national space strategies aspire: Greece's space strategy is almost entirely aspirational in its human-capital language, and Portugal's, while richer, commits in the register of intentions - strengthen, broaden, attract - rather than of programmes with budgets.

[23] Due to report editing and accessibility the graph includes only top 20 documents. The graphs for full body of documents is available upon request.

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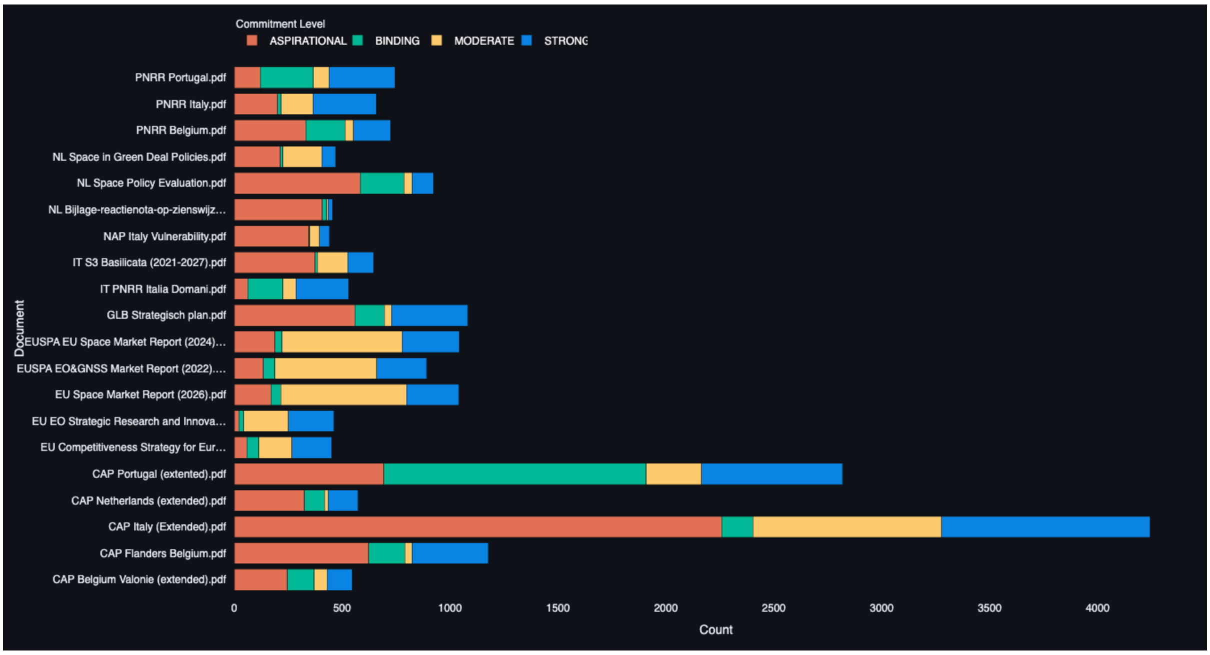

IMAGE 8 – COMMITMENT STRENGTH BY DOCUMENT. RECOVERY PLANS, EXTENDED CAP STRATEGIC PLANS AND EU SKILLS INSTRUMENTS CARRY THE LARGEST VOLUMES OF STRONG AND BINDING LANGUAGE; NATIONAL SPACE STRATEGIES SHOW PREDOMINANTLY ASPIRATIONAL PROFILES[24]

One pattern within this deserves emphasis because it reverses the intuitive reading. Measured by average commitment strength, the themes closest to EO, e.g., support for downstream applications, Copernicus and EU space services, score highest of all, while the most-mentioned theme, generic geospatial and GIS references, scores lowest. Frequency and seriousness are inversely related: policies mention geo-information constantly and casually, but when a policy engages Copernicus or the downstream sector directly, it tends to do so with programme-grade language. The problem is therefore not conviction. It is that the serious engagements are few, scattered, and almost never connected to a training instrument.

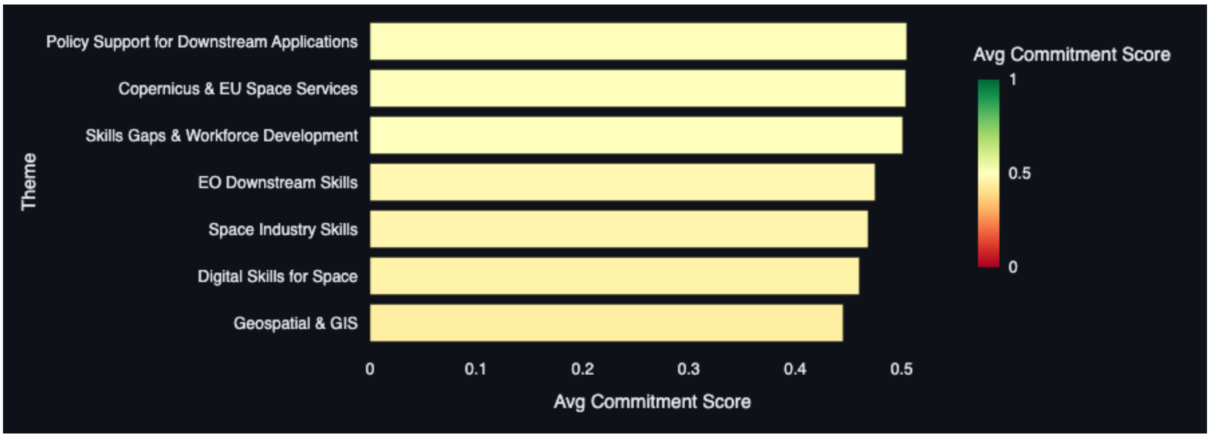

IMAGE 9– AVERAGE COMMITMENT STRENGTH BY THEME. DOWNSTREAM SUPPORT AND COPERNICUS THEMES CARRY THE STRONGEST LANGUAGE IN THE COLLECTION; THE FREQUENTLY MENTIONED GEOSPATIAL & GIS THEME THE WEAKEST - EO IS DISCUSSED RARELY BUT, WHEN DIRECTLY ENGAGED, SERIOUSLY

[24] Due to report editing and accessibility the graph includes only top 20 documents. The graphs for full body of documents is available upon request.

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7.5 The broken chain: diagnosis without delivery

Placing every skills-relevant passage on the capacity-building chain, from awareness, through education and training, to innovation, entrepreneurship and adoption, exposes where the system actually breaks. General skills framing absorbs nearly two fifths of everything the policies say; awareness and adoption take another third. Education (under 5%), training (under 3%) and entrepreneurship (barely 2%) form the tail. The chain is strong precisely where action is cheapest: declaring a skills need costs a sentence, while building a curriculum, funding a course or backing a founder costs money and specificity. Across five landscapes and two hundred documents, European EO-relevant policy has collectively completed its diagnosis and barely begun the prescription - and the emptiest stages of the chain, training and guidance towards employment and enterprise, are exactly the stages where ROOT operates.

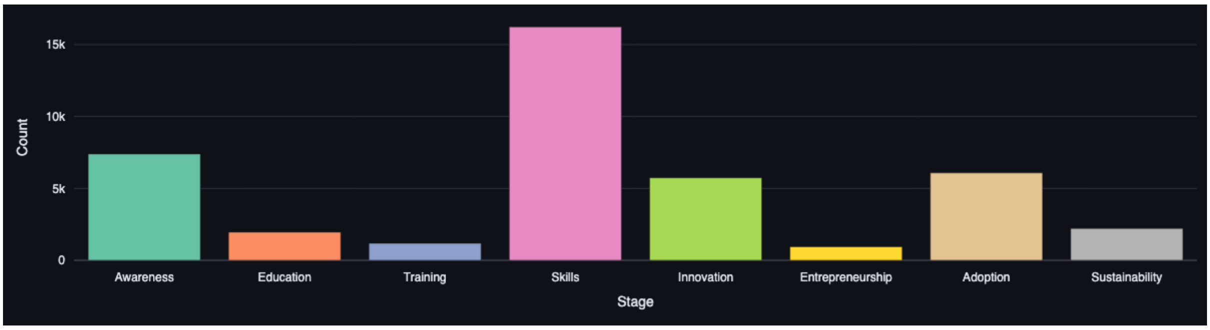

IMAGE 10 – VOLUME OF SKILLS-RELEVANT PASSAGES (EXCERPTS FROM POLICIES) BY CAPACITY-BUILDING STAGE. GENERAL SKILLS FRAMING DOMINATES; EDUCATION, TRAINING AND ENTREPRENEURSHIP (THE DELIVERY STAGES) ARE THE SMALLEST CATEGORIES ACROSS ALL LANDSCAPES

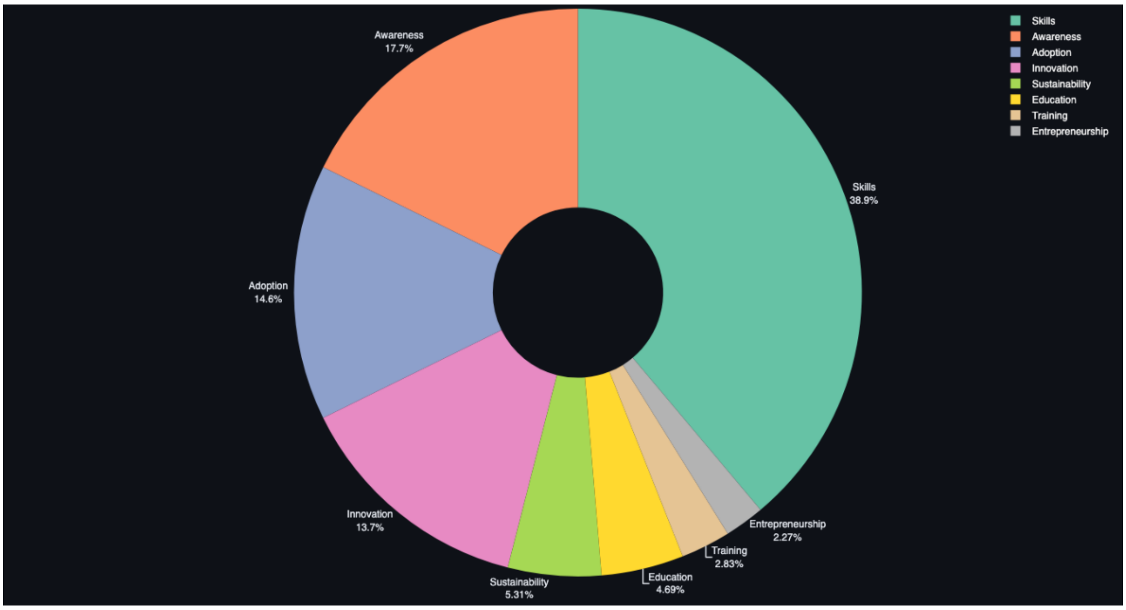

IMAGE 11 – PROPORTIONAL SHARE OF THE CAPACITY-BUILDING STAGES: SKILLS FRAMING 38.5%, AWARENESS 17.7%, ADOPTION 14.6%; EDUCATION, TRAINING AND ENTREPRENEURSHIP TOGETHER UNDER 10%.

The national profiles within this pattern are distinct enough to matter for programme design. The Netherlands routes skills through innovation; a quarter of its substantive passages sit at the innovation stage, reflecting a policy culture that funds capability-building through Growth

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Fund programmes. Italy leans towards education, carried by the PNRR's education reforms and the training measures of its regional S3 strategies. Portugal is distinctive for awareness and adoption, driven by its space strategy's outreach orientation and CAP implementation. Greece has the thinnest base, with its Digital Transformation Bible carrying almost the entire national skills narrative alone, and its strongest binding language arriving from outside, in the Digital Decade country report's recommendation to 'attract and retain ICT specialists... aligning upskilling and reskilling programmes to the demand in the economy'. Four countries, four different places where an EO training intervention would naturally dock: the innovation programme in the Netherlands, the education and recovery instruments in Italy, the outreach-to-adoption pipeline in Portugal, and in Greece, the digital transformation agenda itself.

7.6 The EU has started building the bridge; the countries have not

Until recently, the disconnection between space policy and skills policy was as complete at EU level as nationally. That has changed, and the change is the most significant recent development in the entire landscape. The EU Vision for the European Space Economy treats the skilled workforce as 'a transversal enabler... the backbone of a thriving space economy' and backs the phrase with named actions: a space sector-specific skills methodology feeding the European Skills Intelligence Observatory, an EU Space Skills Academy, and the Space Career Launchpad already launched by DG DEFIS to bridge employers and young space talent. It also states the demand problem in numbers no national document matches: nearly four out of five European SMEs struggle to find workers with the necessary skillsets. ESPI's talent analysis adds the diagnosis of a 'vanishing middle', i.e., sectors that can recruit graduates and senior experts but lose the mid-level professionals in between and cites a reported 72% skills gap in parts of the European space workforce.

Nothing comparable exists in any of the four countries. No national policy, e.g., not the Dutch Long-Term Space Agenda, not Portugal's Space 2030, not Greece's space strategy, not Italy's space economy documents, contains a national reflection of the Space Skills Academy, the skills-intelligence methodology or the career-guidance platform the EU has now committed to. The bridge between space policy and skills policy is being built from the EU end only. For a project piloting EO career guidance in three countries, that is less a gap than an assignment: the EU instruments need national and regional counterparts to land on, and demonstrating what such a counterpart looks like, namely, a regional human-capital deal with an EO pathway, a guidance service that knows the space sector, is precisely the missing piece the EU-level actions cannot supply themselves. The theme coverage across the documents (see Figure 2) shows that the "EO downstream skills" is the systematic weak point at every scale. The strongest EO-skills coverage in the collection sits in EU space-economy and skills instruments, not in national policies. In Annex 1, the SWOT (Table 1) and PESTEL (Table 2) analysis presents in more detail the main internal and external policy drivers and the policy coherence (Table 3) at the level of each country.

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7.7 What the policies monitor and what they fund

A final structural observation completes the picture. Nearly all documents in the collection (90%) carry monitoring and reporting mechanisms capable of tracking skills commitments. But only 3.5% contain funded EO-skills measures, and fewer than 2% target EO skills explicitly. The European policy system has, in other words, built the accountability apparatus before creating the content it would account for: there is a reporting framework waiting for EO-skills commitments that have not yet been made. The same asymmetry appears in the raw material itself, of the tens of thousands of passages in which these documents appear to touch EO and skills, scarcely one in twenty survives close reading as genuine engagement rather than incidental vocabulary. Anyone who concluded from a keyword search that 'EO skills are all over the policy agenda' would be misled. The genuinely usable policy anchors number in the hundreds, and this chapter has named the most important of them by name.

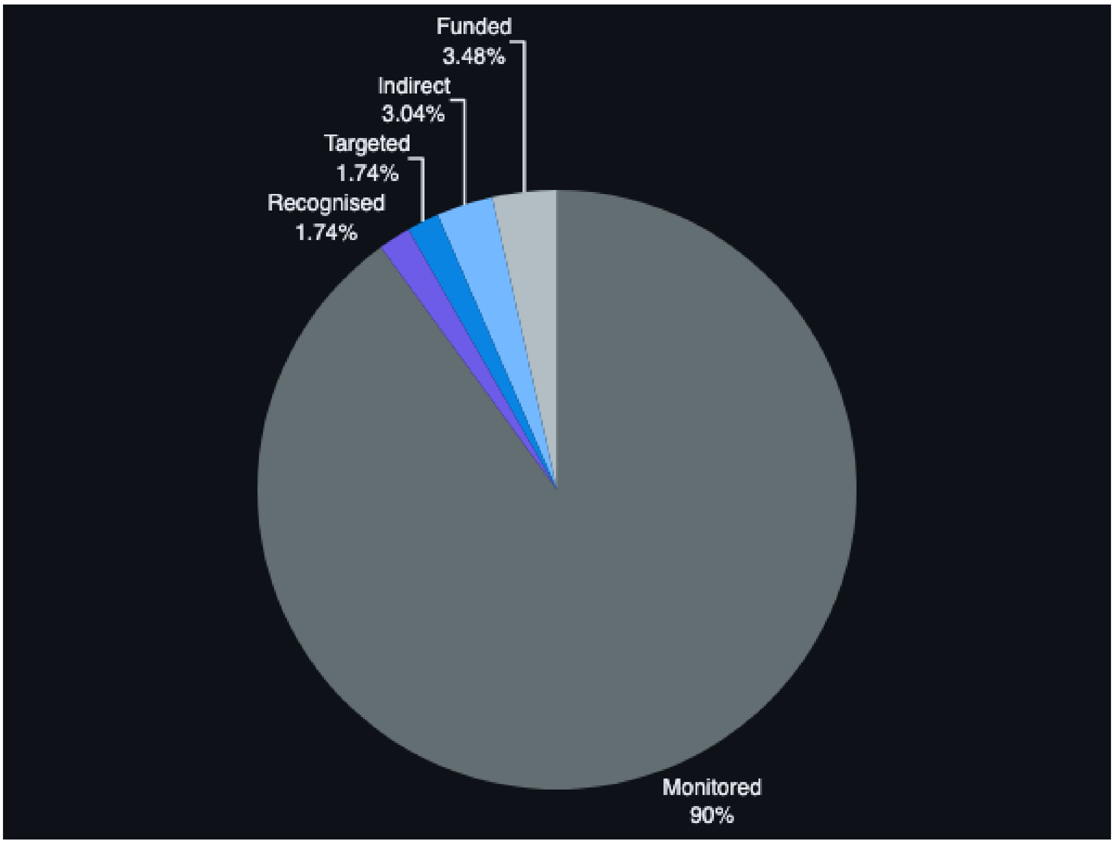

IMAGE 12 –MATURITY OF EO-SKILLS TREATMENT BY DOCUMENT (FROM ABSENT TO MONITORED). MONITORING PROVISIONS ARE NEAR-UNIVERSAL IN FORM; FUNDED (3.5%) AND EXPLICITLY TARGETED (UNDER 2%) EO-SKILLS MEASURES ARE RARE. HENCE, INDICATES ACCOUNTABILITY MECHANISM WAITING FOR CONTENT.

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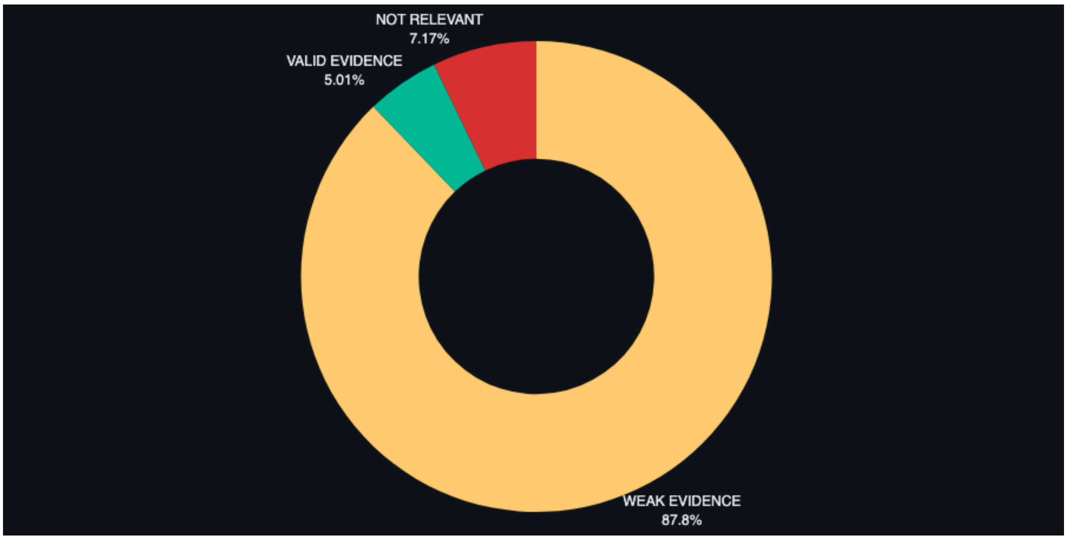

IMAGE 13 - EVIDENCE QUALITY ACROSS ALL SCREENED MATERIAL: ONLY AROUND 5% OF APPARENT POLICY REFERENCES TO "EO" AND "SKILLS" SURVIVE CLOSE READING AS SUBSTANTIVE ENGAGEMENT, WHICH IS THE GAP BETWEEN MENTIONING (KEYWORD PRESENCE) AND REAL POLICY COMMITMENT

7.8 Overall gaps

Read across all five landscapes, the gaps arrange themselves into a coherent structure:

- **Skills without EO.** The policies that define, fund and deliver skills, e.g., the EU acquis, the recovery plans, the CAP advisory systems, the regional strategies and human-capital deals, do not name Earth Observation, geo-information or Copernicus among their target competences, anywhere, in any of the four countries. EO competences currently enter these instruments only disguised as 'digital skills'.
- **EO without instruments.** The policies that understand EO demand, i.e., the national space strategies, control no education, training or guidance instrument, and their human-capital language is the weakest in the collection: aspiration in Greece, intention in Portugal, diagnosis without delivery in the Netherlands until the Long-Term Space Agenda, and near-silence in Italy's space documents.
- **A chain broken at delivery.** Every landscape is strong at diagnosis (skills framing, awareness) and weak at the stages that produce employable people: education, training and entrepreneurship together account for under a tenth of everything the policies say, in every country and at EU level alike.
- **Operational EO use without EO literacy.** The CAP has made satellite monitoring the instrument of agricultural compliance across all four countries, and public bodies from Rijkswaterstaat to national paying agencies consume EO daily, yet no advisory or training system anywhere teaches the data that now governs its users' obligations.
- **A one-sided bridge.** The EU has begun joining space and skills policy, e.g., Space Skills Academy, sector skills intelligence, Space Career Launchpad, but no member state in the study has yet built the national or regional counterpart on which those instruments must land.

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None of these gaps require a new policy to close. The commitments exist at EU level; the money exists in the recovery, agricultural and cohesion instruments; the delivery mechanisms exist regionally; the demand articulation exists in the space strategies. What does not exist, in any of the four countries, is a single working example of these pieces connected, namely, an EO career pathway inside a regional skills deal, a guidance service that can see the space sector, a training module inside an advisory system that already enforces satellite monitoring. Providing an example and documenting how the connection is made so that policies can adopt it is something that does not exist yet. This analysis delivers the conclusion that stands out; none of the studied countries can provide such a working example. For more gaps analysis, see Annex 2 (Table 4).

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8. National consultation – Interviews to Relevant Stakeholders

The following section describes in detail the results of the interviews that were conducted in the context of task 2.1 as national consultation activity to support the policies analysis. The number of interviews for each country is distributed as follows:

- Italy: 4
- Portugal: 6
- Netherland: 6
- Greece: 3

A set of three standard questions was provided for all the interviewees that were asked to answer all of the three questions.

Question A: Policy relevance and alignment:

In your view, how are Earth Observation and geospatial technologies currently reflected in national or regional policies, strategies, and funding priorities?

Question B: Skills needs and barriers:

What are the main challenges, gaps, or opportunities related to EO skills development, education, training, and workforce integration in your sector?

Question C: Future trends and recommendations:

What actions, priorities, or emerging trends should be considered to strengthen EO capacity building, innovation uptake, and employment opportunities over the next five years?

8.1 Synthesis of the Interviews to Italian Stakeholders

Stakeholders' Profile: Italian SME specialised in geomatics and Earth Observation Disclosure: Full attribution Interviewee: Daniela Iasillo, Planetek Italia	
Question A	
Synthesis of the answer	Analysis
Earth Observation (EO) and geospatial data have become strategic assets supporting European and national policies in areas such as climate adaptation, environmental monitoring, disaster risk management, agriculture, and urban planning, while driving the green and digital transitions. Although their value is widely recognised, EO is still insufficiently embedded as an operational decision-support tool, requiring stronger policy integration, dedicated funding, and skills development. Flagship initiatives such as Copernicus at EU level and IRIDE[25] in Italy demonstrate the growing operational uptake of EO services for	Earth Observation is highly relevant across EU policies, acting as a cross-cutting enabler for climate action, environmental monitoring, digital transformation, and resilience. Italy is strongly aligned with the EU policy framework through initiatives such as the PNRR and IRIDE, demonstrating a clear commitment to the operational uptake of EO services. However, further efforts are needed to strengthen policy integration, skills development, governance coordination, and the systematic adoption of EO by public administrations and SMEs.

[25] https://www.asi.it/scienze-della-terra/iride/

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public administrations and evidence-based policy-making.	
Question B	
Synthesis of the answer	Analysis
The EO sector requires not only more space professionals but also hybrid profiles combining geospatial technologies, AI, domain expertise, and operational knowledge across multiple sectors. Growing initiatives such as Copernicus, IRIDE, and Destination Earth are creating new career opportunities throughout the EO value chain. Strengthening education, vocational training, lifelong learning, and public-private collaboration is essential to meet future workforce demands.	Current policies recognise the growing demand for EO skills, but education and workforce development remain insufficiently aligned with labour market needs. While EU initiatives provide a strong framework for skills and innovation, stronger integration between education, industry, and public administrations is needed to build sustainable EO capacity. Italy reflects these challenges, highlighting the need for long-term skills strategies beyond project-based training to fully support the green and digital transitions.
Question C	
Synthesis of the answer	Analysis
EO capacity building over the next years should shift from technical awareness to operational adoption, through stronger training pathways, industry–academia cooperation, and practical learning opportunities. Emerging technologies such as AI, digital twins, cloud platforms, Copernicus and IRIDE services will create demand for hybrid professionals combining EO expertise with sectoral and business skills. In parallel, in-orbit servicing will contribute to a more sustainable and competitive space economy, generating new job profiles requiring advanced technical and interdisciplinary competences.	The response highlights a strong alignment with EU priorities on digital transformation, space sustainability, skills development, and the uptake of Copernicus-based services. However, a critical challenge remains the transition from fragmented project-based training to systemic capacity building involving education systems, industry, and public administrations. Italy is well positioned through national investments such as IRIDE, but further integration of skills strategies, innovation ecosystems, and emerging space economy domains is needed to fully exploit future employment opportunities.
Overall Assessment	
Overall, the three responses highlight a strong strategic relevance of Earth Observation (EO) within the European policy landscape, identifying its growing role as an enabler for climate action, environmental monitoring, digital transformation, resilience, and the space economy. The analysis shows that Italy is broadly aligned with the EU framework through initiatives such as Copernicus uptake, PNRR, and IRIDE, but still faces challenges in transforming technological investments into widespread operational adoption. A key transversal issue emerging across all responses is the need to strengthen EO skills ecosystems by bridging the gap between education, industry, public administrations, and end users, moving from short-term project-based approaches towards long-term capacity building and sustainable employment strategies.	

Stakeholders' Profile: European network gathering public and private entities (resarch body governed by public law) **Disclosure: Full attribution** **Interviewee: Bernardo De Bernardinis, CICA – Consorzio Italiano per la Copernicus Academy**	
Question A	
Synthesis of the answer	Analysis

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Earth Observation (EO) and geospatial technologies are increasingly recognised as strategic tools for supporting evidence-based environmental and climate policies, driven by initiatives such as the Copernicus Programme and investments in space and digital infrastructures. However, the operational use of EO within public administrations remains limited, often being restricted to research activities and pilot projects. The main challenge is no longer technological availability, but the institutional capacity, skills and organisational processes needed to integrate EO into routine decision-making.	The response highlights a clear gap between the maturity of EO technologies and their effective adoption in public decision-making processes. It identifies organisational capacity, institutional commitment and the availability of qualified professionals as the main factors limiting broader EO uptake. This underlines the need for interdisciplinary skills and training pathways able to connect EO expertise with policy implementation and practical sectoral applications.
Question B	
Synthesis of the answer	Analysis
The main skills gap in Earth Observation (EO) concerns not awareness of its potential, but the ability of professionals to effectively use and integrate EO products and Copernicus services into daily workflows. Existing expertise in GIS and geospatial technologies is often insufficient to interpret and exploit satellite-based information for operational purposes. Addressing this challenge requires multidisciplinary training and the development of hybrid profiles able to transform environmental data into actionable knowledge.	The response identifies a key barrier to EO uptake: the lack of practical and interdisciplinary skills rather than limited access to technologies or data. It highlights the need to strengthen continuous professional development, especially within public administrations, to enable the effective integration of EO into institutional processes. The emergence of hybrid roles combining technical, analytical and application-oriented competences is considered essential for future EO-driven innovation and policy support.
Question C	
Synthesis of the answer	Analysis
Over the next five years, capacity building in Earth Observation (EO) should become an integrated element of public sector innovation, moving beyond isolated training activities. Effective learning pathways should combine theoretical knowledge, practical applications and collaboration among public authorities, academia and service providers. The development of interdisciplinary profiles combining environmental expertise, geospatial technologies and data-driven decision-making will be crucial to maximise the societal impact of EO investments.	The response emphasises that future EO capacity building requires a systemic approach, with structured and progressive training pathways adapted to different levels of expertise. It highlights the importance of stronger cooperation among stakeholders to bridge the gap between research, technological development and operational use. The focus on interdisciplinary skills reflects the growing need for professionals capable of supporting digital transformation and evidence-based environmental governance.
Overall Assessment	
The three responses consistently highlight that the main challenge for Earth Observation (EO) uptake is no longer technological availability, but the ability to translate data and services into operational practices through appropriate skills, institutional capacity and collaboration. They identify a clear need for multidisciplinary and continuous learning pathways capable of bridging EO expertise with policy needs and sectoral applications. Overall, the findings confirm that strengthening human capital and fostering knowledge transfer are key factors for ensuring the long-term impact of EO investments.	

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<table>
<tr><th colspan="2">Stakeholders' Profile: in-house society for the innovation in Public Administrations and Municipalities (Public Sector)
Disclosure: Full attribution
Interviewee: Anna Zilioli, ANCILAB</th></tr>
<tr><td colspan="2">Question A</td></tr>
<tr><td>Synthesis of the answer</td><td>Analysis</td></tr>
<tr><td>European programmes, PNRR funds and local initiatives have supported innovation and digital transformation in local authorities, creating opportunities for the adoption of Earth Observation (EO) technologies. However, the diffusion of EO remains uneven, with larger municipalities better equipped to integrate these tools than smaller administrations. Limited staff capacity, increasing administrative burdens and organisational constraints continue to hinder the routine use of EO in local governance.</td><td>The response highlights the importance of funding programmes and territorial initiatives in enabling EO adoption, while identifying a persistent gap between larger and smaller municipalities. The main barriers are not related to the perceived value of EO, but to limited resources, institutional capacity and difficulties in managing innovation processes. This suggests the need for targeted support models, cooperation mechanisms and tailored capacity-building actions for smaller public administrations.</td></tr>
<tr><td colspan="2">Question B</td></tr>
<tr><td>Synthesis of the answer</td><td>Analysis</td></tr>
<tr><td>The limited adoption of Earth Observation (EO) in municipalities is mainly linked to staff shortages and the difficulty of finding professionals with the required GIS and satellite data skills. Training existing personnel represents an opportunity, but is challenging due to high workloads and resistance to changing established practices. Public-private partnerships and cooperation between municipalities could provide effective solutions to improve access to EO expertise.</td><td>The response identifies human resources and organisational capacity as the main barriers to EO integration in local administrations. It highlights the need for innovative approaches to skills development, combining internal capacity building with external support mechanisms. Strengthening collaboration between municipalities, private actors and training providers emerges as a key strategy to overcome resource constraints and accelerate EO adoption.</td></tr>
<tr><td colspan="2">Question C</td></tr>
<tr><td>Synthesis of the answer</td><td>Analysis</td></tr>
<tr><td>Earth Observation (EO) tools are increasingly available within public administrations, but their integration into decision-making processes remains limited due to insufficient skills and awareness. Effective uptake requires attracting new talent, strengthening continuous training for existing staff and fostering a culture of innovation and change. The future challenge will be mainly organisational and educational rather than technological, despite the growing accessibility of satellite data and AI-based tools.</td><td>The response confirms that the main barrier to EO adoption is not access to technologies, but the capacity of administrations to effectively exploit them in operational contexts. It emphasises the importance of both attracting new digitally skilled professionals and upskilling existing employees through continuous learning pathways. The increasing availability of user-friendly EO and AI tools represents an opportunity that can only be fully realised through organisational transformation and appropriate skills development.</td></tr>
<tr><td colspan="2">Overall Assessment</td></tr>
<tr><td colspan="2">The three responses consistently identify that the main barriers to the adoption of Earth Observation (EO) in public administrations are organisational capacity, limited human resources and insufficient integration of EO skills into institutional workflows. They highlight the need to combine recruitment of new digital profiles, continuous training of existing staff and stronger cooperation among municipalities, private actors and knowledge providers. Overall, the findings confirm that the future uptake of EO will</td></tr>
</table>

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depend primarily on building organisational readiness, change capacity and interdisciplinary competences rather than on further technological development alone.

Stakeholders' Profile: public and economic entity supporting agricultural sector (public body) **Disclosure: Chatham House Rule**	
Question A	
Synthesis of the answer	Analysis
The response highlights a gap between national strategic investments in Earth Observation (EO) and their effective adoption in everyday practices within regional and local administrations. Although initiatives such as the PNRR, the Iride constellation and Copernicus data enhancement have significantly strengthened Italy's EO capabilities, local implementation remains limited by skills shortages and insufficient dedicated funding mechanisms. Despite Italy's strong position in the space sector, public administrations remain relatively cautious users of EO technologies.	The response identifies a structural disconnect between high-level policy strategies and operational capacity at territorial level, where limited skills, generational turnover issues and budget constraints hinder EO uptake. It highlights that technological investments alone are insufficient without dedicated resources, training pathways and institutional strategies supporting implementation. The findings reinforce the need for stronger alignment between space policies, funding instruments and capacity-building actions within public administrations.
Question B	
Synthesis of the answer	Analysis
The response identifies agriculture as a sector where the gap between the potential of Earth Observation (EO) technologies and their real-world adoption is particularly evident. Despite the growing role of digital and sustainable agriculture policies, the main barriers are cultural, educational and professional, with traditional training pathways and roles not yet fully adapted to new technologies. The sector requires new hybrid profiles able to combine agronomic knowledge, EO data, GIS, AI and decision-support capabilities to transform satellite information into actionable solutions.	The response highlights that the challenge in agricultural EO adoption is primarily related to skills, professional evolution and knowledge transfer rather than technology availability. It underlines the need to modernise education systems and upskill existing professionals by creating interdisciplinary roles that bridge data analysis and practical farming needs. The findings confirm the importance of developing specialised training pathways to support precision agriculture, sustainability objectives and the effective use of EO for policy compliance and operational decisions.
Question C	
Synthesis of the answer	Analysis
The response emphasises the need for targeted information, training and educational initiatives to strengthen the capacity of agricultural consultants, companies and public administrations to exploit Earth Observation (EO) opportunities. It highlights the importance of developing professionals able to interpret EO data for economic development, planning and sustainable agriculture. Stronger public-private collaboration and the integration of local knowledge and in-situ data are	The response proposes a capacity-building approach centred on knowledge transfer, professional upskilling and cooperation among key actors of the agricultural ecosystem. It recognises agricultural consultants as strategic intermediaries for translating EO technologies into practical applications for farms, especially for smaller enterprises. The findings reinforce the need for integrated innovation ecosystems combining training, data sharing and public-private partnerships to accelerate EO adoption.

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considered essential to maximise the value of EO services.	
Overall Assessment	
The three responses highlight a common challenge in the agricultural sector: the gap between the high potential of Earth Observation (EO) technologies and their effective integration into farming practices, professional services and public policies. They identify skills shortages, outdated educational pathways and limited technology transfer mechanisms as the main barriers to EO adoption. Overall, the findings emphasise the need for interdisciplinary training, stronger public-private cooperation and the development of new hybrid profiles capable of translating EO data into actionable solutions for sustainable and precision agriculture.	

8.2 Synthesis of the Interviews to Portuguese Stakeholders

Stakeholder profile: Industry, Consultancy, Engineering and Technology – Aerospace and Defence **Disclosure: Chatham House Rule**	
Question A	
Synthesis of the answer	Analysis
Earth Observation (EO) and geospatial data are increasingly recognised as strategic assets for supporting digital and green transitions in Portugal and Europe. National strategies such as Portugal Space 2030 and European programmes like Copernicus promote the use of EO for environmental monitoring, climate adaptation, natural resource management and sustainable development. Funding instruments including Horizon Europe, Digital Europe, Structural Funds and recovery plans further support the integration of EO with AI, data analytics and digital technologies.	The response highlights a strong policy framework supporting EO development, with alignment between national strategies and European priorities on sustainability, digitalisation and innovation. It emphasises the role of funding programmes and technological integration as key drivers for expanding EO applications across different sectors. The findings suggest that Portugal has positioned EO as a strategic domain, creating favourable conditions for innovation, skills development and future market uptake.
Question B	
Synthesis of the answer	Analysis
The response identifies a persistent gap between the growing availability of geospatial data and the capacity of organisations to transform them into actionable knowledge. SMEs and public entities face difficulties in exploiting EO due to shortages of skills in GIS, data analytics, AI, programming and spatial modelling. Addressing this challenge requires flexible, multidisciplinary and application-oriented training pathways, particularly for adult reskilling and continuous professional development.	The response highlights that the main barrier to EO uptake is the lack of transversal competences combining technical EO expertise with sector-specific knowledge. It stresses the importance of lifelong learning approaches and modular training models to support professionals in adapting to evolving technological needs. The integration of EO with emerging domains such as AI, data science and climate services is identified as a key opportunity for skills development and employment growth.
Question C	
Synthesis of the answer	Analysis
The response identifies key actions to strengthen EO skills development, including multidisciplinary	The response proposes a comprehensive skills strategy addressing both technical competences

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training, adult reskilling programmes and stronger collaboration between companies, universities and public institutions. It highlights the importance of accessible tools and platforms to facilitate the use of geospatial data by non-specialists. Attracting and retaining talent is also considered essential to support the growth and competitiveness of the EO sector.	and ecosystem-level challenges. It emphasises the need for flexible learning approaches, stronger links between education and labour market needs, and improved accessibility of EO technologies. The findings suggest that future EO workforce development will depend on combining capacity building, innovation partnerships and effective promotion of career opportunities.
Overall Assessment	
The three responses provide a coherent picture of a favourable EO policy and innovation landscape in Portugal, supported by national strategies, European programmes and increasing availability of geospatial data. At the same time, they identify a persistent skills and adoption gap, with organisations struggling to transform EO data into operational knowledge due to limited multidisciplinary competences. Overall, the findings highlight the need for flexible lifelong learning pathways, stronger cooperation among stakeholders and actions to attract new talent in order to fully exploit EO's economic and societal potential.	

Stakeholder profile: Industry. Earth Observation via satellites **Disclosure: Chatham House Rule**	
Question A	
Synthesis of the answer	Analysis
The response describes the growing recognition of Earth Observation (EO) and geospatial technologies in EU strategies and funding priorities since the launch of the Copernicus programme and the Sentinel constellation. The increasing maturity of satellite-based EO products and services has supported their integration into EU-funded projects and policy applications. However, the adoption of EO remains uneven, with national policy frameworks still lagging behind the European level.	The response highlights the progressive evolution of EO from a research-oriented technology towards an operational tool supported by European policies and funding mechanisms. It identifies a remaining gap between the potential applications of EO and their full integration into policy frameworks, particularly at national level. The findings suggest the need for stronger policy alignment and greater awareness of EO opportunities beyond the current sectors of application.
Question B	
Synthesis of the answer	Analysis
The response highlights that Earth Observation (EO) is an enabling technology rather than a standalone solution, with value depending on its ability to address challenges across different economic sectors. The main challenge for the downstream sector is demonstrating added value compared to traditional approaches and integrating EO-based products into existing operational workflows. This requires professionals with both technical EO expertise and a deep understanding of sector-specific needs.	The response identifies the importance of bridging the gap between EO technology development and real-world market adoption through application-oriented skills. It emphasises the need for horizontal profiles capable of connecting data processing, product development and sectoral value creation. The findings reinforce the relevance of interdisciplinary competences and stronger links between EO providers and end-user communities to increase operational uptake.
Question C	
Synthesis of the answer	Analysis

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The response identifies the creation of sector-specific value as the main driver for EO innovation adoption and future employment opportunities. It highlights two possible pathways: EO specialists developing expertise in application domains, or professionals from different sectors acquiring EO competences. Hybrid roles, such as product owners able to connect technological solutions with market needs, are considered essential to ensure successful adoption.	The response emphasises that future EO careers will increasingly emerge at the intersection between technology and sectoral expertise rather than within purely technical domains. It highlights the importance of professionals capable of translating user needs into EO-based solutions and supporting their market uptake. The findings confirm the growing relevance of hybrid profiles combining EO knowledge, domain expertise and innovation management skills.
Overall Assessment	
The three responses highlight the progressive transition of Earth Observation (EO) from a research-driven technology towards an operational asset for economic sectors and policy implementation, supported by European strategies and funding programmes. However, a persistent gap remains between EO technological capabilities and their effective adoption, mainly due to limited integration with sector-specific needs and workflows. Overall, the findings underline the importance of developing hybrid professional profiles that combine EO expertise, domain knowledge and the ability to transform data into practical value and market-ready solutions.	

Stakeholder profile: Academia, International collaborative organization for science, technology, and innovation, involving universities, research centres, governments, and other stakeholders **Disclosure: Chatham House Rule**	
Question A	
Synthesis of the answer	Analysis
Earth Observation (EO) and geospatial technologies are gaining strategic importance in national and regional policy agendas, particularly in relation to digital and green transitions and investments in space infrastructure. Funding opportunities are increasingly available through recovery plans, regional funds and European programmes, supporting infrastructure development and research activities. However, current approaches remain fragmented and lack a long-term vision integrating skills development and human capital as core elements of EO strategies.	The response highlights a policy gap between investments in EO technologies and the development of the workforce needed to fully exploit their potential. While funding mechanisms support technological advancement, the lack of systematic strategies for skills and capacity building may limit long-term impact and adoption. The findings emphasise the need to embed education, training and human capital development within future EO policies.
Question B	
Synthesis of the answer	Analysis
The response identifies the shortage of professionals combining Earth Observation (EO), data science and artificial intelligence skills as a major challenge for the sector. It also highlights limited digital literacy among end-user communities, such as agriculture and maritime sectors, as a barrier to the adoption of EO-based solutions. Pe-	The response confirms that the main skills gap lies in the lack of interdisciplinary profiles able to integrate EO, advanced data analysis and sector-specific applications. It also underlines the importance of improving digital readiness among end users to transform available technologies into operational solutions. The findings highlight the

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ripheral regions face additional difficulties in retaining talent, although they are increasingly developing new career opportunities in space and geospatial fields.	need for targeted education pathways and regional strategies to attract, train and retain EO professionals beyond major innovation hubs.
Question C	
Synthesis of the answer	Analysis
The response identifies three major trends shaping the future of Earth Observation (EO): the transition from raw data to ready-to-use information through AI, the increasing role of EO in regulatory and sustainability frameworks, and the integration of EO with multiple data sources such as IoT and in-situ observations. These developments require professionals with hybrid skills combining EO, AI, compliance knowledge and data integration capabilities. The response also highlights the importance of improving general EO literacy as a foundation for developing advanced skills and future demand.	The response provides a forward-looking perspective on the evolution of EO careers, emphasising the shift from technical data processing towards interpretation, integration and decision support. It highlights emerging skill needs driven by market and policy trends, particularly in sustainability, digital transformation and environmental monitoring. The findings suggest that future capacity building should combine specialised technical training with broader awareness-raising actions to create both expertise and demand for EO solutions.
Overall Assessment	
The three responses highlight a strong recognition of Earth Observation (EO) as a strategic technology for digital and green transitions, supported by increasing investments, policy attention and emerging market opportunities. However, they identify a persistent gap between technological development and the availability of qualified professionals able to integrate EO with AI, sectoral knowledge and multi-source data environments. Overall, the findings emphasise the need for long-term skills strategies, interdisciplinary training pathways and wider EO literacy to ensure sustainable adoption and maximise the societal and economic impact of EO.	

Stakeholder profile: Academia **Disclosure: full attribution** **Interviewee: Prof. Lino Marques, University of Coimbra**	
Question A	
Synthesis of the answer	Analysis
Earth Observation (EO) is increasingly recognised as a strategic component of European digital and green transition policies, with applications ranging from environmental monitoring and precision agriculture to civil protection and spatial planning. In Portugal, this relevance is reflected in national strategies and funding programmes, while the Centro Region is strengthening its position through initiatives such as the Supernova cluster. The future of EO is envisioned as an integrated information ecosystem combining satellite data with other sources and technologies.	The response highlights a strong alignment between European and national policy priorities and the development of regional innovation ecosystems supporting EO adoption. It emphasises that future EO value will depend on the integration of multiple technologies, actors and data sources rather than on satellite information alone. The findings suggest that collaborative ecosystems combining research, industry, public authorities and AI capabilities will be key drivers for EO innovation and skills development.
Question B	
Synthesis of the answer	Analysis

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The response identifies the main challenge for Earth Observation (EO) as moving from data availability to the extraction of useful information supporting decision-making processes. This requires professionals with interdisciplinary skills combining EO, artificial intelligence, data science, GIS, robotics and autonomous systems. The future potential of EO is linked to the intelligent integration of multiple data sources, including satellites, sensor networks and autonomous platforms.	The response highlights the shift from data acquisition towards advanced data exploitation as the key driver of EO evolution. It emphasises the growing need for hybrid professionals able to manage complex, multi-source information ecosystems and translate data into operational insights. The findings reinforce the importance of interdisciplinary training pathways combining geospatial expertise, digital technologies and application-oriented skills.
Question C	
Synthesis of the answer	Analysis
The response emphasises that the future value of Earth Observation (EO) will depend on the ability to transform large volumes of data into actionable knowledge through artificial intelligence and advanced analytics. It highlights the importance of collaboration among universities, research centres, companies and public authorities to develop and validate EO applications in real-world contexts. Strengthening talent development and advanced education is considered essential for increasing Portugal's technological autonomy and innovation capacity.	The response presents a strategic vision of EO development centred on knowledge generation, innovation ecosystems and high-level skills rather than data availability alone. It identifies AI, technology transfer and interdisciplinary education as key enablers for translating EO investments into economic and societal value. The findings underline the need for long-term strategies to attract and retain specialised talent and strengthen the competitiveness of the EO sector.
Overall Assessment	
The three responses provide a forward-looking vision of Earth Observation (EO) as a strategic component of digital transformation, where future value will depend on the ability to integrate satellite data with AI, sensor networks, autonomous systems and other information sources. They consistently identify the need for interdisciplinary skills, stronger collaboration among research, industry and public authorities, and investment in talent development. Overall, the findings highlight that Portugal's future EO competitiveness will rely on building innovation ecosystems capable of converting data into actionable knowledge, supporting both societal challenges and economic growth.	

Stakeholder profile: Industry/SME: consultancy company for scientific solutions and advanced technologies on geodesy, geomatics, geophysics and Geo-IT **Disclosure: full attribution** **Interviewee: Machiel Simon Bos, TeroMovigo, Earth Innovation Lda**	
Question A	
Synthesis of the answer	Analysis
In Portugal, the creation of the Portugal Space Agency has been a positive step, helping to implement policies related to Earth Observation and to direct funding priorities. The national mapping agency, Direção-Geral do Território (DGT), also plays a strong role on the policy side, though it is less involved in funding.	The response highlights the relevance of dedicated institutional actors in shaping Portugal's EO ecosystem and aligning policy priorities with implementation mechanisms. This provides a favourable framework for ROOT to promote stronger links between EO strategies, skills development and workforce needs
Question B	

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Synthesis of the answer	Analysis
The main challenge is finding people with basic programming skills who are also interested in working on EO topics — our company can provide training, but we first need to find suitable candidates. Beyond programming, interpreting EO data requires a solid grounding in physics, and this should be a core part of EO capacity building so people understand what the data actually means and how to use it. This physical/scientific interpretation skillset is harder to teach than programming and deserves more attention in training programs.	The response highlights a shortage of candidates combining programming skills with scientific understanding of EO data. For ROOT, this confirms the need for interdisciplinary training pathways that integrate technical competences with physics and domain knowledge to develop job-ready EO profiles.
Question C	
Synthesis of the answer	Analysis
Europe should invest in developing its own large-scale cloud-based EO processing platforms, comparable to AWS or Google Earth Engine. These platforms lower the barrier to working with EO data significantly, and having a strong European equivalent would make it much easier to turn EO data into useful applications, while reducing dependency on non-European infrastructure.	The response highlights the importance of accessible European EO infrastructures to facilitate data exploitation and innovation. For ROOT, this underlines the need to develop skills not only in EO data analysis but also in the use of cloud-based platforms and digital environments supporting EO applications.
Overall Assessment	
The three responses highlight the importance of strengthening Portugal's EO ecosystem through coordinated policies, qualified human resources and accessible digital infrastructures. They confirm that future EO capacity building should focus on interdisciplinary profiles combining programming, scientific understanding and the ability to exploit cloud-based EO platforms to transform data into operational applications.	

Stakeholder profile: Portuguese aerospace and defence cluster (AED Portugal) Disclosure: Chatham House Rule	
Question A	
Synthesis of the answer	Analysis
Earth Observation is well established in EU and Portuguese policy, with strong recognition of its role in growth, jobs, and public decision-making. EU frameworks like Copernicus, the Climate Law, the Biodiversity Strategy, and the CAP support its use as a key data infrastructure. However, real adoption remains limited, especially among SMEs and non-space sectors, due to weak business models, skills gaps, and technical complexity. In Portugal, fragmented public procurement and weak links between providers and users further slow market development. The main priority is to shift from technology-focused offers to practical	The response shows that Earth Observation is already present in both European and Portuguese policy frameworks, although mostly at a strategic level rather than through full operational use. In Portugal, the Space Strategy 2030 recognises EO as an important driver of economic growth, skilled jobs, and solutions to societal challenges. At European level, programmes and regulations such as Copernicus, the European Climate Law, the Biodiversity Strategy 2030, and the CAP give EO a clear role in public data infrastructure and decision support. At the same time, the answer makes clear that policy recognition has not yet translated into widespread adoption. Many SMEs and non-

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solutions, with the State acting as a key demand driver.	space sectors still face barriers such as low perceived return, weak business models, limited skills, and technical complexity. In Portugal, the gap between providers and public end-users remains evident, with procurement often fragmented and poorly coordinated. The overall message is that EO is increasingly visible in policy, but its practical uptake still depends on stronger demand, better coordination, and more solution-oriented use.
Question B	
Synthesis of the answer	Analysis
EO capacity building is limited not by technical knowledge alone, but by the shortage of hybrid profiles that can connect data, technology, and market needs. Training often does not match what the market actually requires, especially in downstream areas such as commercialization, product development, and integration of EO solutions. Outside the space sector, EO awareness remains low, which slows adoption in sectors like agriculture, environment, insurance, and infrastructure. There are also gaps in career guidance and retraining, especially for adults and mid-level professionals who need clearer pathways into EO roles. Overall, the response points to the need for stronger coordination between industry, academia, and the public sector, with a shift toward more application-oriented training.	The response highlights the shortage of hybrid profiles, the mismatch between training and market needs, and the low level of EO literacy outside the space sector. It also points to gaps in workforce integration, especially the lack of clear career paths and support for retraining and sector transitions. A key opportunity is to make EO capacity building more application-oriented and better aligned with real market demand. The answer is particularly useful because it specifies which competencies are missing, such as commercialization, product development, data integration, and solution management. Overall, it is a relevant and insightful response that links skills, education, workforce integration, and market uptake in one coherent perspective.
Question C	
Synthesis of the answer	Analysis
In the next five years, EO will increasingly move from a technological capability to an integrated operational infrastructure, with priority given to scalable, user-oriented services. It will be essential to invest in usage-oriented training and develop hybrid profiles that combine data, technology, sectoral context, and product development. Tools such as Living Labs and demonstrators will be needed to connect supply and demand and reduce adoption risks for SMEs and public administrations. The State should strengthen its role as an anchor customer through more coordinated, predictable, and results-oriented procurement. Overall, the goal is to make EO an “invisible” and interoperable infrastructure that can generate	The response highlights a major trend: EO is moving from a technical capability to an operational infrastructure supported by Data as a Service, AI/IoT integration, and more automated decision-making. It also clearly identifies priority actions, especially the need for usage-oriented capacity building and hybrid skills that combine technical, sectoral, and product development expertise. A further strength is its emphasis on bridging supply and demand through Living Labs, demonstrators, and collaborative innovation programmes, which makes the answer practical and action-oriented. The public policy dimension is also relevant, especially the call for the State to act as an anchor customer through more coordinated and predictable procurement. Finally, the response

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economic impact and new employment opportunities.	captures an important strategic direction by arguing that EO should become an "invisible" and user-centric infrastructure, which is a strong insight for both innovation uptake and employment creation.
Overall Assessment	
The three responses provide a coherent and mutually reinforcing picture of the EO ecosystem in Portugal and Europe. They show that EO is already recognised at policy level, but that the main challenge is turning this recognition into real operational adoption. A key message is the need to move from a technology-centric approach to a solution-oriented one, with the State acting as an anchor customer. The responses also highlight a structural skills gap, especially the shortage of hybrid profiles able to connect technical knowledge, market needs, and downstream applications. They point out a mismatch between current training offers and the actual needs of sectors outside the space community. At the same time, they stress the importance of stronger coordination among industry, academia, and the public sector. Looking ahead, they frame EO as an operational infrastructure that will increasingly rely on AI, IoT, and data-as-a-service models.	

8.3 Synthesis of the Interviews to Dutch Stakeholders

Stakeholder profile: National public-policy stakeholder working in the broader fields of education, research and space policy. **Disclosure: Chatham House Rule**	
Question A	
Synthesis of the answer	Analysis
The respondent indicated that they had no concrete answers to the questions beyond what can already be found in the Dutch Long-Term Space Agenda (LTR), to which they referred as the main current source describing the national policy position.	The reference to the Long-Term Space Agenda confirms that the Agenda serves as the central point of orientation for national space and EO policy. Beyond this, the response supports few conclusions. In particular, it should not be read as a judgement that the current policy framework is sufficient or complete: the respondent did not comment on this either way. At most, the absence of further observations on education, skills or workforce integration may indicate that these questions did not sit within the respondent's immediate remit. This would be consistent with EO workforce development not yet being a clearly assigned policy responsibility at national level, but it remains an inference by the project team rather than a stated position of the respondent.
Question B	
Synthesis of the answer	Analysis
No specific skills gaps or education barriers were identified.	The absence of an answer is not evidence that no gaps exist, nor that they are considered unimportant. It does suggest that, within this respondent's national policy context, the interface between space strategy and education or labour-

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	market instruments could not readily be addressed in the scope of a short questionnaire. For ROOT, the practical implication is that the connection between national space-policy ambitions and skills policy cannot be taken for granted and may need to be actively constructed and maintained.
Question C	
Synthesis of the answer	Analysis
No specific recommendations were provided beyond the reference to the existing national strategic agenda.	The main implication for ROOT is procedural rather than substantive. A national strategy exists and is documented, but translating it into concrete measures for EO skills and workforce development will require direct engagement with the actors responsible for implementation — whose identity this response did not clarify.
Overall Assessment	
The response provides limited direct evidence but is still informative. It confirms the Long-Term Space Agenda as the reference document for national policy and leaves open, without confirming, the question of where operational responsibility for EO skills development is located. That open question is itself relevant to ROOT's stakeholder-engagement strategy.	

Stakeholder profile: Private-sector EO and geospatial technology specialist involved in developing and commercialising EO-based products and services. **Disclosure: Full attribution.** **Interviewee: Friso van der Burg, Zeta Solutions**	
Question A	
Synthesis of the answer	Analysis
The interviewee did not respond to this question.	No conclusions on national or regional policy alignment can be drawn from this interview.
Question B	
Synthesis of the answer	Analysis
The interviewee did not answer this question separately. However, his response to question C bears directly on the skills theme: companies in the EO sector often spend considerable time processing raw EO data or developing software solutions and algorithms that already exist elsewhere.	The duplication described is primarily an ecosystem and knowledge-circulation problem, but it carries a skills dimension. Alongside conventional technical competences, professionals need the ability to find out what already exists on the market, assess its suitability and integrate it into their own workflows. The response does not specify which competences are currently lacking, so this implication should be treated as indicative rather than established
Question C	
Synthesis of the answer	Analysis
The interviewee identifies the limited sharing and reuse of EO data, tools and solutions as one of the key challenges currently facing the sector. In his view, innovation uptake could be significantly	This is a concrete and actionable recommendation: a shared catalogue, marketplace or comparable knowledge infrastructure connecting existing EO outputs across companies, projects and

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accelerated if organisations had access to a central place where they could discover what is already available on the EO market, while also sharing and reusing existing products, services and algorithms. This would reduce duplication of effort, lower barriers to innovation, and enable companies to focus on creating new value rather than reinventing existing solutions.	research groups. Beyond its commercial function, such an environment could plausibly also serve educational purposes, giving students and professionals practical exposure to the tools and services already in use — although this extension goes beyond what the interviewee himself proposed.
Overall Assessment	
The interview frames the sector's main bottleneck as insufficient circulation of existing knowledge and technology rather than a lack of capability. Stronger mechanisms for discovery and reuse emerge as a clear, practical priority for improving innovation uptake in the Dutch EO ecosystem.	

Stakeholder profile: Higher-education and applied-engineering stakeholder involved in space-engineering education and practical satellite-development activities. Disclosure: Chatham House Rule.	
Question A	
Synthesis of the answer	Analysis
The respondent considers Earth Observation to have been a high priority within the Dutch government's relatively limited investment in the space sector, but notes that this investment has concentrated mainly on the upstream side: technology development and hardware. On the downstream side, attention has focused primarily on atmospheric observation, serving a predominantly institutional market. Space-based monitoring of land and water has received much less emphasis, partly because the Netherlands' small land area can often be covered effectively by UAVs where satellite data is unavailable. At the same time, the respondent observes that the vast availability of EO data from today's satellite constellations creates significant new opportunities, while foreign companies are investing more aggressively in this market and pushing the fragmented Dutch EO business base towards the margins.	The interview identifies a structural imbalance in the Dutch EO ecosystem. Strong upstream capabilities and internationally recognised atmospheric expertise coexist with a downstream sector that remains fragmented, largely institutional in orientation, and increasingly exposed to international competition. The respondent's own observation that “there is clearly a lot that can be done” suggests the constraint is not an absence of opportunity, but the continuity of investment and the limited commercial breadth of the domestic downstream base.
Question B	
Synthesis of the answer	Analysis
The respondent describes a longstanding challenge in broadening the downstream focus from an “atmosphere-only” orientation towards water and land applications, attributing this partly to insufficient funding to sustain all three domains in parallel. In their view, this has led to missed opportunities — including for the upstream sector,	The skills gap identified here is not primarily technical. It concerns the separation between upstream engineering and downstream application communities, which limits mutual understanding on both sides: of user requirements among those designing systems, and of technical possibilities and constraints among those applying the data.

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whose commercial growth has been constrained by the predominantly institutional character of atmospheric applications. For skills development specifically, the respondent argues for an integrated view of the full EO value chain: the users of EO data should talk deeply with the designers and builders of EO payloads.	Education that brings these groups into direct, sustained dialogue — rather than training them in isolation — follows naturally from this observation.
Question C	
Synthesis of the answer	Analysis
The respondent expects the European Union to develop more sovereign EO systems in order to become fully independent of non-EU providers, including the emergence of European companies capable of high-resolution, wide-wavelength imaging of the entire globe on a daily basis. Alongside the required upstream growth, the downstream sector will need to scale up to address the big-data challenges this implies. People will therefore need to be trained in working with data, and specifically in data fusion.	Strategic autonomy is presented here as a workforce challenge as much as an infrastructure one: expanded European observation capacity will deliver limited value without downstream professionals able to process, integrate and exploit the resulting data volumes. For the Dutch ecosystem, this points towards preparing for large-scale, multi-source and near-operational EO services rather than the relatively specialised institutional data use that has dominated to date.
Overall Assessment	
The interview depicts the Netherlands as strong in upstream engineering and institutional atmospheric observation, but weaker in integrated downstream market development, particularly for land and water applications. Future capacity building should connect the full EO chain and prepare professionals for data-intensive European services in a context of growing strategic autonomy.	

Stakeholder profile: Academic and applied-research stakeholder working at the intersection of satellite monitoring, environmental applications, public decision-making and practical experimentation. Disclosure: Chatham House Rule.	
Question A	
Synthesis of the answer	Analysis
The respondent observes that policymaking increasingly relies on EO data within risk-management systems, particularly to identify areas vulnerable to specific threats. During the actual response to disasters such as drought, flooding and heat stress, however, satellite remote sensing is generally not used: in the Netherlands, ground-based measurements remain the dominant source of operational information. This perspective is reflected in funding, which primarily supports short-term projects producing ad-hoc risk maps rather than long-term programmes that embed EO in operational decision-making.	The interview points to a gap between the analytical and the operational use of EO: the technology is accepted for planning and risk assessment, but not incorporated into the systems public authorities use day to day. As long as funding favours short-term demonstrations over long-term adoption, sustained operational demand is unlikely to develop — which in turn makes it difficult for companies and researchers to move from prototypes to lasting services
Question B	

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<table>
<tr><td>Synthesis of the answer</td><td>Analysis</td></tr>
<tr><td>The respondent identifies a substantial skills gap between those responsible for governance and those developing EO technologies and services. Aerospace engineering students are generally not trained to communicate within specific application domains such as hydrology, ecology or economics; conversely, ecological and hydrological experts working within governance structures are typically not trained in the complexities of EO and geospatial data analysis. The respondent notes that this issue is particularly acute in the Caribbean parts of the Kingdom of the Netherlands, on which a white paper was recently published.</td><td>This is a two-sided gap: technology developers lack application and stakeholder competences, while domain professionals lack EO and geospatial literacy. The practical consequence is a barrier to co-design — technical teams risk producing solutions that do not match decision-making needs, while public authorities may struggle to formulate requirements or evaluate the services on offer.</td></tr>
<tr><td colspan="2" align="center">Question C</td></tr>
<tr><td>Synthesis of the answer</td><td>Analysis</td></tr>
<tr><td>According to the respondent, operational monitoring of ecosystems under threat requires the consistent estimation of multiple essential variables within an information system suitable for policymakers. This calls for training experts who can:
- communicate with societal stakeholders across multiple thematic domains, including hydrology, ecology, climate and geopolitics;
- co-design environmental and urban digital twins;
- work confidently with multi-modal remote sensing to provide objective geospatial information;
- integrate observational data with forecasting models; and
- envision and develop new types of satellite monitoring.
The respondent also expressed concrete interest in the Living Lab concept, seeing it as a suitable site for linking sensor measurements to practical experiments and for capacity building around these techniques.</td><td>The professional profile described is deliberately broader than that of a conventional remote-sensing specialist, combining technical, interdisciplinary and governance-facing competencies. The respondent's direct interest in participating in a Living Lab is a practical signal for ROOT: the demand for shared experimentation environments exists not only in theory but among identifiable actors in the ecosystem.</td></tr>
<tr><td colspan="2" align="center">Overall Assessment</td></tr>
<tr><td colspan="2">The interview identifies the transition from EO-based analysis to routine operational use as the principal Dutch barrier. Addressing it requires longer-term implementation funding, professionals able to bridge technical and governance communities, and practical environments, such as Living Labs, where these communities can develop solutions together.</td></tr>
</table>

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Stakeholder profile: Research and talent-development stakeholder from astrophysics, an adjacent data-intensive scientific field with direct experience in satellite-data analysis. Disclosure: Chatham House Rule.	
Question A	
Synthesis of the answer	Analysis
The respondent considers EO to be used constructively in several contexts at both national and regional level, but identifies a discrepancy between the recognised relevance and use of these technologies and the funding actually available to optimise them.	This observation converges with Interview 4: policy recognition of EO does not automatically translate into the resources needed to develop and consolidate its use. The issue raised is one of implementation depth rather than awareness.
Question B	
Synthesis of the answer	Analysis
The respondent notes that astrophysicists are trained to use and analyse satellite data in the astronomical context and possess high-quality hard skills. What young researchers in the field lack is targeted, ad-hoc training that would allow them to transfer these competences into different contexts, from astrophysics to applied science.	This points to an underused talent pool adjacent to the traditional EO disciplines. The gap identified is not technical ability but occupational translation: researchers who already work with large observational datasets may not know how their competences map onto applied EO domains, markets and careers. Targeted transition programmes could convert this existing scientific talent into EO workforce capacity more quickly than building entirely new specialist pipelines — a conclusion that follows closely from the respondent's own framing.
Question C	
Synthesis of the answer	Analysis
The respondent expects that if AI becomes a common tool for space-data monitoring and routine data analysis, there will be an urgent need for scientists who are well trained in innovation and soft skills — both to diversify the scientific applications of Earth Observation and to supervise, monitor and control the outcomes of such analyses.	On this view, AI does not remove the need for EO expertise but changes its character: routine analysis is increasingly automated, while human roles shift towards oversight of automated outputs, interpretation, and the development of new applications. This supports broadening technical training with innovation and communication skills rather than narrowing it.
Overall Assessment	
The interview highlights a concrete opportunity: creating clearer transition pathways for researchers with transferable satellite-data skills from adjacent scientific disciplines, while preparing them for AI-enabled methods and applied societal challenges. The respondent also expressed willingness to contribute to the initiative directly.	

Stakeholder profile: Innovation and business-development specialist working with digital technologies, geospatial applications and challenge-based learning. Disclosure: Full attribution. Interviewee: Bulent Ozel, Lucid Minds	
Question A	
Synthesis of the answer	Analysis

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Bulent Ozel indicated that he was not sufficiently informed to answer this question.	No conclusions about Dutch policy can be drawn from this response. Without generalising from a single case, it is worth noting that EO policy and funding developments are evidently not always visible to innovation professionals working outside specialised space networks — a communication consideration relevant to any effort to broaden the EO ecosystem.
Question B	
Synthesis of the answer	Analysis
Ozel identifies fundamental GIS analytical skills and general data awareness as essential competencies.	This response provides a useful counterpoint to interviews focused on advanced engineering and research capabilities. Broader EO adoption depends not only on specialists but on a wider base of professionals with sufficient foundational literacy to work with geospatial information and judge when it can contribute to a business or societal challenge. Foundational GIS and data-literacy training can therefore serve as an accessible entry point into the EO ecosystem.
Question C	
Synthesis of the answer	Analysis
Given the feasibility of today's AI tools, Ozel recommends conducting more hands-on sessions in which societal, technical and business-related challenges are addressed, and solution ideas are experimenting with.	Challenge-based, AI-supported experimentation can make EO accessible to non-specialists because it starts from a concrete problem rather than satellite technology. AI tools lower the technical barrier to initial experimentation, though — consistent with the interviewee's own emphasis on data awareness — participants still need sufficient literacy to judge whether outputs are meaningful and reliable.
Overall Assessment	
The interview emphasises foundational literacy and practical experimentation. It suggests that the Dutch EO ecosystem should complement advanced specialist education with accessible, hands-on entry pathways for professionals from other sectors.	

8.4 Synthesis of the Interviews to Greek Stakeholders

Stakeholder profile: Industry, SME - enterprise software and engineering solutions for aviation and space **Disclosure: Chatham House Rule**	
Question A	
Synthesis of the answer	Analysis
Earth Observation and geospatial technologies are increasingly recognised in European and national digital transformation and environmental strategies, but their operational uptake remains	The interview highlights a gap between policy ambition and operational implementation. While funding and strategic priorities increasingly recog-

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uneven. While funding opportunities have expanded through programmes such as Horizon Europe and national innovation initiatives, policies often support technology development rather than long-term deployment and integration into operational workflows. Greater emphasis should be placed on facilitating collaboration between technology providers, public authorities and end users, ensuring that EO solutions move beyond research projects into everyday decision-making. Public procurement mechanisms could also play a stronger role in accelerating innovation uptake.	nise the value of EO technologies, greater emphasis is still needed on mechanisms that facilitate long-term adoption within public and private organisations. From an industry perspective, procurement and sustained collaboration emerge as key factors for translating innovation into operational services.
Question B	
Synthesis of the answer	Analysis
The greatest challenge is not the availability of geospatial data but the shortage of professionals who can transform these data into operational solutions for real-world problems. Companies increasingly seek multidisciplinary profiles combining software engineering, artificial intelligence, cloud computing, GIS and remote sensing with an understanding of specific application domains. Universities provide strong theoretical foundations, but graduates often lack experience with scalable software development, modern cloud architectures, DevOps practices and customer-oriented product development. Stronger collaboration between academia and industry through internships, challenge-based learning and applied projects would help bridge this gap.	The respondent identifies the primary skills gap as multidisciplinary rather than purely technical. Industry increasingly requires professionals capable of combining EO and geospatial expertise with software engineering, artificial intelligence and domain-specific knowledge, while also understanding product development and customer requirements. This underlines the importance of closer academia–industry collaboration to improve workforce readiness
Question C	
Synthesis of the answer	Analysis
Artificial intelligence, automation and cloud-native geospatial services will fundamentally reshape the EO sector over the next five years. Future capacity-building efforts should therefore focus on integrated training that combines EO, AI, software engineering and domain-specific knowledge. Open standards, interoperable platforms and greater reuse of existing algorithms and software components should be encouraged to reduce duplication of effort and accelerate innovation. Finally, stronger innovation ecosystems—bringing together companies, universities, public organisations and startups—will be essential for translat-	The interview suggests that the future competitiveness of the EO sector will depend on the convergence of EO, AI, cloud computing and interoperable digital platforms. Capacity-building initiatives should therefore promote integrated technical skills alongside stronger innovation ecosystems that facilitate collaboration, knowledge reuse and technology transfer. Such measures would support both innovation uptake and the creation of sustainable, high-value employment opportunities.

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ing technological advances into sustainable employment opportunities and internationally competitive products.	
Overall Assessment	
The interview highlights a clear transition of the EO sector from data availability and technology development towards operational adoption and value creation. Key challenges identified are the need to bridge the gap between research and market uptake, strengthen collaboration among stakeholders, and address the shortage of multidisciplinary skills combining EO, AI, digital technologies and domain expertise. Future capacity building should therefore focus on industry-oriented education, practical learning pathways and innovation ecosystems capable of transforming EO potential into sustainable services and employment opportunities.	

Stakeholder profile: Research, Public-Private Research Institute on Ecology and Biodiversity **Disclosure: Chatham House Rule**	
Question A	
Synthesis of the answer	Analysis
Earth Observation and geospatial technologies are becoming increasingly important for supporting water resources management and the implementation of European environmental legislation, particularly the Water Framework Directive and the Floods Directive. Satellite observations complement traditional field monitoring by providing spatially consistent information on water bodies, surrounding land use and environmental pressures. European programmes such as Copernicus have significantly improved data availability, while national and EU funding has encouraged the adoption of EO-based monitoring approaches. However, wider operational integration into routine environmental monitoring and water management still requires sustained institutional commitment beyond individual research projects.	The interview highlights EO as an important supporting tool for implementing European water policies rather than as a standalone technology. Although funding and policy frameworks increasingly encourage EO adoption, the transition from project-based applications to routine operational monitoring remains a key challenge for environmental authorities.
Question B	
Synthesis of the answer	Analysis
A major challenge is the limited number of professionals who combine expertise in hydrology, aquatic ecology and environmental legislation with EO and geospatial technologies. Environmental organisations increasingly require staff capable of processing satellite data, integrating them with in-situ measurements and translating the results into indicators that support policy implementation and water management decisions. Strengthening interdisciplinary education and practical training would help bridge this gap and	The respondent identifies the principal skills gap as interdisciplinary. Effective water monitoring requires professionals who understand both environmental processes and EO technologies, while being able to integrate multiple data sources and communicate scientific results within the framework of environmental policy and management.

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facilitate wider operational use of EO within the environmental sector	
Question C	
Synthesis of the answer	Analysis
Future environmental monitoring will increasingly rely on the integration of satellite observations with field measurements, automated sensor networks, UAVs and artificial intelligence to provide continuous information on the condition of aquatic ecosystems. Capacity-building initiatives should therefore promote multidisciplinary training in EO, hydrology, environmental monitoring and data analytics, while encouraging closer collaboration between research organisations, public authorities and technology providers. Long-term operational monitoring programmes will be essential for improving water management, supporting policy implementation and creating new employment opportunities in environmental services.	The interview emphasises the evolution of water monitoring towards integrated, multi-source observation systems capable of supporting evidence-based environmental management. It highlights the importance of multidisciplinary expertise, institutional collaboration and sustained operational monitoring in strengthening both policy implementation and workforce development.
Overall Assessment	
The interview underlines the growing role of EO and geospatial technologies in strengthening water resources management and supporting the implementation of EU environmental policies. The main barriers identified are the transition from project-based applications to operational services and the shortage of professionals with integrated expertise in EO, environmental sciences and regulatory frameworks. Future capacity building should therefore focus on interdisciplinary skills, practical training and stronger cooperation between research, public authorities and technology providers to enable the long-term adoption of EO-based solutions in environmental monitoring.	

Stakeholder profile: Public Administration, cadastral services **Disclosure: Chatham House Rule**	
Question A	
Synthesis of the answer	Analysis
Earth Observation and geospatial technologies have become increasingly important in supporting the digital transformation of public administration and the modernization of land administration systems. National initiatives aligned with European policies, including INSPIRE and Copernicus, have strengthened the availability and interoperability of geospatial information. EO data can complement authoritative cadastral datasets by supporting land monitoring, land-use change detection and environmental assessments. However, greater coordination between public institutions and wider integration of EO products into routine administrative processes would further enhance the efficiency and quality of public services.	The interview highlights the strategic role of EO within digital public administration and geospatial data infrastructures. While policy frameworks increasingly support interoperability and digital transformation, the respondent identifies stronger institutional coordination and operational integration as key priorities for maximizing the benefits of EO in land administration.

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<table>
<tr><th colspan="2">Question B</th></tr>
<tr><td>Synthesis of the answer</td><td>Analysis</td></tr>
<tr><td>Public organisations increasingly require professionals who combine surveying engineering, GIS and cadastral expertise with remote sensing, data management and digital technologies. Although technical knowledge remains essential, there is growing demand for skills related to spatial databases, data interoperability, automation and digital workflows. Continuous professional development is particularly important, as public authorities must keep pace with rapidly evolving geospatial technologies while ensuring the reliability and legal validity of official datasets.</td><td>The respondent emphasises that workforce needs are evolving alongside the digital transformation of public services. Beyond traditional surveying competencies, professionals increasingly require expertise in geospatial information management, interoperability and digital systems, highlighting the importance of lifelong learning and continuous upskilling.</td></tr>
<tr><th colspan="2">Question C</th></tr>
<tr><td>Synthesis of the answer</td><td>Analysis</td></tr>
<tr><td>Over the next five years, greater integration of EO, artificial intelligence and automated geospatial analysis is expected to improve the efficiency of land administration and public-sector decision-making. Capacity-building initiatives should strengthen practical skills in geospatial data management, cloud-based services and interoperability standards while promoting closer collaboration between universities, public authorities and technology providers. Investment in modern digital infrastructures and human capacity will be essential for delivering more efficient, transparent and data-driven public services.</td><td>The interview anticipates that EO will become an increasingly integrated component of digital land administration rather than a standalone technology. Future priorities focus on strengthening institutional capacity, developing digitally skilled professionals and fostering collaboration across academia, government and industry to support innovation in public geospatial services.</td></tr>
<tr><th colspan="2">Overall Assessment</th></tr>
<tr><td colspan="2">The interview highlights the strategic role of EO and geospatial technologies in modernising land administration and enabling more efficient, transparent and data-driven public services. The main challenges identified concern the integration of EO solutions into existing administrative workflows, the need for stronger institutional coordination and the shortage of professionals combining cadastral expertise with advanced digital and geospatial skills. Future capacity building should therefore focus on practical training, interoperability, automation and stronger collaboration between academia, public authorities and technology providers to support the digital transformation of public administration.</td></tr>
</table>

8.5 Outcomes from National Consultation

The national consultations conducted with stakeholders from Italy, Portugal, the Netherlands and Greece provide a consistent picture of Earth Observation (EO) as a strategic domain at the intersection of the green transition, digital transformation, environmental governance and the emerging space economy. Despite differences in national ecosystems and levels of EO maturity, stakeholders converge on a common message: the main challenge for the coming years is no longer access to EO data and technologies, but the ability to transform available

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information into operational knowledge through adequate skills, institutional capacity and innovation ecosystems.

EO and Skills Policy Relevance and Alignment

Across all countries, stakeholders recognize EO and geospatial technologies as increasingly relevant strategic assets supporting European and national policy priorities, including climate adaptation, environmental monitoring, disaster risk management, sustainable agriculture, water management, digital public administration and territorial planning. The European policy framework, particularly through initiatives such as Copernicus, the EU Space Programme, Horizon Europe, Digital Europe and the Green Deal, has created strong momentum for the development and uptake of EO-based solutions.

However, the consultations highlight a ***persistent gap between policy recognition and effective operational adoption***. While major investments have strengthened EO infrastructures and data availability, the integration of EO into routine decision-making processes remains uneven. This challenge is particularly visible within ***public administrations, where EO is often still used through temporary projects, pilot actions or research initiatives rather than being embedded into institutional workflows***.

National experiences show different manifestations of this gap. ***Italy*** demonstrates strong alignment with European priorities through initiatives such as Copernicus uptake, the PNRR and the IRIDE constellation, but ***stakeholders highlight the need to translate these investments into widespread operational use***. ***Portugal*** presents a favourable policy environment supported by national strategies such as Portugal Space 2030 and European funding programmes, while still facing ***challenges in converting technological potential into market and societal impact***. In the ***Netherland***s, a mature space ecosystem and strong upstream capabilities coexist with a ***fragmented downstream market***, where the connection between EO innovation, applications and workforce development requires further strengthening. **Greece** shows growing recognition of EO within environmental and digital transformation policies, but stakeholders emphasise the need to ***move from technology-oriented investments towards long-term deployment strategies***.

A transversal outcome emerging from all consultations is that ***skills development should become an integral component of EO policy strategies rather than being addressed as a complementary or project-based activity***. Current policy frameworks increasingly support technological development, but human capital development, workforce planning and capacity building are not always systematically integrated into EO strategies.

Skills Needs and Barriers

The consultations clearly identify skills availability and capacity building as one of the main bottlenecks limiting the wider adoption and market uptake of EO. Across countries and stakeholder categories, the challenge is not a lack of interest in EO or insufficient access to data, but rather the ***shortage of professionals able to interpret, integrate and exploit EO information in specific operational contexts***.

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A major finding is the ***growing demand for hybrid professional profiles*** combining EO and geospatial expertise with complementary competences such as:

- Artificial Intelligence and Machine Learning;
- data science and advanced analytics;
- cloud computing and digital infrastructures;
- GIS, spatial databases and interoperability standards;
- sector-specific knowledge (e.g. agriculture, water management, climate adaptation, urban planning);
- innovation management, communication and user-oriented product development.

Stakeholders consistently highlight that traditional EO or remote sensing expertise alone is no longer sufficient. The future workforce will need professionals capable of acting as intermediaries between technology providers, data producers and end users, translating complex datasets into actionable information and supporting evidence-based decisions.

Future Trends and Recommendations

The interviews provide a forward-looking vision of EO development, highlighting a transition from data availability towards data exploitation, integration and value creation. Future EO careers and services will increasingly depend on the capacity to transform large volumes of heterogeneous data into reliable information supporting decisions.

Several major trends emerge:

- **AI-driven EO exploitation**: Artificial Intelligence will increasingly reshape EO workflows by supporting automated analysis, pattern recognition and generation of ready-to-use information products. This will shift professional roles from data processing towards interpretation, validation, application design and strategic use of information. Future professionals will need combined competences in EO, AI and domain-specific applications.
- **Integration of multiple observation sources**: The future EO ecosystem will rely on the combination of satellite observations with in-situ measurements, IoT networks, UAV data, sensor infrastructures and digital twins. This requires professionals able to manage complex data environments and develop integrated information services.
- **Growth of application-oriented EO services**: Stakeholders highlight that the future competitiveness of the EO sector will depend on demonstrating concrete value for users. EO specialists will increasingly need to understand sectoral challenges and participate in co-design processes with end users.
- **Increasing importance of innovation ecosystems and Living Labs**: Collaboration between universities, research organisations, companies, public authorities and users emerges as a key condition for successful EO adoption. Practical experimentation environments, Living Labs and challenge-based approaches are considered effective mechanisms to connect skills development with real societal and economic needs.

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Overall, the national consultations confirm that the **future growth of the EO sector will depend less on technological availability and more on the capacity of European regions to develop the human capital, organisational readiness and collaborative ecosystems** required to transform EO data into sustainable economic and societal value.

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9. SWOT Analysis at European Level

The analysis of the European policy framework demonstrates that the European Union has established one of the world's most comprehensive ecosystems supporting Earth Observation (EO), combining research and innovation policies, digital transformation, sustainability objectives, open data infrastructures and skills development initiatives.

However, despite this favourable policy environment, **important gaps remain between strategic ambitions and the practical development of EO-related careers**. The SWOT analysis below synthesises the common findings emerging from the analysis of EU policies and the four participating countries.

Strengths	
Strong strategic policy framework	EO is embedded across major EU strategies including the EU Space Programme, Copernicus, Horizon Europe, the Green Deal, Digital Europe, the Digital Decade and the Pact for Skills.
World-leading EO infrastructure	Copernicus provides free, reliable and globally recognised Earth Observation data, creating an exceptional foundation for innovation and workforce development
High political commitment	Space technologies and EO are increasingly recognised as strategic assets for competitiveness, resilience, environmental monitoring and digital sovereignty
Cross-sector relevance	EO supports multiple economic sectors including climate adaptation, agriculture, mobility, energy, marine environments, urban planning, disaster management and security.
Growing support for innovation ecosystems	EU policies increasingly promote collaboration among universities, research organisations, industry, public authorities and SMEs through innovation ecosystems and quadruple helix approaches.
Weaknesses	
Fragmented skills landscape	EO skills are addressed indirectly through digital or STEM policies, while dedicated EO competence frameworks remain limited.
Weak visibility of EO careers	Career pathways in EO are poorly understood outside specialised communities, reducing attractiveness for students and adult learners.
Gap between education and labour market needs	Universities, vocational education and employers are often insufficiently connected, leading to skills mismatches
Uneven implementation across Member States	While EU strategic priorities are shared, national implementation capacities differ considerably, producing fragmented ecosystems
Limited lifelong learning opportunities	Continuous upskilling and reskilling opportunities specifically targeting EO professionals remain insufficient

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Weak integration of career guidance	Existing education and employment services rarely provide structured guidance on emerging EO professions
Opportunities	
Growing demand for EO professionals	Climate change, environmental monitoring, digital twins, AI, smart cities and resilience policies are generating increasing demand for EO expertise
Integration with AI and data technologies	Combining EO with artificial intelligence, big data, digital twins and geospatial analytics creates entirely new professional profiles
Expansion of downstream markets	Copernicus services and New Space initiatives continue to stimulate new businesses, SMEs and start-ups across Europe.
Union of Skills implementation	Ongoing initiatives on micro-credentials, lifelong learning and skills intelligence create favourable conditions for specialised EO training
Regional Smart Specialisation Strategies	S3 strategies provide opportunities to tailor EO skills development to regional economic priorities and innovation ecosystems
International competitiveness	Europe can strengthen its global leadership by developing a highly qualified EO workforce able to support emerging markets
Threats	
Persistent skills shortages	Demand for digital and geospatial professionals may continue to outpace the supply of qualified specialists
Global competition for talent	Highly skilled EO professionals are increasingly attracted by international markets outside Europe
Rapid technological evolution	Education systems may struggle to update curricula quickly enough to reflect AI, cloud computing, digital twins and new EO applications
Fragmentation between policies	Skills, education, research and space policies are often developed separately, limiting their combined impact
Unequal regional capacities	Less developed innovation ecosystems may struggle to benefit fully from EU opportunities.
Limited awareness among employers	Many sectors that could benefit from EO technologies are still unaware of available services and required competences, slowing labour market growth.

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10. Recommendations

Based on the analysis, the ***following recommendations are proposed***:

1.Develop a European EO skills ecosystem

Strengthen coordination between education providers, research organisations, industry, public authorities and innovation ecosystems, building on the policy mapping and stakeholder analysis developed in T2.1, to support coherent EO skills ecosystems development across Europe that support the implementation of the career pathways (WP3) and the Living Labs (WP4).

2.Improve visibility of EO careers

Increase awareness of EO professions through career guidance, outreach activities and communication targeting schools, universities, vocational education and adult learners, using the results of T2.1 as the basis for career guidance materials and awareness campaigns developed in WP3 and WP5.

3.Align education with labour market needs

Promote closer cooperation between employers and education providers to regularly update curricula according to emerging technological and industrial requirements, to ensure that training provision remains aligned with current and future EO workforce needs.

4.Strengthen lifelong learning

Expand flexible training opportunities, including micro-credentials, short courses and professional upskilling programmes addressing emerging EO applications, supporting the learning pathways developed in WP3.

5.Foster interdisciplinary competences

Support educational programmes combining EO with artificial intelligence, geospatial technologies, data science, digital twins, environmental sciences and domain-specific expertise, reflecting the cross-sectoral skills demands identified and validated through stakeholder engagement activities.

6.Support regional innovation ecosystems

Encourage stronger links between Smart Specialisation Strategies, regional innovation hubs and EO skills initiatives to respond to local labour market needs, using the regional policy

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mapping carried out in T2.1 to tailor interventions and facilitate the territorial integration of the Living Labs developed in WP4.

7.Enhance policy coordination

Improve coherence between space, education, digital, employment and innovation policies to create integrated pathways supporting EO workforce development, building on the policy framework analysed and facilitating the long-term institutional integration and sustainability actions addressed in WP4 and WP6.

8.Strengthen evidence-based monitoring

Develop common indicators to monitor EO skills demand, workforce evolution, education outcomes and career opportunities across Europe, extending the evidence base established in T2.1 and supporting continuous policy evaluation, project impact assessment and future exploitation activities under WP6.

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11. Conclusions

The policy analysis confirms that the European Union has developed a highly coherent strategic framework supporting Earth Observation through research, innovation, digitalisation, sustainability and space policies. Across all four analysed countries—Italy, Portugal, the Netherlands and Greece—the national policy frameworks broadly reflect these European priorities and demonstrate a strong commitment to fostering innovation ecosystems where EO technologies can contribute to economic growth, environmental sustainability and digital transformation.

Nevertheless, the analysis also reveals a common structural challenge. While Earth Observation is increasingly recognised as an enabling technology across multiple policy domains, considerably less attention is given to the development of the human capital required to fully exploit these opportunities. EO-related competences are generally embedded within broader digital, STEM or innovation strategies rather than addressed through dedicated workforce development policies.

The comparison between EU and national frameworks further highlights a persistent implementation gap. Policies successfully promote research excellence, technological innovation and open data infrastructures, yet stronger mechanisms are still needed to connect education providers, research organisations, industry, public authorities and learners throughout the entire skills pipeline. Career guidance, lifelong learning, reskilling opportunities and labour market intelligence remain underdeveloped components of the EO ecosystem.

The findings therefore confirm that ***Europe's challenge*** is no longer the availability of EO technologies or policy support, but rather ***the capacity to translate these assets into sustainable careers and a sufficiently skilled workforce***. Addressing this gap is essential for maintaining Europe's competitiveness in the rapidly evolving space and digital economy.

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Annex 1:

Table 1. SWOT Analysis per ROOT Country

Country	Strengths	Weaknesses	Opportunities	Threats
NL	– ESTEC anchors ~40% of space employment; 10,000+ jobs; EUR 522 m public investment to 2025. – Long-Term Space Agenda (2024): five ministries, six missions to 2035, Cabinet-endorsed. – EU's strongest digital base: 82.7% basic digital skills (1st of 27); ICT specialists 7%. – Mature downstream tradition: TROPOMI, Satellietdataportaal, operational EO (Rijkswaterstaat, CAP). – Deal-based skills machinery: Growth Fund skills roadmaps; Zuid-Holland HCA - training must be 'demand-driven, flexible, modular, skills- and certificate-oriented'; skills passports.	– Fails ESA investment norms; LTR states +EUR 60 m/year needed. – EO absent from every skills instrument; shortage pathways name ICT/energy, never EO. – ICT shortage persists; female ICT share falling (18.7%); HE budget cuts. – Low-skilled retraining trap: 'no funding opportunities... nor an employer willing to fund retraining' (JRC). – Recognition without programming: no Growth Fund vehicle for EO, unlike AI or quantum.	– NTS names EO among ten key technologies (EUR 14 bn agendas) - programme slot open. – Defence demand: space as fifth operational domain (DSII 2025-2029). – EU Space Skills Academy / SPACE4GEO awaits a national counterpart - first-mover advantage. – Zuid-Holland Actieagenda ranks LaserSatCom top-3 value chain; proven deal mechanism beside the cluster.	– ESA subscription under fiscal pressure; commitments only to 2028. – Talent competition from semiconductors, AI, energy. – LTR's tripling ambition throttled by its own unmet human-capital condition. – HE cuts narrow the pipeline for advanced geo-data profiles.
GR	– Strong STEM pipeline: 33.7% of tertiary students (EU 26.9%). – Space + digital centralised in one ministry; HSC as executive arm. – Sovereign assets incoming: 13 EO microsatellites, 2 ICEYE SAR, 4 FOREST thermal ('Hellenic Fire System'), RRF-funded, ESA-managed. – si-Cluster: ~80% of actors, ~3,000 employees, ~EUR 250 m turnover; ESA BIC (Corallia). – Six ESA contracts (Nov 2024) operationalising monitoring services.	– Lowest EU ICT-specialist share (2.4%); basic digital skills 52.4%, stalled since 2021. – Severe brain drain, strong STEM output, weak retention. – Space strategy for human–capital language is almost entirely aspirational. – Skills narrative rests on one document (Digital Transformation Bible); satellites appear only in acronym lists.	– New constellations create visible domestic EO careers for the first time. – RRF reskilling is large but expiring (42% of EUR 6.1 bn lapses end-2026) - closing window. – Digital Decade directs, in binding terms, alignment of reskilling 'to the demand in the economy'. – CAP already trains innovation intermediaries - a carrier for EO content. – AI Factory, quantum communications, chips competence centre.	– RRF expiry cliff end-2026; sustainability unproven. – Without retention, training subsidises other countries' workforce. – Thinnest documented skills-policy base of the four. – Skills must arrive with the satellites (2025-2026) or services underperform.
IT	– Third ESA contributor (EUR 881.2 m, 17%); ESRIN - ESA's EO centre - at Frascati. – Space Economy Law 89/2025: single-window authorisation, SME quota >=10%, EUR 35 m Fund (70% grants). – IRIDE: EUR 1.07 bn, 70+ companies, 31 satellites by mid-2026, services online July 2026. – EUR 4.5 bn space economy, 15,000+ employees; EO services EUR 340 m (+73% vs 2022).	– R&D ~1.3% GDP (EU 2.2%); Moderate Innovator. – Digital Decade (binding): 'below-EU-average basic digital skills and ICT specialist shortages'. – Revenue growth without jobs: very large firms +3.8% employment (2024). – Training offer “fragmented” with “responses often delayed in time” - Emilia-Romagna S3's own words.	– PNRR skills machine: GOL 2.5 m+ enrolled (target 3 m), New Skills Fund, binding MOOC reskilling - all could carry EO profiles. – IRIDE rollout (July 2026) creates immediate public-user training demand. – Space Economy Fund + SME quotas favour downstream SMEs. – Piedmont S3 funds digital skills strengthening priority systems - one step from naming EO.	– PNRR dependence - 'bubble' risk when funds end (PoliMi observatory). – Proposed ESA contribution cut (~EUR 800 m from 2025). – Brain drain of technical graduates. – Skills lag would throttle IRIDE services at the 2026–2027 scale-up.

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Country	Strengths	Weaknesses	Opportunities	Threats
	– Aerospace districts in S3s (Lazio, Piedmont, Lombardy, Apulia); Emilia-Romagna builds “skills intelligence between technology foresight and skills foresight”.	– Space documents thin on skills; human capital sits in PNRR and S3s.	– ESRIN and ESA BICs (Lazio, Padua) as training anchors.	
PT	– Coherent triad: Space 2030 + PT Space (2019, Azores HQ) + DL 16/2019; law's first axis: 'boost the exploitation of space data... through space-based services and applications'. – Budget EUR 55 m (2018) to EUR 135 m (2024); ESA commitment EUR 204.8 m/5 yrs; 102% geo-return. – EUR 1.2 bn GDP contribution 2019-2024; ~4,500 jobs/year. – ICT specialists 5.2%, +13% year-on-year; female share 22.7%. – First spaceport licence (Santa Maria, Aug 2025); AED cluster 160+ entities, 87% exports; ESA BIC Coimbra; ESERO at Ciencia Viva.	– Concentration: 76% of revenue from 14 firms; no company >200 space employees. – Basic digital skills (~56%) improving slower than the EU average (binding language). – Space 2030 skills axis is outreach ('attracting future generations'), not a training programme. – INCoDe.2030 and Emprego + Digital generic; EO unnamed.	– Atlantic Constellation + Digital Planet platform: sovereign demand needing trained users at deployment. – Digital Skills Pact Action Plan 2026-2030 just approved - open programming window. – Emprego + Digital already delivers sector-specific reskilling - ready carrier for an EO module. – Azores as living lab (spaceport; regional government co-owns PT Space). – S3 'collective skills actions' as the regional mass-training instrument.	– Concentration risk: national statistics ride on 14 firms. – Talent competition and emigration pressure persist. – Sector evidence rests on one commissioned study (Novaspace); milestones are projections. – RRF wind-down affects Emprego + Digital / UpSkill continuity.

Table 2. PESTEL Analysis - all countries

Dimension	Netherlands	Greece	Italy	Portugal
Political	– Five-ministry consensus behind the LTR; Cabinet endorsement Feb 2025; fiscal restraint on ESA subscription and higher education.	– Space + digital centralised (Ministry of Digital Governance & AI); new HSC leadership 2025; stable pro-digital agenda.	– Space as explicit industrial policy (COMINT under the PM; MIMIT); proven law-making capacity (89/2025).	– Cross-party continuity behind Space 2030 since 2018; Azores government inside the national agency.
Economic	– EUR 522 m to 2025; 10,000+ jobs; Innovation Leader; Growth Fund proves the mission-scale model (AiNed, QDNL) - EO the only named key technology without one.	– RRF-driven (~EUR 60 m microsat tranche in ~EUR 200 m umbrella); Moderate Innovator; funding abundant and expiring - economics reward speed.	– EUR 4.5 bn space economy; EUR 7.8 bn aerospace commitments to 2028; EO services +73% since 2022; R&D 1.3% of GDP.	– Fastest GDP growth of the four (2.3-4.5%); EUR 290 m/year sector tax return; strong FDI; Moderate Innovator.
Social	– Tight labour market, no brain drain; falling female ICT share (18.7%); strong adult-learning culture ('loopbaan-APK').	– Acute brain drain; strongest STEM enrolment (33.7%) against weakest adult digital skills (52.4%) - retention, not production, is the problem.	– Brain drain and below-EU basic digital skills; engineering tradition concentrated in the districts - delivery should follow the districts.	– ICT specialists +13% year-on-year (5.2%); female share 22.7%; 'Girls in STEM'; emigration pressure remains - guidance should claim the rising cohort for EO.

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Dimension	Netherlands	Greece	Italy	Portugal
Techno-logical	– Top connectivity; AI/quantum programmes; Satellietdataportaal; TROPOMI heritage; 500+ PB Copernicus with growing user base - lowest EO entry barrier in the EU.	– EO microsats, SAR and thermal sensing incoming; AI Factory; quantum communications; sovereign fire/land/water data stream from 2026.	– IRIDE (~68 satellites planned; 31 in orbit mid-2026); Space Factories; AI-on-satellite - multi-sensor sovereign stream needing analysts at scale.	– Atlantic Constellation; Digital Planet EO platform; 5G; digital twins - training must precede launch, not follow it.
Environ-mental	– Water management (Deltaprogramma), adaptation, nitrogen/land-use pressure; CAP satellite monitoring - standing public EO demand, currently unnamed.	– Wildfire as the defining EO driver ('Hellenic Fire System'); water scarcity; CAP monitoring - EO literacy as civil-protection capability.	– Hydrogeological/landslide risk as core driver (IRIDE public services); wildfire; coastal erosion; the Italian extended CAP plan is among the densest skills documents in the corpus.	– Forest fires; Atlantic/marine monitoring - Portugal's natural specialisation niche; CAP monitoring; adaptation.
Legal	– Space Activities Act 2007 + 2015 Unguided Satellites Decree (covers smallsats); EU Space Act (from 2030) adds compliance skills demand.	– Law 4508/2017 (+4643/2019) licensing regime; EU Space Act from 2030 - regulatory-skills demand on top of operations.	– Law 89/2025 in force: authorisation, registry, insurance ceilings (EUR 100/50/20 m) - compliance professions created overnight; EU Space Act interplay.	– DL 16/2019 (am. DL 20/2024), ANACOM authority, compulsory-insurance order; only regime already tested by a licensing decision (spaceport, Aug 2025).

Table 3. Policy Coherence

Country	Vertical coherence (EU - national - regional)	Horizontal coherence (space - skills - user sectors)
NL	– Strong. LTR positions investment against ESA norms and the EU Space Programme; sustained Copernicus commitment since 'De ruimte voor het gebruik'. – Digital Decade roadmap (59 measures, EUR 5.25 bn); RIS3s meet Cohesion enabling conditions - RIS3 Zuid treats skills across the education chain as an “essential framework condition”.	– Weak-moderate. Five-ministry LTR endorsement is exceptional, but skills are owned by education, social affairs and provinces - none reference space; Zuid-Holland HCA shortage pathways omit EO beside ESTEC. – Users (water, agriculture, planning) consume EO daily without naming it; CAP satellite monitoring has no linked training.
GR	– Strong in structure. Digital Decade roadmap (125 measures, EUR 6.1 bn); microsatellite programme ESA-managed; monitoring services aligned with Copernicus; Artemis Accords (Feb 2024). – Regional layer thin: si-Cluster in Attica's S3, but S3s are not skills carriers.	– Mixed. Space and digital uniquely in one ministry - shortest institutional path of the four - but education and labour sit elsewhere; the Bible (skills) and the space strategy (EO) never cross-reference. – CAP trains innovation intermediaries in soft skills without naming the satellite systems they will serve.
IT	– Strong. COMINT under the PM; PNRR channelled through ESA (IRIDE); 21 regional S3s + national S3; EP rapporteur on the EU Space Act provided by Italy. – Aerospace named in four regional S3s - the strongest regional space layer of the four.	– Weak. Space with PM/MIMIT, skills with Labour (GOL/ANPAL) and Education; no space-skills coordination body. – PNRR reskilling commitments never reference geospatial profiles; Emilia-Romagna's skills intelligence unconnected to district demand; IRIDE user sectors have no training line.
PT	– Strong. Space 2030 anchored in EU Council 'Space Strategy for Europe' conclusions; record ESA commitment; Digital Decade roadmap (EUR 854 m). – Only genuinely multi-level governance of the four: the Azores regional government co-founded the national agency.	– Moderate. PT Space bridges research, innovation, defence and the Azores, but skills sit with education/labour; Space 2030 and INCoDe.2030 do not cross-reference. – Sectoral demand (fires, Atlantic monitoring, CAP) recognised without a training link; S3 lists AI/robotics/sensing skills - EO implied, never named.

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Annex 2:

Table 4. Gap Analysis

Dimension	Netherlands	Greece	Italy	Portugal
EO in skills policy	– Gap: EO absent from all skills instruments and shortage lists. – Bridge: insert an EO pathway into the Zuid-Holland HCA deal - mechanism proven, cluster next door.	– Gap: no EO in national reskilling; satellites only in acronym lists. – Bridge: attach EO modules to RRF re-skilling before end-2026 expiry.	– Gap: GOL / New Skills Fund name digital, never geospatial. – Bridge: EO modules inside GOL in the district regions (Lazio, Piedmont, Apulia).	– Gap: INCoDe.2030 / Emprego + Digital generic. – Bridge: write EO into the just-approved Digital Skills Pact Action Plan 2026-2030.
Skills in space policy	– Gap: LTR names human capital as a condition; no instrument. – Bridge: EO Growth Fund proposal (or NTS action agenda) with a talent line, as AiNed/QDNL have.	– Gap: space strategy aspirational on skills. – Bridge: operator/analyst training tied to the six ESA service contracts and the fire system.	– Gap: Law 89/2025 and IRIDE silent on training. – Bridge: use the Space Economy Fund's 70% grants for SME capability-building.	– Gap: outreach axis without a training programme. – Bridge: PT Space + ESA BIC Coimbra training line tied to the Atlantic Constellation.
Funding	– Gap: NLSA instruments lack skills components; generic funds EO-blind. – Bridge: route EO content through ESF+ and regional deals - no new instrument needed.	– Gap: RRF-dependent and expiring. – Bridge: programme EO into ESF+/ERDF with si-Cluster as delivery partner.	– Gap: PNRR-heavy and expiring. – Bridge: S3/ERDF in district regions + New Skills Fund refinancing with EO content.	– Gap: space budget grown but skills-blind; RRF instruments ending. – Bridge: ESF+/ERDF (incl. Azores) + sectoral EO module in UpSkill / Emprego + Digital.
Delivery	– Gap: world-class modular infrastructure (skills passports) without EO content. – Bridge: ROOT training and guidance pilots in the Zuid-Holland Living Lab.	– Gap: fragmented, single-document skills base. – Bridge: universities (ESERO at AUTh) + si-Cluster academy + ESA BIC.	– Gap: fragmented, delayed training offer (per E-R S3 itself). – Bridge: scale E-R skills intelligence to the districts; ESRIN / ESA BIC partnerships.	– Gap: strong nodes (IPN Coimbra, Ciencia Viva) not forming an EO pathway. – Bridge: ROOT-type modular training delivered with the AED cluster.
Demand articulation	– Gap: public bodies use EO daily, unnamed - invisible to learners. – Bridge: advisory/training modules naming the satellite data behind CAP and water obligations.	– Gap: demand arriving on orbit; users are untrained. – Bridge: career guidance built on the concrete demand for microsatellites and monitoring programmes.	– Gap: IRIDE services online (July 2026); public users untrained. – Bridge: user training synchronised with 2026-27 service rollout.	– Gap: sovereign data imminent; user base untrained. – Bridge: synchronise user training with constellation and platform deployment.

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