D 6.5 Long-term Action Plan

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Work package / Task:

WP6 – Developing a long-term Action Plan
T6.5 – Long-term Action Plan

Short Description:

This deliverable presents a long-term action plan for the promotion and future exploitation of the outputs developed by the EO4GEO Alliance as well presenting information on how the Alliance will operate and be sustained in the year to come.

Keywords:

Long-term Action Plan; exploitation, Alliance, engagement; impact

Dissemination Level		
PU	Public	X
RE	Restricted to other programme participants (including Commission services and project reviewers)	
CO	Confidential, only for members of the consortium (including EACEA and Commission services and project reviewers)	

Revision History:

Revision	Date	Author(s)	Status	Description
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0.2	18-Nov-2020	Kevin Ramirez Emanuele Barreca	Draft	Additional elements were added to the table of content and more elements were added to the content
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0.4	10-Jun-2021	Kevin Ramirez	Draft	Initial information was collected from other tasks of WP6
0.5	2-Sep-2021	Kevin Ramirez	Draft	The original table of content was reviewed and updated
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2.1	30-Jun-2022	Kevin Ramirez	Updated version	Annex I and II up-dated with final versions of MoU and Network Agreement

Executive Summary

The long-term action plan (LTAP) is intended to stimulate and guide activities supporting the exploitation and future use of the main results arising from the EO4GEO Alliance. The Alliance has developed a series of outputs and tools specifically addressing the existing educational and skills gap present in the EO*GI sector. Funded by the Education, Audio-visual and Cultural Executive Agency from the European Union (EACEA) under the Blueprint for Sectoral Cooperation on Skills, the EO4GEO project is transitioning into the EO4GEO Alliance. The original 25 consortium members and the 50+ associated partners are now in the process of consolidating and giving shape to the EO4GEO Alliance which is expected to be a leading organisation in EO*GI skills development in Europe.

This document was prepared with the main purpose of illustrating how the specific strategic and operational objectives described in the Sector Skills Strategy in Action for the Earth Observation (EO) and the Geoinformation (GI) sector can be made operational. The document also presents a road map for sustaining the EO4GEO Alliance in the long-term. This has been done by harvesting insights from key deliverables of the project addressing instrumental components of the sustainability of the EO4GEO Alliance.

The long and mid-term goals were specified in the Sector Skills Strategy in Action. The core purpose of the LTAP is to specify the actions required to reach those goals.

The main components of this road map are the following:

- Specifying and implementing a suitable governance model and structure for the Alliance
- Specifying and implementing a business model and plan for the financial sustainability of the Alliance
- Specifying and executing actions for the multiplication, mainstreaming and impact of the Alliance results
- Executing actions for the maintenance and roll-out of the technical components developed by the Alliance
- Execution of additional core activities assuring that the Alliance reach its goals

The efforts made in presenting a detailed list of activities to drive the operation of the EO4GEO Alliance combined with the insights making the different components of the sustainability roadmap for its operation aims to make this LTAP a robust source of information for the members of the Alliance as well as for other relevant stakeholders willing to support the effective implementation of the Sector Skills Strategy.

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Acronyms

Acronym	Description
AI	Artificial Intelligence
BoK	Body of Knowledge
BP	Business Plan
CEDEFOP	European Centre for the Development of Vocational Training
Climate-KIC	Climate Knowledge and Innovation Community (KIC)
CoVEs	Centres of Vocational Excellence
DG-DEFIS	DG for Defence Industry and Space
DG-EMPL	DG for Employment, Social Affairs, and Inclusion
DG-GROW	DG Internal Market, Industry, Entrepreneurship and SMEs
DG-RTD	DG for Research and Innovation
EACEA	Education, Audio-visual, Culture Executive Agency
EARSC	European Association of Remote Sensing Companies
EARSeL	European Association of Remote Sensing Laboratories
EC	European Commission
EO	Earth Observation (inc. Meteorology)
EO*GI	EO and GI sectors
EQF	European Qualifications Framework
ESCO	European Skills, Competences, Qualifications and Occupations
EU	European Union
GEO	Group on Earth Observations
GI	Geographic Information
GISIG	Geographic Information System International Group
JRC	Joint Research Centre of the European Commission
LTAC	Long Term Action Plan
MOOC	Massive Open Online Course
NEREUS	Network of European Regions Using Space Technologies
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
OGC	Open Geographical Consortium
RS	Remote sensing

SME	Small and Medium Enterprises
SSS	Sector Skills Strategy
UAV	Unmanned Aerial Vehicle
UCGIS	University Consortium for Geographic Information Science
UN	United Nations
UNEP	United Nations Environmental Programme
UN-GGIM	UN Committee of Experts on Global Geospatial Information Management
VET	Vocational Education and Training

1   Introduction

1.1   EO4GEO project

EO4GEO is an **Erasmus+ Sector Skills Alliance** gathering **25 partners** and supported by a strong group of Associated Partners[1] **from 16 EU countries**, most of which are part of the **Copernicus Academy Network**. Be they from academia, public or private sector, they are all active in the education and training fields of the space/geospatial sector. The project is also supported by a strong group of Associated partners mostly consisting of associations or networks active in the space/geospatial domain. The project started on January 1st, 2018, upon approval by the EU Education, Audio-visual, and Culture Executive Agency (EACEA) and runs over 54 months.

EO4GEO **aims to bridge the skills gap in the space/geospatial sector** by creating a strong Alliance of players from the sector/community reinforcing the existing ecosystem and **fostering the uptake and integration of space/geospatial data and services**. EO4GEO works in a **multi- and interdisciplinary** way and applies innovative solutions for its education and training actions including case-based and collaborative learning scenarios; learning-while-doing in a living lab environment; on-the-job training; co-creation of knowledge, skills, and competencies; etc.

EO4GEO defines a **long-term and sustainable strategy** to fill the gap between supply of and demand for space/geospatial education and training considering the current and expected technological and non-technological developments in the space/geospatial and related sectors (e.g., ICT). The strategy is implemented by: creating and maintaining an ontology-based Body of Knowledge (BoK) for the space/geospatial sector based on previous efforts; developing and integrating a dynamic collaborative platform with associated tools; designing and developing a series of curricula and a rich portfolio of teaching/learning units directly usable in the context of Copernicus and other relevant programmes and conducting a series of training actions for a selected set of scenarios in three sub-sectors - integrated applications, smart cities and climate change - to test and validate the approach. Finally, a long-term Action Plan is being developed and endorsed to roll-out and sustain the proposed solutions.

For more information on the project please visit http://www.eo4geo.eu/about-eo4geo/.

1.2   Objectives of the work package

Work package 6 (WP6) aims to develop the necessary mechanisms required to ensure the long-term sustainability of the EO4GEO Alliance, whose main components are illustrated in Figure 1, and the current and future outcomes emerging from its operation. This would allow a sustainable and systematic collaboration between all the actors involved in education and training throughout all the parts of the space/geospatial value chain.

The following are the main objectives of the work package:

- To define possible long-term governance structures and mechanisms for the Alliance

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[1] 53 associated partners as of 2nd June 2022

- To identify the financial resources needed to execute the Action Plan and the possible sources of funding
- To find mechanisms for mainstreaming the activities, maximising their impact, and creating multiplier effects
- To highlight how the project outputs can be rolled out and maintained in a systematic way after the project lifetime
- To embed in a unique long-term action, plan the key aspects needed to sustain the project outputs from the day after the project closure up to 10 years and beyond

Further developments identified by the 5 Working Groups	New outputs to be developed (after the project end)
WHAT to do in details after the project end	

Sector skills strategy (SSS) in Action (Vision, mission, goals, 5 strategic objectives, 15 specific objectives of the space/geospatial sector)	Long-term action plan • Governance model (of the Alliance) • Business plan (of the Alliance) • Mainstreaming, impact and multiplication approach (of the ecosystem) • Maintenance and roll-out plan (of the ecosystem)
WHAT to do for the EO*GI sector and WHY	HOW to sustain the ecosystem

11 project outputs already developed (during the project lifetime)
HOW to enable the EO4GEO approach from business processes and curricula to training offers, leveraging the Body of knowledge

EO4GEO Alliance (Entity whose value proposition is to play a leading role in the implementation of the Sector skills strategy)
WHO will sustain the ecosystem

Figure 1 – Main components of the EO4GEO ecosystem

This approach integrates the outputs and different results developed along the EO4GEO project as well as new ideas proposing alternatives and scenarios to manage the current and future developments of EO4GEO as an Alliance.

The objective of the work package is to present a coherent action plan that would facilitate the future operation of the Alliance by exploring options for its governance and financial sustainability. Therefore, suitable avenues were identified for the uptake and mainstreaming of the proposed activities hence enhancing its impact in the short, middle, and long term.

In addition, WP6 is grounded on the Sector Skills Strategy in Action (SSS) and on the complementary activities carried out by five Working Groups established to identify detailed actions enabling the achievement of the five Strategic Objectives of the SSS, namely:

- **Strategic Objective 1**: To set up a skills intelligence mechanism to identify the skills and competences required and provide feedback on the evolving sector needs

- **Strategic Objective 2**: Reinforce cooperation among stakeholders from the academic, private, and public sectors on skills development and requirements

- **Strategic Objective 3**: To set-up a mechanism for helping and guiding candidate learners in their skilling, upskilling, and reskilling efforts

- **Strategic Objective 4**: To facilitate and stimulate a more integrated approach to skills development across different value chains
- **Strategic Objective 5**: Encourage citizens' engagement, citizens' science practices and hands-on activities enhancing the inclusion/recognition of EO*GI applications' value in everyday aspects of life

1.3   Objectives of the Task 6.5

The main objective of this task is to prepare a long-term action plan to maximise the promotion and impact of the results produced by the EO4GEO Alliance. This will be achieved by fostering the knowledge and learnings gathered during the course of the project on the dissemination, promotion, and interactions with users of the Alliance results and relevant stakeholders.

The long-term action plan provides insights into how to make the strategic and operation objectives presented in the Sector Skills Strategy in Action a reality. This process will entail the establishment of a suitable governance and business model that will allow the Alliance to operate after the official end of the project. The document also integrates insights and recommendations relevant to the roll-out, mainstreaming, multiplication, maintenance, and the generation of impact based on the exploitation of its results.

1.4   Purpose of the document

The purpose of this document is to provide the members of the EO4GEO Alliance and stakeholders with information and insights regarding the next steps and actions to be carried out by the Alliance to support its further operation and exploitation of its results. The document will pay special attention to describe the necessary actions to bridge the existing skills gap on the EO*GI sector as highlighted in the Sector Skills Strategy in Action.

This document shines light on the activities and additional outputs that need to be developed by the Alliance in order to achieve its vision of fostering the growth of the EO*GI sector by ensuring a workforce with the right skills, in the right place, at the right time.

1.5 Structure of the document

The document has been developed with the following structure:

Section one is this document introduces the discussed topic including a description of the EO4GEO project, the objectives of this specific work package and task as well as information about the purpose of the document its structure and the methodology that was followed for its realisation. **Section two** of the document presents in its totally the Sector Skills Strategy in Action. A document that was previously prepared as a separate deliverable but due to its importance and clear links with the actions proposed in the long-term action plan it was decided to include it as the first chapter of the Long-Term Action Plan after the introductory section of the project. **Section three** describes the envisaged future activities of the EO4GEO Alliance as illustrated in the SSS in Action. This section of the report is of paramount importance as it is here where the future activities and actions of the Alliance will be described in detail. **Section four** provides key information for the long-term sustainability and operation of the Alliance, and it is based on information harvested from other deliverables. **Section five** presents the conclusions based on the content addressed throughout the main body of the long-term action plan.

1.6 Methodology

The process leading to the development of this document was based on the findings and insights derived from several sources ranging from in person and online workshops and meetings as well as the outcomes and conclusions reached by other teams working on different elements of the EO4GEO Alliance and its long-term sustainability.

The Long-Term Action Plan has been developed as a collection of 4 main building blocks which combined address the actions that need to be taken in the short-, medium- and long-term by the EO4GEO Alliance and its stakeholders. The different components of the LTPA have been developed to guarantee the effective operation of the Alliance and a dynamic and fruitful interaction and collaboration of its members and stakeholders.

Figure 2 - Building blocks of the LTAP

The main building blocks of the LTAP are the Sector Skills Strategy in Action (section two of the LTPA) and the future activities of the alliance (section three of the LTAP). The SSS in Action provides through its 5 strategic objectives and its associated operational objectives the main activities that should be pursued to tackle the existing EO*GI skills and training gap. The section addressing the future activities of the Alliance, illustrates how those recommended activities should be achieved by describing the resources needed, initial timelines and the stakeholders that should be involved. The necessary mechanisms and systems ranging from the governance, financial sustainability and the multiplication and mainstreaming of the Alliance results was addressed in the fourth section of the LTPA (Roadmap for sustaining the Alliance).

In addition to the insights gathered through meetings and workshops previously mentioned, information about the future activities of the Alliance was gathered by a series of working groups composed by members of the EO4GEO consortium and complemented by representatives from the associated partners. The process of gathering information to prepare this document also benefited from two face-to-face workshops organised by the sustainability team.

The workshops took place in the following dates:

- **WP6 Workshop 1** – Organised in Brussels, Belgium on the 29th of March 2019
- **WP6 Workshop 2** – Organised in Mendicino, Italy on the 22nd and 23rd of August 2019

Apart from the workshops held in Brussels and Mendicino, a series of bi-weekly calls were organised with the purpose of discussing relevant topics related to the long-term sustainability of the project including relevant elements for the long-term action plan. From these online calls it is relevant to highlight the following:

- **Bi-weekly call 12** – Governance analysis of EIT Climate-KIC
  Date: 24-Jul-2020

Topic: A member of the legal team from EIT Climate-KIC presented the evolution of the governance of the organisation and how it responded to challenges mainly related to different funding streams available.

- **Bi-weekly call 15** – Sustainability of the Alliance
Date: 16-Oct-2020
Topic: Discussion about the long-term sustainability of the Alliance. In this session a representative from DG DEFIS was invited to provide some insights from the European Commission perspective on the supporting programmes and activities to encourage the upskilling and reskilling of Europe's workforce.

- **Bi-weekly call 23** – Sustainability of the BoK tools
Date: 9-Apr-2022
Topic: In this session an online tool was used to capture inputs and recommendations from the project partners on the key elements necessary to assure the long-term sustainability of the BoK tools.

As highlighted in this section of the document, the LTAP was developed based on the analysis of numerous inputs and insights from members of the EO4GEO consortium as well as insights from external stakeholders and the assessment of sectorial reports and other relevant publications.

2   Sector Skills strategy in Action

2.1   Introduction

The Earth Observation (EO)[2] and Geographic Information (GI) sector (EO*GI)[3] is of strategic importance with great potential to support many European, national, and sub-national policy domains. The sector provides and/or is working with data from satellites, aircrafts, and drones. The data is used around the world for diverse applications, benefitting citizens and society and providing unrivalled information for agriculture, natural disaster management, climate change observations, marine weather forecast, etc.

Due to the large amount of data made available and accessible through data and information infrastructures at various levels, the uptake of existing data and services is not being utilised and their integration in added-value services for governments, businesses and citizens could be improved. The [Space Market Uptake European Parliament report](#) (Delponte, Pellegrin, Sirtori, Giannetto, & Boschetti, 2016)[4] revealed that the lack of specialised technical and scientific skills, knowledge and competences hinders this uptake by private companies, public sector, and other actors. Furthermore, there is a gap between the offerings of academic and Vocational Education and Training (VET)[5] at both universities and private institutions, and the specific needs to make this uptake happen seamlessly.

The sector is developing dynamically and rapidly, resulting in an increased demand for qualified personnel. A skilled and educated workforce will enable the sector to attract high value, innovative and knowledge-based businesses, adapt more readily to the challenging technological environment and respond better to societal challenges. New trends are an opportunity to invest in skills and technology that will accelerate national EO*GI capabilities. There are numerous factors impacting skills demand and supply such as technological developments, changing customer demands, new business processes, growth strategies, globalisation, political and economic uncertainty, and others. It is assumed that understanding the drivers that influence the sector, (new) skills requirements will emerge. With these new and emerging technological and societal trends, new opportunities and challenges see light. The EO*GI sector is preparing the path to deliver solutions through other platforms that were not previously considered such as apps, cloud computing and other technology platforms which give added value to the services and facilitate the uptake from different users in diverse business sectors. In this process, EO data from the satellites, combined with geoinformation data, help increase productivity, develop more efficient and environmentally friendly operations, and improve economic gains and quality of life, among others.

Related to the rapid technology change, one of the most important challenges faced by companies and public authorities dealing with EO*GI information is finding people with the right qualifications at the right time. The market not only needs remote sensing and geoinformation specialists, but also programmers, big data analysts, artificial intelligence and machine learning specialists and business developers.

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[2] Earth Observation (EO) collects information about the Earth using sensors.

[3] Geographic information (GI) often combines data with non-spatial information.

[4] http://www.europarl.europa.eu/RegData/etudes/STUD/2016/569984/IPOL_STU(2016)569984_EN.pdf

[5] VET is a key element of lifelong learning systems equipping people with knowledge, know- how, skills and/or competences.

The Sector Skills Strategy (In Action) is based on the preliminary [EO*GI Sector Skills Strategy](#)[6] (Miguel-Lago, Vandenbroucke, & Ramirez, 2021) and summarises the vision, mission, goals, and strategic and operational objectives. It also provides the major activities, milestones, and well-defined outputs to meet them.

To that end, the [Erasmus+](#)[7] [EO4GEO](#) Sector Skills Alliance[8], funded by the Education, Audio-visual and Culture Executive Agency from the European Union ([EACEA](#)[9]) under the [Blueprint for Sectoral Cooperation on Skills](#) scheme, has developed this Sector Skills Strategy. EO4GEO is proposing skills development recommendations, preparing, and taking actions for education and training that will unleash students' and workers' potential to be the EO*GI sector innovators of tomorrow and the EO*GI adopters in other industry end-user sectors (agriculture, energy, transport, local government, maritime, etc.). User engagement is particularly important to allow the EO*GI sector to make a step-change in mass-market uptake of these services.

EO4GEO builds on the [New Skills Agenda for Europe](#) (2022) which is designed to improve the quality and relevance of skills in order to meet the needs of a rapidly changing society and increase the mutual understanding of skills and qualifications in the European labour market. EO4GEO aligns with the spirit of the [Copernicus Programme](#) to reinforce the European capacity in Earth observation, including geoinformation data, tools, and services, putting users in the driver seat. EO4GEO also supports full and open access to EO data, information, and knowledge as a crucial element for better understanding social, economic, and environmental challenges. This includes full access to all the training resources and tools developed by the Alliance and made available to the public through the EO4GEO [project website](#) (EO4GEO, 2022).

2.1.1 Setting the scene

The Council of the European Union highlighted in June 2020 the importance for Member States, in cooperation with the private sector, universities and research organisations, as well as intergovernmental organisations, to increase efforts to develop skills and stimulate innovation and entrepreneurship. The Council also stressed the need to foster an attractive work environment and a viable space sector and calls on Member States and the European Commission to facilitate a more integrated approach on skills development across the value chains of the space sector. The Commission is developing a comprehensive approach addressing skills at all levels – regional, national and EU. This strategy is implemented through the [blueprint for sectoral cooperation on skills](#)[10] initiative, launched with the [new skills agenda for Europe](#) which directly applies to business sectors helping to develop more and better skills.

Following the EC communication on the skills agenda for Europe[11], skills are a pathway to employability and prosperity in any sector. In order to ensure that EO*GI programmes such as [Copernicus](#) deliver their benefits according to the set expectations reaching other market sectors, it is essential to deploy an effective Sector Skills Strategy (SSS) to stimulate the uptake of these EO*GI

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[6] http://www.eo4geo.eu/download/d-1-6-space-geospatial_sector_skills_strategy_v2-0/?wpdmdl=3800&masterkey=5ce6e2483a83c

[7] Erasmus+: EU's programme to support education, training, youth and sport in Europe.

[8] EO4GEO project (www.eo4geo.eu): An innovative strategy for skills development and capacity building in the EO*GI field.

[9] Education, Audiovisual and Culture Executive Agency from the European Union (EACEA).

[10] Framework for strategic cooperation in each economic sector between key stakeholders

[11] Council of the European Union. https://data.consilium.europa.eu/doc/document/ST-8512-2020-INIT/en/pdf

data, services and information, and thus stimulate the development of innovative downstream applications.

Despite a fragmented institutional and policy environment, the sector has evolved very fast in the last 10 years. A recent EO employment report from EARSC (2021)[12] indicates an estimation of the total number of EO[13] service employees in Europe close to 25.000 people. According to the PwC report "Extracting Value from Earth Observation Data" (PwC, 2019), the global EO economy was estimated to be between EUR 9.6 and 9.8 billion, divided between EO satellite sales and EO data acquisition, processing, and transformation into information products for end users. The sector is predominantly driven by the upstream market, with the global EO downstream market estimated to be only between EUR 2.6 and 2.8 billion, mainly driven by governmental applications contributing between 50% and 60% of the revenues. That is contrasted with the European figures provided by the EO industry survey report (EARSC, 2019)[14] where the total revenue in the private sector in 2019 was €1.37b representing a growth of around 10% per annum for the last 5 years. Despite this growth, companies declared that they have problems finding suitable candidates in the labour market.

"The EO*GI sector is healthy and sustains a 10% annual growth." (EARSC Industry survey, 2019)

While the EO*GI sector is evolving rapidly with the improvement and development of acquisition capability and online platforms to access data, infrastructure and analytics, the technological evolution is not seen as new but as an assimilation of the sector with these technologies. The risk is how the sector identifies and addresses these new challenges and opportunities, which generate new conditions for employment and have unpredictable impacts on job creation. However, in all senses we need to see it as an opportunity for economic growth and development. The rapid rise of on-demand data and the spread of platform has a concrete impact on the EO*GI value chain.

Its ground segment faces disruptive changes in the way data storing and access is organised, in particular for Sentinel data, which is granted to be full, free, and open, and thus increasingly offered in the form of services. The new paradigm of big data ("bring the users to the data") has led to a shift towards the provision of analysis-ready data in central data infrastructures, and to an increasing cloud-based processing and information extraction.

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[12] Skills are a pathway to employability and prosperity. https://eurlex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016DC0381 and https://ec.europa.eu/eurostat/web/skills/policy-context

[13] https://earsc.org/wp-content/uploads/2021/03/EARSCEmployment-survey-v1-1.pdf. The study shows that the National Public sector bodies and the EO services sector together represent the absolute majority of the workforce in this sector, with 83% of the total EO employees.

[14] *"All persons whose work relies on EO data or services. Any person working for an organisation which is using EO data."* https://earsc.org/industry-facts-figures/
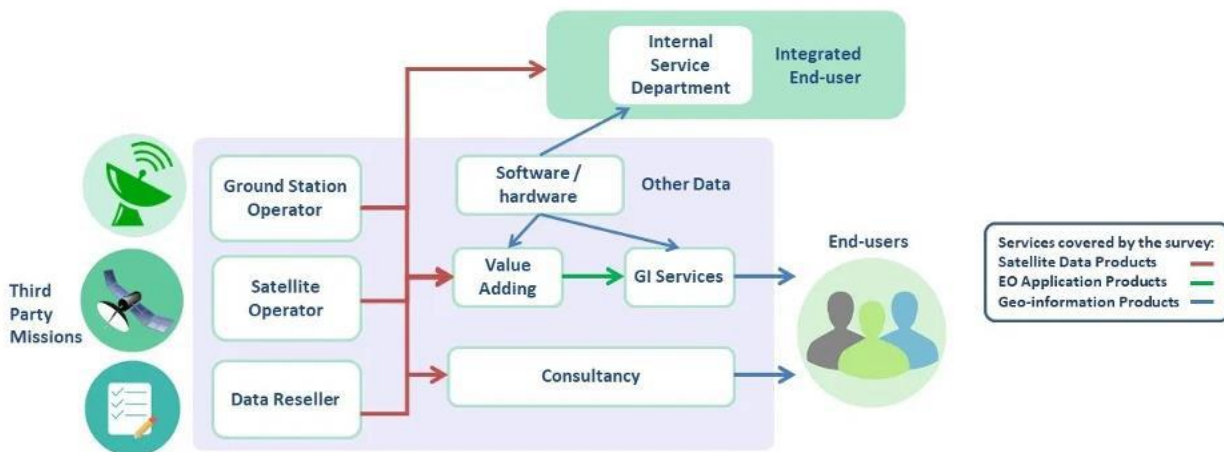
Figure 3 - The EO value-chain (source EARSC)

Another shortcoming in Europe is the insufficient crossover between the academic/research community on the one hand, and the business/industry community on the other. For instance, closer ties expressed in partnerships or collaborations, traineeships, internships, or common research projects are underdeveloped. Although they could result in more effective outcomes for the EO*GI sector, raise awareness among students of opportunities in the sector and help to close the skills gap. One of the ideas to solve this mismatch between the need for skills and the supply is a closer cooperation between the private sector and universities & research centres. This can help develop appropriate solutions, including tapping into talent earlier in the recruitment cycle or helping to modernise the curricula.

The World Economic Forum (WEF) estimated that around 50% of the working population in many parts of the world will need reskilling in the next five years due to the impact of digital transformation and new technologies. This is a big challenge for the sector, as the lack of effective intervention could create a bottleneck in economic growth. This would require a greater emphasis on lifelong training, reskilling, and upskilling of employees for higher-value tasks in the use, creation, maintenance, and delivery of geoinformation services.

Besides these long-term trends and contextual factors shaping the European EO industry, the 2019-2020 coronavirus pandemic has come as a shock to the wider European and global economy and the EO*GI industry in specific. The COVID-19 pandemic has highlighted how EO*GI derived information has become an important component that can help us monitor and potentially mitigate against the impact of the coronavirus outbreak.

Defining a strategy in 10 steps

For an effective roll-out, it is essential to develop a methodology to approach the Sector Skills Strategy carried out as a step-by-step methodology for the take-up at the national or regional level. It builds on 10 steps:

1. Alliance's identification, consultation, and agreement of the strategic vision and mission for the sector growth base on skills development
2. Mapping the sector indicated by the analysis of the current sectoral status
3. Defining goals and objectives
4. Monitoring the supply and demand and assessing the skills mismatch and requirements
5. Track skills gaps and shortages
6. Identifying the activities which support the strategy
7. Implementation of the defined
8. Validation cycle
9. Assessment and recommendations for the Long-Term Action Plan
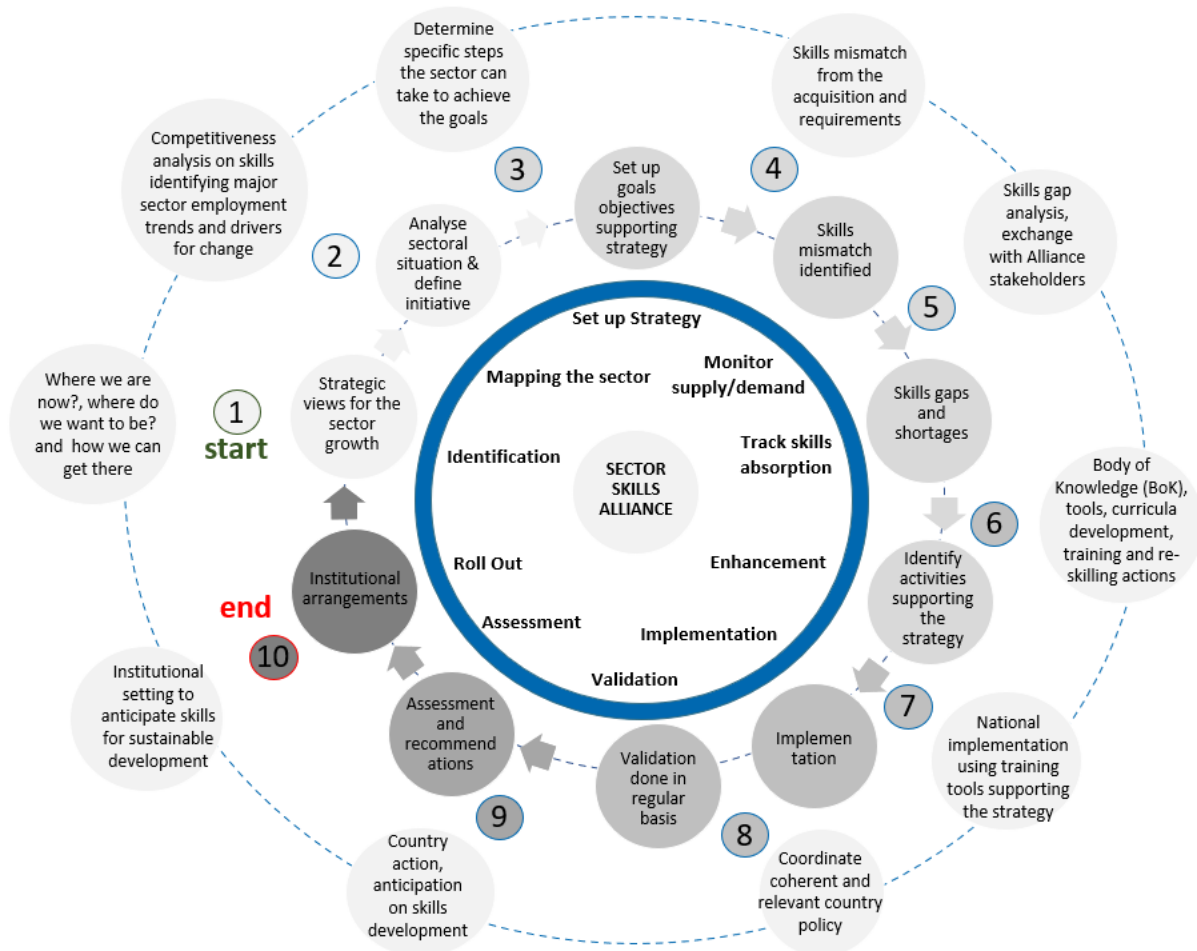10. Institutional engagements to secure policy implementation

Figure 4 - Sector Skills Strategy (In Action) methodology

2.2 Analysis of current status

Whole world of change, the disruptive evolution on the EO*GI sector

The EO*GI sector does not exist and evolve in isolation. The sector is by default linked to and intertwined with many other domains that influence each other: engineering, mathematics, physics, information science and many other fields and technologies and businesses (vertical sectorial activities such as maritime transport, insurance, agriculture, etc.) are very relevant and influence what happens in the sector. Moreover, general developments in society have an impact on what the sector does, how it operates and the new technologies that are being embraced. Activities in the EO*GI sector are also more and more driven by the needs of different thematic areas and fields of application. In order to identify the (future) skills requirements, it is important to understand what these major drivers are and the related trends that have an impact on the sector.
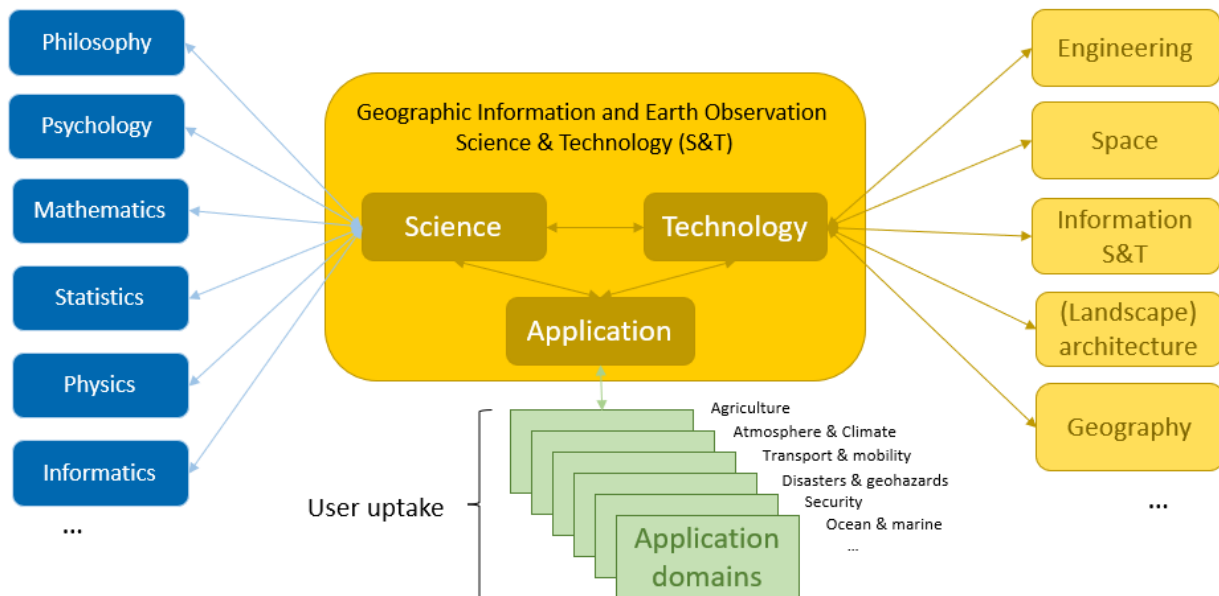

Figure 5 - The EO*GI Science & Technology domain (Vandenbroucke, 2020, based on DiBiase, 2006)

2.2.1 Drives and trends

The drivers and trends in our world are influenced by, and take place, in a general context of change. Different perspectives must be considered: economic ups and downs, political realities, technological developments, environmental pressures and climate disruption, social changes and new expectations, and of course dramatic events such as the COVID-19 pandemic[15]. Moreover, everything

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[15] COVID-19 demonstrates systematic vulnerabilities and Copernicus provides much- needed information on the global situation, supporting the resilience and non-dependence of Europe. From analysis of air pollution data to trace people's movements; using

is interconnected: economies, people, technology, and the environment. What happens in one part of the world has an impact on other parts of the world. Everyone and everything is part of it. The earth observation and geoinformation sector is highly impacted by those mega-trends.

The United Nations Global Geographic Information Management (UN-GGIM) [16] initiative, which brought together representatives of the geoinformation and statistical communities from all countries across the world, identified 5 major drivers and 31 related trends that impact the EO*GI sector. The drivers are not only technological, but other aspects are deemed to be equally important. The related trends are also not occurring in isolation: drivers and trends are interconnected.

1) Rise of new data sources, and new analytical methods

The amount of data has grown exponentially over the past decades. In the EO*GI sector this phenomenon is very clear. The Copernicus programme alone generates over 15 TB of Earth Observation data daily, i.e., the third largest data provider globally. Moreover, the data is low-cost, high quality and updated frequently. In addition, the generation of data by mobile devices, crowdsourcing, and via social media is creating more factual and location-based information. Everyone and everything is a 'sensor'. What is particularly challenging is that the data is very diverse. Accessing, managing, analysing these huge amounts of data requires new techniques and technologies in order to digest them and to extract useful and usable information from it. One particular aspect of this is the push and demand for having current, near real-time data, not only static data.

2) Technological advancements

Technological developments have never been so fast and disruptive as they are now, in all possible sectors. Especially in the information sector, there have been important changes in the way we capture, store and handle information. New types of computing [17] – providing ever more 'power' at our finger-tips – make new things possible: e.g., High Performance Computing (HPC) and Quantum Computing, but also different ways of storing and processing (centralised and decentralised). These developments have made the explosion of data volumes and the currency of data possible. Computing power is also becoming available at a low cost, so many, including Small and Medium Enterprises (SME) and even individuals, can access and use it. The fact that devices are connected with each other through high-speed networks allows different devices to talk to each other and work together on common tasks. These developments make technologies possible (such as Artificial Intelligence, Sensor Web Enablement, Internet of Things, etc.). Automation and autonomy of devices are becoming a reality, not only computers, but also e.g., the vehicles that are making Intelligent Transport Systems (ITS) reality.

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contextualized data, monitoring environment impact on farming, or assessing how environmental changes may impact infectious disease transmission, the Copernicus Programme should be seen as a part of Europe's critical infrastructure providing data in times of emergencies and instability. Skills are vital for business recovery.

[16] Report from UNGGIM on future trends (https://ggim.un.org/future-trends/)
[17] Fog computing is a combination of traditional centralized data storage and processing and cloud computing.

3) Evolution of user requirements

Against this background, users, and other business sectors (that are incorporating EO*GI into their business workflows) have ever higher expectations since they have become part of the networked society. They closely live together in mega-cities but are also close to their peers in other parts of the world. Users do not want to be passive consumers of information delivered by governments or commercial enterprises. They want to have instant access to data that is relevant for them, when they need it, but they also want to contribute to the debate, to take part in decision making, and they want to provide their 'own' information and insights. Traditional policy and decision making are also shifting, from more static approaches and (complex) processes to fast and continuous monitoring, modelling, simulating, and predicting all the possible positive and negative impacts of those decisions on the environment, the economy, our health. Cities and communities become smarter and smarter and intertwined.

4) Structural shift of industry

Various industries are evolving rapidly. The automotive industry is seeing important changes towards increased autonomy, and the tourism industry is modernising at a fast pace, making tourists active participants in a visual world where they can experience how a city looked like a few hundred years ago through augmented reality techniques. Spatial and urban planning, transport, and mobility, are becoming more location enabled, including the use of simulation techniques, and applying agent-based modelling techniques to improve planning and to manage dense traffic flows. Industries are becoming more and more participative, while they are also more digital and automated. The EO*GI sector itself has become more automated and is more involved in the digital transformation of Government and Society. There is a push towards improved collaboration between industries, and public authorities, academia, and individuals alike.

5) A changing legislative environment

The new possibilities that come with the emerging technologies, the streams of data and the ever-demanding user needs also come with new challenges and a driver that counterbalances with it to a certain extent. Although people want more information, including its location component, and share their own information with many, risks related to that are becoming a central topic of discussion. An increasing number of connected devices and data sources also require an increased focus on data ethics.

2.2.2 Skills requirements

*EO*GI is a key economic sector where skills development plays an important role*

In past studies, the gap and mismatch between the educational and training system and the requirements of the market were already evident (e.g., smeSpire[18], BESTSDI[19], giCASES[20]). EO4GEO analysed the supply and demand side, as well as the impact of the technological trends on

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[18] A European Community of SMEs built on Environmental Digital Content and Languages (http://www.smespire.eu/)

[19] Infrastructure for spatial information in Europe Directive

[20] giCASES eLearning training material of the six giCASES Cases Studies, with 14 Training modules in 37 training units, is freely available on the giCASES training platform (http://www.gicases.eu/)

skills requirements and the occupational profiles of the future[21]. The lack of qualified personnel is considered by all to be a major bottleneck for the further development and advancement of the sector. The following findings should be considered when defining the skills strategy.

Skills and skills-sets

The EO4GEO survey on demand confirms previous findings that geoinformation data handling skills remain key. Other skill-sets, related to the first one, are analytical methods, visualisation and cartography, and programming & development skill-sets. Individual skills that are stressed are: the extraction, transformation and loading of EO*GI data; the interpretation of EO*GI data; georeferencing and resampling of data; and the evaluation of data quality. This is not surprising due to the increased importance of (geoinformation) data in policy making and in society in general. UNGGIM stresses the refocusing on and increased importance of skillsets related to data science and analytics, computer science, and data visualisation. In particular, the use of AI and Machine Learning techniques for data analytics will become predominant, while also particular skills are required, e.g., the handling of Unmanned Aerial Vehicles (UAV's) for surveying. The visualisation skills required are much broader now than what is usually covered in cartography or web mapping. The focus is shifting to advanced visualisation techniques for decision making that can also easily be understood by citizens (presenting decisions e.g., in case of emergencies, but also to monitor decisions and predict potential impacts). Repetitive tasks and skills for data collection, storage and management will diminish.

Occupational profiles

The changing needs for skills have of course had a huge impact on the occupation profiles required by the market. Over the past decades, the organisation of work has changed dramatically and that has an impact on the occupational profiles needed: it is a mixture of skill-sets, both highly technological as well as transversal that is defining the profiles. The EO4GEO survey and interviews among experts identified 3 major profiles: EO*GI developers, EO*GI data analysts and EO*GI project managers. Analysis of job advertisements revealed the need for more traditional profiles such as cartographers and remote sensing experts, but also various types of EO*GI related profiles, such as developers, (data) specialists, analysts, and technicians. While geographers, cartographers, EO*GI analysts, remote sensing scientists, surveyors, photogrammetrists, and EO scientists still make up a large part of the current workforce, the range of geoinformation career paths has diversified and incorporates expert groups previously not covered (UN-GGIM, 2020)[22].

Learning approaches

Continuous learning and regular reskilling/upskilling are required in this rapidly changing world. The UN-GGIM even states that around 50% of the working population in many parts of the world will need reskilling in the next five years due to the impact of digital transformation. Moreover, reskilling and upskilling should focus more on skills related to higher value tasks such as data analysis, modelling & prediction, using information to make well-balanced decisions, etc. Even more importantly, learning and development of education and training offerings should not only focus on the graduate and postgraduate levels, but include initiatives for the primary and secondary levels. With the increasing

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[21] Skills requirements. New projects such as GEOBIZ provide also useful insights. The UN-GGIM initiative also discussed and assessed the issue.
[22] https://ggim.un.org/documents/DRAFT_Future_Trends_report_3rd_edition.pdf

exposure of geoinformation data through smartphone devices and wider integration within the gaming industry, learning – in an adapted environment – should start with young people, stimulating their spatial thinking and behaviour. Finally, the way we offer education and learning is shifting it is more and more experimental, case-based, and especially collaborative. The latter is crucial since it is almost impossible to have the knowledge, skills, and competencies to cover all aspects of geoinformation data technology, and to apply it to resolve real-world problems; the set-up of multiband inter-disciplinary teams comes to the forefront.

2.2.3 Stakeholders' analysis: a complex ecosystem

The current EO*GI Alliance consists of a network-of-networks, but it is also linked to and embedded in the Copernicus ecosystem. The latter in turn is also connected to the broader space and geoinformation ecosystem. The Alliance formed in the context of the EO4GEO project taps already (partially) into this large and complex ecosystem through its 53 associated members, its network of individual experts, its advisory and editorial board, etc. The project analyses and tries to animate this complex ecosystem in a collaborative way and to further develop it as part of the Sector Skills Strategy.

In addition to the stakeholders directly related to the EO*GI Alliance from its formation, a number of key stakeholders are being identified and engaged. This exercise presents a forward-looking approach which is essential to guarantee the uptake of the tools and other outcomes developed within the Alliance, and to engage the right stakeholders that will play an important role in its future development as well as in the full implementation of the strategy.

The complex ecosystem of stakeholders necessary for the successful implementation of the strategy is composed by members from the space and geoinformation sector as well as organisations dedicated to the provision of skills and training. In addition, the EO*GI Alliance has also engaged organisations from sectors such as climate change, food systems, land management and many others. The EO*GI Alliance pays special attention in the engagement of stakeholders from other sectors, as the training actions developed in the Alliance will support the uptake and further use of geoinformation in sectors addressing key societal challenges.

Figure 4 illustrates some of the stakeholder groups and organisations that have been identified and that are currently being engaged to support the work of the EO*GI Alliance.
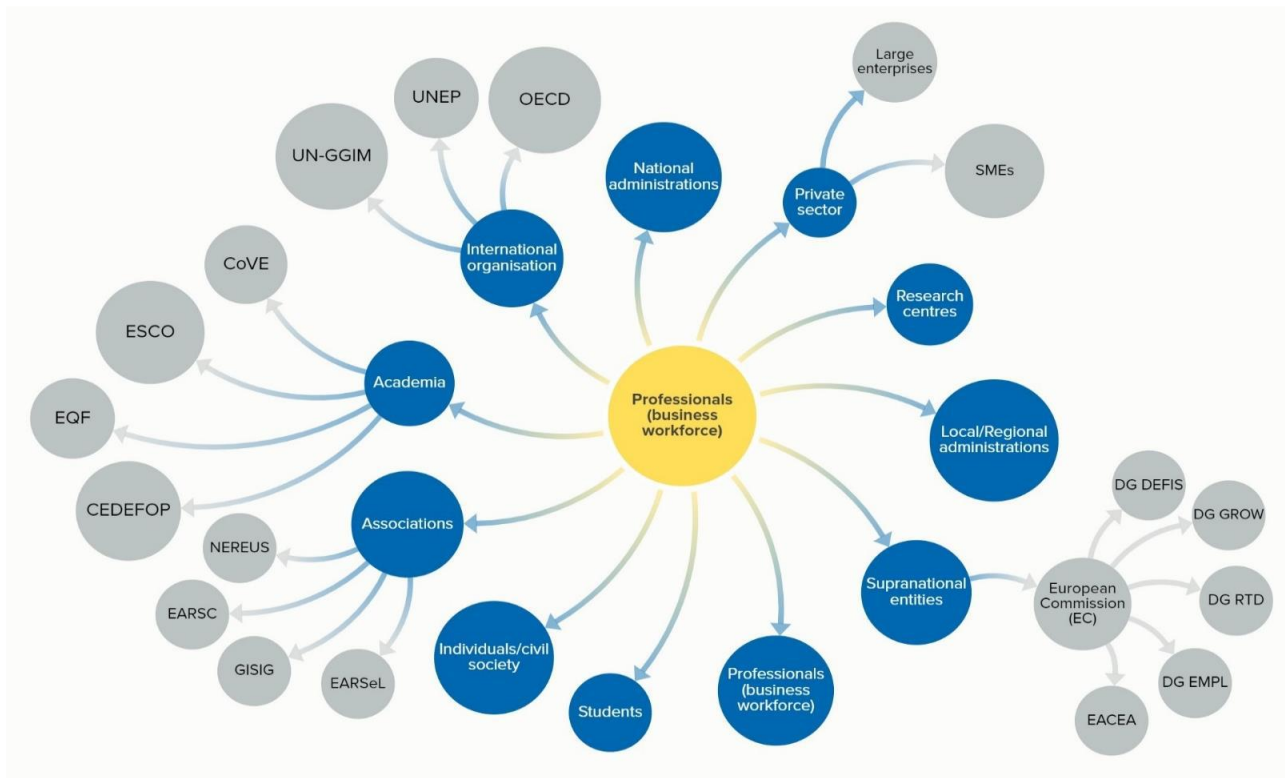
Table 1 - Representation of the main stakeholder's groups

Figure 6 - Example of the stakeholder's ecosystem mapping[23]

Initiatives such as CoVE, ESCO, EQF and CEDEFOP mapped under the category "Academia" will be relevant for the integration of the educational courses and curricula into existing frameworks. Organisations that will facilitate the regional and national uptake results of the Alliance will be mapped under the groups' associations, local/regional administrations, and national administrations. The stakeholders identified under the group "International organisations" will be essential in building bridges with existing initiatives globally and through agencies of the United Nations, the World Bank, and the OECD, just to name a few. The private sector, a key player defining job offers and occupational profiles are mapped under the sub-categories "Large enterprises and SMEs".

The analysis and mapping of stakeholders are of paramount importance to effectively engage and disseminate the outcomes of the project, and through this collaborative process build a rich Alliance of stakeholders that will contribute to its long-term sustainability.

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[23] Acronyms available in the Table of Acronyms

2.3 Vision and mission

Unlocking value through skills

Vision - The vision statement looks forward and creates a mental image of what the EO*GI Sector wishes to achieve in the medium and long term regarding the need for skills EO*GI to achieve a maximum impact. The VISION of the EO*GI Sector is to foster its growth by ensuring a workforce with the right skills, in the right place, at the right time. It recognises the responsibility of the EO*GI community to plan for sector growth covering aspects of the industry challenges in relation to skills gaps and finding a skilled workforce. It keeps the pipeline of talent flowing and enforces a skilled and innovative workforce.

Mission - The mission statement describes how it is intended to contribute to the vision of enforcing a capable, and innovative workforce and serving to communicate purpose and direction. It is designed to stimulate action towards skills development. The MISSION of the EO*GI Sector is to ensure strategic cooperation among stakeholders on skills development. The mission is designed to stimulate action towards bridging cooperation among the EO*GI community. The Alliance is committed to ensuring the right skills are available to improve the competitiveness in the sector, ensuring its growth. Facilitating and coordinating skills development programmes to respond to sectoral challenges.

Goals - The EO4GEO Sector Skills Alliance aims to operate as a "Leader" for EO*GI skills development in Europe by providing insights and intelligence on the demand for and offer of education and training (coordinated with other stakeholders) relevant for the sector, and the skills required by the market.

With this in mind, EO4GEO aims to harmonise curricula, and to give recommendations and develop training materials (when needed) at academic and vocational levels, directly linked and adapted to the European classification of Skills/Competences, Qualifications and Occupations (ESCO).

By adopting this forward-looking perspective, **8 GOALS** have been identified, providing a compass to all stakeholders for contributing to the successful implementation of the Sector Skills Strategy. identified, providing a compass to all stakeholders for contributing to the successful implementation of the Sector Skills Strategy.

> *"Skills intelligence developed through collaboration, engagement and political commitment will lead to modern curricula and a training offer that is aligned with market needs" (Danny Vandenbroucke, KU Leuven, 2021)*

Goal 1 – Monitoring market intelligence

A coordinated effort is needed to improve competitiveness in the sector and to penetrate other sectors by monitoring and understanding market intelligence and embracing new trends.

Goal 2 – Mapping skills needs

Skills needs are identified and mapped against the supply of academic and vocational education and training, with the aim to align them, hereby focusing on flexible learning paths for different occupational profiles.

Goal 3 – Harmonised curricula designed

Harmonised curricula are designed and recognised, and mobility activities and training offers are developed and implemented at the Pan-European level, leveraging skills transferability.

Goal 4 – Key qualifications identified

A set of key qualifications is defined, described, and promoted according to a standardised approach, in line with the European classification of Skills, Competences, Occupations and Qualifications (ESCO), and accepted by all stakeholders involved.

Goal 5 – Provide innovative context

The use of EO*GI data and services as an inspiring and innovative context for learning across all age groups and value chains is encouraged and supported.

Goal 6 – Political commitment

Political commitment is ensured at EU, national, regional, and local levels, to stimulate innovative skills development and translated in governance, financial and other ways of support.

Goal 7 – Strategic collaboration

A strategic collaboration between the skills Alliance, private sector, government, academia, and "end-user" sectors is established. Stakeholders collaborate in an efficient and effective manner, taking conscious actions to support the political commitment for skills development.

Goal 8 – Awareness and engagement

The EO*GI awareness of, and engagement with "end user" sectors is improved, leading to increased uptake of EO*GI data and services. Continuous outreach and awareness raising through the promotion of the use of EO*GI in learning and innovation activities.

These 8 goals reflect a future state where skills development and workforce are leveraged to anticipate the skills mismatch advancing on key policies.

2.4 Objectives and expected impact

Strategic and Operational Objectives, and expected impact

The vision, mission and general goals need to be translated into Strategic Objectives (SO), which are derived from and linked to the challenges and drives identified in the State of Play. The SO are then further detailed in a series of Operational Objectives (OO) which are measurable and can be detailed as actions and activities which will form the biggest part of the Long-Term Action Plan (LTAP). Both the SOs and OOs will lead to a certain impact that contributes to bridging the skills gaps and mismatches, and an improved user uptake of EO*GI.

2.4.1 Overview

The objectives have been specifically formulated to address missing elements in the training and skilling of the EO*GI workforce, as well as creating the training capacity to bridge the EO*GI skills gaps in other domains. The implementation of the OOs combined with the activation of a LTAP will be a significant step forward in bridging the existing skills gap of the sector.
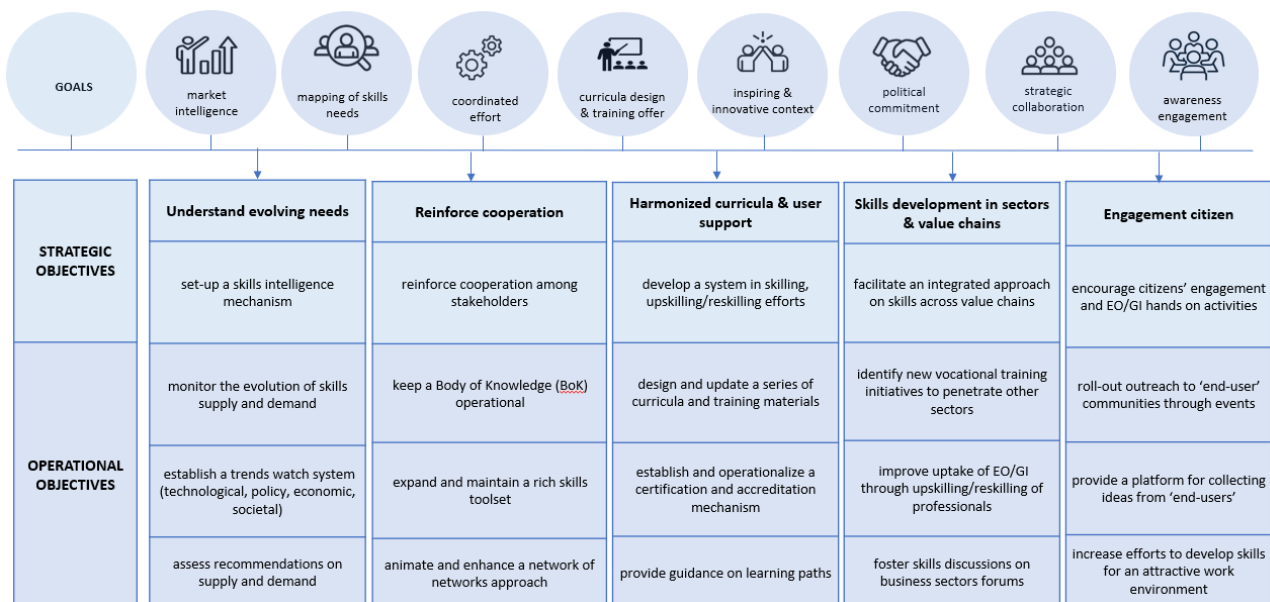

	GOALS market intelligence	mapping of skills needs	coordinated effort	curricula design & training offer	inspiring & innovative context	political commitment	strategic collaboration	awareness engagement
	Understand evolving needs		**Reinforce cooperation**		**Harmonized curricula & user support**		**Skills development in sectors & value chains**	**Engagement citizen**
STRATEGIC OBJECTIVES	set-up a skills intelligence mechanism		reinforce cooperation among stakeholders		develop a system in skilling, upskilling/reskilling efforts		facilitate an integrated approach on skills across value chains	encourage citizens' engagement and EO/GI hands on activities
OPERATIONAL OBJECTIVES	monitor the evolution of skills supply and demand		keep a Body of Knowledge (BoK) operational		design and update a series of curricula and training materials		identify new vocational training initiatives to penetrate other sectors	roll-out outreach to 'end-user' communities through events
	establish a trends watch system (technological, policy, economic, societal)		expand and maintain a rich skills toolset		establish and operationalize a certification and accreditation mechanism		improve uptake of EO/GI through upskilling/reskilling of professionals	provide a platform for collecting ideas from 'end-users'
	assess recommendations on supply and demand		animate and enhance a network of networks approach		provide guidance on learning paths		foster skills discussions on business sectors forums	increase efforts to develop skills for an attractive work environment

Figure 7 - Goals, Strategic and Operational Objectives

2.4.2 Understand evolving needs

Strategic Objective 1: To set up a skills intelligence mechanism to identify the skills and competences required and provide feedback on the evolving sector needs.

Rationale – Currently, the academic and vocational education and training offered are lagging behind the continuously evolving needs of the industry, the individual businesses, public sector actors and society at large. The actual offer is focusing too much on the upstream part of the space sector, while the downstream EO*GI sector, and especially the different application domains and the connection/synergies with the user communities, such as other business sectors (agriculture, infrastructure, insurance, etc.), are underrepresented. Moreover, requirements are evolving continuously, and due to technological trends and user expectations, the education and training offer needs continuous updating of existing curricula, and the development of new curricula reflecting new skills requirements. Therefore, it is of utmost importance that the sector systematically monitors and assesses these evolving needs through a well-organised observatory that will significantly contribute to the "Pact for Skills"[24] and contributes as a tool to monitor the competitive environment in the EO*GI sector in the digital economy worldwide.

Operational objectives and actions

1. To monitor the evolution of supply of, and demand for education and training on a regular basis (OO11). The monitoring of the supply side can occur through desktop studies, surveys or even by using semantic technologies (automated processes) resulting in a catalogue of education and training offered by the sector. The demand can be captured by organising regular surveys among stakeholders.

2. To establish a "trends watch system" that alerts the community on emerging developments (e.g., technological, policy, economic, societal) (OO12). A technical system should be set-up, together with stakeholders, to collect – if possible, in an automated way – emerging technological, political, and societal trends, to group/cluster and analyse their impact on the EO*GI sector in terms of skills, and to define a roadmap on how to integrate them in curricula.

3. To assess supply and demand at regular intervals with the view to draw recommendations for the stakeholders of the sector (OO13). The supply, demand and new trends should be assessed together to find gaps and mismatches, and to identify priorities for integration of (new) topics in existing and new curricula. The aim is to have the findings regularly published, broadly distributed, and recognised by the whole community.

    Outcome(s) – Operational Sector Skills Intelligence Observatory

    Expected impact – Improved awareness of where skills development should go, which will help the future updates of the sectoral skills strategy and the future Pact for Sectoral Skills, and will allow for the improvement of vocational training, the upskilling and reskilling of professionals and newcomers on the job market, and ultimately employment. This approach would also give the EO*GI sector the necessary intelligence and understanding of the latest

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[24] More info on the "Pact for Skills" can be found at the following address: https://ec.europa.eu/social/main.jsp?catId=1517&langId=en

trends and needs to effectively support companies, workers, students, and other stakeholders obtain the training, skills, and competences they need to succeed.

Timeline – OO11 and OO13 are foreseen to be organised every two years, while OO12 is conceived to be continuous leading to an assessment every semester.

Target public – Academic sector, businesses workforce, public sector actors, VET providers.

Stakeholders – Key education and training providers, as well as organisations that are currently already involved in monitoring technology trends, should be involved, among others in the supranational scope (ESA, JRC), international bodies such as UN-GGIM, associations representing the sector such the Open Geospatial Consortium (OGC)[25], EARSC, other business professionals, EO*GI private services providers companies, VET providers, etc.

2.4.3 Reinforce cooperation

Strategic Objective 2: Reinforce cooperation among stakeholders from the academic, private, and public sectors on skills development and requirements.

Rationale – Businesses and academic stakeholders of the sector have their own language(s). The Earth Observation companies have long agreed on a taxonomy for the EO services (EARSC)[26] which help service providers and users have a mutual understanding of the types of services that can be offered and the benefits that can be delivered, while the community has also its Body of Knowledge (BoK) for EO*GI Science & Technology[27]. Other BoKs, vocabularies and ontologies exist, but are not linked to each other. A BoK defines (related) concepts and terms used in the sector, but also the related skills, learning resources available and much more. Because of new technological and non-technological developments, it is necessary to update the shared language continuously, adding or updating learning outcomes and skills related to new and evolving concepts. The continuously evolving BoK is connected to a range of different tools and functionalities fostering the development of skills, training materials and job profiles. In the context of the Copernicus programme, data policy provides full, open, and free-of-charge access to data and information, in line with the international data sharing principles of the Group for Earth Observation (GEO). To establish a global vocabulary as a best practice, international cooperation should be of significant importance to the BoK development.

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[25] In the last version of the OGC Tech Trends Mind map, 48 trends are identified (some of the previous trends were split, others are new).

[26] EARSC taxonomy: https://earsc-portal.eu/display/EOwiki/EO+Taxonomy

[27] The EO4GEO project has integrated the EARSC taxonomy user uptake definitions into the BoK

Operational objectives and actions

- To keep a Body of Knowledge (BoK) for EO*GI[28] operational, feed it with the results of the Technology Trends Watch and link it with other relevant BoKs, vocabularies and ontologies (OO21). This will require the continuous improvement of its content by adding new concepts (theories, technologies, EO*GI applications & services oriented to user communities, etc.), revising and defining skills, adding reference materials, etc. Many other BoKs, taxonomies and ontologies are being developed and will become operational in the future, e.g., from ESA, OGC, etc. but require actions and good coordination with their owner to be able to use them as input to the EO*GI BoK.

- To expand and maintain a rich toolset to support skills development, and to make it accessible and re-usable for all stakeholders (OO22). The maintenance of the BoK, and its exploitation for curricula design, the definition of job offerings and other activities conducted by many stakeholders of the EO*GI sector, requires an ecosystem of tools that make use of the BoK and that are continuously maintained, upgraded, and expanded with new functionality.

Outcome(s) – An operational EO*GI BoK that serves as an engine for skills development, supported by an ecosystem of open tools, used by all stakeholders, and supported by the network of networks.

Expected impact – Will lead to a common understanding of what the sector covers, its challenges and opportunities, the elements to be covered in skills development, the liaison with the user uptake, etc. It will define curricula in a standard way based on this common language, but also support Human Resource Management (HRM) activities in the sector.

Timeline – Continuous updating of the BoK, with special attention to updates each semester when the trends watch is updated. Development of new tools during the first 3 years after EO4GEO ends, while linking to other BoKs and ontologies will be spread over a 3 to 5 year period.

Target public – EO*GI experts from the academic, as well as the public and private sectors.

Stakeholders – Collaboration with international organisations such as ESA, ICA, OGC, UCGIS, surveyors and organisations managing other existing BoKs or specialised taxonomies on the EO services such as EARSC.

Public-private academia partnerships play a fundamental role in skills development.

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[28] EO4GEO BoK (http://www.eo4geo.eu/bok/)

2.4.4 Harmonised curricula and user support

Strategic Objective 3: To set-up a mechanism for helping and guiding candidate learners in their skilling, upskilling and reskilling efforts.

Rationale – A rich offer of academic training exists in universities, especially with regard to the theoretical and scientific elements of space, and the EO*GI sector. The skills development part is usually less developed. Formalised vocational education and training offers in the sector are also less developed and not standardised, and in many cases no certification mechanism exists. They are usually part of projects, summer schools or just organised as a training offer, but in an ad-hoc manner. The downstream sector needs particular attention, especially the many sectoral or thematic application domains that (can) make use of EO*GI data and services. From this perspective, more practical, case-based learning curricula could and should be designed in a collaborative effort by academic, EO*GI service companies, the public sector, and other business sector actors. Moreover, it is very difficult for candidate learners from the EO*GI or other business sectors to find their way through the offer and receive the support they need to define a personalised learning path. Europe has a strong and diversified EO*GI service industry capable of providing many products and services derived from satellite observations, other platforms and various geoinformation data across a wide range of applications. Many countries lack the skills to develop products on their own. This presents opportunities for the European service industry to provide tailored products and services for local and regional markets in third countries, potentially through partnership programmes and joint ventures. Before promoting the EO*GI sector abroad, it is important to ensure the required skills and competencies to succeed abroad are available/developed[29] in the skills development setup such as internal adoption of common innovative practices to increase internal uptake of EO-technology and help to build the required expertise and credibility to effectively develop international markets.

Operational objectives and actions

- To design and regularly update a portfolio of curricula and training materials, notably for added-value services and applications, covering different occupational profiles, and make them accessible to all stakeholders through a one-stop portal (OO31). The training offer should be organised logically and cover many different domains, introductory topics as well as full learning cycles and programmes. The training offer can also vary in format: from webinars over MOOC's to more extensive training programmes. The first step to facilitate access and sharing is to have one entry point, even if some offers might be hosted elsewhere. The description of the offer should be available in one area and be easy to understand for learners.

- To establish and operationalise a certification and accreditation mechanism for the training offered (OO32). Together with the relevant bodies, the curricula should be harmonised as much as possible in order to form a kind of recognised baseline shared by all stakeholders. They should go through certification and accreditation mechanisms where appropriate and coordinate with European Skills/Competences, Qualifications and Occupations (ESCO) presenting the EO*GI skills cross-horizontal to other business sectors.

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29 EARSC 2020, https://earsc.org/2017/11/21/earsc-position-paperon-earth-observation-services-industry-internationalisationeconomic-diplomacy/

- To provide guidance for learners to define their own learning paths and to follow training actions (OO33). Users should be supported in assembling personalised learning paths, based for example on a series of questions. Also, more standard training programmes, offered to cover a learning path for a clearly defined occupational profile, should be made available. Users should be able to interact with tutors and with their peers.

Outcome(s) – A set of standard curricula for different occupational profiles is defined and a rich portfolio of training offer is available, open for and accessible by all through a one-stop portal.

Expected impact – Training offers are recognised at EU level, and more easily accessible and personalised according to individual needs, supporting the development of the pool of talents for the sector. This will lead to skills recognition & transferability for a series of occupational profiles. This will in turn facilitate comparability between countries, regions, but also between stakeholders that offer VET courses. It will in that sense make it easier for professionals and people entering the job market to compare and select different offerings.

Timeline – Within the first three years after the end of EO4GEO, key curricula are designed for key occupational profiles as identified during EO4GEO. The setup of the one-stop portal, including the guidance mechanisms, should be developed in the first two years after EO4GEO ends. That also includes an operational catalogue of training offers (training materials and actions). After that period, the offering will be extended gradually.

Target public – Education and Training providers from the academic, private, and public sector at the offer side. Professionals that want to upskill and reskill, young people who want to enter the job market, people who want to reorient their career.

Stakeholders – Agencies and bodies specialised in certification, accreditation, etc., both at the European and national/subnational levels.

2.4.5 Skills development across sectors and value chains

Strategic Objective 4: To facilitate and stimulate a more integrated approach on skills development across different value chains.

Rationale – The benefits and opportunities for other business sectors are not fully taken into account and exploited. Focus in the EO*GI sector should be on reaching out to the public sector as customer and application domains to highlight the potential value of EO*GI for their domain, or to discover new opportunities in a collaborative way demonstrating how the benefits are driven along a value chain. This would contribute to a better understanding and help to identify market needs, allowing geoinformation and space data & services to boost job creation and speed up a mass market uptake. Reskill and upskill activities in different business sectors are required to support the adoption of EO*GI as part of the digital agenda implementation, encouraging them in the uptake of skills development to better perform business sectors' challenges and needs. It is particularly important to create the conditions for integrating EO*GI data and services into other sectors and allow the EO*GI sector to make a step-change in mass-market uptake of these services. Actions are needed to help develop and foster EO*GI skills in the end-user sectors (agriculture, energy, transport, local government, etc.) as this is where the "pull" for EO*GI data and services eventually comes from.

In a context of increasing international competition, a broad uptake of EO*GI is critical to fully exploit the sector potential. For example, the development of smart cities, smart farming, smart logistics, construction, extractive industries, etc. can all be positively impacted through a further adoption and inclusion of EO*GI based services, enhancing their international competitiveness and thus export potential.

Operational objectives and actions

- To identify new vocational training initiatives to penetrate other sectors and application domains with a focus on societal challenges and the needs of citizens' daily life (OO41). Together with representatives and professionals from the public sector and these other sectors and application domains, the EO*GI skills identified and developed for other domains can become relevant and adapted to those domains. Specific training initiatives can be set up, e.g. to support particular work processes and new user services in those domains.

- To improve the uptake of EO*GI data and technologies through the upskilling and reskilling of professionals (OO42). The education and training initiatives should help improve the user uptake of the massive amount of data, services, and applications. Professionals from these other domains (marine, agriculture, transport and mobility, tourism & cultural heritage, etc.) must be offered training actions that will enrich and upgrade their current skills, and that will open up new opportunities in their own sector as well.

- To foster industry forums with other business sectors where skills development and transfer are considered (including digital skills, (big) data and analytics) (OO43). Shaping the research and innovation from EO*GI through open dialogue with industry experts from business sectors establishing a user community across different sectors. Open dialogue with the demand side will guide the development, delivery, and uptake of EO*GI services in Europe.

Outcome(s) – A series of skills development/ skills transfer initiatives and training activities for other business sectors and value chains sees light.

Expected impact – Will lead to new innovative initiatives and start-ups driven by reskilled, upskilled, or newly skilled people in other business sectors. More individuals and organisations from these other sectors will enter the EO*GI market. New innovative joint ideas will emerge, and a cross-sector approach will support integrated decision-making. Roadmap for business leaders in planning and realising EO*GI relevant innovation across a range of sectors (what does EO*GI mean for your business).

Timeline – It is proposed to start the identification of new end-user communities and application domains from the first year. The first skills development initiatives with/for other sectors will start from the second year.

Target public – Public and private organisations from different application domains and their professional staff, young people that want to enter the job market. Innovative people from other sectors such as ICT, insurers, urban developers, energy, etc. Those experts that want to dive into the EO*GI market.

Stakeholders – Associations representing other sectors.

2.4.6 Citizen focus

Strategic Objective 5: Encourage citizens' engagement, citizens' science practices and hands-on activities enhancing the inclusion/recognition of EO*GI applications' value in everyday aspects of life.

Rationale – Individual user needs and the search for new talent should be better taken into account ensuring a strong knowledge base in the sector. So, it is not only about other sectors (see SO4) but also about citizens, youths as well as experienced people that need to be involved in a dynamic way and/or use EO*GI as consumers. Individuals can have great ideas and they can learn from the sector, the wealth of information, services, and applications to support their daily activities. From that perspective, a more dynamic learning environment in the form of sandboxes or living labs which can learn from the experience of others i.e., the gaming sector is probably the most appropriate format. Gaming can be used in a positive way as an opportunity for educational, skills development and public awareness where EO*GI could be used as a tool to collect data linked to agriculture, cultural heritage and other applications where local data enhances the results.

Operational objectives and actions

- To promote and reach out to 'end-user' communities, and to engage citizens through various events, especially at the local level, on job opportunities, internships and apprenticeships, roadshows (OO51). These events[30] could be organised at the European and international levels, but also at the national and sub-national levels with support from local authorities. They can attract young people that want to enter the job market, but also professionals that want to reskill/upskill. Companies and public sector organisations can explain and demonstrate what type of skills they need.

- To provide a platform/forum for collecting and testing ideas from 'end-user' communities (OO52). Such a platform can become part of the one-stop portal that offers access to learning materials and training initiatives. It could be provided in the form of an innovative sandbox or living-lab through which new ideas for applying EO*GI data and technologies are shaped and tested. The platform would also serve as a user and discussion forum. This can in turn provide input to skills development. This platform will bring together a specific market representing all business-sector interested communities (downstream market actors, EO innovators and researchers, end-users).

- To increase efforts to develop skills and stimulate innovation and entrepreneurship, to foster an attractive work environment (OO53). Specific efforts are needed to support citizens to start new businesses, to shape new ideas that make use of EO*GI data that can lead to new products and services, helping them embrace new technological developments.

Outcome(s) – A series of events and a collaborative platform in the form of a sandbox.

Expected impact – A regional/local hubs network would allow citizens to raise awareness, develop individual skills and cooperation among all, leveraging knowledge across society and

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30 References of events where secondary and high school are addressed: SpaceEU, Our Space our Future, EUCYS

supporting the development of a pool of talent with space and geoinformation specific skills for industry.

Timeline – The bigger events at the European level should be organised, e.g., every two years, starting in 2023. The setup of a sandbox can start in the third year or so, as it requires a thorough preparation.

Target public – Young people that want to experiment with new EO*GI technologies, and that eventually want to enter the EO*GI job market. Innovative people from other sectors such as ICT experts that want to dive into the EO*GI market.

Stakeholders – Schools, youth organisations, professional organisations.

3   Envisaged future activities of the Alliance

In order to translate the SSS in Action into concrete and actionable activities, the Strategic and Operational Objectives were scrutinised and further developed according to a fixed schema. The idea is that even though the descriptions in this section are the result of a collaborative effort of some of the core EO4GEO partners and some of the Associated partners[31], the work and state of affairs should regularly be evaluated and adapted, including new ideas and insights.

Each Strategic Objective (SA) is sub divided in Operational Objectives (OO). For each of the former there is a rationale, expected outcomes, expected impact, a very rough timeline, the target public, and possible stakeholders. For each of the latter there is a description of one paragraph. Starting from each of the OO and their brief description following aspects were developed:

'What' - Actions/Activities required to reach the objective [In the form of a bullet list to understand what the activities are about];
One or more **indicators** that check(s) whether and when the objective is reached. [Preferably with a clear idea of target values];

'How' – What will be the approach, method … to conduct the activity/action [Surveys, interviews, workshops, development of tools, automate a process …];

Output/outcomes – What will be the tangible and less tangible results building further upon what is already described in the SO. They are usually linked to indicators [This can also be in a bullet list] ;

Expected impact – Briefly describing what is the long-term impact if any [Not always possible to be defined];

Timeline – While in the SSS in Action the timeline is defined at the level of SO's, this time it is defined for each of the OO's and related activities. [How long would it take, is it something to be done annually or continuously, etc.];

Target public – This should be cross-checked with what is mentioned in the SO [e.g. Academic tutors, HEI students, ICT experts, EO*GI companies … a fixed list is not possible since the description should be granular enough and also highlight particular groups where appropriate];

Stakeholders – This is a non-exhaustive list of particular existing organizations who are expected or could contribute to the activities/actions [e.g. Associations, particular HEI's might also be possible, … also under the SO organizations are mentioned];

Resources required – This is also covered in the Business Model and Plan. [This is in terms of people – how many FTE, but also the 'profiles' and 'expertise' needed, other resources such as computers, software, platforms you need to consider – e.g. in case of developing a MOOC];

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[31] The work reported in this section was performed by GISIG, UJI, PLUS, KU Leuven and EPSIT with the help of the following core and Associate Partners: EARSC, VITO, Planetek, UTwente, Jena, SpaSe, VRI-IES (all core partners), VVA, OGC, University of Pisa, Eurisy, Icon Group, Sinergise.

3.1   Strategic Objective 1

STRATEGIC OBJECTIVE 1
Set up a skills intelligence mechanism to identify the skills and competences required and provide feedback on the evolving sector needs

OPERATIONAL OBJECTIVE 1.1: To monitor the evolution of supply of and demand for education and training on a regular basis.

What	To ensure a matching between skill requirements from the industry and the (academic and vocational) educational offer, both need to be assessed systematically (ideally on an annual basis) and continuously, through: • Review of supply of education and training via the analysis of curricula reports from Higher Education Institutions/VET providers teaching Remote Sensing / Geomatics / Photogrammetry /…; • Review of training offers developed by companies / associations / trade unions and social partners either on a commercial basis (i.e. commercial lectures) as training service providers, or as part of their policies for staff up-skilling and re-skilling;

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- Regular organisation of surveys, complemented with interviews among stakeholders on education and training offered;
- Review of job offers for EO*GI professionals in industries and public institutions (e.g. analysing LinkedIn or other platforms) and monitoring market needs;
- Monitoring and analysing the evolving student population(s): gender, background, entrance in the market, …;
- Monitoring PhD studies and topics of specialisation, including the collaboration between academia and businesses in this domain (see among others the OGC survey on the topic)
- Check results (engineering reports, summary videos etc.) of activities such as the ones from OGC (Innovation Programme), ESA phi-lab, UN-GGIM, etc., and keep the on-going collaboration with OGC staff to gain more insights and being updated on initiatives:
  - Examples from OGC: https://www.ogc.org/projects/initiatives/completed
  - http://ceur-ws.org/Vol-2977/paper13.pdf
  - https://www.ogc.org/projects/initiatives/active
- The information collected should be systematized, managed and stored in a repository so that it can be used for analysing the information in a consistent way; the information on supply should be annotated or tagged with concepts stored in the BoK for EO*GI

On top of technical skills, also green, communication, commercial and strategic skills are necessary, to make sure the technological trends are taken into account in the educational offer and the market and user needs. In addition, together with "traditional" commercial and strategic skills, genuine interest in the space sectors, and knowledge about the geo-political component of it are necessary.

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<tr><td>**Indicators**</td><td>

Target indicators are settled in principle at a European level, however national peculiarities should be also taken into account. The indicators will be organized according to a logical framework matrix where sources of verification and base assumptions will be also stated.

- Number of respondents to the annual supply (of skills) surveys – Target: at least 400 for each survey;
- Number of respondents to the annual demand (of skills) surveys – Target: at least 400 for each survey;

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	• Number of in-depth interviews conducted every year with representatives from businesses on skills needs and educational and training needs – Target: at least 30 per year; • Number of in-depth interviews conducted every year with representatives of the public sector– Target: at least 30 per year; • Number of curricula, courses (BSc, MSc), modules and/or lectures[32] identified for the upstream part of the space sector, documented and stored in a repository – Target: approx. 250 per country in the first year, supposed to increase by 50 each subsequent year; • Number of curricula, courses, modules and lectures identified for the downstream EO*GI sector, documented and stored in the repository – Target: approx. 250 per country in the first year, supposed to increase by 50 each subsequent year; • Number of PhD studies and topics of specialisation detected – Target: approx. 70 per country in the first year, supposed to increase by 15 each subsequent year; • Number of open positions in the EO*GI sector analysed to collect skills requirements - Target: approx. 250 per year • Number of business oriented courses identified - Target: approx. 50 per year; • Number of EO*GI occupational profiles addressed by the identified education and training offer - Target: approx. 50 per year; • Number of new occupational profiles and related skills contributed the ESCO classification– Target: at least 5 per year, starting in the second year.
How	• Desktop studies: identify a list of web sites / repositories where relevant / interesting documents are hosted; • Surveys; • Semi-structured interviews; • Delphi Panels;

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[32] A Study program is a curriculum of one or more courses (grouped or not in Modules) that is intended to lead to a degree, diploma, or certificate. A Module is a collection of courses, grouped for some reason. The grouping could be based on year or semester, topic, elective or not, or any other criterion. A Course is a unit of teaching, a set of lectures or a plan of study on a particular subject, usually leading to an exam or qualification. A Lecture is a formal talk on a serious subject intended to display information or teach people about a particular subject (also known as lessons or classes).

	• Use of semantic technologies (automated processes) to collect available information and use the Web like a "store" which can be leveraged by applications to perform tasks automatically. This should include also research papers, recommendations etc. from stakeholder organizations like ESA, EU funded projects in this domain; • Regular exchanges with key stakeholders through a dedicated forum of discussion (could be also a discussion group on LinkedIn plus a Facebook page to address different target groups?); • Identify, test, analyse and select web scraping tools to automatically extract skills, technologies, applications, job profiles. Define the minimum requirements that the tool must possess to fit our purposes; • Use the identified web scraping tools to help extracting data on skills, technologies, applications, job profiles from research to media monitoring. Web scraping tools often use machine learning, natural language processing (NLP), custom dictionaries, and text analysis algorithms. These tools evaluate content based on semantics and context to understand opinions and classify user responses; • Use data mining software to examine the data collected with the above methods and tools for the purpose of discovering patterns and building predictive models. Data mining techniques are widely used in artificial intelligence applications and are the first step in machine learning processes https://www.capterra.it/directory/31083/data-mining/software; • Analyse technical vs commercial lectures to focus on commercial and strategic skills and not only technical ones; • Store the identified curriculum, courses (BSc, MSc), modules and lectures in a repository where they are described using metadata based on international standards (i.e. Dublin Core, DCAT or ISO 19788); • Pursue interoperability of defined metadata with other widely used standards (i.e. OGC standards in RDF format, e.g. https://defs.opengis.net/vocprez/search?search=OGC&from=http%3A%2F%2Fwww.opengis.net%2Fdef%2Fdocs);
Output/ outcomes	• Overall, a good insight in what is offered as education and training in the space / geo-information domain and the needs of the sector. • A repository (or catalogue) with collected education and training offer, described by metadata.

	• A report on the supply and demand side including an insight in both supply and demand (the analysis of supply against demand is part of OO13). • A dashboard where, at a glance, the collected series of data, graphs, lists and all relevant collected information are accessible to the user in a clear and organized way. • A set of occupational profiles for the EO*GI sector to be included in the ESCO classification and a set of (new/updated) skills to be included in the BoK.
Expected impact	Improved insight and awareness of where skills development should go. This will help the future updates of the sectoral skills strategy and the future Pact for Sectoral Skills, and will allow improving vocational training, the upskilling and reskilling of professionals and newcomers on the job market and ultimately employment. This approach would also give the EO*GI sector the input for deriving the necessary skills intelligence and understanding of the latest needs and existing gaps/mismatches between offer and demand assessed as part of OO13. Collaboration / Interdisciplinary research is a benefit here as well. The impact could also consist in providing a framework to identify opportunities for interdisciplinary research more effectively and efficiently.
Timeline	Collection of information is performed continuously, while the analysis of the offer and demand is repeat every two years for academic offerings, and annually for the non-academic offerings. Yearly assessment of the demand with information collected at different occasions: • Industry, taking advantage of existing events, exhibitions, conferences, career days attendance etc. • Educational and training sector, e.g. complementary commercial-oriented modules relatively easy and quick to include
Target public	Academic sector, businesses, workforce, public sector actors, VET providers, students
Stakeholders	Project Partners: KU Leuven, PLUS, UJI, GEOF, UPAT, FSU-EO, UT-ITC, UNIBAS, EARSC, GISIG, EPSIT, VRI-IES, UNEP-GRID, SpaSe, Planetek Associated Partners: all Key education and training providers as well as organisations that are currently already involved in monitoring technology trends should be involved, among others those in the supranational scope (ESA, JRC), international bodies such as UN-

	GGIM, associations representing the sector such the Open Geospatial Consortium (OGC)[33], other business professionals, EO*GI private services providers companies, VET providers, etc. Universities and companies involved in H2020 (HE) projects should be considered as well, detecting technical vs. commercial activities.						
Resources required[34] (PER YEAR)	Main cost category	Cost category	Unit description	Unit cost	Quantity	Total costs	Notes
	Personnel	Senior expert	Person day	€ 600,00	60	€ 36.000,00	Monitoring coordinator (0,25 FTE)
	Personnel	EO technology domain senior expert	Person day	€ 600,00	60	€ 36.000,00	0,25 FTE
	Personnel	EO technology domain junior expert	Person day	€ 300,00	120	€ 36.000,00	0,5 FTE
	Personnel	GI technology domain senior expert	Person day	€ 600,00	60	€ 36.000,00	0,25 FTE
	Personnel	GI technology domain junior expert	Person day	€ 300,00	120	€ 36.000,00	0,5 FTE
	Personnel	EO*GI policy domain senior expert	Person day	€ 600,00	60	€ 36.000,00	0,25 FTE
	Personnel	EO*GI policy domain junior expert	Person day	€ 300,00	120	€ 36.000,00	0,5 FTE
	Personnel	Senior technician	Person day	€ 450,00	60	€ 27.000,00	0,25 FTE
	Personnel	Junior Technician	Person day	€ 300,00	120	€ 36.000,00	0,5 FTE
	Travels	Trips to attend workshops to proceed on SO1.1 activities (2workshops attended by 10 people each)	Unit	€ 700,00	20	€ 14.000,00	n.a.

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[33] In the last version of the OGC Tech Trends Mind map, 48 trends are identified (some of the previous trends were split, others are new).

[34] See also D6.2. This is a first estimate. Some activities might be added and need additional resources, while others can be performed more efficiently.

	Services	Support for conducting large professional surveys	Unit	€ 15.000,00	1	€ 15.000,00	n.a.
						€ 344.000,00	

Priority	High: the assessment of the educational offering and industry needs is fundamental to take actions to ensure the matching of skills offered and skills needed
References	EARSC Industry Survey https://earsc.org/wp-content/uploads/2021/11/EARSC-Industry-survey-2021-2-2.pdf EARSC Survey on the total employment in Europe in the EO services https://earsc.org/survey-on-the-total-employment-in-europe-in-the-eo-services/ Studies on offer and demand, and business requirements conducted as part of the GEOBIZ project: http://geobiz.eu/ PERSEUS: https://cordis.europa.eu/project/id/640211 D1.1 - Current supply of space/geospatial education and training http://www.eo4geo.eu/download/eo4geo_d1-1_current-supply-of-space-geospatial-education-and-training_v2-1/?wpdmdl=3836&masterkey=5cfe84423e22e D1.2 - Workshop on demand for space/geospatial education and training http://www.eo4geo.eu/download/eo4geo_d1-2_workshop-on-demand-for-spacegeospatial-education-and-training_v2-2/?wpdmdl=3838&masterkey=5cfe846ce87d7 D1.3 - Demand for space/geospatial education and training and priority occupational profiles http://www.eo4geo.eu/download/eo4geo_d1-3_demand_for_space-geospatial_education_and_training_and_priority_occupational_profiles_v2-1/?wpdmdl=3840&masterkey=5cfe849bd1fee D4.1 - Business processes and occupational profiles http://www.eo4geo.eu/download/d4-1_business-processes-and-occupational-profiles_v2-0/?wpdmdl=4827&masterkey=5e45a07016892 D4.2- EO and related curricula http://www.eo4geo.eu/download/eo4geo_-d4-2-eo-and-related-curricula_v2-0/?wpdmdl=9155&masterkey=622f4749d89b9
Potential funding programme	ERASMUS+, HORIZON EUROPE, Marie Skłodowska-Curie Actions, Digital Europe Programme Resilience and Recovery Funds EU and ESA Call for Tenders European Social Funds Regional and national funds Private support and sponsorships (also by dedicated Foundations)

OPERATIONAL OBJECTIVE 1.2: To establish a "trend watch system" that alerts the community on emerging developments (e.g., technological, policy, economic, societal).

What	A technical system should be set-up, together with stakeholders, to collect – if possible, in an automated way - emerging technological, political, and societal trends, to group/cluster and analyse their impact on the EO*GI sector in terms of skills and education & training to be offered, and to define a roadmap on how to integrate them in curricula. In practice a system should be set-up that continuously monitors trends and a mechanism to collect information 'manually'. The results might be published in the form of reports and a visually appealing dashboard. With trends we mean current trends versus disruptive trends and technologies. The innovation cycle should be also verified, together with maturity levels of innovation and Technology Readiness Levels (TLRs).
Indicators	The following indicators are considered, part of them also according to CEDEFOP's guide (annually unless specified otherwise): • Number of papers analysed related to a specific technology over time – Target 500 over a 5-year period • Number of technologies in use identified in related retrieved articles – Target 50 • Number of extracted skills in scientific paper databases and their frequency - Target 50 • Number of people that visit the trends dashboard – Target 50.000 by the 3rd year • Number of identified trends that are integrated in the BoK – Target 50 by the end of the 3rd year • Number of new trends and new developments in evolving trends 'discovered' annually – Target 20 • Share (percentage) of the EO*GI trends among all trends discovered – Target 70% • Appearance of signals on the trend topic in different geographic locations (EU countries and beyond) – Target 20
How	Extract the part related to EO*GI from Cedefop skills forecasts, which offer quantitative projections of the future trends in employment by sector of economic activity and occupational group. To check and try to replicate their methodology for investigation and analysis. Conduct semi-structured interviews to sample of selected stakeholders. Develop forecast through the Delphi Panel technique, identifying beforehand the experts who should take part in it (to this purpose, criteria for the selection of experts should be defined). Use publication monitoring systems to check scientific and other publications on particular topics.

	Support EARSC in the survey on the total employment in Europe in the EO services. Each year, EARSC publishes a report looking at the companies in the EO services sector including the number of employees working within the private sector. EARSC also published an employment report which indicate a figure to the total employment in all categories of employer both public and private, commercial and academic. This survey is not annual.
	Perform an automatic analysis of job offers and occupational profiles occurrence of skills (leverage on the experience of DRIVES and ASSET + projects). Use web scraping tools as identified in OO11, including Semantic Web/Linked Data technologies, Machine Learning techniques, Sentiment Analysis (market intelligence).
	Acquire the methodology and perform a PESTLE analysis. It is a tool used to gain a macro picture of an industry environment. PESTLE stands for Political, Economic, Social, Technological, Legal and Environmental factors. It allows a company to form an impression of the factors that might impact a new business or industry. The model of the analysis could be extended to encompass also demographic and education factors. Typically, this analysis (macro) is complemented by a SWOT (micro) analysis, which is focused on the strengths, weaknesses, opportunities and threats for a certain solution/tool.
	Promote regular exchanges with key stakeholders through a dedicated forum of discussion where exchange on the trends impacting the sector are regularly analysed (this could be also a discussion group on LinkedIn plus a Facebook page to address different target groups)
	Perform a regular "matching" of predicted outcomes / indicator importance with reality, using also the Hype Cycle model to graphically represent the maturity, adoption and application of EO*GI technologies.
Output/outcomes	A dashboard to present the results of trends' monitoring at a glance, including accompanied by an annual report. The results can / should be used to update skills requirements and curricula (see SO3).
Expected impact	The dashboard and the annual report will be used by educational and training centres to intercept future needs and guide their training programs, and by industry to highlight their incoming needs in skills and competences. In the long term, the dashboard will become the catalyst for skills anticipation at the European level.
	More agility (If you make this matching regularly, you can be more agile in technology trends analysis - makes your system more valuable.)
Timeline	Continuous, assessment every semester
Target public	Academic teachers and tutors, VET Providers
	EO*GI companies
	Investment companies

	Businesses workforce
	Public sector actors
Stakeholders	Core Partners: KU Leuven, PLUS, UJI, GEOF, UPAT, FSU-EO, UT-ITC, UNIBAS, EARSC, NEREUS, GISIG, Planetek, EPSIT
	Associated Partners: All
	Key education and training providers as well as organisations that are currently already involved in monitoring technology trends should be involved, among others those in the supranational scope (ESA, JRC), international bodies such as UN-GGIM, associations representing the sector such the Open Geospatial Consortium (OGC), EARSC, other business professionals, EO*GI private services providers companies, VET providers, etc.
	Universities involved in H2020 (HE) projects and Marie Curie Actions, as well as industry and investment companies.
	In the industrial world, the subjects involved are mainly sector associations: EARSC, EUROGI, GEO, OGC® with their national chapters, BigKnowledge, Deloitte, Gartner.

Resources required[35] **(PER YEAR)**

Main cost category	Cost category	Unit description	Unit cost	Quantity	Total costs	Notes
Personnel	Senior expert	Person day	€ 600,00	60	€ 36.000,00	Watch coordinator (0,25 FTE)
Personnel	EO technology domain senior expert	Person day	€ 600,00	60	€ 36.000,00	0,25 FTE
Personnel	EO technology domain junior expert	Person day	€ 300,00	120	€ 36.000,00	0,5 FTE
Personnel	GI technology domain senior expert	Person day	€ 600,00	60	€ 36.000,00	0,25 FTE
Personnel	GI technology domain junior expert	Person day	€ 300,00	120	€ 36.000,00	0,5 FTE

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[35] See comment for the required resources for OO1.1.

	Personnel	EO*GI policy domain senior expert	Person day	€ 600,00	60	€ 36.000,00	0,25 FTE
	Personnel	EO*GI policy domain junior expert	Person day	€ 300,00	120	€ 36.000,00	0,5 FTE
	Personnel	Senior technician	Person day	€ 450,00	60	€ 27.000,00	0,25 FTE
	Personnel	Junior Technician	Person day	€ 300,00	120	€ 36.000,00	0,5 FTE
						€ 315.000,00	

Priority	High - as you want to stay on top of trends
References	CEDEFOP Guides on understanding technological changes & skill needs OGC TechTrends Watch Deloitte annual reports Gartner Hype Curve and Annual Top-10 Trends Assessments D1.4 - Trends and challenges in the space/geospatial sector http://www.eo4geo.eu/download/eo4geo_d1-4-trends-and-challenges-in-the-space-geospatial-sector_v2-1/?wpdmdl=3842&masterkey=5cfe850544b23
Potential funding programme	ERASMUS+, HORIZON EUROPE, Marie Skłodowska-Curie Actions Digital Europe Programme Resilience and Recovery Funds EU and ESA Call for Tenders European Social Funds Regional and national funds Private support and sponsorships (also by dedicated Foundations)

OPERATIONAL OBJECTIVE 1.3: To assess supply and demand at regular intervals with the view to draw recommendations for the stakeholders of the sector

What	The supply, demand and new trends should be assessed together to find gaps and mismatches (objective 1), and to identify priorities for integration of (new) topics in existing and new curricula and required actions to make this happen. The aim is to have the findings regularly published, broadly distributed, and recognised by the whole community.
Indicators	The following indicators are considered (annually unless specified otherwise): • Number of potential occupational profiles identified – Target 20 by the end of the third year, then annually 5 new ones • Number of new occupational profiles defined and integrated in ESCO – Target 5 • Number of reports published - Target 1 high level report annually • Number of downloads of the reports - Target 100.000 cumulative over 5 years • Number of policy and research recommendations formulated – Target 5 • Number of communications per semester – Target 50 • Number of workshops per year – Target 5 • Number of stakeholders reached by communication actions, divided by target group – Target 200.000 over a 5-year period
How	Definition of a framework to conduct the assessment of offer against demand of skills (current and anticipated). The key steps in skills forecasting are common and typically include (from CEDEFOP's Guide): (a) a projection of employment prospects in the main sectors or industries; (b) translation of these projections into trends in employment at the level of occupations; (c) an assessment of replacement needs (to take account of job openings arising from retirements and other withdrawals from the workforce); (d) forecasts of supply of labour by age, gender, qualification level and occupation, encompassing both new entrants to the workforce and the unemployed; (e) calculation of (future) labour market imbalances by comparing occupational demand with various indicators of supply (as identified in OO11).

	A systematic action of dissemination and data collection through web surveys and interviews will be carried out in concert with the sector associations, in the academy, industry and public institutions. Dedicated webinar/seminars (useful also to collect feedback). Take advantage of existing events and gathering to reach a wide audience Online communication: socials, newsletter Drafting of discussion notes and position papers Organise regular gap analysis workshops: showing the expert communities your indicators and approaches and do a „reality check " Feedback from the experts needs to feed back into the system (-> include the expertise in the system - „human-agent collectives ", considering ethics etc.)
Output/outcomes	Regular communication on industry vs. educational offer mismatches and suggested actions to bridge the gaps. The main output will be a report containing an integrated assessment to be presented publicly every two years and which will contain the main indications about the market and current technological situation and anticipated trends for the stakeholders, with provision of actionable recommendations to support the implementation of required actions to fill skills gaps and mismatches. The ambition is to have such report recognized by the sector and by other sectors to be the reference publication where you can find everything you need, and you can refer to.
Expected impact	• In the long term, a continuous dialogue between the various stakeholders would be desirable to create a continuous dialogue on supply and demand and automatically create convergence • Educational institutions being more aware of educational needs and adapting their offering accordingly, ultimately supporting the competitiveness of European EO industry.
Timeline	It is advisable to put in place a process that allows for a smooth and up-to-date process and systems where smaller changes can be adopted instead of big changes every 2 years (or annual, with quarterly literature reviews and a watch over the market), with recommendations update every semester. Continuous awareness and dissemination actions through different communication channels.
Target public	Academic teachers and tutors, VET Providers EO*GI companies Investment companies Businesses workforce

	Public sector actors						
	Policy makers in charge for skills development at regional, national and EC level						
Stakeholders	Core Partners: KU Leuven, PLUS, UJI, GEOF, UPAT, FSU-EO, UT-ITC, UNIBAS, EARSC, NEREUS, GISIG, Planetek, EPSIT						
	Associated Partners: All						
	Key education and training providers as well as organisations that are currently already involved in monitoring technology trends should be involved, among others those in the supranational scope (ESA, JRC), international bodies such as UN-GGIM, associations representing the sector such the Open Geospatial Consortium (OGC), EARSC, other business professionals, EO*GI private services providers companies, VET providers, etc.						
	Universities involved in H2020 (HE) projects and Marie Curie Actions, as well as industry and investment companies.						
	In the industrial world, the subjects involved are mainly sector associations: EARSC, EUROGI, GEO, OGC®, etc. with their national chapters.						
	Also organisations such as OECD, Gartner, Deloitte, VVA, …						
Resources required[36] (PER YEAR)	Main cost category	Cost category	Unit description	Unit cost	Quantity	Total costs	Notes
	Personnel	Senior expert	Person day	€ 600,00	60	€ 36.000,00	Assessment coordinator (0,25 FTE)
	Personnel	EO*GI skills gap domain senior expert	Person day	€ 600,00	60	€ 36.000,00	0,25 FTE
	Personnel	EO*GI skills gap domain junior expert	Person day	€ 300,00	120	€ 36.000,00	0,5 FTE
						€ 108.000,00	
Priority	High						

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[36] See comment for OO1.1 and OO1.2.

References	• Study CEDEFOP's guides prepared to perform this kind of analysis (i.e. 4197_en_Understanding_technological_changes_&_skill_needs_guide1) – Also valid for OO1.2 • OGC Innovation Program: new activities are often based on findings from previous initiatives in a similar domain. • OECD and EARSC reports • D1.5 - Skills shortages, gaps and mismatches between supply and (future) demand http://www.eo4geo.eu/download/eo4geo_d1-5-skills-shortages-gaps-and-mismatches-between-supply-and-future-demand_v2-2/?wpdmdl=4773&masterkey=5e454ec9238e2
Potential programme for funding	ERASMUS+ HORIZON EUROPE Marie Skodowska-Curie Actions Digital Europe Programme Resilience and Recovery Funds EU and ESA Call for Tenders European Social Funds Regional and national funds Private support and sponsorships (also by dedicated Foundations)

3.2 Strategic Objective 2

STRATEGIC OBJECTIVE 2
Reinforce cooperation among stakeholders from the academic, private, and public sectors on skills development and requirements

OPERATIONAL OBJECTIVE 2.1: To keep a Body of Knowledge (BoK) for EO*GI operational, feed it with the results of the Technology Trends Watch and link it with other relevant BoKs, vocabularies and ontologies

What	The BoK is the central instrument that supports and steers the collaboration, it is a commonly agreed language that is continuously evolving with new technological and societal trends. Organizational: • Set up the organizational structure and maintain an editorial board and advisory committee to provide qualitative updates of the BoK as to respond to new trends and evolutions in the EO*GI field, supported by experts through the network-of-networks approach; • Actively engage and build a community of experts and users of the BoK for discussion, feedback and BoK evolution; • Set up cooperation with organizations in related fields that maintain their respective BoK/vocabularies for linking with the EO*GI BoK; • Work out and decide on a proper communication and branding strategy for the BoK; • Promote and disseminate the BoK both within and outside the EO*GI scientific and professional community, including showcasing example usages for multiple audiences. Technical: • Maintain and keep the existing EO4GEO platform, as basis for online availability and visualisation of the BoK, operational in terms of server infrastructure, software, periodic maintenance; • Develop tracking and monitoring capabilities for BoK uptake and usage; • Evolve the BoK and BoK platform towards semantic web and linked data technologies;

	- Further extend the standards compliancy and availability of the BoK, in terms of different access methods and data formats; - Develop and provide supporting material to support BoK extensions, in terms of concept clusters, concepts and relationships; - Support new releases of the BoK in terms of data cleaning, installing the new BoK in the data repository and operationalizing it; - Revise the data model and data storage technology to allow seamless linking with and interoperability between external BoKs; - Technically link external BoKs, vocabulary or ontology using Semantic Web and Linked Data principles; - Use semantic and natural language processing technologies for BoK validation, analysis, further extension and advanced uses; - Provide different renderings of the BoK focusing on usability for various end-user cases and different user groups; - Extend the BoK with multi-lingual support.
Indicators	- Size of community around the BoK over the next 5 years ➢ Target: maintain a community of 250 people; minimum 50 people active; evolving towards 500+ people over the next 5 years - BoK platform uptime in the next 10 years ➢ Target: 99% uptime; minimum: 95% uptime; ideal: 99,99% uptime - Average amount of yearly expert hours invested in BoK content updating/evolution ➢ Target: 100; minimum: 50; ideal: 500+ - Amount of new BoK releases in the next 3 years ➢ Target: 3 releases; minimum: 1 release; ideal: 5+ releases - Compatibility of BoK platform with semantic web and linked data technologies ➢ Target: compatible for external use; minimum: partially compatible for external use; ideal: full internal and external compatibility - Amount of new access methods and/or data formats for the BoK leading to new uptake of the BoK in the next 5 years ➢ Target: 3; minimum: 1; ideal: 5+

	- Amount of uptake of the BoK and/or associated tools in novel applications and/or domains in the next 5 years - Target: 5; minimum 2; ideal: 10+ - Amount of linked external BoKs, vocabularies or ontologies - Target: minimum 1 linked; ideal: 3+ linked - Amount of promotional/dissemination activities in the next 5 years - Target: 10; minimum: 5; ideal: 15+ - Type of monitoring and tracking capabilities for BoK usage developed in the next 5 years - Target: BoK & concept-level tracking; minimum: basic BoK usage tracking; Ideal: BoK & concept-level tracking, usage visualisation - Amount of yearly unique daily visits to the BoK in the next 10 years - Target: +20%; minimum: +5%; Ideal: +50% - Amount of new BoK renderings in the next 5 years - Target: 3; minimum: 1; Ideal: 5+ - Amount of articles/papers citing the BoK or BoK-related articles in the next 5 years - Target: 100; minimum: 50; Ideal: 250+ - Amount of other language supported over the next 5 years - Target: 3; minimum: 1; Ideal: all European languages
How	- Attend and disseminate at scientific, business and public events - Periodic online meeting of editorial board and advisory board regarding BoK content validation, updates and evolution - Periodic online meeting of experts to discuss and update BoK, targeted singular initiatives for focused, intensive BoK evolutions - Software maintenance (BoK platform and BoK) - Data cleaning and curation (BoK release) - Software design and development (linking new BoKs/vocabularies) - Promotional/dissemination activities (e.g. publications, press articles, blog posts, talks/demonstrations in scientific and professional fora, participation in related events, etc.)
Output/	A qualitative, up-to-date Body of Knowledge, in line with the evolving EO*GI field

outcomes	• The EO4GEO BoK platform, through which the BoK is online available, including Application Programming Interface (API) for programmatic access and built up on it, the BoK visualisation and search tool for online access, functional and available • Extensions of the BoK platform, in terms of novel methods, techniques, developments and tools • Linked external BoKs, vocabularies or ontologies • Increased visibility for the EO*GI BoK • New practical usages of the BoK
Expected impact	An up-to-date Body of Knowledge, as a roadmap of state-of-the-art knowledge and associated skills, is essential to materialise the common understanding of the evolving EO*GI field. Such a common understanding explicitly represented and made available for online visualisation and other materializations (e.g. audio, machine-readable content), search and use by practitioners, the educational sector, researchers and professionals, promotes a homogeneous view on the EO*GI field and aligns different viewpoints of the aforementioned sectorial actors. Furthermore, keeping the BoK programmatically available through the EO4GEO platform ensures BoK-based software support (see Operational Objective 2). Moreover, linking the BoK with other fields may extend the reach of BoK-based approaches and software, further complementing the existing coverage of the core EO4GI field. Spill-over effect of the developed methods, techniques, technologies and tools to other domains and application areas.
Timeline	• Continuous updating of the BoK, with semester focus for its publication; • Yearly meeting of BoK editorial board; • Continuous maintenance of the EO4GEO platform to ensure online availability of the BoK; • Opportunity-based initiatives, for addressing new domains, target audiences and applications.
Target public	Professional sector, academic sector, education sector and public sector actors, organizations managing related BoKs or specialized taxonomies
Stakeholders	Partners: KU Leuven, UJI, UT-ITC, GISIG Associated Partners: - All EO4GEO partners and associated partners as experts for EO*GI BoK evolution - Any interested practitioner, academic, professional, or educational expert in the EO*GI field - Key partners managing related or complementary BoKs/vocabularies (e.g., ESA, ICA, OGC, UCGIS)

Resources required	Main cost category	Cost category	Unit description	Unit cost	Quantity	Total costs	Notes

Priority	High

References	- Erasmus+ SPIDER project – Open Spatial Data Infrastructure Education Network (https://sdispider.eu/) - ISA2 – Interoperability solutions for public administrations, business and citizens (https://ec.europa.eu/isa2/home_en) - JRC ELISE 2020 – Creating Public Value through Local and Regional Innovations (https://etendering.ted.europa.eu/cft/cft-display.html?cftId=6618) - International Cartographic Association - Cartographic Body of Knowledge (CartoBoK) (https://bok.cartography.no/) - UCGIS BoK – maintaining and updating the Body of Knowledge (http://gistbok.ucgis.org) - ESA OSMOSE ontology (https://mb4se.esa.int/OSMOSE_Main.html) - Open Geospatial Consortium – Glossary of Terms (https://www.ogc.org/ogc/glossary) and OGC Definitions Server (https://www.ogc.org/def-server)
Potential funding programme	ERASMUS+, Horizon Europe, European Commission Call for tenders

OPERATIONAL OBJECTIVE 2.2: To expand and maintain a rich toolset to support skills development, and to make it accessible and re-usable for all stakeholders

What	To design, develop and manage skills, educational offers, etc., a series of tools is needed in an open environment that is continuously evolving and maintained.
	Organizational:
	• Set up an organizational and governance structure around the tools to ensure continuity, promotion, building a user community and generate income streams;
	• Promote and disseminate the EO4GEO tools & EO4GEO platform as basis for tool development, both within and outside the EO*GI scientific and professional community;
	• Set up strategic partnerships and create synergies with key players in the domain (e.g. teams behind ESCO, Europass, Eures, …).
	Technical:
	• Maintain and keep the existing EO4GEO platform, including permalinks as Universal Resource Identifiers (URI) and Application Programming Interface (API) as basis for BoK-based application development, operational in terms of server infrastructure, software, periodic maintenance;
	• Maintain and keep the Living Textbook tool, as editor for the BoK operational in terms of server infrastructure, software, periodic maintenance;
	• Maintain and keep the existing ecosystem of tools (i.e., curriculum design tool, occupational profile tool, job offer tool, BoK annotation tool, BoK matching tool) operational in terms of server infrastructure, software, periodic maintenance
	• Set up and offer access to a wide portfolio of EO*GI domain tools under the EO4GEO Alliance umbrella
	• Identify new application areas, domains, users, use cases for existing a new BoK-based and/or EO*GI domain tools
	• Extend the existing tools in the ecosystem (i.e., curriculum design tool, occupational profile tool, job offer tool, BoK annotation tool, BoK matching tool) with new functionality, based on the identification of new use cases and the demands of users in the EO*GI sector;

	- Make the existing tools in the ecosystem (i.e., curriculum design tool, occupational profile tool, job offer tool, BoK annotation tool, BoK matching tool) compatible with existing standards and tools aimed at similar goals; - Develop new BoK-based tools within the ecosystem of tools aimed at addressing the skill gap between educational offer and professional demand in the EO*GI sector; - Incorporate natural language processing, semantic and artificial intelligence techniques in existing and novel BoK-based tools for improved automation and advanced functionalities; - Improve the usability and user experience of existing and future BoK-based tools, taking into account different audiences and target domains; - Elaborate user manuals and (video) tutorials for the existing and novel tools.
Indicators	- Size of user community around BoK-tools over the next 5 years - Target: 250 people; minimum: 50 people; ideal: 500+ people - Amount of successful new income streams in the next 10 years - Target: 50; minimum: 20; ideal: 200+ - Amount of distinct users using the tools in the next 5 years - Target: 1000; minimum: 250; ideal: 10000+ - EO4GEO BoK platform uptime - Target: 99% uptime; minimum: 95% uptime; ideal: 99,99% uptime - EO4GEO BoK editor uptime - Target: 99% uptime; minimum: 95% uptime; ideal: 99,99% uptime - EO4GEO ecosystem of existing tools uptime - Target: 99% uptime; minimum: 95% uptime; ideal: 99,99% uptime - Amount of new functionalities implemented based on demand (per year; next 5 years) - Target: 1 tool improved; minimum: 0 tools improved; ideal: 2 tools improved - Amount of external tools with which existing EO4GEO BoK tools are made compatible (over next 3 years) - Target: 1 tool; minimum: 0 tools; ideal: 2 tools - Amount of new tools implemented addressing educational / professional skill gap (over next 5 years) - Target: 3 new tools; minimum: 1 new tool; ideal: 3+ new tools - Amount of new tools implemented for other application areas (over next 5 years)

	➢ Target: 1 new tool; minimum: 0 new tools; ideal: 2 new tools
	• Amount of promotional/dissemination activities (over the next 5 years)
	    ➢ Target: 10; minimum: 5; ideal: 10+
	• Amount of EO4GEO domain tools offered access to (over the next 5 years)
	    ➢ Target: 10 additional; minimum: current tools; ideal: 10+ additional
	• Amount of new application areas, domains, users, use cases identified (over next 5 years)
	    ➢ Target: 5; minimum: 2; ideal: 5+
	• Amount of new tools implemented addressing educational / professional skill gap (over next 3 years)
	    ➢ Target: 1 new tool; minimum: 0 new tools; ideal: 1+ new tools
	• Amount of uptake of the existing and new tools (over the next 5 years)
	    ➢ Target: 50 distinct uptakes; minimum: 25 distinct uptakes; ideal: 100+
	• Amount of usability tests performed with existing or new tools (over next 3 years)
	    ➢ Target: 50 tests; minimum: 20 tests; ideal: 100+ tests
	• Amount of advanced functionalities based on NLP, AI and semantic technologies implemented (over next 5 years)
	    ➢ Target: 10; minimum: 5; ideal: 10+ tests
	• Amount of user manuals/tutorials developed (over next 3 years)
	    ➢ Target: elaborate user manual for each tool, video tutorial for complex tools; minimum: basic user manual for each tool; ideal: elaborate user manual and video tutorial for each tool

How	• Software maintenance (BoK platform and BoK, existing tools); • Requirements engineering, software design and development (extending functionality of existing tools, implementing new tools); • Promotional/dissemination activities (e.g. publications, press articles, blog posts, talks/demonstrations in scientific and professional fora, participation in related events, etc.
Output/outcomes	• A functional BoK platform and ecosystem of tools built upon it; • A portfolio of EO*GI domain tools under the EO4GEO Alliance umbrella; • A functional editor for EO*GI BoK, also usable for other BoKs, increasing interoperability between BoKs; • A user community around the BoK and EO*GI domain tools; • Extended functionality of existing tools based on stakeholders' demand;

	• Compatibility with existing tools in the field; • New tools based on new use cases and stakeholders' and users' demand; • Increased visibility for the EO4GEO platform and tools.
Expected impact	Making the BoK programmatically available through the EO4GEO platform ensures the possibility of software-based support for sectoral skill development, upskilling and reskilling, as was demonstrated during the EO4GEO project (e.g., through curriculum design, aligning job and educational offers, etc.). The existing rich ecosystem of tools based on the BoK, aimed at the professional sector on one hand, and at the educational sector on the other hand, may help to bring up-to-date knowledge, competences and skills towards these sectors and allow aligning both. Depending on the specific needs within the EO*GI field, extended functionality or new tools can further help to the aforementioned alignment (e.g., a curriculum vitae tool), and linking with existing tools (e.g., PRAXIS internship offers - https://www.praxisnetwork.eu) may further promote the ecosystem of tools specifically designed for the EO*GI sector. Use of natural language processing, semantic and AI technologies are expected to improve automation, extent, quality, and ultimately uptake of the tools. Furthermore, through the Application Programming Interface included as part of the EO4GEO BoK platform, external developers gain access to the BoK as a common, shared vocabulary, and are empowered to write their own tools based on the BoK, making a developer community around the BoK possible, possibly addressing new requirements and use cases.
Timeline	Continuous.
Target public	All actors in the EO*GI field, with special focus on the professional and education sector.
Stakeholders	Partners: - KU Leuven, UJI, UT-ITC, GISIG APs: - Associated partners with interest for BoK-based EO*GI tools - Academic, professional or educational actor in the EO*GI field interested in using and/or expanding the BoK-based ecosystem of EO*GI tools - Open-Source software community

Resources required	Main cost category	Cost category	Unit description	Unit cost	Quantity	Total costs	Notes

Priority	High
References	- PRAXIS Internship offer tool (https://www.praxisnetwork.eu) - Europass Curriculum Vitae tool (https://europa.eu/europass/en/create-europass-cv) - edX education platform (https://www.edx.org/) - LabXchange education library (https://www.labxchange.org/)
Potential funding programme	• ERASMUS+, Horizon2020, European Commission Call for tenders

OPERATIONAL OBJECTIVE 2.3: To animate and enhance a network-of- networks and avoid fragmentation and negative side effects, bringing together stakeholders and user communities

What	EO4GEO Alliance seeks to establish a result-oriented dialogue with key institutions, industry and stakeholders in order to contribute and discuss both the EO4GEO outcomes as well as future demands and needs of these communities. The Networks-of-Networks (The EO4GEO Alliance) helps establishing and maintaining lines of communication with stakeholders to share information and EO4GEO resources. The emphasis on the Sector Skills Alliance through a coordinated community management effort through the Network of Networks supports in getting to better known other communities, finding out gaps and challenges concerning the sector skills development. This objective is linked to a strategic collaboration of the private sector, government and "end user" sectors. Organizational: • Set up an organizational and governance structure for Network-of-Networks steering and coordination (See also section on Governance); • Map the stakeholders (users and contributors) and value chains in more detail;

	• Signature of the pact for Skills by the Alliance and its members;
	 • Define levels of engagement with stakeholders (Stakeholder's categories):
	   o Working with representative bodies (such trade unions, employers, politicians) to develop an integrated approach;
	 • Establish a dialogue mechanism > Define type of messages and propose key messages for each group of stakeholders:
	   o Forum for exchange where a mechanism of "user requirements" is established (N. users engaged);
	   o Leveraging success stories to influence policy;
	 • Set up, animate and maintain an end user and stakeholder community > participation of contributors to achieve EO4GEO Alliance goals > recognition from the work (interviews, highlight ideas) > new contributions…;
	 • Engage with and bridge the gap with other relevant communities (e.g., ESCO, CEDEFOP, DG Employment, …);
	 • Position the EO4GEO Alliance in major EU and other initiatives/frameworks (e.g. Green Deal, Sustainable Development Goals, …).

Indicators	• Prepare the objectives for the Pact for skills and set up their indicators
	 • Number of partners in the Alliance
	   ➢ Target: 1 per month
	 • Number of active collaborations with Associated partners (building further on existing initiatives and collaborating with leading actors
	   ➢ Target: 3 activities/year
	 • Number of end users involved in the next 3 years
	   ➢ Target: 250+
	 • Number of Advisory Board members engagement
	   ➢ Target: Activities with at least 2 Advisory Board members
	 • Track number of visitors pf the Alliance website (Making network of experts more visible)
	 • Number of new use cases resulting from the network-of-networks approach in the next 5 years
	   ➢ Target: 30
	 • Number of uptakes resulting from the network-of-networks approach in the next 5 years
	   ➢ Target: 25+

	• Engagement with the Copernicus Academy and Relays networks
	    ➢ Target: Presenting activities at the Copernicus networks (1/2 year)
	• Engagement with National and Regional/Local education system
	    ➢ Target: 1-2 activities / year
	• Engagement with other sector (capacity building actions > Transferability of skills to another sector)
	    ➢ Target: 1-2 activities / year

How	Develop and implement wider activities to improve awareness and engagement with the other stakeholders through EU programmes, such ERASMUS+ • Organising an EO/GI skills annual conference.
Output/outcomes	Set up a coherent methodology for the community building activity under the EO4GEO Alliance
Expected impact	Be the reference Alliance for the Pact for Skills within the EO*GI sector. The Forum of exchange will create a mechanism to gather feedback on Skills Development. Coherent Alliance supported by all the members.
Timeline	Continuous.
Target public	All actors in the EO*GI field, with special focus on the professional and education sector.
Stakeholders	Partners: - EARSC, Nereus, GISIG, Climate-KIC, … APs: - Associated partners - Copernicus Networks (Relays/Academy) - …
Resources required	
Priority	High. The NoN is the base of engagement with communities
References	

Potential funding programme	ERASMUS+, Horizon Europe

3.3   Strategic Objective 3

STRATEGIC OBJECTIVE 3
To set-up a mechanism for helping and guiding candidate learners in their skilling, upskilling and reskilling efforts

OPERATIONAL OBJECTIVE 3.1: To design and regularly update a portfolio of curricula and training materials, notably for added-value services and applications, covering different occupational profiles, and make them accessible to all stakeholders through a one-stop portal.

What	A rich portfolio of training material and exemplary curricula, as well as framework curricula, will be collected, annotated and made available to different target groups. In particular, this includes the following actions:
	• Specify targeted occupational profiles and monitor trends of evolving upskilling or reskilling needs based on the work done under SO1;
	• Design curricula based on identified gaps in existing curricula against novel trends – share the designed curricula in the community through the EO4GEO platform and tools;
	• Develop and assemble training material in different levels of details and modularity – following a building block / modular approach,
	• Update and quality assure curricula and training materials.
	With respect to organisational and technical aspects, the following actions are required:
	• Support versatile learning paths and flexibility in qualification levels;
	• Offer certificates based on accredited and modular course schedule targeting different EQF levels (see also OO32);
	• Develop and maintain a one-stop portal for skilling, upskilling and reskilling learners (see also OO33).

Indicators	• Increase number of targeted occupational profiles by 50% over the course of 3 years • Update existing curricula and develop new baseline curricula: respectively 5 and 3 annually, starting in the first and second year • Have an update cycle at least once a year for the available training materials; number of course elements doubling within 2 years • Number of training materials offered that is 'localized' (e.g. translated in local language, using local data …): 3 initiatives in the first 3 years • One-stop portal developed and in full operation by the 2nd year • Number of visitors increase by 30% p.a. • Course enrolments exhibit a growth rate of 20% p.a.
How	Material design and update: • Consultation with stakeholders working on SO1 on current trends and market requirements by structured (and repeatable) surveys; • Assure annotation of training material with BoK concepts and document training materials with metadata; • Ensure high granularity and connectivity of training material, and its complementarity by dedicated learning objectives and constructive alignment; • Ensure high level of barrier-free access, including multi-linguality (e.g. by optimising slides for browser translation), well-conceivable graphics and read-aloud explanatory text fragments. Quality assurance: • Trainers and instructors follow quality criteria in preparing and documenting the teaching material, as by the accredited procedure; • Programme board of EO4GEO Alliance oversees key performance indicators and implements corrective measures. Platform design and development:

	- Backend (server and database) plus a front-end (web portal) offering advanced search functions of training materials (keywords, learning outcomes, BoK concepts, qualification level, prerequisites, etc.); - Underlying data model enables course modularity and individual learning path design; - Gamification elements (e.g. experience points) support an amenable way of consuming the material; stimulating elements; - Maintenance: versioning of training materials in the background; - Agile SCRUM development methodology for incremental development with fast functional prototyping.
Output/outcomes	The one-stop portal offers a rich portfolio of training materials and a modular course design. An advanced data model relates course elements in a suitable granularity with the courses being created around these elements. The course material is linked to BoK concepts (SO2), thus revealing clear learning outcomes, which enables individualised learning paths and a flexible response to dynamic curricula requirements. The course material is documented throughout by relevant metadata and annotations and follows a general categorisation considering the general characteristic of the content and its potential dynamics. More fundamental, e.g. physical, concepts are kept separate from higher dynamic or applied topics. In this high granularity, the material undergoes a regular update cycle, dedicated to all course elements, which might quickly fall behind. New technological trends or forthcomings in cloud processing are reflected in course updates as well as other emerging socio-political framework conditions which may affect the sector.
Expected impact	A broad community is addressed and mobilised; in tailor-made courses, learners are accompanied in their upskilling and reskilling efforts; targeted material offer versatile learning paths to a variety of occupational profiles; students are provided with specialisation options; the work force in general is aware of the offer provided by the one-stop portal. The regularly updated material matches the needs and the dynamics and trends of the emerging EO*GI sector. Learners stay attuned to follow implications of new technological developments or even shifting paradigms in this highly dynamic field.
Timeline	- Initial catalogue of training material: 1 year - Annual updates of material - Development of platform including database: 2 years - Accreditation cycle > 5 years
Target public	Learners:

	- Young professionals - Upskilling and reskilling workforce - HEI students … Trainers - HEI educators - VET providers - Companies (CTOs, …)
Stakeholders	- EO4GEO Skills Alliance - HEI associations (e.g., AGILE, EUROGI, …) - Business associations (e.g. EARSC) - VET providers - Training networks (e.g., Copernicus Academy) and the European chapter of the EOTec DevNet
Resources required	Achieving this OO requires resources for development and maintenance. Development costs occur for the initial setup of the one-stop portal, the creation of material repository, and the design of the conceptual data model and the technical realisation of the operational database. Maintenance costs concur regularly, estimated for all relevant components on a per annual (p.a.) basis if not otherwise specified. - Portal setup including technical frontend and backend (including material repository, database, automated indexing, annotation management, etc.): 300,000 EUR plus 50,000 EUR maintenance p.a.; - Provision of training material including regular update cycle: 500,000 EUR plus 100,000 EUR p.a.; - Compiling and offering courses: 200,000 EUR p.a. (initial portfolio) plus 150,000 EUR p.a.; - Revenue / fees: there is a (potential) return of investment by collecting fees for issuing certificates (learners' view) or the provision of material collections for tailor-made courses (training provider's view). Fees need to be calculated considering economic viability and the amount received via public funds / funded project activities (see also section on business model and plan).

Priority	High
References	
Potential funding programme	ERASMUS+, Horizon Europe, ESA sectoral programmes, transnational programmes (ERANET etc.)

OPERATIONAL OBJECTIVE 3.2: To establish and operationalize a certification and accreditation mechanism for the training offered

What	To have a dynamic and high-quality education and training system for the EO*GI sector, it is necessary to investigate and develop a certification and accreditation mechanism based on existing mechanisms of HEI, VET providers and dedicated mechanisms that might be different in Member States or even Regions. Therefore, the first action would be to: • Identify and assess different certification and accreditation mechanisms, and how these are already (or not) applied in the EO*GI sector, especially for training of professionals, life-long learning and VET in general. Implementing a transparent and effective certification mechanism requires the following actions: • Defining a clear set of quality measures that ensure learning objectives can be achieved by the applied training actions and respective assessments (constructive alignment); • Implementing exercises and testing routines that allow for objective and transparent, and partly automated, assessment; • Ensure that a modular certification system will provide flexible and stepwise upskilling paths. A proper certification mechanism in place is one of the prerequisites for an accreditation. Further elements towards full accreditation imply: • Identification of a suitable accreditation body for implementing a European approach (accreditation to be recognised across European member states); • Proper documentation of the key elements of the training programme and commitments of training providers (including members of the EO4GEO Alliance); • Definition of the highest possible level of accreditation allowing for the most flexible integration of contributing elements (courses, material, training actions, etc.);

	• Promotion of transparent and commonly agreed quality indicators for training material and certification.
Indicators	• Number of partners involved in the EO4GEO Alliance that applies the certification and accreditation mechanisms is growing from 50% after the 3rd year to 100% after the 5th year • Number of certificates issued exhibit a growth rate of 15% p.a. • Accreditation following European approach in regular intervals (e.g., 5-6 years)
How	• Workshop(s) with identified accreditation bodies and VET providers • Include a documentation of certificates in the one stop platform • Accreditation: based on self-report and an international jury of external evaluators
Output/ outcomes	The activities will lead to a certification and accreditation mechanism available for the sector, and to be applied for vocational training initiatives. Once ready and fully operational, education and training offers will be delivered according to this mechanism.
Expected impact	Training offers in the sector will be recognized in the EU, across countries. This will lead to skills recognition & transferability for a series of occupational profiles. This will in turn facilitate comparability between countries, regions, but also between stakeholders that offer VET courses.
Timeline	Identification and assessment of certification and accreditation mechanism is foreseen for the first year. The mechanism if developed and operational by the 3rd year.
Target public	Organisations that offer vocational training (universities, companies …) Candidate learners wherever they come from
Stakeholders	Accreditation bodies (e.g. AQ Austria) CEDEFOP EACEA
Resources required	Quality assurance & accreditation: 50,000 EUR p.a. plus 20,000 EUR per accreditation cycle (5-6 years)
Priority	Medium
References	Erasmus+. Erasmus accreditation in the fields of vocational education and training, school education and adult education: https://erasmus-plus.ec.europa.eu/programme-guide/part-b/key-action-1/erasmus-accreditation-vet-school-adult

	CEDEFOP. Accreditation and quality assurance in vocational education and training: Selected European approaches . https://www.cedefop.europa.eu/files/etv/Upload/Information_resources/Bookshop/568/4089_en.pdf
Potential funding programme	Erasmus+ National and Regional programmes

OPERATIONAL OBJECTIVE 3.3: To provide guidance for learners to define their own learning paths and to follow training actions

What	The course offer shall allow maximum flexibility in achieving specific learning objectives via self-defined learning paths. The idea is that an intelligent system based on semantic technologies guides the candidate learners. For example, a learner might visit the portal and provide their scope of interest, their CV and additional background. The system will then automatically analyse this input, compare it with the training offer, and advice on training actions or self-learning material to be taken in a particular order (based on required pre-requisite knowledge, skills, and competences). The system will then help to organize the training also practically, e.g. suggesting the time needed to finalize a training module. To achieve this aim, the following actions are needed: • Implement a system in the platform (one-stop-shop) that helps users to create their learning paths by selection of courses, providing information about the skills to acquire after assessing their level of knowledge and skills (through a survey or test) and their envisioned progress on skills development; • Establish a strategy how to create a learning path from training offers of different sources/providers, and how to couple them in a reasonable way with respect to skills that are aimed to be achieved; • Organize a series of training actions, online or physical or hybrid based on the defined learning paths: the learning paths can be defined for occupational profiles, be at the organization's or individual levels;

	• Set-up a mechanism for making interactions between tutors and their peers possible; • In a second stage the system would be further developed and enhanced with semantic technologies to automate the guidance process. This stage is a big endeavour on its own and might become a big Research and Innovation Action under the Horizon programme; • For this second stage technology providers and semantic web developers should be involved, as well as end-users to test with real cases.
Indicators	• Number of learning paths for an occupational profile – Target: 10 learning paths for typical occupational profiles, gradually growing towards 20 • Number of personalized learning paths defined – Target: 100 after over the first 3 years • Users learning paths created vs. users learning paths accomplished (comparison over the defined time-period) • Number of training actions – Target: 5 in the first year and then gradually growing towards 10 per year
How	For defining learning paths: • Collection of available training offers from different providers that are annotated in a way to be represented on the portal, registration and link to the selected offers • Provide information on "modules" through which one can obtain certificates (see OO32) For developing and offering an intelligent guidance mechanism: • Development of a set of semantic web tools (becoming part of the toolset under SO2)
Output/outcomes	• Structured overview on learning path of candidates: skills to acquire, achievements (progress/certificates) to document learners progress - intended to ease targeted learning paths and individual educational histories • Intelligent guidance mechanism as part of the one-stop-shop that helps candidate learners to define a learning path for an occupational profile or even individualized in an automated way, making it easier to find the training offer that matches their requirements best.

Expected impact	Searching for the most suitable training will become easier, while also the learning process will run more smoothly leading to a higher success rate in accomplishing the training with the necessary skills transferred. This will in turn result in more people with right skills entering the job market or willing to change sector(s).
Timeline	For these activities a prerequisite is to have an existing one-stop-shop platform with user profiles. Designing (new) curricula, developing, and adapting training materials, and organizing training actions will grow gradually. The latter might also depend on concrete demands from the public and private sector (training-on-demand). For the development of the intelligent guiding mechanism, important research, development, and testing phases are required. Those activities will require a 5-year period and will highly be dependent on available funding.
Target public	(Life-long) learners: professionals from the private and public sector, with an intention to skills, reskill and upskill in a certain field of EO*GI within the domain or neighbouring domains • Professionals in thematic domains (e.g. urban planners) • Professionals in the ICT domain • Young people entering the job market
Stakeholders	• Existing training providers in the EO*GI sector (ESRI, SERCO, EO College, ...) • Semantic web / technology specialists: e.g. BigKnowledge • W3C
Resources required	Especially the development of the intelligent guidance mechanism requires a serious investment with some research, development, experimenting/testing. This is seen as a typical large Horizon project (with budget between 10 and 15 million€)
Priority	Low to medium (depends for the second phase which requires important funding)
References	• Example: user experience of Copernicus MOOC with regard to the documentation of the learning process (XP-points for lessons accomplished), resembles level concept in gamification • W3C - World Wide Web Consortium https://www.w3.org/standards/semanticweb/#:~:text=The%20term%20%E2%80%9CSemantic%20Web%E2%80%9D%20refers,SPARQL%2C%20OWL%2C%20and%20SKOS.

	• BigKnowledge - https://bigknowledge.net/
Potential funding programme	Erasmus+ Horizon National and regional research funding PhD funding / grants

3.4 Strategic Objective 4

> **STRATEGIC OBJECTIVE 4**
> To facilitate and stimulate a more integrated approach on skills development across different value chains.

OPERATIONAL OBJECTIVE 4.1: To identify new vocational training initiatives to penetrate other sectors and application domains with a focus on societal challenges and the needs of citizens' daily life.

What	The space / geoinformation sector is already well-connected with other sectors in the sense that earth observation and geospatial data and technologies are used in several applications/domains. Sectors such as automotive, defence, maritime, tourism and cultural heritage, transport, and mobility, as well as more traditional sectors such as agriculture, environment, climate (change), etc. Are on the radar. In a first step, EO4GEO will identify more systematically the potentially interested sectors and sub-sectors. 1. Screen and analyse current training offer in other sectors – part of these offerings might already include EO*GI aspects, others might not yet include these; 2. Build a repository of Work or Business Processes in those sectors using Business Process Model and Notation (BMPN) extending the current EO4GEO repository (this might include processes that citizens are performing or involved in); 3. Identify particular tasks and activities in those processes that require EO*GI related (new) skills – Special attention for activities that are already identified in other Work Processes

	4. Identify and describe new occupational profiles and assess similarity of profiles already defined for the EO*GI sector – Identify and define skills-sets for these profiles;
	5. Link to and learn from other initiatives and projects that focus on skills development in other sectors (Horizon, CfT, Erasmus+, ISA² … Academies …) – Identify relevant work from sectors that 'overlap' with the EO*GI sector, e.g. the sector of Intelligent Transport Systems (ITS) from the automotive sector;
	6. Identify new (location enabled) public user services in Public Sector as they see light in different European countries – making the link with e-Government and Digital Government Transformation.
Indicators	The following indicators and targets are defined: • Number of other sectors identified in which EO*GI skills could add value or might even become essential, and with which an active collaboration is set-up – 2 sectors after 1 year, 4 after 2 years and up to ten before the 10-year period ends; • Number of relevant trainings offers from other sectors in which EO*GI aspects could be integrated – 20 identified after 3 years, 100 before the 10 year's timeline; • Number of BPMN schema's describing relevant business processes in other sectors – 10 process described after 1 year, 30 after 3 years, and 100 after 10 years; • Number of specific occupational profiles identified in the other sectors in which EO*GI skills might play an important role – 5 profiles identified before the end of year 5; • Number of potential locations enabled public services identified supporting G2G, G2B and G2C interactions – 10 after 2 years, 50 before the end of the 10-year period.
How	Depending on the activity, different methods will be used: • Desk studies, surveys, interviews and web crawling/scraping for analysing training offers in other sectors and identify location enabled public services; • Interviews, workshops and process modelling for getting insight in work processes in other sectors; • Using EO4GEO tools for describing occupational profiles … in other sectors; • …
Output/outcomes	Following results will be achieved: ✓ There is an active collaboration with other sectors through joint projects and educational activities;

	✓ A portfolio of relevant training initiatives from or within other sectors is operational and contains European, national and regional/local initiatives; ✓ The EO4GEO portfolio of business processes described by BPMN is extended with work processes from other sectors and sub-sectors; ✓ Relevant occupational profiles relevant for other sectors and value chains already described in ESCO have been updated with relevant EO*GI skills; ✓ There are more location-enabled public services for Government, Businesses and Citizens
Expected impact	The use of EO*GI data and technologies is better integrated in a broad range of sectors and sub-sectors, also beyond 'traditional' sectors
Timeline	Most of the activities will develop and be spread over the long-term, i.e. the 10-year period, others are more concentrated: • Engaging other sectors actively will start from the first year, gradually evolving and intensifying; • Identifying training offers in other sectors and sub-sectors and getting an insight where EO*GI skills could be integrated started also in the first year, but will run over three years; • The identification, modelling and understanding of the business processes is spread over the first 5 years, focusing on some in the first years and gradually expanding
Target public	• VET providers in other sectors • Process owners in other sectors (e.g. monitoring agricultural practices) • Professionals active in other sectors (e.g. urban planners) • Local and regional public authorities
Stakeholders	Associations representing other sectors
Resources required	The activities to be performed are estimated at 1 FTE annually, gradually decreasing to ½ FTE after 5 years
Priority	High
References	

eo4geo

Potential funding programme	Erasmus+, Horizon, national and regional funding schema

OPERATIONAL OBJECTIVE 4.2: To improve the uptake of EO*GI data and technologies through the upskilling and reskilling of professionals

What	Professionals active in other sectors might benefit from reskilling and upskilling including not only generic new ICT skills, but also skills related to the EO*GI domain. Such skills might be beneficial for their current work, but also open up new possibilities and activities. Special attention should be given to the possibilities related to new developments such as Artificial Intelligence (AI), Machine Learning (ML), etc. 1. Identify current specific skills and skills-sets in other domains – analyse particular Bodies of Knowledge, ontologies or vocabularies, or training initiatives in which such skills are defined; 2. Monitor and analyse current ESCO skills and occupational profiles in other domains, and how they could be built upon – Assess how EO*GI skills defined in the BoK for EO*GI could be used to reinforce and 'upgrade' these skills; 3. Assess skills developments in the general ICT domain – These skills are influencing and becoming more and more relevant for different sectors and value chains; 4. Design and conduct specific continuous learning programmes for skilling and upskilling, preferably in collaboration with these other sectors – This might also take the form of joint MOOC's which would allow to reach a broader public; 5. Define transition paths for upskilling and reskilling in those other sectors based on new technological and non-technological developments (see also SO1) - Analyse differences between current skills in those other domains and these new developments; 6. Identify and establish a portfolio of internships and projects for skilling, upskilling and reskilling – Joint projects between the EO*GI sector and different sectors, starting from particular value chains.
Indicators	The following indicators and targets are defined: • Number of skills and skills-sets descriptions identified for other sectors – At least 5 sectors and 10 skills-sets;

	• Number of currently described occupational profiles and skills-sets in ESCO for which the EO*GI skills or skills-sets could be beneficial – 5 profiles and skills-sets analysed and updated within 2 years and 10 after 5 years. • Number of relevant ICT skills or skills sets identified and integrated in training activities – Over the full 10-year period, 5 skills-sets identified and integrated in training actions; • Number of continuous learning programmes designed, developed and conducted – Target: annually 2 training actions, starting in the second year; • Number of internships and joint projects defined and conducted – throughout the 10-year period 100 internships and 20 joint projects
How	Depending on the activity, different methods will be used: • Desk studies, surveys, interviews and web crawling/scraping for identifying skills and skills-sets in other sectors; • Developing tools to link the EO*GI BoK and related tools to other vocabularies, BoK's, ontologies … (see also SO2); • Using EO4GEO tools for describing and designing continuous learning programmes; • Developing tools for defining learning and transition paths for other sectors (to include EO*GI curricula) • Animating an active platform for internships, job offers … • …
Output/outcomes	✓ ESCO occupational profiles and related skills are up-to-date regarding EO*GI skills that are relevant for other sectors; ✓ Where relevant ICT specific skills, especially those linked to new technological developments, are taken into account in training activities; ✓ An adapted training offer for other sectors and sub-sectors is available and training actions are offered on a regular basis (in different modes); ✓ A portfolio of internships is offered and maintained on the EO4GEO platform according to standard procedures and international standards; ✓ A series of joint projects with one or more sectors are defined and conducted with one or more sectors an sub-sectors with active involvement of EO4GEO.

Expected impact	More professionals and organisations from other sectors will enter the EO*GI market and will be better skilled, reskilled or upskilled with EO*GI skills.
Timeline	Most of the activities will develop and be spread over the long-term, i.e. the 10-year period, others are more concentrated: • Identifying, analysing the other sectors and their skills, as well as the current ESCO occupational profiles and skills will be done in the first 2 years; • Life-long learning or continuous learning programmes, the internships and joint projects are spread over the full period
Target public	• Associations representing other sectors • Public and private organisations active in other sectors • ESCO management • Professionals active in other sectors (e.g. urban planners) • ICT experts
Stakeholders	Associations representing other sectors Associations representing the ICT sector ESCO
Resources required	The activities to be performed are estimated at 2 FTE annually, of which 1 FTE is related to the design, development and implementation of training activities. When a MOOC would be developed this is estimated at ½ FTE effort (6 months).
Priority	High
References	edX online learning: https://www.edx.org/
Potential funding programme	Erasmus+, Horizon, national and regional funding schema

OPERATIONAL OBJECTIVE 4.3: To foster industry forums with other business sectors where skills development and transfer are considered (including digital skills, (big) data and analytics)

What	Most thematic fields and business sectors are organised in dedicated communities and fora. In order to cross-fertilise and stimulate multi- and interdisciplinary collaboration, specific initiatives and activities should be developed to bring this collaboration into practice. This will generate new research, innovation, and co-creation of knowledge among the sectors. 1. Connecting to and building of a network of other experts active in the other sectors and sub-sectors – This can occur by attending and being active in each other's events, exchanging experts and tutors for particular educational and training initiatives, etc. 2. Organise specific events to showcase EO*GI oriented activities in/for those sectors – Showcasing the use of EO*GI data and technologies for particular applications might generate new initiatives and raise interest for reskilling and upskilling programmes; 3. Identify topics of possible research and innovation for joint work / projects – Identify learning (while-doing) paths for different occupational profiles; 4. Bringing different sectors together for exchanging experience, views and ideas for common action (cross-sector events) – This could take the form of events where the use of EO*GI data and technologies are demonstrated based on the previously mentioned project work; 5. Organisation of fairs for demonstrating capabilities, solutions – Linking this to job fairs where job offers from public and private sector in which EO*GI is relevant reaches individuals entering the job market, but also professional active in other business sectors.
Indicators	The following indicators and targets are defined: • Number of experts from other sectors and sub-sectors that are identified and actively contribute to the BoK, training activities (e.g. as tutors) – After 3 years, 100 additional experts from other sectors or sub-sectors are actively involved; • Number of tutors that are actively involved in training activities – Over the 10-year period 50 tutors are contributing and vice versa EO*GI tutors are asked for by other sectors, at least 50 times; • Number of specific events for and with other sectors – Annually at least 1 event;

	• Number of joint projects and demonstrators – Starting in year 2, one project or demonstrator is defined and worked on, while annually the results are showcased in one or more events; • Number of people attending the events and job fairs – On average 250 people attend the annual events.
How	Depending on the activity, different methods will be used: • Using social network tools (LinkedIn, Facebook, Twitter …) to build and maintain the network of experts; • Events and fairs, and interviews for identifying (new) work forces; • Using the BoK on EO*GI to design and monitor an innovative research and project portfolio; • …
Output/outcomes	✓ The community of experts in the EO*GI field is expanded with experts from other sectors, sub-sectors and value-chains and are actively involved in training activities and multi-disciplinary projects; ✓ There is a rich offer of events for supporting skills development in the EO*GI sector and for the promotion of the use of EO*GI data and technologies in other sectors; ✓ Job fairs and dedicated events for particular sectors and sub-sectors attract professionals and newcomers in the job-market to promote and the uptake of EO*GI in various sectors; ✓ There is a rich portfolio of innovative and collaborative projects in which EO*GI data and technologies are used covering a wide range of sectors and sub-sectors.
Expected impact	New innovative joint ideas and projects will emerge, and a cross-sector approach will support integrated decision-making. This will also lead to new innovative initiatives and start-ups driven by reskilled, upskilled, or newly skilled people in other business sectors.
Timeline	Most of the activities will develop and be spread over the long-term, i.e. the 10-year period, others are more concentrated: • Setting-up and expanding the network of experts from the various sectors and sub-sectors will be more concentrated in the first 3 years, but its maintenance is spread over the full period; • Events, including job fairs, and innovative projects will be (equally) spread over the 10-year period
Target public	• Professionals active in other sectors (e.g. urban planners) • ICT experts willing to reorient their career • Young people entering the job market

Stakeholders	Associations representing other sectors
	Associations representing the ICT sector
Resources required	The activities to be performed are estimated at 1 FTE annually, mainly to prepared and organise events and job fairs. The logistics and costs related to the organisation of an annual event is around 50.000€. The set-up of innovative projects is not included in this.
Priority	Medium
References	
Potential funding programme	Erasmus+, Horizon, national and regional funding schema

3.5   Strategic Objective 5

STRATEGIC OBJECTIVE 5
Encourage citizens' engagement, citizens' science practices and hands-on activities enhancing the inclusion/ recognition of EO*GI applications' value in everyday aspects of life.

OPERATIONAL OBJECTIVE 5.1: To promote and outreach to 'end-user' communities and to engage citizens through various events, especially at the local level, on job opportunities, internships and apprenticeships, roadshows.

What	Organise events at local level, in the form of "EO*GI days", aiming to:
	• Attract young people that want to enter the job-market, but also professionals that want to reskill/upskill (linked to SO4 for similar activities for other sectors)
	• Facilitate the creation of a stable relation with local Digital Innovation Hubs (DIH)

	- Facilitate the creation of a stable relation with local science and research centres to stimulate curiosity and inspire EO*GI learning (in the form of EO*GI dedicated exhibits, integration of EO*GI in school programs provided by science centres, hosting of EO4GEO days, etc.) - Facilitate the creation of a stable relation with the European Citizen Science Association and Citizen Observatories to integrate EO*GI dimension in their project portfolios - Organise the "EO4GEO" fair to: - Improve knowledge about EO*GI targeting secondary schools; university students; young professionals; - Promote EO4GEO outputs; - If the EO4GEO fair will be organised online, it could be developed as a permanent matchmaking platform
Indicators	1 EO4GEO day every two years in the first 6-year period and each year in each EU region in the long-term (about 270). EO4GEO Fair: number of participants (~150); EU countries targeted.
How	- Format: - EO4GEO day (roadshow-like) - Virtual vs. f2f vs. hybrid (depending on covid conditions) - Duration: 1 day - Content: - Invited speeches, exhibition corners, coffee corners for scheduled bilateral meetings, workshops - Invited speakers: - Local Authorities sharing at least one Business Process they are in charge of, actually or potentially benefiting from EO*GI, therefore expressing end-user driven EO*GI needs. - EO*GI local companies offering job opportunities - Logistics: - Venues hosting 200-300 people + exhibition booths
Output/outcomes	A series of EO4GEO days shaped as described above attracting many people and introducing them in the world of EO*GI.

Expected impact	• Increase the number of young employees in the EO*GI sector (quantitative target to be defined) • Increase the number of reskilled/upskilled EO*GI workforce (quantitative target to be defined) • Evaluate impact of EO4GEO on first year university students through a survey to be send to academic partners
Timeline	From 2023 onwards.
Target public	• Young people that want to enter the job-market • Professionals that want to reskill/upskill • Students in their university course
Stakeholders	Schools, youth organizations, professional organisations actually or potentially interested to EO*GI, Local Authorities, local DIHs.
Resources required	20k for each EO4GEO day x 270 EO4GEO days/year = 5,4M/year (assuming that this is done annually, in practice this will not be the case, certainly not in the first years)
Priority	Medium
References	• Project (missing acronym) already funded under tender invitation EASME/COSME/2018/009: Copernicus digital skills initiatives support action
Potential funding programme	• Single Market Programme (ex COSME) (https://ec.europa.eu/commission/presscorner/detail/en/IP_18_4049) and its follow-up activities (e.g. European Innovation Ecosystems) • Estimated 20% co-financing through local sponsorships

Cost table (within Resources required):

Cost item	Unit description	Quantity	Unit cost	Total cost	Notes
Venue hiring		1	€ 5.000,00	€ 5.000,00	
Invited speakers		1	€ 1.000,00	€ 1.000,00	
Dissemination material (printed)		1	€ 5.000,00	€ 5.000,00	
Dissemination channels (media)		1	€ 3.000,00	€ 3.000,00	
Secretariat	Person days	30	€ 200,00	€ 6.000,00	
				€ 20.000,00	Total cost for each EO4GEO day
		270	€ 20.000,00	€ 5.400.000,00	Total yearly costs for all EO4GEO days

OPERATIONAL OBJECTIVE 5.2: To provide a platform/forum for collecting and testing ideas from 'end-user' communities.

What	In this era, learning is becoming more and more dynamic and is continuously evolving. Learning is more and more linked to real cases, but also to experimenting (learning-while-doing). New techniques are used to facilitate the learning process such as gaming, the use of Virtual and Augmented Reality techniques (VR/AR), and more. While doing so, it is easier to attract young people since these techniques and environments are close to their own living environment (especially gaming). Such living lab environments or sandboxes are also a good basis for innovation, and they might serve to initiate new initiatives: kick-off a research project or even a new company. Design, implement and maintain an EO4GEO living-lab, with the following main features: • a forum to collect ideas from 'end-user' EO*GI communities • a sandbox to shape and test new ideas for applying EO*GI data and technologies
Indicators	• Number of forum users (quantitative target to be defined) • Number of monthly posts/comments in the forum (quantitative target to be defined) • Number of new ideas tested in the sandbox (quantitative target to be defined) • Number of components developed
How	The EO4GEO forum will be the place where 'end-user' EO*GI communities (e.g. individual people from companies creating added value from EO data, GIS companies, Public Authorities implementing business processes using EO/GI data and technologies, citizens involved in EO*GI related citizen science initiatives, research bodies involved in EO*GI activities, people involved in EO*GI related education and training programmes) will exchange ideas, publishing and commenting posts. The forum will be realised according to the following steps: • Design • Implementation • Technical maintenance • Content moderation

	The EO4GEO Sandbox will be a platform equipped with EO*GI tools, which will enable users to test and document new ideas for applying EO*GI data and technologies (e.g. processing EO*GI data, applying AI algorithms to EO*GI data, publishing web services exposing EO*GI data). The sandbox will also be supported by procedures, guidelines and other documentation, a new financial model (e.g. crowdfunding), etc. The sandbox will be realised according to the following steps: • Design • Implementation • Maintenance (technical infrastructure) • Maintenance (content (applications))
Output/ outcomes	An EO4GEO living-lab shaped as described above, dynamic and reaching a young and less-young group of individuals. The focus is on individual participants rather than 'representatives' from universities, companies, etc. (although those might play a role of facilitator to support the others)
Expected impact	• Increase the awareness of EO*GI data and technologies in EO*GI end-user communities • Increase the cross-fertilisation among the EO*GI business-sector interested communities • Provide input to EO*GI skills development • Favour matchmaking between companies and young professionals
Timeline	From 2023 (forum) and 2024 (sandbox) onwards.
Target public	• Individual citizens: young people, even youngsters at school • Downstream market actors • EO innovators and researchers • End-users (e.g. professional organisations actually or potentially interested to EO*GI, Local Authorities), local DIHs • Academia • Professional organisations
Stakeholders	• Downstream market actors • EO innovators and researchers • End-users (e.g. professional organisations actually or potentially interested to EO*GI, Local Authorities), local DIHs.

	(For the EO4GEO living lab target, public and stakeholders are the same, because each of them is both contributor and user).
Resources required	99,5k for 2023, 43k for 2024 and for each next year (see next table for more details)

Cost item	Unit description	Quantity	Unit cost	Total cost	Sub-total	Notes
Forum design	Person days	20	€ 300,00	€ 6.000,00		
Forum implementation	Person days	20	€ 300,00	€ 6.000,00		
					€ 12.000,00	A: Forum total set-up costs (una tantum)
Forum maintenance - technical	Person days	10	€ 300,00	€ 3.000,00		
Forum maintenance - content (moderator)	Person days	30	€ 400,00	€ 12.000,00		1h x day
Forum web hosting	Fee	1	€ 500,00	€ 500,00		
					€ 15.500,00	B: Forum total yearly costs
Sandbox design	Person days	60	€ 400,00	€ 24.000,00		3 months
Sandbox implementation	Person days	120	€ 400,00	€ 48.000,00		6 months
					€ 72.000,00	C: Sandbox total set-up costs (una tantum)
Sandbox maintenance (technical infrastructure)	Person days	52	€ 400,00	€ 20.800,00		1 day per week
Sandbox maintenance (content (applications))	Person days	13	€ 400,00	€ 5.200,00		2 hours per week
Sandbox web hosting	Fee	1	€ 1.500,00	€ 1.500,00		
					€ 27.500,00	D: Sandbox total yearly costs
					€ 99.500,00	Total 2023 (A+B+C)
					€ 43.000,00	Total 2024 and yearly costs for next years (B+D)

Priority	Medium
References	For examples on sandboxes see Leuven 2030: https://en.leuven2030.be/
Potential funding programme	Horizon Erasmus+

OPERATIONAL OBJECTIVE 5.3: To increase efforts to develop skills and stimulate innovation and entrepreneurship, to foster an attractive work environment.

What	Create and maintain an "EO*GI dimension" in the existing and new DIHs.
Indicators	• Number of DIHs approached (quantitative target to be defined)

	• Number of DIHs hosting an "EO*GI dimension" (quantitative target to be defined) • Number of new businesses created in the EO*GI sector (quantitative target to be defined)

How	• Main steps:
	     o establish a close contact with local DIHs
	     o investigate the possibility/opportunity to create and maintain an "EO*GI dimension" in the DIHs
	     o plan the creation and maintenance of an "EO*GI dimension" in the DIHs
	     o create an "EO*GI dimension" in the DIHs
	     o maintain an "EO*GI dimension" in the DIHs

Output/ outcomes	A series of DIHs with an "EO*GI dimension".
Expected impact	• Increase the awareness of EO*GI new business opportunities in people willing to start new businesses • Increase the innovation in the EO*GI business-sector
Timeline	From 2023 onwards.
Target public	People (citizens, entrepreneurs, start uppers) willing to start new businesses in the EO*GI sector
Stakeholders	• DIHs actors • Associations of entrepreneurs
Resources required	
Priority	Medium
References	
Potential funding programme	

4 Roadmap for sustaining the EOGEO Alliance

In the previous sections of the long-term action plan the Sector Skills Strategy in Action was presented alongside the future envisioned expected activities of the Alliance. In this part of the document, different elements to enable the long-term sustainability of the Alliance such as its governance, business model, maintenance plan and strategies to multiply and mainstream its results are discussed.

This section of the document is divided into two main sub-sections:

- Multiplication, mainstreaming and impact of the results of the Alliance

- Necessary means to create impact

Both elements are further elaborated in the next sections of the long-term action plan.

4.1 Mainstreaming, impact and multiplication of the results of the Alliance

The analysis of the different elements related to the overall impact of the project has been done based on the following two elements:

- The multiplication, mainstreaming and impact generated by the results of the Alliance

- The resources needed to maintain the results of the project and their roll-out

4.1.1 Mainstreaming, impact and multiplication

The activities undertaken to multiply, mainstream and generate impact based on the use of the results of the EO4GEO Alliance are of paramount importance to achieve its mission and vision and its overall objective of bridging the skills gap in the EO*GI sector. Based on the importance of this task for the future of the Alliance, the members of the consortium have collectively used their networks and existing relationships with relevant stakeholder groups to promote and disseminate the results of the Alliance.

In this section of the long-term action plan, we will pay special attention to discuss the work done during the project to facilitate and encourage the use of the Alliance results by a variety of stakeholder groups and the additional actions that need to be taken in the short and medium term.

4.1.1.1 What has been done in terms of mainstreaming, impact and multiplication

The approach undertaken during the EO4GEO project to assure the mainstreaming, multiplication and the generation of impact based on the use of the project results have yielded very positive outcomes and learnings. This process was structured around four logical steps that looked at the outputs produced by the project, mapped the stakeholders that were likely to benefit from their use, engaged them using different communication tools and resources which led to the final step which was the reuse of the project results in different application settings.

The process is illustrated in figure 8 below.
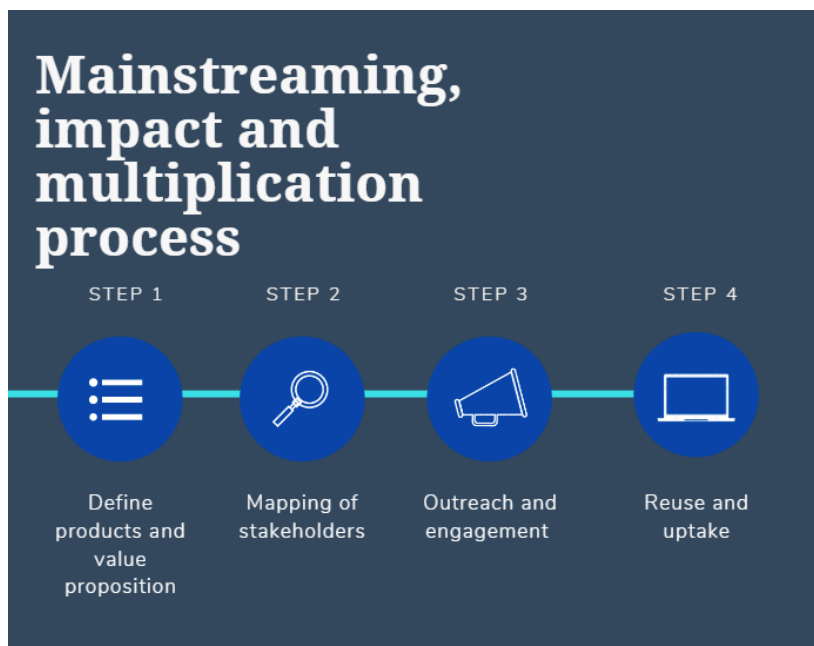
Figure 8 - Mainstreaming, impact and multiplication process

Before we proceed to illustrate the actions and activities put in place to promote the use of the results of the Alliance, it is relevant to clearly define the three main terms used to highlight the exploitation of the Alliance results. In this document, we have chosen to use the descriptions given by the Cambridge dictionary which offer a simple but clear definition of the terms.

- **Mainstreaming** - the process of making something start to be considered normal. In the context of EO4GEO it would mean that the broader space/geo-information community, a large amount of education and training providers, would use the results in their daily work, and/or that they replicate the results in other settings. This process started but is something to achieve in the medium-term.

- **Impact** - a powerful effect that something, especially something new, has on a situation or person. For EO4GEO, it means that large numbers of learners, VET providers subscribe and apply the approach, methodology and EO4GEO results to systematically develop (new) skills, upskill, and reskill. This stage is not yet reached and will depend largely on achieving the objectives defined in the SSS in Action.

- **Multiplication** - the process of increasing in number by a large amount, or of making something increase. In the context of EO4GEO it refers to the application of the results in other contexts, in other countries, by other stakeholders, etc.

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4.1.1.2 Define products and value proposition

Throughout the EO4GEO project a series of activities were performed to contribute to the process of addressing the current skills gap in the EO*GI sector. The different project outputs developed for this purpose are at different levels of maturity and have shown significant potential to tackle existing education and training challenges and help in the process of providing the right skills in the right place and at the right time.

Figure 9 below provides a visual representation of the project outputs and how they are related to each other:
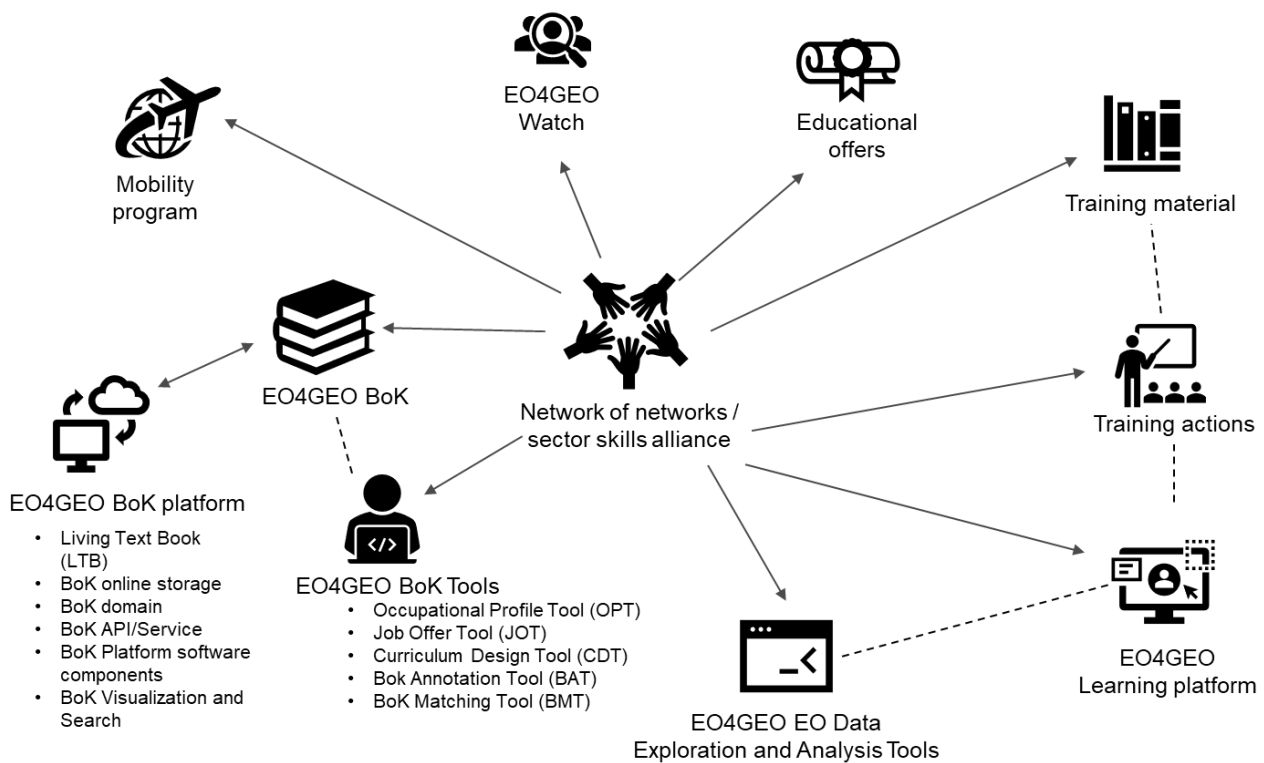
Figure 9 - EO4GEO Project outputs

A more comprehensive analysis of each of the project outputs can be found on the Deliverable 6.2 – Long-term Business Plan. It is important to state that the efforts from the consortium in the process of multiplying, mainstreaming, and achieving impact were mainly focused on 5 outputs of the project as illustrated in figure 10. These specific project results were chosen based on their maturity level, potential for exploitation by internal and external stakeholders and their relevance in supporting the process of bridging the current skills gap in the EO*GI domain.
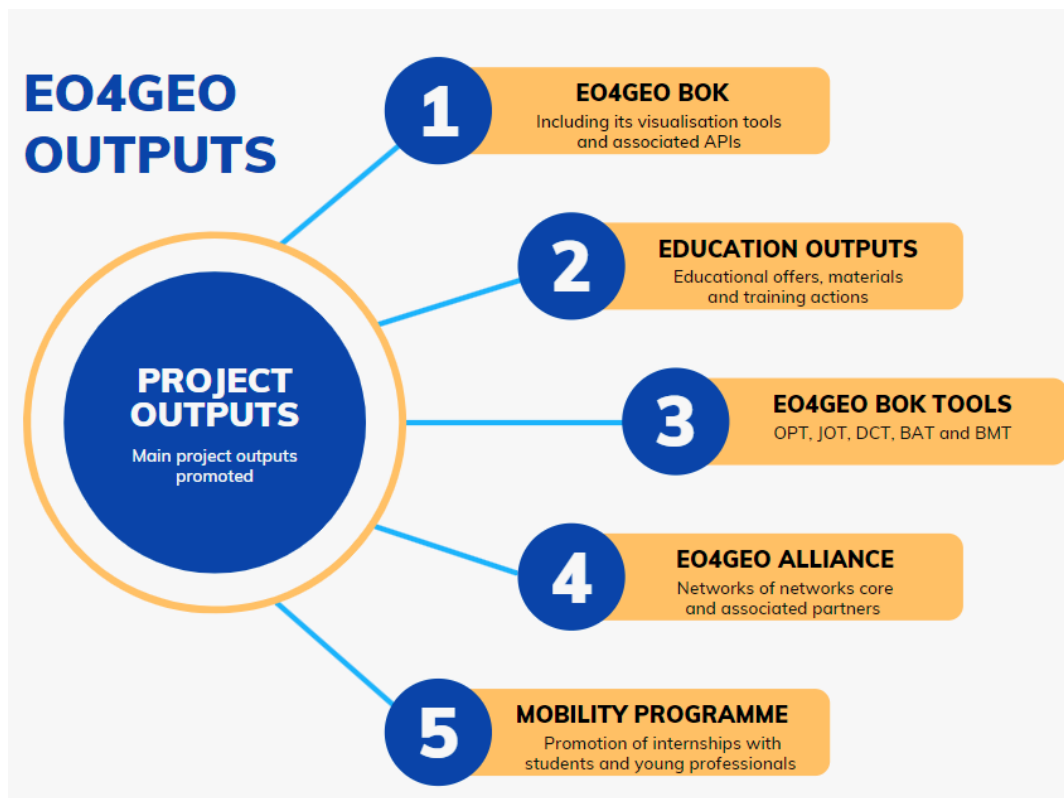
Figure 10 - Main project outputs promoted

4.1.1.3 Mapping of stakeholders

The process of mapping relevant stakeholders was initiated by requesting the members of the consortium to suggest organisations and individuals that could play a role in the sustainability of the project including the mainstreaming, impact, and multiplication of the project's outputs. The results obtained from this consultation process were recorded on a database where the progress of the interactions with the different organisations and individuals could be registered. This allowed the team to keep track of the organisations that have been contacted, follow the status of the engagements, and assess if additional follow-up emails or calls were required. The list of stakeholders recorded information on the type of organisation, country, reason for engagement, relevance of the stakeholder and other relevant data.

4.1.1.4 Outreach and engagement

An important element of the work on the long-term sustainability of the project relied on developing an effective outreach and engagement campaign with relevant stakeholders. This work was of paramount importance as it supported different components of the sustainability of the project. It helped in creating a network at the national and regional level for the uptake and reuse of the EO4GEO results, as well as engaging industry and European institutions to explore financial support for the sustainability of the Alliance. The outreach process was supported by a rich database of stakeholders who were engaged based on their relevance and strategic importance for the multiplication, mainstreaming and impact of the project results. In addition, all the project partners supported the outreach and engagement process by facilitating interactions with their comprehensive

network of stakeholders. Networks such as the European Association of Remote Sensing Companies (EARSC), the Network of European Regions Using Space Technologies (NEREUS) played a key role in facilitating discussions with potential users of the project results.

The engagement of key stakeholders was done in the following steps:
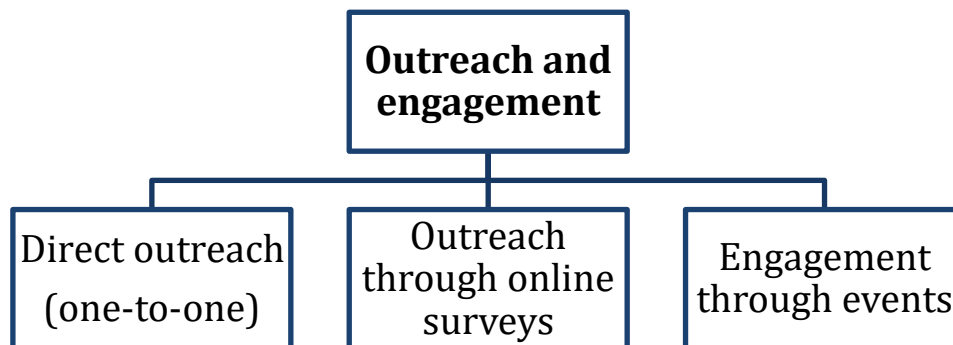
Figure 11 - Engagement stages of stakeholders

4.1.1.5 Reuse and uptake

The EO4GEO Alliance has developed a series of important outputs such as the ontology-based body of knowledge, a comprehensive set of EO*GI curricula and training actions, just to mention a few. The portfolio of services developed throughout the lifespan of the Alliance has been prepared to solve existing challenges in the provision of education and training in the EO*GI domain. The Alliance results have already been used and tested by members of the consortium, associated partners, and representatives of the Advisory Board. The team working on the sustainability of the Alliance focused its efforts on promoting the reuse of the Alliance outputs through a process similar to a market research. This process aimed to demonstrate the value provided by the EO4GEO Alliance, engage relevant stakeholders, and encourage the future uptake and use of the Alliance results and support its long-term sustainability.

The process leading to the reuse of the project outputs was modular and dynamic as it was adjusted considering the nature and interest of the organisations contacted. In some cases, the process required a couple of calls with the targeted organisations before they committed some time to review and test the project outputs. In some other cases, it was necessary to invite the developers of the project results to provide more technical information or answer more specific questions on the functionality of the project outputs.

Figure 12 illustrates the standard process conducted during the engagement of stakeholders with the purpose of enabling the testing of the project results in their specific context and addressing their existing needs and challenges.

| Select stakeholdes from database | Engagement through email and request for a call | Intial call to introduce the project and its outputs | Process leading to reuse |
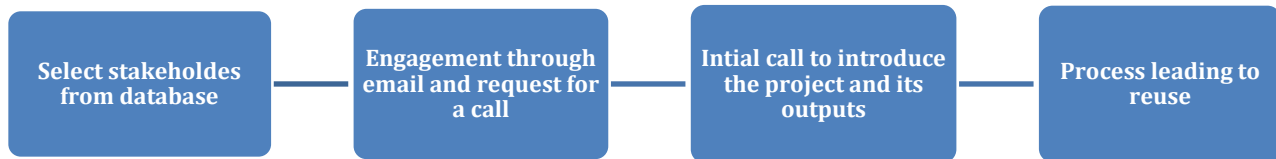
Figure 12 - Process used for the reuse of the project outputs

4.1.2 Next steps in the process of mainstreaming, impact and multiplication of the Alliance results

The consolidation of the EO4GEO Alliance, which is currently on the way, will bring new opportunities and challenges regarding its operation, the way it interacts with current and new stakeholders and the different opportunities to exploit its results. It is important to harness the learnings and outcomes obtained during the implementation of the EO4GEO project as they will be instrumental in accelerating the implementation of the strategic objectives of the Alliance. Regarding the specific efforts and actions to mainstream, multiply and generate impact, it is important that the Alliance relays on the relevant preparatory work and the experience obtained during the running and implementation of the EOGEO project.

It is also relevant to acknowledge that the process of multiplying, mainstreaming and generating impact based on the exploitation and use of the results of a project is a gradual and usually long-term endeavour. Regarding the EO4GEO Alliance, the first cases illustrating the use of its outputs happened internally. The members of the consortium due to their engagement in the Alliance where well placed to start experimenting with the different outputs and adapting the tools and results to their work environment. This illustrates the multiplication of the use of the Alliance results which is an initial but necessary step in the process of making its outputs available to the broad EO*GI community. It is at this stage of ample use of the results of the Alliance (mainstreaming) where real impact can start to be seen in the organisations and stakeholders that are consistently using its outputs. One of the main challenges for the Alliance in the following years is to move from multiplication cases to a broader uptake of the Alliance results.

In this section of the document we will look at some of those elements that need to be taken into consideration for the future promotion and dissemination of the Alliance results with the clear intention of achieving multiplication, mainstreaming[37] and impact.

- **Further consolidation of the existing network** – During the project duration a robust network of experts, potential users of the project results, policy and decision makers, regional authorities, representatives of the private sector, stakeholders from the education and training sector and many more individuals and organisations were actively engaged. It is now up to EO4GEO Alliance to keep these stakeholder groups interested and engaged around the mission, vision and main activities detailed in the SSS in Action and the LTAP of the Alliance.

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[37] Tips on Mainstreaming practices were retrieved from 'Mainstreaming – Tips and Tricks!' developed within the EU project EQUAL. The report is available at the following link: https://ec.europa.eu/employment_social/equal_consolidated/data/document/etg5-mainstreaming-paper-final.pdf

The proposed engagement and active participation of these stakeholders can be achieved by:

- o **Effective communication** – This requires the Alliance to prepare timely and effective communication messages through the existing platforms such as the project's website, the twitter, and Medium accounts as well as the elaboration of targeted newsletters and other communications outputs to stakeholder groups of particular interest. This targeted communication will facilitate the dialogue between the Alliance and some specific stakeholder groups by making the interactions more assertive and providing their parties with content and information addressing their needs and pains.

- o **Enhance the interaction and collaboration with key stakeholders** – Through the EO4GEO consortium, fruitful working relationships were cultivated with international bodies capable of playing a crucial role in implementing the SSS in Action and the LTAP. Organisations such as the European Union Agency for the Space Programme (EUSPA), the European Space Agency (ESA) and the different Directorate Generals of the European Commission just to mention a few are instrumental in supporting the Alliance achieve its overarching objectives. It is therefore important to find additional areas for collaboration that would allow the parties to keep working together. This might entail the participation of the Alliance in European calls and tenders issued by these stakeholders on topics where the Alliance is well placed to provide a meaningful contribution. Initiatives such as the Pact for Skills are especially interesting for the Alliance as they have been designed to further progress the five-year plan of the European Skills Agenda and the sustainable competitiveness of the European Green Deal. Elements which the EO4GEO Alliance is well placed to address and contribute in the years to come.

- o **Integration of new members in the Alliance** – The strategic objectives presented in the Sector Skills Strategy in Action define a set of ambitious actions that require the engagement and participation of new stakeholders. The contribution, know-how and experience of these new organisations will enrich the operation of the Alliance and will bring it closer to have the necessary capacity, expertise, and experience to effectively implement the objectives of the SSS in Action. The enlargement of the Alliance should be based on the previous analysis of stakeholders and on the intelligence gathered by the activities of the different work packages, the Steering Committee, and insights from the Advisory Board.

- **Transferring 'tried and tested' practices**: The results developed within the context of EO4GEO have been successfully tried and tested by the members of the Alliance. These cases should therefore be leveraged to extend their use to other organisations, universities, and entities, and maximise the mainstreaming and ultimate impact of the project. This process has already been started by the Alliance through the systematic collection of use cases not only emerging from the members from the Alliance but also from external stakeholders. These cases will help the Alliance in the process of mapping potential users of the outputs, refining elevator pitches for the different Alliance results, understanding in which conditions and type of organisations the results will be more likely to be uptake, etc.

- **Accreditation of training materials**: Another important step in ensuring the mainstreaming of the project would be ensuring that the training materials are officially recognised by an educational institution or entity, in order to confirm their credibility and validity. This could be

achieved by exploiting the connections with the several Universities and VET providers that EO4GEO has collaborated with during the course of the project.

- **Internationalisation of the EOGEO Alliance** – Another important element to consider when it comes to the mainstreaming, multiplication and impact of the Alliance results is the opportunity to reach users beyond the European borders. This important element has been stressed in discussions with the DG DEFIS and other agencies of the European Commission. Under the EO4GEO project initial discussions were held with organisations and agencies especially from North and Latin America as well as stakeholders from Africa. The EO4GEO Alliance can play a vital role in supporting training providers and learners from these emerging and developing economies find suitable learning approaches that support their educational journey. The interaction with non-European partners can also lead to open new opportunities of funding for the Alliance in the form of capacity building, training, and the implementation of innovative education solutions to these communities. To this purpose, the Alliance is closely following the EU Global Action on Space initiative and already engaged with the initiative EOTEC DevNet (Earth Observation Training, Education, and Capacity Development Network) which foresees regional groups covering many areas outside Europe (Africa, Asia-Oceania, Americas).

- **Strengthen the collaboration with European regions through Smart Specialisations** – EO4GEO's presence should also be consolidated at the regional level, in order to support strategic sectors and regional research and innovation strategies for smart specialisation (RIS3) – for example, food and maritime. The Alliance needs to develop a clear approach to engage smart specialisation strategy regions with matching sectors by demonstrating tangible benefits for the relevant stakeholders at regional level. An initial mapping exercise was done during the second year of the EOGEO project identifying regions in the project partner's countries which are specialised in space and especially in EO*GI. This exercise needs to be continued every year and needs to feed into the efforts of dissemination and exploitation of the Alliance results.

- **Emphasis at regional and national level** – It is important to assure that the project results are known and used at regional and national level. This entails developing a good understanding of how skills and vocational training on EO*GI domain is delivered at national and regional level. Initial information on this process has already been collected through the interviews featuring representatives of national and regional bodies. This activity also entails the envisaged close collaboration with the national Copernicus User Forums, which is already operational in some countries.

- **Contributing to the policy debate and influencing policy changes** – In order to foster deep and systemic change in the field of Earth Observation and skills creation, it is important to keep contributing to the policy debate. Rallying the support of EC policy makers who have already been involved in EO4GEO is for example a way to add political weight to efforts to influence and change space policy at the EU level. The Alliance is working to play a role in this sense also through the planned establishment of a Large Scale Partnership under the Pact for Skills for the EO*GI sector.

Complementary activities

- **Participation in relevant events** – The participation of the EO4GEO Alliance in international, European, and regional events focus on skills, education and training in the EO*GI domain should be a priority. The COVID-19 pandemic prevented the members of the EO4GEO Alliance to participate in sectorial events and conferences at the most critical part of the project (its two final years). The ground lost during this period in terms of networking, dissemination of the project results and strategic interactions with stakeholders should be recovered in the following months considering that most of the limitations brought by the pandemic are now gone. Steps to address this opportunity have already been taken, a good example of this is the participation of the EO4GEO Alliance in the UK National Earth Observation Conference 2022. During the event the Alliance is given the opportunity to present its main results and the overall approach developed to bridge the EO*GI skills gap during the session "Earth Observation Education" which will be held on the 7th of September 2022 in Leicester, United Kingdom. The participation in the EU Space Week in Prague at the beginning of October 2022 is also foreseen.

4.1.3 Maintenance and roll-out

This section of the long-term action plan provides information related to the roll-out and maintenance of the EO4GEO ecosystem components corresponding to existing outputs developed during the project lifetime for both the existing outputs and the new outputs to be developed after the project end. The maintenance plan developed within the project took into consideration an "as-is" maintenance and an evolutionary maintenance for the outputs developed during the project lifetime.

In particular, the evolutionary maintenance is the one needed in order to bring the current outputs to the level of maturity envisaged by the SSS in Action.

The analysis of the evolutionary maintenance is articulated in the following steps:

1. Maintenance policy: what is the level of maturity envisaged by the SSS in Action?

2. Maintenance strategy: which are the actions to be taken to this end?

3. Maintenance program: how to implement the actions identified in step 2?

4. Maintenance checklist: how to monitor the implementation of the required specific maintenance tasks identified in step 3?

4.1.3.1 Maintenance analysis of the technical environment

The following section of the report provides a brief description of the outputs of the Alliance along with an initial estimate for their evolutionary maintenance. A more detailed description of the maintenance of the Alliance results can be found in Deliverable – Roll-out and maintenance of the ecosystem.

4.1.3.1.1 Network of networks / Sector skills Alliance

- **Output description** – The Space-Geoinformation Sector Skills Alliance is a network of stakeholders and experts from academia, private and public sector, aiming at ensuring the strategic cooperation among stakeholders on skills development.

- **Evolutionary maintenance**

Maintenance policy

In line with the SSS in Action, the Alliance will work after the project end to attract more and more actors of the EO*GI sector, bringing together stakeholders and user communities, reinforcing the cooperation among them on skills development. Indeed, the SSS in Action foresees an animated Network of networks, aiming at bringing together experts and user communities in the EO*GI sector. Moreover, the long-term objective is to penetrate also other sectors and application domains, exporting the identified EO*GI skills. The Alliance should also continue the dialogue with industry experts, representing the demand side of skills, in order to guide the development, delivery and uptake of EO*GI services in Europe.

Maintenance strategy

In order to accomplish the objectives envisaged by the SSS in Action, the Alliance that will be set-up before the project closure should guarantee mechanisms to enlarge the partnership and strengthening its role in the sector.

Maintenance programme

For the evolutionary maintenance, GISIG highlighted the need of a project manager and a communication officer, with an effort of approximately 10 days per month (50% FTE), costing 22.500€ per year. Also, in the case of the evolutionary maintenance, GISIG foresaw a cost of 200€ per year (150€ hosting + 50€ domain) in order to update EO4GEO website.

Maintenance checklist

A precise maintenance checklist should be prepared by those in charge of the evolutionary maintenance of the EO4GEO Alliance. As an indication, the checklist should consider economic and management requirements, in order to ensure that the maintenance program is built into economically sustainable actions that will concretely support the accomplishment of the objectives envisaged by the SSS in Action.

4.1.3.1.2 EO4GEO BoK

- **Output description** – The EO4GEO BoK defines the underpinning inter-related concepts (theories, methods, technologies, etc) of the EO*GI sector that should be covered in education and training. Furthermore, the EO4GEO BoK represents a common vocabulary for the concepts/skills of the EO*GI domain, allowing the standardisation of terms used to describe knowledge and skills in the sector, making sure that EO*GI education and professionalisms speak the same "language".

- **Evolutionary maintenance**

Maintenance policy

The SSS in Actions requires specifically that the EO4GEO BoK will improve its content by add connecting to other domain BoKs, adding new concepts, revising, and defining skills, adding reference materials etc. This improvement should take into account the results of the EO4GEO Watch (described in subsection 3.10), in order to ensure that the BoK will consider all the relevant technological, policy, economic, societal trends.

Maintenance strategy

Regarding the maintenance strategy of the BoK, it is of fundamental importance that it's kept up-to-date and operational, since all the EO4GEO ecosystem is built on it. To this end, a proper engagement of the expert communities is under investigation, e.g., setting a reward system to ensure their involvement. In parallel, mechanisms to ensured that the BoK will be "fed" with the results of the EO4GEO Watch are also under investigation.

Maintenance programme
The estimation of resources needed to update the BoK includes:

- Personnel: 1 FTE
- Equipment: Database and hosting server for expert's database
- Other costs: Fees for contributing experts

4.1.3.1.3   EO4GEO BoK Platform

- **Output description** – The EO4GEO BoK Platform stores, serves and is the main entry point for the EO4GEO BoK. It provides a universal representation of BoK concepts and relations, together with a set of useful software components ready to be used in software applications based on the BoK.

- **Evolutionary maintenance**

Maintenance policy

The SSS in Action emphasises heavily on the need to have a BoK that is up-to-date and operational. This isn't possible without a regularly maintained BoK Platform. This would need efforts to sustain an editorial board and a group of experts who maintain the BoK content.
In particular, its evolutionary maintenance is strictly connected to possible updates of the EO4GEO BoK. In fact, when a new version of the BoK comes out, it has to be installed in the BoK Platform in order to be stored and accessed.

Maintenance strategy

The BoK Platform developed during the project lifetime is already mature and ready to host new versions of the BoK.

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Maintenance programme

UJI assumes the intervention of a developer to take care of the installation of a new version of the BoK, which will generate an estimated cost of 300€ for each installation.

Maintenance checklist

A precise maintenance checklist should be prepared by the developing partner. The checklist should consider, in particular, all the technical requirements to be met in order to assure that the EO4GEO BoK Platform will match with the objectives envisaged by the SSS in Action.

4.1.3.1.4 EO4GEO BoK Tools

- **Output description** – The EO4GEO BoK Tools are a set of innovative collaborative tools which can be used independently or combined, depending on the user's profile and needs. The EO4GEO BoK tools are all based on the EO4GEO BoK and allow different functionalities.

- **Evolutionary maintenance**

  Maintenance policy

  The SSS in Action recommends that the toolset produced by EO4GEO is continuously maintained, upgraded, and expanded with new functionalities.

  Maintenance strategy

  The expansion of the EO4GEO BoK toolset and the development of new functionalities will respond to the needs coming from the academia, the public and the private sector, aiming at tackling real needs of the EO*GI sector.

  Maintenance programme

  For the evolutionary maintenance, UJI highlighted that this would be a custom development, responding to a specific set of needs of clearly identified users. Therefore, it's not of value providing a generic estimation of costs, while not knowing the characteristics of the new possible tool. The updates of the current toolset and the development of new tools will respond to the demand of the actors in the EO*GI sector.

  Maintenance checklist

  A precise maintenance checklist should be prepared by the developing partner. The checklist should consider, in particular, all the technical requirements to be met in order to assure that the EO4GEO BoK Tools will match with the objectives envisaged by the SSS in Action.

4.1.3.1.5 EO4GEO EO Data Exploration and Analysis Tools

- **Output description** – EO4GEO EO Data Exploration and Analysis Tools (EO4GEO EO Tools) provide insight into the Earth Observation world, as well as a cloud-based environment

where one can build on top of EO4GEO training material and work on specific scenarios that require EO skills.

- **Evolutionary maintenance**

Maintenance policy

The SSS in Action recommends that the toolset produced by EO4GEO is continuously maintained, upgraded, and expanded with new functionalities.

Maintenance strategy

Also in this case, and in line with the SSS in Action, the aim for the future is to expand the EO4GEO EO toolset, in order to support skills development in the sector.
The expansion of the toolset and the development of new functionalities will respond to the needs coming from the academia, the public and the private sector, aiming at tackling real needs of the EO*GI sector.

Maintenance programme

The evolutionary maintenance of the EO4GEO EO tools is currently under investigation.

Maintenance checklist

A precise maintenance checklist should be prepared by the developing partner. The checklist should consider, in particular, all the technical requirements to be met in order to assure that the EO4GEO EO Tools will match with the objectives envisaged by the SSS in Action.

4.1.3.1.6 Education offers

- **Output description** – The educational offers developed in the context of EO4GEO consist in the program structure of modules, courses, and lectures/assignments (at university level as well as vocational training) designed to achieve specific knowledge and skills in the EO*GI sector.

- **Evolutionary maintenance**

Maintenance policy

The SSS in Action requires the update of the curricula produced during the project lifetime and the development of new curricula. The educational offers to be produced should be harmonized and go through certification and accreditation mechanisms, where appropriate, and coordinate with European Skills/Competences, Qualification and Occupation (ESCO) presenting the EO*GI skills cross-horizontal to other business sectors.

The aim is to develop more educational offers, assuring that they will convey the EO*GI skills required by the most frequently performed business processes. Furthermore, the upcoming educational offers will be logically organized, so to cover many different domains.

An important objective for the future is to establish and make operational the appropriate certification and accreditation mechanisms for the curricula. This is one of the activities the Alliance will be most dedicated to after the project end.

Maintenance programme

The same resources and costs assessed for the "as-is" maintenance are foreseen also to prepare and run activities focused on developing (exercising) model for curricula design which envisage future user need.

Maintenance checklist

A precise maintenance checklist should be prepared by the developing partners. The checklist should consider, in particular, all the quality requirements to be met in order to assure that the educational offers will match with the objectives envisaged by the SSS in Action.

4.1.3.1.7 Training materials

- **Output description** – The training material developed in the context of EO4GEO addresses the needs of educators in the field of EO*GI, setting a focus on introductory themes and current technologies. It's meant to deliver knowledge and skills as described in the EO4GEO BoK.

- **Evolutionary maintenance**

  Maintenance policy

  The SSS in Action requires the update of the training material produced during the project lifetime and the development of new training.
  The training offered should cover introductory topics as well as full learning cycles and programmes. It should also be organised logically and cover different domains.

  Maintenance strategy

  The aim is to develop more training material, assuring that it will convey the EO*GI skills required by the most frequently performed business processes. Furthermore, the upcoming training material will be logically organized, so to be reused in many different training actions.

  Maintenance programme

  The evolutionary maintenance includes the update of existing training material and the development of new training material. With reference to the update of course material and its code in Github, UJI estimates a 40-hour effort for each course, corresponding to a cost of about 3.000€. With reference to the development of new training material, PLUS estimated a three-hour training course requiring an approximate time for preparation of 10-20 hours and

additional 2 days to make material available in Reveal.js. This requires an estimated employer's costs of 350€ for the daily rate of a professor and 200€ employers costs for the daily rate of scientific staff making the training available in Reveal.js.

<u>Maintenance checklist</u>

A precise maintenance checklist should be prepared by the developing partners. The checklist should consider, in particular, all the technical and quality requirements to be met in order to assure that the training material will match with the objectives envisaged by the SSS in Action.

4.1.3.1.8   Training actions

- **Output description** – The Training Actions delivered during EO4GEO project are webinars, workshops, summer schools, etc., which are meant to deliver to the attendees the knowledge and skills in the EO*GI sector, as described by the EO4GEO BoK. These actions are built on Business processes (BPMN) and occupational profiles and cover 3 EO*GI subsectors: Integrated Applications, Smart Cities and Climate Change.

- **Evolutionary maintenance**

<u>Maintenance policy</u>

The SSS in Action requires the update of the training actions produced during the project lifetime and the development of new training actions.
The training offered should be organised logically and cover different domains. The training offer can also vary in format: from webinars over online courses to more extensive training programmes. The SSS in Action foresees one entry point for all the training actions in order to facilitate access and sharing (even if some offers might be, in practice, hosted elsewhere).

<u>Maintenance strategy</u>

The aim is to develop more training actions, covering areas of the EO*GI sector beyond the 3 subsectors (integrated applications, smart cities and climate change) identified during the project lifetime. The training actions will convey the EO*GI skills required by the most frequently performed business processes. Furthermore, the upcoming training actions will be logically organized.

<u>Maintenance program</u>

The evolutionary maintenance includes new edition of past training actions and/or the development of new training actions.

Planetek considered 2 re-editions of the already existing training module, which will require the effort of 1/12 FTE (considering that the cost of 1 FTE is 5.000€ on a yearly basis).

Regarding the production of new training actions, Planetek foresaw expenses related to the production of 2 new modules per year, the integration of the training material in Planetek MOOC and management of the attendees. This will require 1/5 FTE (1 FTE costs = 10k€).

PLUS considered a new edition of a 3-hour training action: this will require one day of work for trained scientific staff (employer's costs for daily rate: 270€).

UJI foresaw an effort of 20 hours per training action, with a cost of 1500€, for preparing and executing new training actions.
For the evolutionary maintenance, UNIBAS foresaw the effort of 1/2 FTE (EO researcher/teacher), with a yearly cost of 25.000€.

<u>Maintenance checklist</u>

A precise maintenance checklist should be prepared by the developing partners. The checklist should consider, in particular, all the quality requirements to be met in order to assure that the training actions will match with the objectives envisaged by the SSS in Action.

4.1.3.1.9　　**EO4GEO Learning platform**

- **Output description** – The EO4GEO Learning platform consists in a Moodle instance collecting the training actions organized during the project lifetime. For each training action, the metadata shows information such as related EO4GEO BoK concepts, learning outcomes, structure, sharing conditions, authors and contributors.

- **Evolutionary maintenance**

<u>Maintenance policy</u>

The SSS in Action requires that the trainees approaching the training offer will be guided and supported in defining their learning paths. Furthermore, users should be able to interact with tutors and with their peers.

<u>Maintenance strategy</u>

The aim is to enrich the EO4GEO Learning platform with a helpdesk, helping the users design their learning path and access the relevant training actions. It is planned also to have tutors to support users on specific aspects related to the training actions.

<u>Maintenance programme</u>

The resources and the related costs for the evolutionary maintenance of the EO4GEO Learning platform are currently under investigation.

<u>Maintenance checklist</u>

A precise maintenance checklist should be prepared by the developing partner. The checklist should consider, in particular, all the technical and quality requirements to be met in order to assure that the EO4GEO Learning platform will match with the objectives envisaged by the SSS in Action.

4.1.3.1.10   EO4GEO Watch (Operational Sector Skills Intelligence Observatory)

- **Output description** – The EO4GEO Watch is intended as a mechanism to keep track of the demand and offer of EO*GI skills, the technology trends, and the policies relevant to the sector.

- **Evolutionary maintenance**

  Maintenance policy

  The SSS in Action requires to set up a skills intelligence mechanism to monitor the supply and the demand of education and training, to detect the upcoming trends in technology, policy, economy, and society, and to suggest how to integrate these new trends in existing and new curricula.

  Maintenance Strategy

  The EO4GEO Watch is one of the ecosystem components that will be developed after the project's end. The plan is to set up an observatory that keeps track of the changes in EU policies and in the demand/offer of skills. It will also keep track of the latest technological developments. The Watch will detect signals of changes and alert the stakeholders of possible threats and opportunities of the sector.

  Maintenance Programme

  EARSC was identified as the best candidate partner to estimate the resource needed to set-up the EO4GEO Watch and the related maintenance costs.

  Regarding the initial set up of the Watch, EARSC foresaw the following resources in terms of personnel:

  - 1 senior coordinator (1/3 FTE)
  - 1 EO*GI technology domain senior expert (1/3 FTE)
  - 1 EO*GI policy domain senior expert (1/3 FTE)
  - 1 EO*GI skills gap domain senior expert (1/3 FTE)

  EARSC emphasised that this estimation is based on the assumption that the EO4GEO Watch will build on an established network (e.g. based on EARSC existing resources, such as industry surveys, policy mechanisms checking the EU directives, international and European network of stakeholders for collaboration and partnerships).

  Otherwise, if certain methodologies of work are not yet established, the estimated resources might increase (1 FTE for each category).

  When the Watch will be set up and fully operational, EARSC estimated the following resources:

  - 1 senior coordinator (1/4 FTE)
  - 1 EO*GI technology domain senior expert (0,25 FTE) + junior expert (0,25 FTE)

- ○ 1 EO*GI policy domain senior expert (0,25 FTE) + junior expert (0,25 FTE)
- ○ 1 EO*GI skills gap domain senior expert (0,25 FTE) + junior expert (0,25 FTE)

<u>Maintenance checklist</u>

A precise maintenance checklist should be prepared by those on charge of the evolutionary maintenance of the EO4GEO Watch. The checklist should consider economic and management requirements, in order to ensure that the maintenance program is built into economically sustainable actions that will concretely support the accomplishment of the objectives envisaged by the SSS in Action.

4.1.3.1.11 Mobility programme

- **Output description** – The mobility program promotes internships and project work by students and professionals in a working environment (international or not). An online portal collects offers/demand of internships and project works.

- **Evolutionary maintenance**

<u>Maintenance Policy</u>

The SSS in Action encourage to promote internships and apprenticeships. This can be done through a robust mobility program.

<u>Maintenance Strategy</u>

The mobility program developed during the project lifetime is mature and ready to be extended, connecting new actors from the academia and from business.

<u>Maintenance Programme</u>

As evolutionary maintenance, GISIG foresaw an increased effort of the same figures: approximately 8 days per month, meaning 40% FTE, costing 16.500€ per year.

<u>Maintenance checklist</u>

A precise maintenance checklist should be prepared by those in charge of the evolutionary maintenance of the mobility program. The checklist should consider economic and management requirements, in order to ensure that the maintenance program is built into economically sustainable actions that will concretely support the accomplishment of the objectives envisaged by the SSS in Action.

4.1.4 Roll-out approach

As discussed in other sections of this document, the Alliance outputs, which have different levels of maturity need to be evolutionary maintained in order to meet the desirable level of maturity envisaged by the SSS in Action. Once this happens during the operation of the Alliance, they will be ready for the roll-out and, therefore, to be deployed within the EO*GI community.

It is important to be clear about what is understood by **roll-out**. According to the definition of the Cambridge dictionary, to roll-out (something) is to make a new product, service, or system available for the for the first time[38]. In the specific case of the EO4GEO Alliance, the term roll-out indicates the action of making all the resources, tools and results produced by the Alliance available to the EO*GI community as well as to stakeholders in the education and training sector.

This requires a precise roll-out plan that, for each of the output, existing and new, considers the following aspects:

- market analysis
- identification of stakeholders and users
- communication strategy

An investigation of the skills demand and offer in the EO*GI sector should be regularly performed, together with an analysis of the technological and societal trends. This in order to ensure that the outputs deployed meet the actual needs of the sector.

In parallel, all the relevant stakeholders should be identified, together with the potential users of the outputs.

Additionally, a proper communication strategy should be followed, taking into consideration the different target users and stakeholders.

4.2   Necessary means to create impact

This part of the long-term action plan will look at two aspects essential to enable the operation and running of the EO4GEO Alliance in the years to come.

The two elements are the governance model and structure that needs to be designed and put in place for running the Alliance and the second element is related to its financial sustainability and the business plan that needs to be made operational to guarantee the Alliance has the sufficient funds to achieve is ambitious goals. In this section the governance model and structure are discussed first followed by an analysis of the suggested business plan for the Alliance.

Based on the importance of these two components for the sustainability of the Alliance, they were grouped in the LTPA as necessary actions for the creation of impact in the short, medium and long-term.

4.2.1 Governance model and structure

Developing a robust governance structure for the EO4GEO Alliance is essential to guarantee its long-term sustainability and its capacity to effectively play a driving role in bridging the exiting skills gap in the EO*GI sector. Based on this need, the team working on the long-term sustainability of the Alliance investigated several governance structures and models that could suit its ambitions and future needs. A comprehensive analysis of the different governance elements investigated can be found on the Deliverable – Long-term Governance Structure.

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[38] https://dictionary.cambridge.org/dictionary/english/roll-out

4.2.1.1 Analysis of governance structures for the EO4GEO Alliance

The governance of the EO4GEO project was designed around a set of given conditions and considerations to support the effective delivery of the actions embedded in the detailed project description and the engagement of stakeholders for the long-term sustainability of the Alliance. The challenge to address at the later stage of the project was to define a flexible governance model for the Alliance that would further enhance the value created along its duration as well as giving room to the adhesion of new stakeholders as members as well as a different set of funding streams.

In order to address this challenge an assessment of different governance structures and models was conducted leading to the following results:

- **Option 1: Shared network governance:** This option would entail that the Alliance is governed by the network members themselves, without a lead organisation or network broker.

- **Option 2: Lead-organisation:** This option would entail that the Alliance is governed by a lead organisation that is participating in the network. Under this option, several sub-options can be distinguished and applied to the EO4GEO Alliance:

  - **Option 2.1 -** This option entails that GISIG, the current coordinator of the EO4GEO project, will take a central role in supporting and steering the governance of the Alliance.

  - **Option 2.2 -** This option foresees the embracement of the Alliance by Climate-KIC, one of the partners in EO4GEO.

  - **Option 2.3** - This option entails that the EC will embrace the 'EO4GEO Alliance' and some of its key component. Within the EC, several organisations could act as the lead organisation: DG DEFIS, EUSPA or DG EMPL.

- **Option 3: Establishment of a Network Administrative Organisation (NAO**): This option entails the setup of a separate administrative entity specifically to govern the network and its activities.

The report on the "Long-term Governance Structure" provides a detailed analysis of some – theoretical – insights on the requirements and success factors of each of the governance models assessed. In addition to these, some more specific – overall – requirements could be added and taken into consideration for the assessment of the options. These include:

- **Effectiveness**: Extent to which the governance option is contributing to achieving the objectives of the Sector Skills Strategy in Action[39]

- **Efficiency:** Extent to which the costs associated with preparing/implementing the option are reasonable

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[39] http://www.eo4geo.eu/sector-skills-strategy-report/

- **Feasibility:** Extent to which there are no constraints (political, technical, operational, …) that do not allow the implementation of the option

- **Relevance:** Extent to which the governance option provides an added value compared to existing initiatives (and other proposed governance options).

These factors are taken into consideration for identifying the pros and contras of the different options, which will result into an overall assessment of the option as well as possible next steps.

4.2.1.2 Assessment of EO4GEO governance models

This section of the report will further analyse the most suitable governance models selected for the EO4EO Alliance paying special attention to describe and consider how the current and future members of the Alliance would interact and how decisions could be made under each of the models that has been assessed.

4.2.1.2.1 Option 1 – Shared network governance

Under this option, there will be some level of collaboration among the stakeholders of the EO4GEO Alliance. However, no lead organisation will be assigned or established to take care of the governance of the network. The network will be governed by the members. These members would still have the full freedom to act and take other initiatives, in other words their autonomy is not jeopardised. Also bilateral or multilateral collaboration between the members or partners is still possible. In comparison with other options, this option can be considered as highly feasible and relatively easy to implement, with relatively little costs. The main weaknesses of this option are related to its long-term sustainability and its external legitimacy. There is a risk that the commitment of network participants will be(come) rather low. The lack of a formal structure or arrangement will also have an impact on the external "face" (or "brand") of the network, i.e. how the collaboration is perceived by outsiders. In case of a larger number of participating organizations, a shared governance mode will be less efficient. Moreover, it requires a high level of trust among the participants and a strong consensus on the goal of the network. Especially on the longer term, the effectiveness and relevance of the option might decrease. In this context, it is important to notice that the EC Pact for Skills demands for concrete commitments on upskilling and reskilling, which might be lacking – or less visible - in case of shared governance.

4.2.1.2.2 Option 2 – Lead-organisation

This option would entail that the Alliance is governed by a lead organisation that is participating in the network. Although several sub-options can be distinguished under this option, it is useful to already take into consideration the – theoretical – requirements and success factors of this lead-organization form of governance. A key requirement is a high level of trust among the participants for the lead organization. There is the risk of an unbalanced distribution of power, since in some cases the lead organisation could be the most powerful member of the network. Also important is that the lead organisation has the right skills and competencies to match the collective needs of the network. This is difficult to assess in advance, as it depends on the needs (and objectives) of the network, which should be decided upon prior to the selection of the governance mode. It should be noticed that – some of – these objectives have been defined already as part of the Sector Skills Strategy in Action.

Under this option, we identified a set of sub-options that have been further assessed along the project.

- **Sub-option 2.1** entails that GISIG, the current coordinator of the EO4GEO project, will take a central role in supporting and steering the governance of the Alliance. In comparison with the options of shared network governance, this option will require some additional costs and efforts to prepare and implement, but overall it still can be considered as a relatively efficient and feasible option. GISIG not only is the current coordinator of the EO4GEO project, but also operates as a network of organizations in the field of EO*GI, grouping together the experience of universities, enterprises, and administrations. As the current coordinator of the EO4GEO project, GISIG actively contributed to the preparation of the Sector Skills Strategy, it can be argued that this option will be effective in realizing the objectives defined in the Strategy. At the same time, this option will allow to build further on the current governance (structure) of the EO4GEO project, which adheres to the key principles and requirements of the EC on sector skills cooperation. The challenge will be to sustain the collaboration among existing network of organisations but also add new – public, private, academic – organizations to the network, allowing a better representation of the space/geoinformation domain. Other key challenges in implementing this model will be to clearly define the role and business model of GISIG, as - administrative – entity responsible for governing the network and its activity, and to decide on the extent to which the EO4GEO governance structure will be aligned with the existing organisational and governance structure of GISIG.

- **Sub-option 2.2** entails that EIT Climate-KIC will act as lead organization of the network. EIT Climate-KIC is a Knowledge and Innovation Community (KIC), working to accelerate the transition to a zero-carbon economy. EIT Climate-KIC identifies and supports innovation that helps society mitigate and adapt to climate change. EIT Climate-KIC currently is the exploitation coordinator of the EO4GEO project and steers the exploitation vision and activity of the project. Capacity building is part of the core activities of EIT Climate-KIC, as it runs a range of education programmes across Europe and online, for students, postgraduates and professionals. EIT Climate-KIC aims to enhance the - entrepreneurial - skills of people across Europe, but with a particular focus on skills and knowledge for climate action. Space/geoinformation skills could be considered as part of this scope, but it also entails various other skills domains and competencies. Despite its central role in preparing the (future) exploitation of EO4GEO, it would require additional efforts (and costs) for EIT Climate-KIC to take up the role of EO4GEO Alliance lead organisation, also taking into consideration the internal procedures that need to be followed. Moreover, the integration of EO4GEO into the existing structure(s) of Climate-KIC could be very challenging, or even impossible due to a limited level of alignment between the EO4GEO objectives and the Transition in time strategy of EIT Climate-KIC.

- **Sub-option 2.3** entails that the EC will serve as the lead organisation of the EO4GEO Alliance. At least three organizations at the EC level are active in the fields of skills development and/or space/geoinformation. The Directorate-General for Defence Industry and Space (DEFIS) leads the European Commission's activities in the Defence Industry and Space sector. DG DEFIS is in charge of implementing the EU Space programme consisting of the European Earth Observation Programme (Copernicus), the European Global Navigation Satellite System (Galileo) and the European Geostationary Navigation Overlay Service (EGNOS). DG DEFIS is implementing and supporting various actions on skills development in the space sector. The core mission of the European Union Agency for the Space Programme (EUSPA)

is to implement the EU Space Programme and to provide reliable, safe, and secure space-related services, maximising their socio-economic benefits for European society and business. EUSPA aims to serve as the essential link between space technology and user needs, translating the European Union's investment in space into valuable, reliable services for European citizens. The Directorate-General for Employment, Social Affairs, and Inclusion (EMPL) is responsible for EU policy on employment, social affairs, skills, labour mobility and the related EU funding programmes. DG EMPL aims to create more and better jobs, promote skills and vocational education and training and improve the functioning of the labour markets. Although these three organizations can be considered as key organizations in the fields of skills development and/or space/geoinformation, it cannot be excluded that also other EC organizations could play a role in – supporting – the governance of the EO4GEO Alliance. In the assessment of this sub-option as a governance model, in which we focus on the three key organizations, some main observations can be made, which also apply to other EC organizations:

- ○ Although these organizations could embrace some of the EO4GEO components or outputs (such as the skills intelligence, the Body of Knowledge, the training materials, etc.), it is less realistic they – directly – act as the lead organization of the EO4GEO Alliance.
- ○ Even for the embracement of these components, these organizations tend to rely on tenders or grants, to engage other – networks of – organizations in providing these products or supporting services. These should be seen as relevant opportunities for the EO4GEO Alliance to acquire external funding for some of its activities. In other words, the Alliance and its governance form should allow to get access to these funds, which also requires the right network competencies.
- ○ Especially in the field of "skills partnerships", the EU has put in place several EU funding instruments for upskilling and reskilling, including funding directly from the European Commission (e.g. ESF+ EaSI Strand), funding through national authorities (e.g. European Regional Development Fund, Erasmus+) and funding through intermediaries (e.g. InvestEU).

4.2.1.2.3 Option 3 – Establishment of a Network Administrative Organization (NAO)

The third option entails the establishment of a new separate administrative entity specifically to govern the network and its activities. Theoretically, such a model is considered to be most effective when there is some trust among a moderate to a high number of network participants and when the consensus among these members on the goal of the network (or Alliance) is moderately high. The NAO model is also most effective when there is a strong need for network-level competencies. At this stage, it remains difficult to assess these conditions.

It is important to take into consideration that the establishment of a new organisation would require – additional – time, effort and (financial) resources. It should be seen as a (possible) future step in the overall establishment of the EO4GEO Alliance governance model, which also includes the decision on the level of collaboration within the network and the goal and value proposition of the network. Especially in case of a high level of commitment among the – core – members of the network, a NAO model might allow to develop a governance form that is fully in line with the needs and interests of these members.

4.2.1.3 Next steps for the EO4GEO Alliance governance structure

The definition of the EO4GEO governance structure is an important aspect of the EO4GEO governance model. The following main recommendations can be made with regard to the structure:

- The definition of the governance structure should follow the definition of the level and kind of collaboration the EO4GEO Alliance wants to achieve and the selection of the EO4GEO governance mode.

- First step in the definition of the governance structure should be the choice between a one-tier[40] or a two-tier[41] structure. The governance structure should also adhere to other key principles of good – corporate – governance.

- Experiences in the current governance of the EO4GEO project should be taken into consideration, but modifications to the existing governance structure should be made to adhere to the principles of good governance and to be able to implement the Sector Skills Strategy in Action and the LTAP. One of these modifications might be the size and composition of the board, to ensure the EO4GEO Alliance has an effective and balanced board.

Steps have already been taken by Steering Committee of the EO4GEO project for defining the governance of the Alliance in the short-term (2022-2025). Among some of the actions that have already been taken, it is important to highlight the following:

- **Memorandum of Understanding (MoU)** – A Memorandum of Understanding was circulated among the current core partners of the project. In the aforementioned MoU the different parties would have to agree on the continuation and consolidation of the EO4GEO Alliance with the coordination of the GISIG Association acting as the operational body of the Alliance.

- **Network Agreement (EO4GEO Alliance)** – A Network Agreement for the EO4GEO Alliance was circulated among the core and associated partners of the project. This agreement provides specific instructions on how the Alliance should be governed from July 2022 until 2025.

  Some of these elements entail the creation of the following bodies:

  - General Assembly (with one representative for each of member)
  - Steering Committee
  - Operational body

Actions are currently being taken to consolidate the responses obtained from the core and associated partners of the EO4GEO project and their willingness to form part of the EO4GEO Alliance. This process will lead to the consolidation of a new group of organisations, out of original project partners and associates and welcoming new stakeholders in the Alliance, signing their commitment and motivation to materialise the ambitious strategic objectives framed under the Sector Skills Strategy in

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[40] In the one-tier structure there is only one board that consists of both the management and the supervisors. The supervisors are part of the board. Within the board a distinction is made between executive directors and non-executive directors.
[41] In the two-tier structure there is a separation between management and supervisors. The board is responsible for the day-to-day management of the organization. A separate supervisory board supervises the management. The supervisory board is responsible for the general policy and strategy of the organization.

Action and further explained in other sections of this document. The MoU and the Network Agreement are enclosed as Annex I and Annex II. Their content is based on several iterations among core partners and advice from their legal departments and was endorsed during the final project meeting in Brussels on 19th May 2022, with some suggestions for improvements. It is expected that the partners start signing the documents already by the end of the contractual period (June 2022).

4.2.2 Business model and plan

The second element considered as fundamental for enabling the creation of impact in the Alliance is the development of a suitable business model and plan for its operation. This business model and business plan will be based on the value created by the Alliance so far and the actions that have been described in section 3 of this document.

As detailed in a previous section, the SSS in Action identifies 5 Strategic Objectives, each of them articulated in 3 Operational Objectives, for the EO*GI sector to be accomplished by the EO4GEO Alliance in the medium/long term after the project end. This ultimately aim to foster the growth of the EO*GI sector, ensuring a workforce with the right skills, in the right place, at the right time.

The outputs developed during the project lifetime can effectively contribute to the implementation of the SSS in Action. However, in order to do that, some of them will need to reach a higher level of maturity with respect to the current one, while also new output and outcomes will see light. The current level of maturity of each output has been also assessed with reference to its role as envisaged by the matching objective.

Figure 13 - Matching the existing outputs of the Alliance the Operational Objectives of the SSS in Action

Strategic Objective 1 (SO1) aims to set-up a skills intelligence mechanism to identify the skills and competences required and provide feedback on the evolving sector needs.

The corresponding Operational Objectives are:

- to monitor the evolution of supply of, and demand for education and training on a regular basis (Operational Objective 1.1 - OO11),
- to establish a "trends watch system" that alerts the community on emerging developments (e.g., technological, policy, economic, societal) (Operational Objective 1.2 - OO12),
- to assess supply and demand at regular intervals with the view to draw recommendations for the stakeholders of the sector (Operational Objective 1.3 (OO13).

The EO4GEO Watch, when set-up, will respond to that.

Strategic Objective 2 (SO2) aims to reinforce cooperation among stakeholders from the academic, private, and public sectors on skills development and requirements.

To this end, it's important to:

- keep a Body of Knowledge (BoK) for EO*GI operational, feed it with the results of the Technology Trends Watch and link it with other relevant BoKs, vocabularies and ontologies (Operational Objective 2.1 - OO21),
- expand and maintain a rich toolset to support skills development, and to make it accessible and re-usable for all stakeholders (Operational Objective 2.2 - OO22),
- animate and enhance a Network of Networks and avoid fragmentation and negative side effects, bringing together stakeholders and user communities (Operational Objective 2.3 - OO23).

The first two Operational Objectives are matched by the EO4GEO BoK, the EO4GEO BoK Platform, the EO4GEO BoK Tools and the EO4GEO EO Data Exploration and Analysis Tools. The need expressed by Operational Objectives 2.3 is matched by the Sector Skills Alliance.

Strategic Objective 3 (SO3) aims to set-up a mechanism for helping and guiding candidate learners in their skilling, upskilling and reskilling efforts.

This will be achieved through:

- the design and regular update of a portfolio of curricula and training materials, notably for added-value services and applications, covering different occupational profiles. All this will be made accessible to all stakeholders through a one-stop portal (Operational Objective 3.1 - OO31),
- the establishment and operationalisation of a certification and accreditation mechanism for the training offered (Operational Objective 3.2 - OO32),
- the provision of guidance for learners to define their own learning paths and to follow training actions (Operational Objective 3.3 - OO33).

There is correspondence between these objectives and the educational offer, the training and the Learning Platform developed in the context of EO4GEO. For the time being, OO32 isn't matched by

any of the project outputs already developed, as shown in Figure 4. The Alliance will take care of this after the project end.

Strategic Objective 4 (SO4) aims to facilitate and stimulate a more integrated approach on skills development across different value chains.

To this end, it is needed to:

- identify new vocational training initiatives to penetrate other sectors and application domains with a focus on societal challenges and the needs of citizens' daily life (Operational Objective 4.1 - OO41),
- improve the uptake of EO*GI data and technologies through the upskilling and reskilling of professionals (Operational Objective 4.2 - OO42),
- foster industry forums with other business sectors where skills development and transfer are considered (including digital skills, (big) data and analytics) (Operational Objective 4.3 - OO43).

The Sector Skills Alliance will respond to that, together with the Watch.

Strategic Objective 5 (SO5) aims to encourage citizens' engagement, citizens' science practices and hands-on activities enhancing the inclusion/recognition of EO*GI applications' value in everyday aspects of life.

To this end, it will be important to:

- promote and reach out to 'end-user' communities, and to engage citizens through various events, especially at the local level, on job opportunities, internships and apprenticeships, roadshows (Operational Objective 5.1 - OO51),
- provide a platform/forum for collecting and testing ideas from 'end-user' communities (Operational Objective 5.2 - OO52),
- increase efforts to develop skills and stimulate innovation and entrepreneurship, to foster an attractive work environment (Operational Objective 5.3 - OO53).

Again, these objectives recall an important role of the EO4GEO Alliance, supported by the Mobility program and possibly by the EO4GEO Learning Platform.

4.2.2.1 Sustainability analysis

The outputs produced during the project lifetime are ready to be used outside the project consortium. But, having in mind the objectives of the SSS in Action, their full exploitation has not been reached yet, but many opportunities exist. The EO4GEO Alliance already started working on that, together with the partners who developed the outputs, and will continue to do so after the project end.

An investigation outside the consortium, in the form of a market analysis, is however necessary to assess what additions will be needed for a full exploitation.

At this stage, it is possible to assess what is required so that the project outputs will meet the level of maturity envisaged by the SSS in Action.

4.2.2.2 Revenue streams

The business model of the Alliance is strictly connected to the governance model that will be adopted as well as to the prioritisation given by the Alliance to the different types of revenue streams. Possible revenue streams for the Alliance are identified as follows:

- EU/National (co)funded projects
- Membership fees
- Paid services
- Investors/Sponsors

It is understood that the process of attracting new sources of funding for the future operation of the EO4GEO Alliance will demand collective efforts and coordination by their members and the engagement of external stakeholders when needed.

We also refer to the report "Long-term Business Plan" for details on the resources and cost plan based on estimated production costs to provide paid services and the evolutionary maintenance costs for the project outputs (as detailed in section 4.1.3) and the corresponding resources to cover them.

EU/National (co)funded projects

This includes National programs (e.g. the Resilience and Recovery Fund) and EU projects. The latest, in particular, are mostly related to several multiannual programmes which publish calls for proposals almost regularly in the funding & tender portal of the European Commission[42]. A constant monitoring of the portal is needed to select the calls of possible interest for the Alliance, based on the coherence of the call's objectives with the Alliance Long Term Action Plan. An initial monitoring led to the analysis illustrated in Figure 14, which was shared with the project partners, aiming to stimulate discussions about incoming opportunities.

The following elements are then recommended as part of the operation of the Alliance:

- **Mapping funding opportunities** – A system needs to be put in place by the Alliance with the sole purpose of consistently mapping different types of funding opportunities. The outcomes of the mapping exercise should be made available on a monthly basis to the management of the Alliance for discussion and to decide what funding opportunities are worth pursuing.

- **Applying to new calls and tenders** – A team within the Alliance should be responsible to manage the process of applying to new calls and tenders relevant to its core activities. This team will be responsible to assess whether the identified call/tender is suitable for the Alliance. In case a decision is made to submit a proposal, the team would need to identify the Alliance partners with the capacity and knowledge necessary to submit a competitive proposal.

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[42] https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home
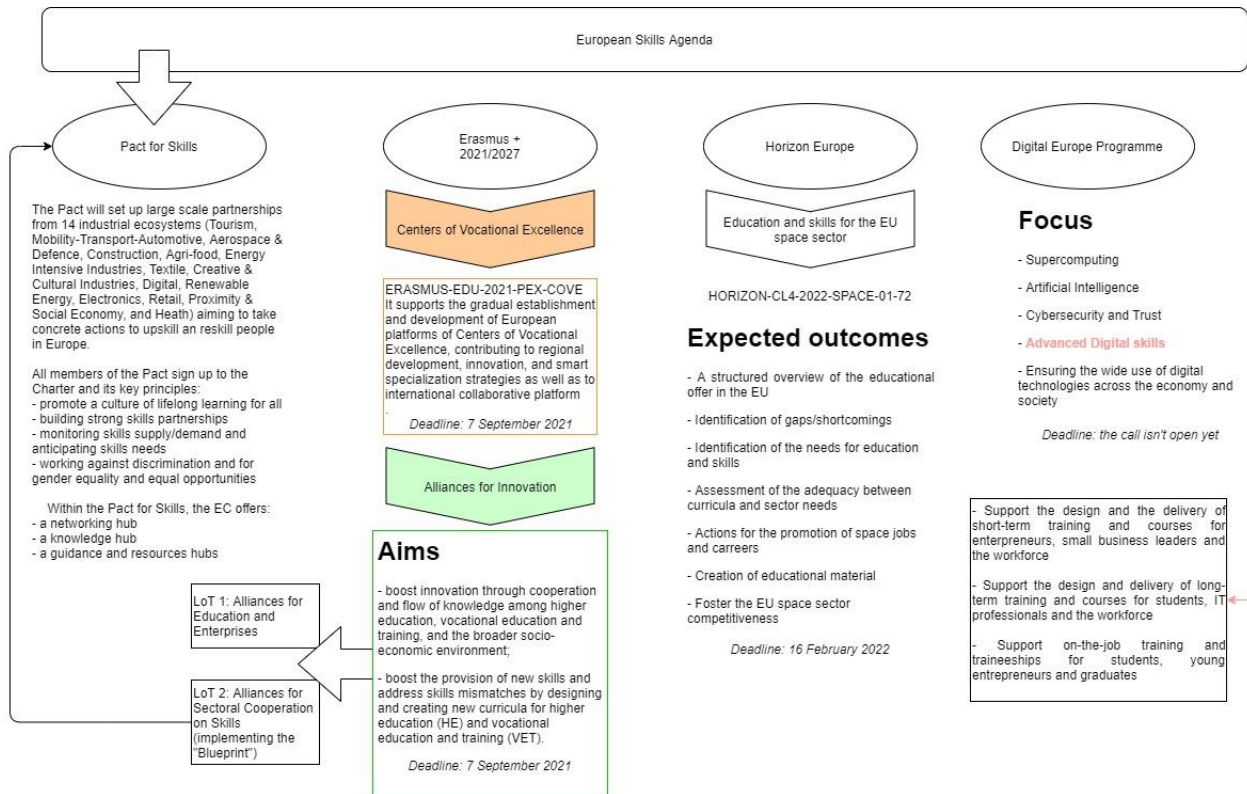
Figure 14 - Analysis of EU funding opportunities

A more recent monitoring, focused on Erasmus+ Programme, detected some calls of potential interest for the EO4GEO Alliance:

- Partnerships for Innovation: Alliances

    o Alliances for Sectoral Cooperation on Skills (implementing the 'Blueprint') (ERASMUS-EDU-2022-PI-ALL-INNO-BLUEPRINT)

    o Alliances for Education and Enterprises (ERASMUS-EDU-2022-PI-ALL-INNO-EDU-ENTERP)

- Partnership for Excellence - Centres of Vocational Excellence (ERASMUS-EDU-2022-PEX-COVE)

For future ERASMUS+ Calls, the action "Forward-Looking projects" has been also identified as of great interest for the objectives of the Alliance.

Within the overall LTAP context, EU (co)funded projects represent a good opportunity to develop new outputs and/or to further improve the currently existing ones.

Membership fees

An annual fee to be paid by the members of the EO4GEO Alliance to cover the operation and coordination of the activities has been provisionally agreed. The fee for the year 2022 (II semester) and 2023 has been defined as follows:

- 240,00 = Euro for the first semester (July to December 2022)
- 480,00 = Euro for 2023.

The funds collected from member's fees as well as the other potential review streams will gradually contribute to the financial sustainability of the Alliance in the long-term.

Paid services

This revenue stream is related to the possible commercial exploitation of current and future outputs, creating a portfolio of paid services for different types of clients. The marketability of these services, currently limited by the non-optimal level of maturity of some of them, can increase if the evolutionary maintenance of the already existing outputs will follow the indications provided in D6.4 "Roll-out and maintenance of the eco-system". A dedicated business plan for each service should be elaborated, based on specific requirements to be formalised involving potential customers, considering that:

- a possible high level of customisation of the paid services could be easily achieved thanks to the intrinsic modularity and flexibility of the outputs,

- the related high production costs will be fully remunerated by adequate selling prices of the services, justified by their high level of specialisation.

We refer to the report "Long-term Business Plan" for details on the production plan elaborated referred to a possible portfolio of paid services.

Investors/Sponsors

Another possible revenue stream consists in the funds of parties (industry, EU institutions, finance, academies, research bodies, etc.) interested to invest (in equity and/or debt) in the overall operation of the Alliance and/or in Alliance specific initiatives, e.g. the creation of a large-scale partnership in the context of the Pact for Skills, ESCO itself for the identification of EO*GI related professional profiles, etc.

Sponsors may be also interested to financially support specific initiatives, e.g. events, training actions.

5   Conclusions

This Long-Term Action Plan (LTAP) is based on the EO4GEO Sector Skills Strategy (SSS) in Action. It consists of the text of this Strategy and details the Strategic Objectives into (possible) concrete actions and actions. It also summarizes the work on the means that are needed to reach the objectives in terms of Governance model and structure, and Business model and plan. This also includes mechanisms to multiply EO4GEO results and become mainstream, and to maintain and roll-out the (technical) components of EO4GEO.

The starting point of the SSS in Action is that the EO*GI sector is a healthy sector that sustains an annual growth of 10%. There are several drivers and trends that make this happen:

1) The rapid rise of new data sources making them abundant and requiring new analytical methods;
2) Technical advancements that impact the sector such as AI and ML, IoT, and more;
3) The evolution of user requirements with experts and citizens alike in need of streams of current and up-to-date data;
4) The structural shift of the industry and
5) A changing legislative environment.

The Strategy stresses existing and emerging occupational profiles. There is a need for more EO*GI developers, EO*GI data analysts and EO*GI (project) managers. But also existing profiles such as surveyors, Remote Sensing experts, EO scientists, cartographers, EO*GI developers remain important. Together with the profiles come a series of skills-sets such as data visualisation techniques and cartography, programming & development skill-sets, the interpretation of EO*GI data, data science and analytics.

The SSS defines a clear visions and mission, and 5 Strategic Objectives and 15 Operational Objectives which form the basis for this LTAP:

1. To set up a skills intelligence mechanism to identify the skills and competences required and provide feedback on the evolving sector needs.
2. To reinforce cooperation among stakeholders from the academic, private, and public sectors on skills development and requirements.
3. To set-up a mechanism for helping and guiding candidate learners in their skilling, upskilling and reskilling efforts.
4. To facilitate and stimulate a more integrated approach on skills development across different value chains.
5. Encourage citizens' engagement, citizens' science practices and hands-on activities enhancing the inclusion/ recognition of EO*GI applications' value in everyday aspects of life.

The Sector Skills Strategy has drawn a lot of attention and interest from the EO*GI Community which can be derived from the number of downloads of the document (3874).

Five Task Forces (or Working Groups) were set-up to develop the 15 Operational Objectives and to translate them into potential actions and activities. In the Task Forces people from 18 partners and associated partners were actively involved providing ideas and proposing actions for the future. At the time of writing this LTAP, a total of 94 actions and activities have been identified and described. To this end the actions and activities were elaborated in terms of 'what', 'how', the outputs and

outcomes, expected impact, possible indicators with targets envisaged, as well as a (rough) timeline, the target public, the stakeholders and the required resources.

It must be stressed that this is work in progress. Some Operational Objectives are less developed than others, and some elements might still be missing or are incomplete (e.g. necessary resources). Moreover, some actions and activities already started or are in a planning stage. The tables in Section 3 of the LTAP have to be seen as guidelines for e.g. preparing new project proposals.

The LTAP also provides guidance on the means that are required for implementing the proposed actions and activities including governess and financial aspects. Indeed, without a well-thought governance model, and strong governance structure, and without a clear business model and the necessary money, actions and activities will not take place. EO4GEO has developed both and the Alliance thinks we have a good base to continue and deepen the work that is needed.

Finally, a lot of work has been done and is summarized in this LTAP to take the necessary steps to create multiplication effects by using and reusing the results of EO4GEO by partners, the broader EO*GI community and other sectors. 82 multiplication cases have been identified and 20 have been implemented or initiated. It is clear from these that there is a huge interest in what EO4GEO has been doing and a willingness to further cooperate on skills development in the sector. Therefore, also a more stable maintenance and roll-out mechanism for the more and less tangible results is a must. Also that is part of this LTAP.

Where our sector is heading to …

Our society is currently facing very serious challenges ranging from the depletion of natural resources, the constant thread of the further escalation of arm conflicts such as the ongoing war on Ukraine to the ever-present risks brought by climate change. In the first half of 2022, natural disaster which in many cases are driven by climate change has caused overall losses of US $65 billion[43]. We have also seen record temperatures being noted across Europe and other parts of the world as well as the rise in aggressive fires and droughts damaging ecosystems and putting in risk the global provision of food.

The EO*GI sector can play a critical role in managing natural ecosystems such as the Amazon basin, the monitoring of ice sheets which is an essential climate variable within the global climate observation system. In addition, the effective use of Earth Observation and geospatial technologies are relevant sources of information for monitoring key aspects of our lives in the cities such as the concentration of heat islands, the quality of air and identifying patterns in the use of different modes of transport.

In addition, the EO*GI sector is strategic in supporting the implementation of different policy initiatives of the European Union such as the Green Deal, the Common Agricultural Policy (CAP) and the Digital transition just to mention a few.

Is this cross-sectoral nature and its capacity to bring value to different application domains that makes the EO*GI technologies so critical in the process of understanding, monitoring, and managing different aspects of our lives in the planet.

The EO4GEO Alliance is exceptionally well placed to stimulate and drive the process of bridging the current EO*GI skills gap and to support Europe's workforce in acquiring the rights skills, in the right place, at the right time. Our mission of ensuring strategic cooperation among stakeholders on skills development in the EO*GI sector illustrates the commitment of the Alliance to engage all relevant

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[43] https://www.munichre.com/en/company/media-relations/media-information-and-corporate-news/media-information/2022/natural-disaster-figures-first-half-2022.html

stakeholders and make better use of European Union's resources. This also entails stimulating and engaging the private sector to contribute financially to support the delivery and full implementation of the mission and vision of the EO4GEO Alliance.

In addition, the EO4GEO Alliance has demonstrated its capacity to lead and provide tangible results as demonstrated by its 11 outputs ranging from the Body of Knowledge to the training approach including training materials, training actions and a complete set of tools based on the Body of Knowledge. These outputs are further supported by the Sector Skills Strategy in Action, a document that provides the forward-looking perspective on the provision and development of education, training, and skills in the EO*GI sector by defining specific strategic and operational objectives. The next building block of the approach developed under the EO4GEO Alliance is a list of actions necessary to make the strategic and operational objectives of the SSS in Action operational. This is all supported by a business, governance, maintenance, mainstreaming approach that provides the necessary stability to the Alliance and its members to effectively keep advancing in the implementation of the Sector Skills Strategy in Action. All these elements are key components of the information presented in this document and known as the Long-term Action Plan for the EO4GEO Alliance.

To conclude, it is important to remember that an educated workforce will enable the sector to attract high value, innovative and knowledge-based businesses and adapt more readily to the challenging technological environment that the EO*GI sector is currently experiencing.

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Annex I

EO4GEO Alliance

Memorandum of Understanding among:

Acronym	Partner name	Represented by
GISIG	Geographical Information Systems International Group (IT)	Giorgio Saio, Coordinator
KU Leuven	Katholieke Universiteit Leuven (BE)	
PLUS	Paris-Lodron-Universität Salzburg (AT)	
EPSIT	EPSILON ITALIA SRL (IT)	
UNI JENA	Friedrich-Schiller-Universität Jena (DE)	
…….	*Each partner completing this list with its name and legal representative once signing*	
…….		
…….		
…….		
…….		
…….		
…….		

hereinafter referred to as "the Parties"

WHEREAS

1. The Parties participated in the Blueprint Sectoral Skills Alliance "EO4GEO" (Project No 591991-EPP-1-2017-1-IT-EPPKA2-SSA-B) submitted to the European Commission in the framework of the ERAMUS+ Sector Skills Alliance (Lot 3) Call for Proposal of 2017,

2. The Grant Agreement n – 2017-3113 / 001 – 001 states the contractual conditions for project implementation agreed between the Commission and the contractual partners on the other side (including its amendments n. 2017-3113 / 001 – 002, n. 2017-3113 / 001 – 003 and n. 2017-3113 / 001 – 004), as also detailed in the individual Associated Contracts signed between GISIG, as project coordinator, and each contractual partner,

3. The EO4GEO consortium evolved towards an enlarged Network, the EO4GEO Alliance, including the contractual Parties and 50 Associated Partners at the moment of the drafting of this agreement,

4. Each Party remains owner of its own background knowledge and material made available to achieve the EO4GEO results, to which access is granted on fair and reasonable conditions.

5. According to Article II.8 of Annex II "General Conditions" ERASMUS+ Grant Agreement No 591991-EPP-1-2017-1-IT-EPPKA2-SSA-B governing the EO4GEO project, the ownership of the project results, including IPRs, shall be vested in the Contractual Partners, as defined in Article 1.

6. Each Contractual Partner will be free to undertake any initiative, even commercial ones, devoted to the exploitation and valorisation of outputs and outcomes of the EO4GEO project, provided that reference is always given to the EO4GEO project, which generated such knowledge/results.

7. The Parties wish to define the exploitation and maintenance of the EO4GEO outputs and outcomes after the ERASMUS+ project and its funding has come to an end (30/06/2022), with the option to participate, as "Founders Members" in the EO4GEO Alliance, as defined in Art 1.4.

8. The GISIG Association, coordinator of the EO4GEO Erasmus+ project, authorised by its Executive Committee, offered its availability to take the role of operational body of the Alliance.

NOW THEREFORE IT IS HEREBY AGREED AS FOLLOWS:

Article 1- Definitions
In this Memorandum of Understanding (MoU), unless the context otherwise requires:

1. "Parties" shall mean the contractual partners of the EO4GEO ERASMUS+ project signatories of this MoU.

2. "Contractual partners" means the signatory of the ERASMUS+ Grant Agreement (official project partners).

3. "EO4GEO Brand" is represented by the name "EO4GEO" referring to the source of the outputs and outcomes developed during the project.

4. "EO4GEO Alliance" means the network that is going to be constituted to follow-up the EO4GEO activities and translate into actions the objectives of the Sectoral Skills Strategy, open to the adhesion of all interested stakeholders in the space geo-information sector including, but not limited to, the EO4GEO Associated Partners.

5. "Associated Partners" means the partners which joined the EO4GEO project either at the moment of proposal submission or during the project implementation.

6. "Members" means the partners of the EO4GEO Alliance (Founders Members and new members joining the Alliance).

Article 2 - Purpose and Scope

Objectives of the Alliance are those fixed in the Sector Skills Strategy in Action, to which reference is made[44], and any subsequent modified/new objectives that would be agreed upon among all parties.

The Strategy is a high level and strategic document which proposes a vision & mission and defines the goals that guide the definition of a long-term action plan to address the skills needed and the knowledge generated by the sector.

In this context, the Parties recognise the high potential of a joint exploitation of the EO4GEO outputs and outcomes rather than acting separately, since they are built on a joint effort and the complementarity of partners' skills and experience.

Therefore, the Parties agree on the importance of collaboration after the end of the contractual period (30/06/2022). The collaboration will be continued in the form of a consolidated "EO4GEO Alliance", actively attracting other organisations and seeking for new funding opportunities.

To pursue this objective, the Parties agree to set-up flexible rules and guidelines enabling the practical functioning of the "EO4GEO Alliance" after the project end, avoiding restrictions/barriers as much as possible.

The MoU refers mainly to the exploitation of the EO4GEO outputs and outcomes, their maintenance and further development in the medium- and long-term as well as new initiatives to guarantee their sustainability, in line with what agreed in the Long-term Action Plan.

Article 3 – EO4GEO Outputs and Outcomes

The main EO4GEO outputs and outcomes which have innovative potential and will be the basis for the follow-up within the EO4GEO Alliance, according to their different level of maturity, are schematically illustrated in the following picture.

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[44] http://www.eo4geo.eu/sector-skills-strategy-report/
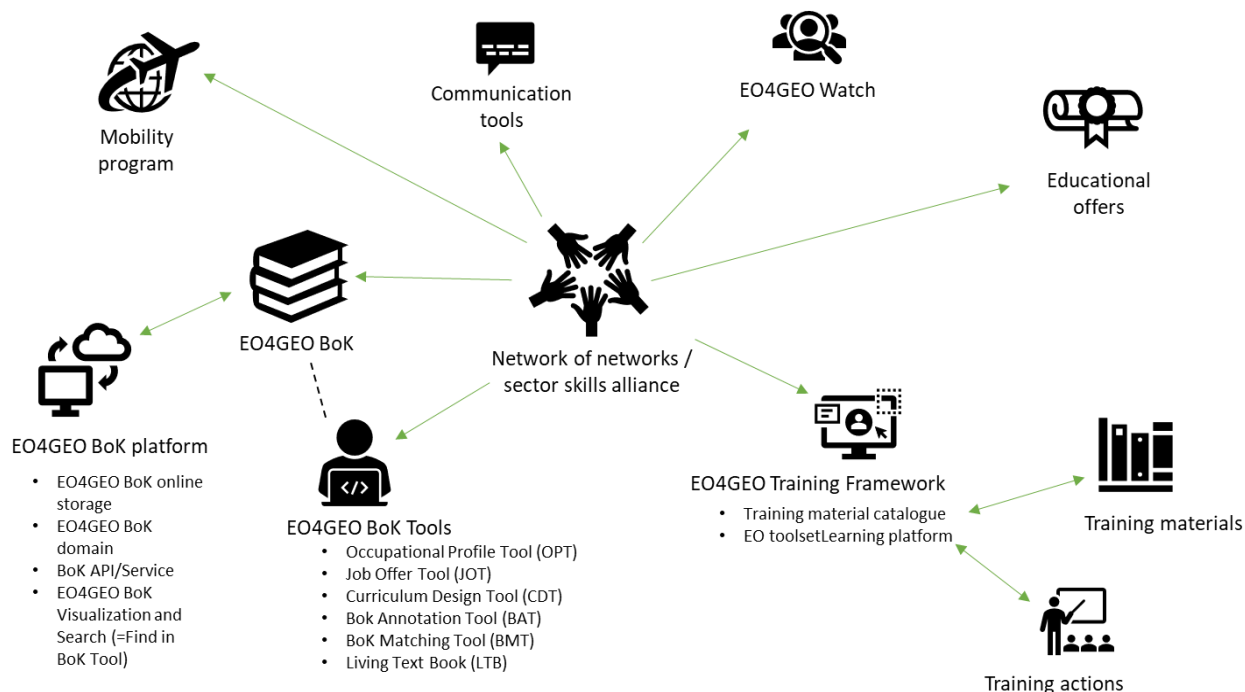
The EO4GEO Outreach Brochure contains details on each output[45].

Article 4 – Setting of the EO4GEO Alliance

The Parties agrees on the continuation and the consolidation of the EO4GEO Alliance with the coordination of the GISIG Association acting as the operational body of the Alliance.

To join the Alliance, each member will have to subscribe a specific Network Agreement. Those Parties who will subscribe the Network Agreement until this MoU remains into force (ref. Article 5 below) will be considered Founder Members of the EO4GEO Alliance.

After the MoU's expiration, new adhesions will be always possible, subject to the procedures settled in the above mentioned Network Agreement.

It is hereby agreed that this MoU shall not create any obligations for each Party to enter into the Network Agreement.

It is also understood that those partners signing this MoU and not subscribing the Network Agreement will have no obligations towards the Alliance and could never be subject of complains nor sanctions for non performance of activities within the Alliance.

Article 5 – Duration

The present MoU has a fixed duration until 31st December 2022.

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[45] The Brochure is available a http://www.eo4geo.eu/download/eo4geo-outreach-brochure/?wpdmdl=7901

After that period the MoU will end its scope and the EO4GEO Alliance, composed by the members signing the Network Agreement, will continue to operate according to the rules settled therein.

Article 6 - Language

This MoU is drawn up in English, which is the language that shall govern all documents, notices and meetings for its application and/or extension or in any other way relative thereto.

Article 7 - Entire Memorandum of Understanding – Amendments

Amendments or changes to this MoU shall be valid only if made in writing and signed by an authorised signatory of each of the Parties.

Article 8 – Personal data management

The Parties mutually declare to be informed (and, where applicable, to expressly consent) that "personal data" provided, also verbally for pre-contract activities or in any case collected as a consequence of and during the execution of this MoU, shall only be processed for the purposes of the Regulation itself, following the procedures described in clause 4.2 of the GDPR (European Regulation 2016/679), aware that failure to provide the same may result in the total or partial impossibility to execute the MoU.

Authorized to sign on behalf of GISIG – Geographical Information Systems International Group, Italy	
Name(s)	Giorgio Saio
Title(s)	Coordinator (Legal Representative)
Date	
Stamp	
Signature(s)	

1 signature page per signatory

Annex II

Network Agreement (EO4GEO Alliance)

WHEREAS

1. The Blueprint Sectoral Skills Alliance "EO4GEO" (Project No 591991-EPP-1-2017-1-IT-EPPKA2-SSA-B, hereinafter referred to as the EO4GEO project) submitted to the European Commission in the framework of the ERAMUS+ Sector Skills Alliance (Lot 3) Call for Proposal of 2017, ended on 30th June 2022,

2. The EO4GEO consortium evolved towards an enlarged Network, the EO4GEO Alliance, including the contractual Parties and 50 Associated Partners at the moment of the drafting of this agreement,

3. Each EO4GEO contractual partner remains owner of its own background knowledge and material made available to achieve the EO4GEO results, to which access is granted on fair and reasonable conditions.

4. The ownership of the EO4GEO project results, including IPRs, shall be vested in the Contractual Partners, as defined in Article 1.

5. Each Contractual Partner will be free to undertake any initiative, even commercial ones, devoted to the exploitation and valorisation of outputs and outcomes of the EO4GEO project, provided that reference is always given to the EO4GEO project, which generated such knowledge/results.

6. The Parties wish to govern the exploitation and maintenance of the EO4GEO outputs and outcomes after the ERASMUS+ project and its funding has come to an end (30/06/2022) by setting and keeping operational the EO4GEO Alliance, as defined in Art 1.6,

7. The GISIG Association, coordinator of the EO4GEO Erasmus+ project, authorised by its Executive Committee, offered its availability to take the role of operational body of the Alliance.

NOW THEREFORE IT IS HEREBY AGREED AS FOLLOWS:

Article 1- Definitions

In this Network Agreement, unless the context otherwise requires:

1. "Parties" shall mean the signatories of this Agreement.

2. "Contractual partners" means the signatory of the ERASMUS+ Grant Agreement (official project partners).

3.   "Associated Partners" means the partners which joined the EO4GEO project either at the moment of proposal submission or during the project implementation.[46]

4.   "Founder Members" means those Contractual partners who sign(ed) the Network Agreement by 31st December 2022.

5.   "EO4GEO Brand" is represented by the name "EO4GEO" referring to the source of the outputs and outcomes developed during the project.

6.   "EO4GEO Alliance" means the contractual network consisting of the Parties (hereinafter also referred to as "members"), open to the adhesion of all interested stakeholders in the space geoinformation sector including, but not limited to, the EO4GEO Associated Partners.

Article 2 - Setting the EO4GEO Alliance

The EO4GEO Alliance is set as a contractual Network coordinated by the GISIG Association which acts as its operational body. The Alliance is characterized by its EO4GEO branding and visual identity and is organized according to its specific governance as detailed hereinafter in Article 4.

The Alliance is open to new adhesions and to the collaboration with national and international organisations and other stakeholders within the Space Geoinformation sector.

Article 3 – Purpose of the Network Agreement

This Network Agreement intends to establish the framework for cooperation by specifying:

-       the governance structure of the Alliance and the attributions of each of its bodies;
-       the financing of the Alliance;
-       the rules for the adhesion or withdrawal of a member;
-       the rights and duties of the members (including the main principles guiding the operation of the Alliance and of its members).

Article 4 Objectives

Objectives of the Alliance are those fixed in the Sector Skills Strategy in Action, to which reference is made[47], and any subsequent modified/new objectives that would be agreed upon among all parties.

The Strategy is a high level and strategic document which proposes a vision & mission and defines the goals that guides the definition of a long-term action plan to address the skills and knowledge needed by the sector.

In this context, the Parties recognise the high potential of a joint exploitation of the EO4GEO outputs and outcomes rather than acting separately, since the results are built on a joint effort and the complementarity of partners' skills and experience. This include the maintenance and further development in the medium- and long-term of project outputs and outcomes, as well

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[46] The full list of Contractual Partners and Associated Partners is available at http://www.eo4geo.eu/partnership
[47] http://www.eo4geo.eu/sector-skills-strategy-report/

as the promotion of new initiatives to guarantee their sustainability and the achievement of the Strategic Objectives as defined in the Sector Skills Strategy in Action.

Article 5 Government of the Alliance

The Alliance has its own governance, composed by the following bodies:

- General Assembly (with one representative for each member)
- Steering Committee
- Operational body

Article 6 – General Assembly

The General Assembly is composed by one representative from each member, each of them being entitled to express one vote in the meetings.

The General Assembly is convened by the Steering Committee at least once a year. The convocation is sent by email at least 10 days before the meeting.

The first General Assembly will be convened by the Operational Body at the beginning of the II semester 2022.

The General Assembly is regularly constituted with the intervention of at least half of the members in the first convocation and, with any number of people present, in the second convocation. The Assembly appoints its President and will be considered regularly constituted even if it takes place through video-conference or with analogue technological solutions.

The resolutions are adopted by majority of the members present, except in the case of modification to the Network Agreement or termination of the Agreement.

The resolutions concerning modifications of the Network Agreement as well as its termination before the expiring of its duration are valid with the presence of the half plus one of the members and a favourable vote of 75% of those present and/or those represented.

The resolutions of the Assembly are registered in the minutes of the meeting and prepared by the Operational Body.

The tasks of the General Assembly are the following:

a)   Appoints the members of the Steering Committee;
b)   Approves the operational trends of the Alliance, and the programmes of activities proposed by the Steering Committee;
c)   Resolves on the exclusion of a member for serious causes according to the provision of Art. 14, upon proposal by the Steering Committee;
d)   Approves the annual budget and operational fee as proposed by the Steering Committee;
e)   Resolves on the modification of the Network Agreement;
f)   Resolves on the closing of the Alliance and the procedures for liquidation if needed;

g)   Takes, upon proposal by the Steering Committee, every other resolution concerning the life and the activities of the Alliance.

Article 7 – Steering Committee

The Steering Committee is composed by the appointed representative of the Operational Body and up to 10 members appointed by the General Assembly. At least 5 Members of the Steering Committee shall represent Founder Members.

The Steering Committee is in charge for 3 years. For the substitution in case of vacation during the 3 years of validity of the charge, the Steering Committee arranges the co-optation; the Assembly will arrange the ratification in the first meeting following the co-optation. The members co-opted by the Committee or appointed by the Assembly will expire with the members in charge at the moment of their nomination.

The Steering Committee is presided by the representative of the Operational Body; in case of absence, the Committee appoints its president among the people present.

The Steering Committee usually meets every two months and could be convened more frequently according to the needs. The members of the Steering Committee unable to participate can give proxy to a third person attending the meeting.

The Steering Committee is convened by e-mail to be sent at least 10 days before the date of the meeting. For the validity of the meeting it is necessary the participation of at least 1/3 of the members appointed by the General Assembly, or their delegates, and at least with the presence of three members in charge.

Representatives of other members of the Alliance and/or experts might be invited to take part in the meeting of the Steering Committee, without voting rights.

The Steering Committee will be considered regularly constituted even if the meeting takes place through teleconference.

The resolutions are adopted by majority of the votes of people present and, in case of an equal number of votes, the vote of the president of the meeting.

If considered necessary, consultations on specific decisions can be made through e-mail to the Members of the Committee. The decisions object of consultation will be valid if approved by at least half of the committee members and have to be ratified during the first subsequent meeting of the Committee.

The tasks of the Steering Committee, are the following:

- Drafts yearly the operational trends of the Alliance and the related programme of activities;
- Drafts the annual budget and propose the annual operational fee, to be submitted to the approval of the General Assembly;
- Decides for the constitution of a Technical and Scientific Committee;
- Approves the constitution of working groups on the Strategic Objectives and/or on specific thematic areas;
- Approves the collaboration of the Alliance with other complementary initiatives;
- Takes the necessary actions in case the planned activities require changes with respect to the approved budget;

- Identifies potential Call for Tenders, Call for proposals and other opportunities that are of interest to the EO4GEO Alliance for realizing parts of its Strategy;
- Identifies potential members interested in preparing and submitting proposals;
- Identifies criteria for participation, as well as operational conditions (e.g. deadlines);
- Resolves on the admission of new members and propose the exclusion of a member for serious reasons, according to what defined in Article 14;
- Resolves on the active and passive quarrels.

In the initial period (II semester 2022), the Steering Committee appointed by the first General Assembly will stay in charge till the first Assembly of 2023, which will be asked to renovate it.

Article 8 – Operational Body

The role of Operational Body of the Alliance is covered by GISIG Association, in continuity with its role of coordinator of the EO4GEO Project and in line with the Association's statutory objectives.

The tasks of the Operational Body are the following:

a) Coordinates the activities of the Alliance according to the programmes approved by the General Assembly;

b) Ensures the maintenance and up-dating of the Alliance web site as well as its presence on social networks, respecting the EO4GEO branding and visual identity;

c) Animates the Alliance and promote the adhesion of stakeholders, in collaboration with all member, according to the "network of networks" approach;

d) Draws up the draft budget that has to be approved by the Steering Committee and then by the General Assembly;

e) Gives account to the Steering Committee of the developed activity and of the work progresses for single programmes and/or projects, as well as of the use of the operational yearly budget;

f) Carries out all the other tasks assigned to it by the Network Agreement and by the resolutions of the Steering Committee.

Article 9 – Funding schema of the EO4GEO Alliance

The activities of the EO4GEO Alliance executed by the Operational Body and not supported by specific funding and/or revenues will be sustained through an operational budget, defined on a yearly basis. These activities includes all those listed in Article 8 above and, in particular for points b) and c):

- animation of the network of networks and enlargement of the partnership;
- promotion and dissemination (including maintenance and up-dating of the EO4GEO web site, animation of the social networks, editing of newsletters, promotion of the participation in sectoral events,….);
- search for funding opportunities and the promotion of new initiatives;

- maintenance of institutional contacts at EC level and the submission for a Large Scale Partnership under the Pact for Skills.

The above described activities and those detailed in Article 8 will be covered through annual functional fees from the members, the amount of which will be defined by the Steering Committee, and approved by the General Assembly. Notwithstanding the possibility for the Steering Committee and the General Assembly to decide differently through their voting procedures, for the first period the amount of the functional fee is:

- 240,00.= Euro for the first semester (July to December 2022);
- 480,00.= Euro for 2023.

The Parties agree that the financial contribution provided to cover the functional budget will constitute the common operational fund, adequate to pursue the objectives of the Alliance and sustain its functioning. In case the collected funds exceed the costs sustained for a specific year, the surplus will be used to cover part of the budget of the following year.

It is agreed that the functional fee will be reduced by 50% for the small and micro enterprises.

It is also agreed that sectoral association of high interest for the activities of the Alliance will have the option to provide their annual functioning fee in terms of contribution in kind (provided that it is financially appreciable).

Those members allowed to correspond the fee in terms of contribution in kind will be required of giving evidence of the financial value of the provided contribution. Their actual contribution will be evaluated and approved by the Steering Committee.

The associated members of the Operational Body, already sustaining the GISIG's institutional activities through the payment of an annual association fee, will get a reduction of the annual functional fee corresponding up to 30% of the GISIG Association's annual fee.

The associated members of other associations or consortia participating in the Alliance will get a reduction of 20% of the annual functional fee while joining the Alliance themselves.

The payment of the annual functioning fee shall be executed within 30 days from the emission of the related invoice by the Operational Body.

Article 10 Membership and new adhesions

The EO4GEO Alliance is constituted by the Parties subscribing this agreement. The Alliance is open for new stakeholders interested to join and contribute to the Alliance.

The applications for membership must be addressed to the Operational Body of the Alliance and transmitted to the Steering Committee. The admission to the Alliance is decided by the Steering Committee, also through email consultation.

EO4GEO Contractual Partners, the EO4GEO Associated Partners as well as the associated member of the Operational Body, already members of the GISIG Association, wishing to join the Alliance do not need the formal prior approval by the Steering Committee to be admitted.

The new member will be asked to sign this Network Agreement and to pay the annual functioning fee, as defined in Article 9, to contribute to the basic operational budget of the Alliance.

Article 11 – Rights and duties of the members of the Alliance

All members of the Alliance are entitled to be represented by one person in the General Assembly. They can propose a candidate to be elected by the GA to become member of the Steering Committee according to their specific expertise. They are also fully entitled to take part in all discussions related to the adoption of concrete measures and implementation of activities to pursue the objectives of the Alliance as defined in the Sectoral Skills Strategy in Action.

The members are also entitled to have visibility on the Alliance website and to promote their activities via the channels operated by the Alliance, including social media, newsletters, sectoral events of interest.

All members of the Alliance are informed about the functioning of the Alliance and especially the funding opportunities for new activities to be promoted as part of the Long-term Action Plan.

By signing this Agreement, each member of the Alliance accepts to respect the rules set therein and to pay the functional fee as defined at the beginning of each year by the Steering Committee and approved by the General Assembly.

Each member also accepts to contribute to the programme of activities approved by the General Assembly according to its expertise and possibilities including, but not only, the promotion of new joint initiatives and projects, whatever could be their source of funding.

While participating in the activities and initiatives of the Alliance, each member also agrees to adopt a behaviour guided by fair principles of transparency and confidentiality towards all members within the Alliance. In particular, each member accepts to:

- not to disclose to third parties the content of projects, proposals and whatever sensitive documents produced within the Alliance by one or a group of the members;

- to inform in due time the Steering Committee, in any case as soon as the information is acquired, about any new initiative and opportunity which could generate potential competition among the Alliance's member (i.e. participate in different proposals under the same call), to guarantee a coordinated approach to cooperation and promotion of new activities and keep strong the EO4GEO branding towards externals.

Article 12 – Ownership of results

Without prejudice to what reported in the premises regarding the ownership of the EO4GEO project results, the future results generated by the Alliance will be the property of those members who contributed to the development of such results.

The conditions, fair and reasonable, for the availability of such results, and the possibility to be further exploited and developed will be set by the member(s) owner(s) of such result(s) on a case by case basis.

Each member of the Alliance remains owner of its own background knowledge and material made available to achieve the results of the Alliance, to which access is granted on fair and reasonable conditions.

Article 13 – Duration

For each member, the present Agreement will enter into force at the date of signature and will terminate on 31st December 2025. After that period the members of the Alliance might renovate it as it is or re-define the terms as well as the scope of this Agreement.

The Agreement can be terminated also before the end of the established duration whenever its objectives as detailed in Article 3 are no more pursued by the members or the members decides to continue the collaboration through different governance models or through the constitution of the EO4GEO Alliance as a separate legal entity. The decision on the termination of the Network Agreement is taken by the General Assembly with the procedure detailed in Article 5.

Article 14 – Withdrawals and exclusions

A Party may, at any time, withdraw its participation in the Alliance by giving a written notice to the EO4GEO Alliance Operational Body.

The disagreement on the amount of the annual functional fee, as well as on the modifications of the Network Agreement, approved by the General Assembly will constitute a legitimate reason for withdrawal.

The Assembly can resolve the exclusion of a member for serious causes, which will have immediate effect. Among serious causes the following are not exclusively considered:

- serious misconduct toward the Alliance and its members, including disclosure of sensitive information, reserved draft proposals or evident competitive initiatives taken against the Alliance taking profit of the activities developed and shared within it;
- failure to pay the annual functional fee after two reminders by the Operational Body and, in any case, within the first six months of the year to which the fees refers.

In the case of resignation or exclusion the member has no right of restitution of the paid membership fee; moreover it must pay the annual fees till the moment in which the withdrawal or exclusion comes into effect.

Article 15 - Settlement of Disputes

In case of dispute or differences between the Parties arising out or in connection with this Agreement, the Parties shall endeavour to settle it amicably.

Failing this, the dispute shall be submitted to the unquestionable judgement of a board of three arbitrators, to be appointed (if there are two conflicting parties), one by the party requiring the arbitration and the other one by the other party. The third arbitrator, who shall act as President of the Board of Arbitrators, shall be appointed by mutual consent by the two arbitrators appointed with the above mentioned procedure.

Article 16 - Language

This Agreement is drawn up in English, which is the language that shall govern all documents, notices and meetings for its application and/or extension or in any other way relative thereto.

Article 17 - Entire Agreement – Amendments

Amendments or changes to this Agreement shall be valid only if made in writing and signed by an authorised signatory of each of the Parties.

Article 18 – Personal data management

The Parties mutually declare to be informed (and, where applicable, to expressly consent) that "personal data" provided, also verbally for pre-contract activities or in any case collected as a consequence of and during the execution of this Regulation, shall only be processed for the purposes of the Regulation itself, following the procedures described in clause 4.2 of the GDPR (European Regulation 2016/679), aware that failure to provide the same may result in the total or partial impossibility to execute the Regulation.

Article 19 - Jurisdiction clause

Failing amicable settlement, the Courts of Genova (IT) shall have sole competence to rule on any dispute between the Parties in respect of this Agreement.

The law applicable to this Agreement shall be the law of Italy.

This Agreement is signed in original individually by each Party on the same agreed text as above detailed.

Place and date,   On behalf of (name of the organization)

(Name and function of the signatory)

_____   _____