PARSEC

ACCELERATOR

D2.3 PARSEC Joint Strategic Vision for EO in Food, Energy, and Environment

WP2 – Cross-border and cross-sectoral collaboration

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List of acronyms

AVAESEN - Valencian Region Energy Association
B2B – Business-to-business
B2C – Business-to-consumer
B2G – Business-to-government
bwcon - Baden-Württemberg: Connected e.V.
CAP – Common Agriculture Policy
EARSC – European Association of Remote Sensing Companies
EO – Earth Observation
EU – European Union
GNSS – Global Navigation Satellite System
IT – Information Technology
NEREUS – Network of European Regions Using Space Technologies
PCP – Pre-Commercial Procurement
PPP – Public Private Partnership
R&D – Research and Development
SDGs – Sustainable Development Goals
SEBS – Sentinel Benefits Studies
SME – Small and Medium Enterprises
TRL – Technology Readiness Level
UN – United Nations

Executive Summary

This report presents a strategic vision for Food, Energy, and Environment sectors and the implementation of the Earth Observation (EO) technology into their value chains. The report also covers the performed actions within the task 2.1 Cross-sectoral and cross-border ecosystem development, which was crucial for the achievement of one of the main project's goals - to foster cross-border and cross-sectoral collaboration enabling better access to integrated knowledge and inducing SMEs' innovation and entrepreneurship potential.

Through the project's interactions with the targeted sectors' communities, both directly through the PARSEC beneficiaries, as well as through the external entities and their networks, the PARSEC consortium gathered feedback on the sectors' needs, challenges, and current use of EO. To collect information about the ecosystem, the consortium firstly conducted a preliminary research on the User Needs, to validate if the foreseen programme's support will meet the beneficiaries' requirements. Secondly, a database of potential entities creating the ecosystem was produced for the internal use of the consortium. A plan of activities foreseen for the beneficiaries and the ecosystem was outlined to facilitate the matchmaking between European SMEs, and in the later stage of the project between PARSEC beneficiaries and potential export partners. On top of that, discussions between representatives of users' sectors and EO experts were organized in an online series of webinars called PARSEC User and Technology Talks. Based on the mentioned, the additional internal expertise, and the EO sector research conducted by the European Association of Remote Sensing Companies (EARSC), a strategic vision for the sectors was created and is presented in this document.

To fully understand the landscape of available EO solutions, the EO value chain was explained (section 3.1.1.), and already existing integrated value chains were enumerated. Section 3.1.2. presents known use cases of the EO-based solutions in the three sectors, such as crop monitoring, environmental impact monitoring, parametric insurance, autonomous in-field machines, farm management, navigation for ships, energy sites planning, energy production forecasting, grid monitoring, regulatory compliance monitoring, urban and emergency management.

Through PARSEC's activities and interactions with the sectors, as well as through EARSC's research, several challenges were identified, which - once addressed - can improve the process of integrating EO into other sectors' processes and tolls. Major, overarching challenges observed include e.g.: 1) market and/or user acceptance deriving from lack of awareness about the EO potential, 2) difficult access to other sectors and markets and finding new customers, 3) collaboration with the public sector.

The strategic vision suggests solutions for the posed challenges. To smoothly implement EO-based solutions into other sectors, a participatory or co-design approach should be more common. Nevertheless, to make it a common practice, long-lasting and strong connections between the sectors need to be created through e.g. clusters and common initiatives, as well as through sharing information on the available solutions and the technology's capabilities. The public sector can contribute to the support of the EO implementation through more common use of Public Private Partnerships and Pre-Commercial Procurements. Recently issued policies, such as European Green Deal, or Common Agriculture Policy reform, stimulate the use of innovative technologies, such as EO-based solutions, which have the potential to revolutionize traditional sectors including the key sectors targeted by PARSEC Food, Energy, and Environment).

1 Introduction

The added value and the potential of a technology cannot be fully recognized unless it is successfully applied, and its end user can benefit from it. Earth Observation (EO)-based technologies and their development are therefore strongly intertwined with the end users – their sectors, background, already used technologies and tools, and their needs. To facilitate the application of EO-based solutions in the PARSEC targeted sectors – Food, Energy, and Environment, and above all, to make sure the newly created solutions correspond to the users' needs, PARSEC Accelerator has undertaken several actions to facilitate the process not only for its direct beneficiaries but also for the broader international ecosystem.

This report summarizes the undertaken steps and the outcome of the conducted research and outlines a vision of what should be targeted and changed to facilitate the collaboration between sectors in the PARSEC ecosystem.

2 Methodology

2.1 Task 2.1 Cross-sectoral and cross-border ecosystem development

To support the creation of integrated value chains across the Earth Observation sector and the three PARSEC sectors, the Accelerator has foreseen several actions. The fostering of cross-border and cross-sectoral collaboration enabling better access to integrated knowledge and inducing SMEs' innovation and entrepreneurship potential was one of the goals of the project, and there is a Work Package dedicated to the achievement of this set goal. The establishment of the ecosystem has been mostly supported by the involvement of cluster and business network organisations in the programme and the tasks (EARSC, AVAESEN, bwcon) which facilitated the interactions between different sectors and European regions.

Within the task 2.1 Cross-sectoral and cross-border ecosystem development, the following steps relevant in this context were foreseen:

- Creating a database of companies linked to PARSEC through the clusters in the different industrial sectors, *i.e.*, EO, Food, Energy, Environment – **completed**

The creation of a database and therefore, a landscape of players in each of the PARSEC sectors was a starting point for conducted identification of relevant actors and creation of the interactions with these. The database was created and populated with all partners involved in the project and has been updated throughout the project's duration.

- Producing a strategic vision for the networks of companies and the benefits of an ecosystem including the methodology to be used for gathering user needs throughout the extended network – **completed**

This report presents the strategic vision and the recommendations for the Earth Observation sector and its intermediary and end users' sectors which aim at facilitating interactions and implementation of new solutions across value chains within and across sectors.

- Generating a plan of activities linked to the strategic vision which will help the companies form partnerships and exchange information on technology capabilities, markets and business – **ongoing**

A plan supporting the cross-border and cross-sectoral relations was closely related to the support given to the PARSEC beneficiaries. The activities can be divided into two phases:

1) Open Call 1 – partnership matchmaking

2) Open Call 2 – export matchmaking

In the 1st phase, a group of 100 European SMEs representing 31 countries was put together to get to know other markets and sectors. Their interactions were supported and facilitated through numerous PARSEC events, as well as through dedicated matchmaking events. On top of that, a continuous matchmaking platform was launched which enabled easy potential-partner search. The tool was not only useful for the #100PARSEC (100 selected companies from Open Call 1), but also it was open to external entities willing to create a cross-border and cross-sectoral collaboration or further investment.

In the 2nd phase, which is still ongoing, the activities focus on creating collaborations and facilitating export of European solutions to other regions across Europe and the rest of the world. PARSEC beneficiaries with the support of export promotion identify potential export targets and have been participating in matchmaking events.

PARSEC still makes efforts to establish sustainable relations with numerous clusters.

- Creating an inventory of user needs based on the industrial sectors – **preliminary completed, further ongoing**

The initial evaluation of the sectors' needs was performed in the first months of the project and was presented in *D2.1 PARSEC User Needs Report*. The collected feedback was broadened through interactions with the beneficiaries of both stages of the Accelerator, and especially through series of meetings with representatives of PARSCE sectors – the PARSEC User and Technology Talks.

2.2 Joint strategic vision creation

The abovementioned elements serve as a base for creation of the joint vision for the Earth Observation and Food, Energy, and Environment sectors. All performed actions coming from several Work Packages and tasks were intertwined to create a comprehensive and exhaustive strategy.

To pinpoint challenges and capabilities of the sectors, to identify where EO could be implemented, and most importantly, to define which barriers to its implementation exist, the following plan was followed:

- Conducting a preliminary User Needs research composed of surveys and interviews
- Interacting with the beneficiaries representing all the sectors and collecting their feedback
- Creating links with the sectors' representatives *i.e.*, sectoral and regional clusters
- Organization and facilitation of (online) industry user-centric discussions through PARSEC User and Technology Talks series
- Preparing content and reports on Market Trends Observatory and Technology Watch which reflect the needs and interest of the targeted audience, as well as identify already existing examples of EO value chain integrated into other sectors as a means of inspiration and input to business planning
- Collection of expertise from within PARSEC consortium

- Juxtaposition and comparison of the collected data and the available sector's research (e.g. EARSC industry and employment surveys, FIRE and e-shape projects)
- Identification and exploration of existing and planned initiatives supporting the implementation of EO in different sectors including policy research.

The gathered knowledge about the sectors and feedback collected from PARSEC Ecosystem lead to the creation of the following vision for the collaboration between the Earth Observation sector and its intermediary and end users' sectors – Food, Energy, and Environment.

3 Strategic vision

3.1 Positioning of EO

As explained in the previous sections, the Earth Observation (EO) sector and the solutions based on EO data are closely related to and dependent on its end users. To understand how the technology can be implemented into any other sector, firstly, it has to be explained what the EO value chain is composed of and what is the role for different actors and users in it, and secondly, the potential of using EO has to be recognized, based on the existing use cases. The following subsections draw the current EO value chain and its use in the PARSEC sectors.

3.1.1 EO value chain

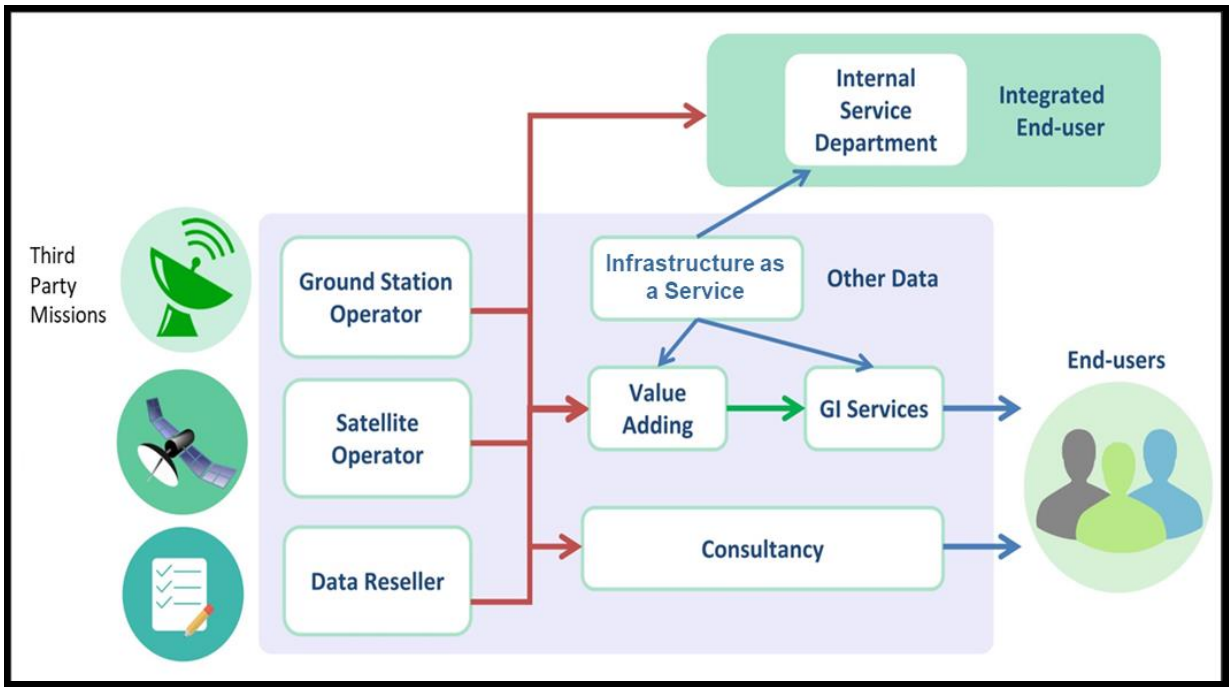

Figure 1 Earth Observation value chain [EARSC]

Figure 1 presents the overall EO value chain, starting with:

- Ground Station Operator - an organisation which is providing the service of “data reception” by operating the equipment necessary to control and to acquire data from EO satellites. They may be doing this for their own satellites or under contract to a satellite operator or other third party.

- Satellite Operator - an organisation which is operating one or more EO satellites which either they own, or they operate under license with the owner (which may be a government or public sector body).
- Data Reseller - data provider/data suppliers - distribute raw data from their own or other satellite systems. Initial processing on raw data, such as radiometric correction and geometric correction is usually carried out to correct for any distortion due to the characteristics of the imaging system and imaging conditions.

Up until this point of the value chain, the Earth Observation sector focuses on its own process of data reception, collection, and provision. The following segments of the value chain are already directly related to its end-users:

- Value Adding - the group of companies that processes the raw or semi-processed data from the remote sensing instruments and converts the data into information that is (commercially) useful to end users.[1]

Here is where the companies need to make a business decision on what kind of product or service to create for the end user. This needs to be defined based on the users' needs (*e.g.*, lack of energy infrastructure monitoring system or current costly monitoring system, need for new more cost-efficient tool, *etc.*) and their current technological readiness (*e.g.,* infrastructure provider has its own IT system, hence, is prepared to use an online tool, but may have requirements towards systems integration). At this stage it is important to have on board or include in the preparation process, representatives of the targeted sectors, or make a use of the research exploring the needs and challenges of the sector.

Consultancies on the other hand by definition need to be able to address the end users' needs and be able to advise on the EO-based product or services to be applied:

- Consultancy involves any advisory activity that is not directly related to an added- value product or service delivery.[2]

To successfully develop a solution which will be implemented in whichever of the targeted sectors, the intermediary or informative users or even end-users should be included in the co-design of the product or service. There is a lot of potential to use EO-based solutions in the PARSEC sectors, and many of the users are already benefiting from its added value. The following section covers the examples of current use cases of how the Earth Observation is implemented into other sectors' value chains.

3.1.2 Integrated EO value chain into PARSEC sectors

3.1.2.1 Food

The food sector (with focus on, but not limited to agriculture) was selected as one of the PARSEC targets, because it is one of the sectors which need to develop in the upcoming decades due to the growing population and consumption, as well as it needs to adjust to the new policies and respond to implications of and contribution to climate change. At the same time the sector remains an important pillar of the European economy.[3]

[1] EARSC Industry Survey 2015
[2] Vega Report 2008
[3] EUROSTAT, 2020: Agriculture, forestry and fishery statistics — 2020 edition

Earth Observation (EO) is already widely present in Agriculture, which is the second biggest user of the EO-based solutions after applications in the areas of security, defence, and military.[4] Beyond agriculture, PARSEC in their definition of the Food sector also includes Fisheries and aspects of Transportation linked to the Food value chain which also implement EO-enabled solutions.

Most common EO applications in the Food sector can be classified as follows:

- **Classification and monitoring of crops**

The satellite data is now widely used to monitor the fields, including the recognition of the type of crops, their health status, and projection of yields. EO-based solutions also offer the monitoring of vegetation growth, and soil moisture, and can support the management of use of fertilizers. EO allows to detect and monitor pest and diseases outbreak, as demonstrated by solutions further developed under PARSEC.

- **Regulatory compliance monitoring**

EO allows to monitor difficult to reach or vast territories without costly in-person control. This can be useful for both e.g. farmers and their reporting as well as the authorities to verify the regulatory compliance and to detect and monitor violations with high precision.

- **Environmental impact monitoring**

Satellite-based monitoring allows early detection and evaluation of environmental impact of the activities on Earth, in case of agriculture it mostly concerns the emission of greenhouse gases, but also its impact on e.g. water quality (water pollution) or soil erosion.

- **Parametric insurance**

Parametric insurance represents a new approach to the traditional insurance methods, and what is important for Food and EO, parametric insurance approaches open new opportunities to both sectors. Firstly, it bases its predictions and rates on EO data, and secondly, it provides new models to secure the crops and capital for farmers.

- **Autonomous in-field machines**

To manage the farms in more cost- and time-efficient ways, more modern estates invest in autonomous in-field machines. The use of such a technology also opens the way for satellite-based services which can support the use of the machines. They might be guided using Global Navigation Satellite System (GNSS) or EO data or a combination of these.

- **Farm management**

The abovementioned tools and applications together form a new approach to farm management, which aims at being cost- and time-efficient, but also at minimalizing environmental impact.

- **Fisheries – navigation and regulatory compliance**

EO is more often used as a tool to navigate ships (routing), especially in the winter conditions, or polar regions, as well as to track illegal fishing.

3.1.2.2 Energy

The Energy sector needs to transform due to increasing energy consumption but also due to new regulations and the sector's impact on the environment. Such regulations like revised Renewable Energy Directive, Paris Agreement, or the recent European Green Deal impose a high need for changes in the current energy grid and energy production composition. Several segments of the energy sector are already among EO users, such as oil and gas, utilities including electricity, and alternative energy (e.g. wind, solar).

- **Site planning**

Earth Observation-based tools can be helpful since the early stage of the energy production, *i.e.*, already at the stage of sites placement. Based on the EO data it is possible to estimate the best sites for wind turbines, as well as for solar panels.

- **Energy production forecasting**

[4] EARSC Industry Survey 2019

Similarly, EO data (e.g. meteorological data) and tools can forecast energy production, depending on its source, based on irradiation forecast (for solar energy) or snow cover (hydropower).

- **Grid monitoring**

EO can also provide data to assess the current conditions of the grid, both underground and on the surface. Such technology allows very cost-efficient and accurate monitoring of, *e.g.*, remotely located installations or underground pipes.

- **Regulatory compliance monitoring**

Yet another solution most beneficial for the authorities is the monitoring of unregistered infrastructure, *e.g.*, used for detection of unregistered solar panels, which have implications for funding and taxation mechanisms.

3.1.2.3 Environment

Environmental applications were at the core of the EO sector and the Copernicus programme from the beginning. The broad environmental sector remains an important user of the EO-based solutions.[5] As with Food and Energy, new regulations and the increasing environmental awareness in all aspects of human activity, new solutions facilitating the environment protection and monitoring are more in need. Apart from the applications used in other sectors which contribute to monitoring or minimalizing the environmental impact, there are several main aspects in which the environmental sector can be supported through the use of EO.

- **Monitoring of the environmental impact**

The assessment of the impact of human activities on the environment is not only possible in food and energy as described, but actually the EO-based technology can be used to assess any kind of activities. One of the most impactful ones is the raw materials sector, which currently can be also monitored with the use of satellite data. The same applies to the impact of urban areas or ship activity on the sea.

- **Urban management**

Urban areas and their authorities can benefit from diverse solutions offered by the EO; from air quality monitoring, to heat wave prediction, to detection of low-quality building insulation. Also, as mentioned in the previous sections, EO-based solutions can be used to monitor construction, condition of built infrastructure, or track violations of the local regulations.

- **Health**

Information on air quality or the atmospheric temperature can be used to manage the urban areas to make them more liveable. What is more, EO can also provide a direct help with monitoring diseases risk areas.

- **Ecosystem monitoring**

Apart from overall environment monitoring, governments can monitor the local, regional, or national ecosystem. This might be especially helpful to monitor remote and vast areas. Appropriately analysed and used satellite data serve also to monitor the population of protected animals and their habitats.

- **Emergency management**

The extreme environmental changes and the climate change more often result in natural disasters, such as wildfires or floods. EO data can also support the risk management, through *e.g.*, live monitoring of wildfires or oil spills, which allows to react in reasonably short time and to prepare for the development of the danger.

The examples covered in this report are not exhaustive and serve just as an overview. More diverse solutions are available on the market and many more are being developed. The following section will try to pinpoint the reasons why EO-based solutions are not as widely used as they could be.

[5] EARSC Industry Survey 2019

3.2 Challenges to be addressed

There is a huge potential for new cutting-edge solutions to improve value chains of numerous sectors, nevertheless, it is very challenging for a new solution, especially based on a new technology, to conquer the market. For Earth Observation (EO), within the PARSEC research, supported by the research conducted by EARSC, several main reasons can be identified for lower use of the solutions than might be achieved.

According to the newest *EARSC Industry Survey* conducted in 2020, EO companies identified the biggest barrier to growth to be **market/user acceptance**. Almost 60% of respondents perceive it as the biggest barrier[6], which aligns with the comments we gathered from the PARSEC beneficiaries. What the barrier is strictly connected to is the **lack of awareness** about the technology. Users firstly are not aware of the existing solutions, and secondly, are lacking trust into the solutions which are still considered as new.

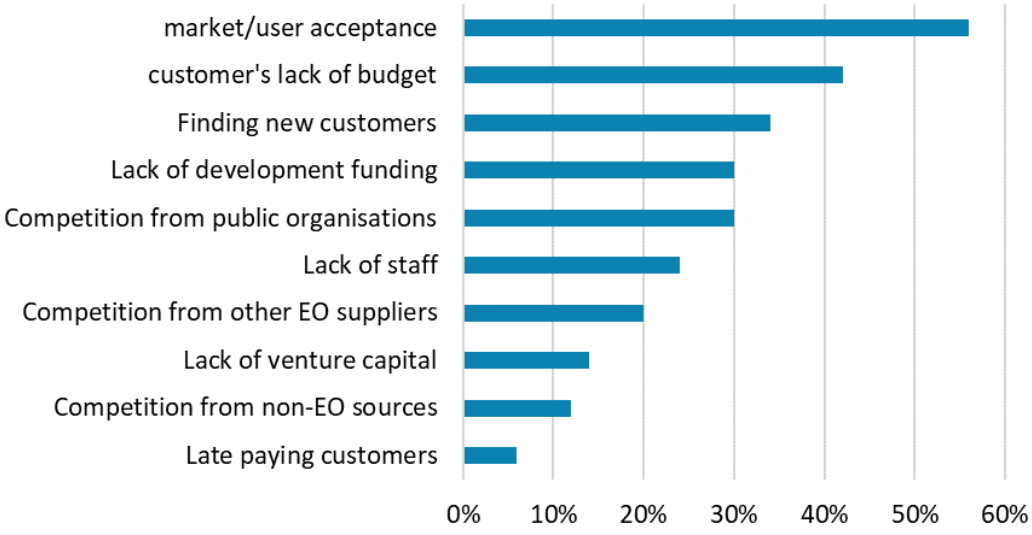

Figure 2 EARSC 2020 Industry Survey - Perceived barriers to growth

PARSEC Accelerator's structure was based on four pillars – access to knowledge, access to market, access to funding, and access to technology. These four aspects are considered crucial for the development of new companies. The preliminary research conducted by PARSEC confirmed the primary needs of European SMEs. According to *PARSEC User Needs Report*, **access to market** was indicated by 86.1% of respondent as the aspect companies need to develop the most.[7] In the follow-up question, detailing what element of the access to market they would like to improve the most, 91.7% of the respondents selected reaching new customers (see **Figure 3**).

[6] EARSC Industry Survey 2020
[7] PARSEC D2.1 User Needs Report

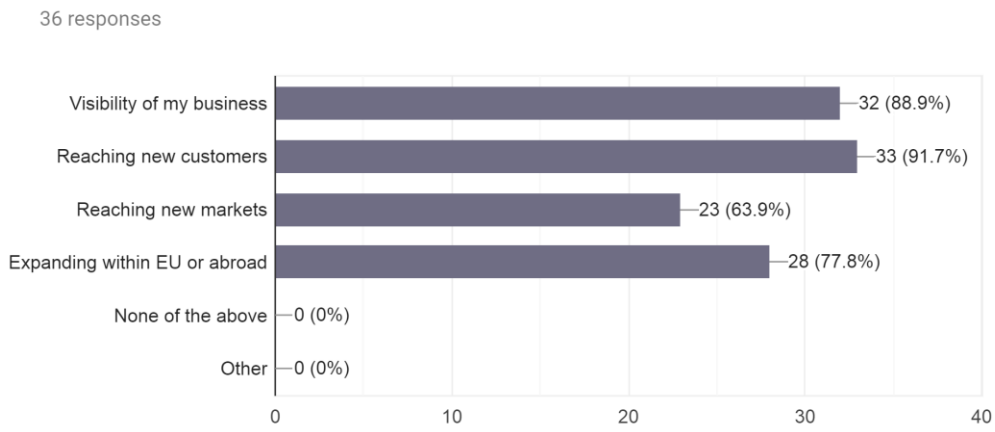

Figure 3 PARSEC User Needs research - answers to question "What would you like to work on" in Access to market domain

The numbers from the *EARSC Industry Survey 2020* confirm the challenge. **Finding new customers** was chosen as the third biggest barrier to growth. Both the interviews with external entities, as well as the conversations with the PARSEC beneficiaries confirmed that reaching out to new customers, especially outside the national or regional market is the main challenge they are facing. Hence, one of the most needed and appreciated support provided by the Accelerator was networking; beneficiaries indicated networking as one of "the most valuable" in PARSEC, and at the same time, the one they still want to have more support in.[8]

What is particular for the EO sector is its links with the public sector. Policy authorities currently constitute the biggest share of the market (43%).[9] As satellite data and EO-based solutions can target vast areas of the Earth's surface, and as explained in the previous sections, contribute to verification of the regulatory compliance, authorities can be a great targeted end-user. Nevertheless, **collaboration with the public sector** poses additional challenges for the EO services providers. Apart from the challenge of convincing the customer to invest into a new technology, which is challenging also in B2B or B2C relations, a B2G model is more complex in its procedure. Not only do companies need to participate in tenders, but also bid against other participants, and in the end the financing process due to the regulations take longer than in B2B or B2C transactions. Public calls also tend to be stricter on the regulatory compliance and technical requirements.

The mentioned main challenges contribute to the difficulty of creating smooth connections between sectors and easily integrating their value chains. What is more, the obstacles concern diverse aspects of the commercial activity, therefore, there is no one answer or solution to address all of them. Thus, only coordinated actions performed by different actors could improve the current status of the EO implementation into Food, Energy, and Environment sectors. In the following section, the vision for the future is outlined, pinpointing proposed actions to be undertaken.

3.3 Vision for the future

A strategy to successfully implement Earth Observation (EO) into value chains of PARSEC's targeted sectors – Food, Energy, and Environment demands a broad scope and a long-term perspective. Only

[8] Online survey was conducted via Mentimeter during PARSEC Get Together closed event.
[9] EARSC Industry Survey 2019

the involvement of numerous stakeholders and undertaking various actions can guarantee having an impact on the ecosystem. The scope of the PARSEC programme and this report cannot exhaustively cover all the means to influence collaborations between the sectors, however, in this section several steps are identified. The indicated missions can serve as guideline for representatives of the EO sector, as well as the all the potential users' sectors. The selected tools and actions are not limited to the three PARSEC sectors.

To create solutions that will be useful for the end-users and will correspond to their needs and be suitable to the tools they are currently using, as it was mentioned in section 3.1 Positioning of EO, it is crucial to include representatives of the targeted sector in the creation process. This so-called **participatory or co-design approach** allows the intermediary or end user to contribute to the development of the solution and provide feedback before the solution is finalized and available on the market.[10] Introducing changes at this stage or redefining the goals for the service are more feasible, and above all, cheaper at the early stage of the product development. Such initiatives like PARSEC facilitate the use of such an approach by putting together entrepreneurs from the EO and the targeted sectors together with each other as well as with potential users from these sectors.

Nonetheless, to propagate co-design, sectors (of users and the EO providers) need to have links and be able to collaborate easily. To achieve such a close collaboration and to facilitate the flow of knowledge and smooth networking between individual companies or entrepreneurs, an **ecosystem of well-connected networks** needs to be cultivated. PARSEC is just one of numerous needed initiatives which put together clusters from different sectors and regions. However, they should only serve as a starting point. The created collaborations should seek further connections and enlarge the ecosystem of well-connected networks of clusters and associations. The **links between sectors** need to be sought for. Individual companies looking for a stable income strategy might not be willing to explore new potentially risky sectors and markets on their own, and that is exactly the task for clusters. Spreading mutual awareness and understanding might be a starting point for new business collaborations. In this step, the R&D and research institutions play an important role in supporting the growth of the ecosystem and its new connections.

For both suggested ways to integrate EO into the targeted sectors' value chains, there is an underlying additional mission, which is **raising awareness**. Without sharing the information about the potential of the technology, its effectiveness and possible applications, potential users will not consider exploring EO-based solutions as a facilitation of their work. **Promotion** of the capabilities of the EO sector should be one of the key goals of such entities like the European Association of Remote Sensing Companies (EARSC), and initiatives such as PARSEC. Through the international connections with diverse sectors, it is easier to reach out to vast groups of potential users, ready to improve their value chain with an innovative technology or solution. Therefore, it is highly beneficial to promote success stories by means such as the Sentinel Benefits Studies (SEBS), "showcasing the benefits brought by the usage of Sentinels data to society, environment and economy: a bottom-up assessment based on traceable impact along selected value chains."[11] The material produced through this project is exhaustive but simple, to make the content understandable to the reader new to the technology. Similarly, the Eurisy portal promotes satellite applications for end-user communities. Eurisy bases on the links created between different sectors and countries through their space agencies, governmental offices, and international organisations,[12] which also emphasizes the importance of the strong links between the ecosystem's stakeholders. On a more regional level, the

[10] Trischler, Jakob; Pervan, Simon J.; Kelly, Stephen J.; Scott, Don R. (2018). "The Value of Codesign". Journal of Service Research. 21: 75–100. doi:10.1177/1094670517714060.
[11] SEBS, "About", https://earsc.org/sebs/about/.
[12] Eurisy, "About", https://www.eurisy.eu/about/.

Network of European Regions Using Space Technologies (NEREUS), under the project Copernicus4Regions, creates brochures and flyers promoting uses cases of Copernicus data, such as "The ever growing use of Copernicus across Europe's regions".

To support newly created companies and newly launched, or soon-to-be-launched solutions, PARSEC provided access to two online platforms to facilitate reaching out to new customers, and new sectors. eoMALL gathers information on EO-based services offered online, acting as a marketplace for these. Through the platform users can easily compare the offers and access the online selling point. eoPAGES on the other hand helps the potential customers to find suppliers who are able to promote their products on the platform. Both tools provide an easily available one place where the suppliers and users can meet.

Spreading the word about the EO potential and raising awareness among potential end-users can be supported by public bodies, which will highly increase the effectiveness of the activities. Public bodies are especially crucial as one of the main users of EO-based solutions. The public sector has several tools to make space for the new solutions and use them in different sectors. One of the available tools would be the **Public Private Partnerships (PPPs)**. This arrangement is claimed to result in earlier delivery of services, which are usually of a higher standard. Additionally, thanks to the involvement of private parties, the PPPs give greater benefits to society as a whole. PPPs are also more prone to implement innovative, more risky solutions and technologies, which is what EO constitutes for some.[13] Another tool which might contribute to the increase of the use of EO data is the **Pre-Commercial Procurement (PCP)**. The arrangement in its core targets seeking for new innovative solutions and support their development. "It is an important tool to stimulate innovation as it enables the public sector to steer the development of new solutions directly towards its needs."[14] PCP facilitates access to the public sector for innovative companies and opens the public domain for new innovations.

The integration of EO into other sectors' value chains is also currently being facilitated through recent **policies**. With the European Union's (EU) commitment to implement the Paris Agreement and the United Nations' (UN) Sustainable Development Goals (SDGs), several strategic documents demand diverse sectors (including Food, Energy, and Environment) to implement innovative and fast changes. One of the biggest and thoroughly discussed set of policies is the **European Green Deal**, which aims at making the EU's economy sustainable by turning climate and environmental challenges into opportunities in different policy areas. Space and EO technologies can contribute significantly, *i.a.*, to the achievement of the ambitious goals for the environment. The "Earth observation data, combined with in-situ data and other sets of non-satellite-based data, has become an essential operational instrument to monitor the evolutions of the environment and measure progress towards the goals set by the Green Deal and the UN 2030 Agenda for Sustainable Development."[15] In a similar manner, EO can be propagated through the **EU's "Fit for 55" package** targeting a 55% reduction in carbon emissions by 2030 and net-zero emissions by 2050.

EO solutions can play a significant role in achieving other Green Deal goals like clean, affordable, and secure energy, sustainable and smart mobility, Farm to fork-related goals, zero pollution, toxic-free environment, transition towards a climate-neutral Europe etc. "It is important to keep raising awareness of the many services offered by EO data and services; in that regard, the Green Deal

[13] World Bank PPP Infrastructure Resource Centre; EPEC, "The Non-Financial Benefits of PPPs-A review of Concepts and methodology", June 2011.
[14] Pre-Commercial Procurement, European Commission
[15] EARSC, Policy Blog, 25.09.2020

should be an opportunity for the EO sector to play a more significant role and to demonstrate the added value of EO data, especially for policy makers."[16]

The **Common Agriculture Policy (CAP)** reform sets nine objectives to which EO can contribute as well, such as climate change, environmental care, rural areas, or preservation of landscapes. Use cases mentioned in section 3.1.2.1. Food and 3.1.2.3. Environment could be an answer to successfully achieving the reform's goals. The same applies to the **Farm to Fork Strategy**, where EO can support the evidence-based decisions for improving food security, provide the scientific basis to support resilience of agricultural productivity to climate change, and monitor agricultural practices, irrigation management, water productivity, fertilizer management, and crop protection, and more.

The fact that international policies are opening up to innovative solutions and high technology, also incentivising private companies to introduce new solutions to e.g., remain compliant, is a great stimulator and a great opportunity for the EO sector. The needed innovation will invigorate the interactions between sectors, as for instance Food, Energy, and Environment, will be seeking for new solutions to respond to the newly set goals and requirements. The policy-stimulated interactions can contribute to building a long-lasting links and collaborations between sectors and facilitate the application of a co-design approach. Still at the moment, especially for the PCP arrangement, the effort remains on the side of the sectors' representatives to be open for interactions and for the EO sector to raise awareness of its capabilities and potential and to demonstrate capabilities to develop market-oriented solutions addressing real user needs. Based on the experience in PARSEC, companies are actively looking for new partnerships and new markets and sectors to address. This shall be further fostered by facilitating networking, connections, and in the end, implementation of the EO value chain into other sectors.

Within the strategic vision for Food, Energy, and Environment sectors, Earth Observation can be foreseen to be an integrated part of the sectors. Through the achievements of the set mission different stakeholders will be able to optimize their processes and productivity through the use of EO. Not only it will support the development of the EO sector, but also will directly benefit the end users' sectors through improved performance, cost-reduction, and being more environment-friendly. What has been achieved so far through the PARSEC Accelerator should be continued and fostered, as creating bridges between the sectors and bringing the innovation providers closer to their users sets the ground for integrated value chains.

[16] EARSC, "The European Green Deal – An opportunity for the Earth Observation services industry"

ANNEX 1 List of publicly available results of PARSEC research and used support documents

PARSEC Deliverables:

- D2.1 User Needs Report
- D2.7 Market Trends Report
- D2.9 Technology Watch and Future Trends Plan II

PARSEC tools:

- Market Trends Observatory and Technology Watch
- User and Technology Talks:
  - Food
  - Energy
  - Environment

EARSC supporting documents:

- Industry Survey 2020
- Industry Survey 2019
- Industry Survey 2017
- Industry Survey 2015

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GEOMATRIX UAB Extreme GEO-computing

rasdaman raster data management

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