D2.6 Market Trends Observatory Wiki

WP2 – Cross-border and cross-sectoral collaboration

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1.0	28/01/2020	Draft		EVF
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Executive Summary

The Market Trends Observatory (MTO) presents market developments and trends in the form of articles in an online environment. It becomes live as of M10. This deliverable provides an overview of the scope of the MTO, elements of the technical implementation, and a presentation of its content during its first release. Additional content will be produced throughout the lifetime of the project.

1 Market Trends Observatory

1.1 Overview

The Market Trends Observatory aims to provide knowledge to the PARSEC community of applicants and other stakeholders. Knowledge is provided in the form of short articles about developments and trends in the market; opportunities such as funding schemes, supporting programmes, or specific tenders; success stories of Earth Observation (EO) products and services; as well as information about relevant policies and regulation. These articles elaborate on implications for EO and are matched with both PARSEC sectors as well as Earth Observation application fields to ease access to relevant content for the users.

1.2 Technical Implementation

The technical implementation of this first version has been realised within the PARSEC Accelerator website as a set of pages and functions for filtering and search. The content management system serving the website (WordPress) allows editing and categorising market trends contents as well as suggesting the user-related content.

This implementation also serves the Technology Watch, which allows linking market developments and trends with related technologies.

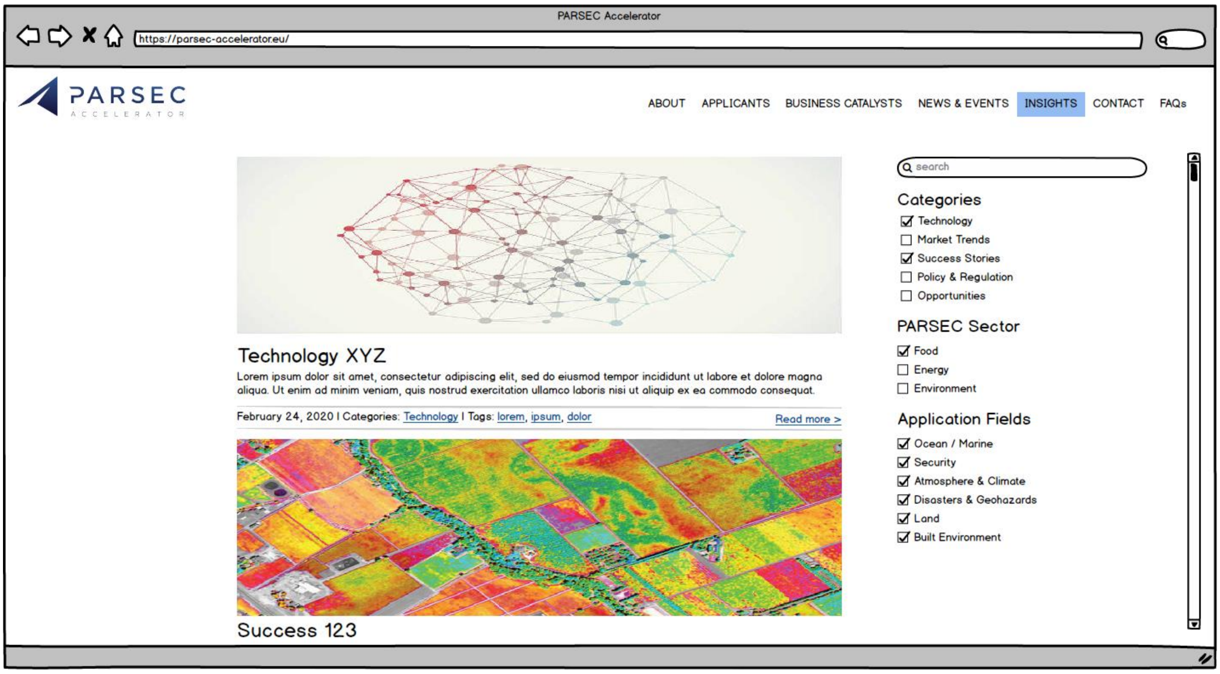

Figure 1: Mockup of landing page for Market Trends Observatory and Technology Watch

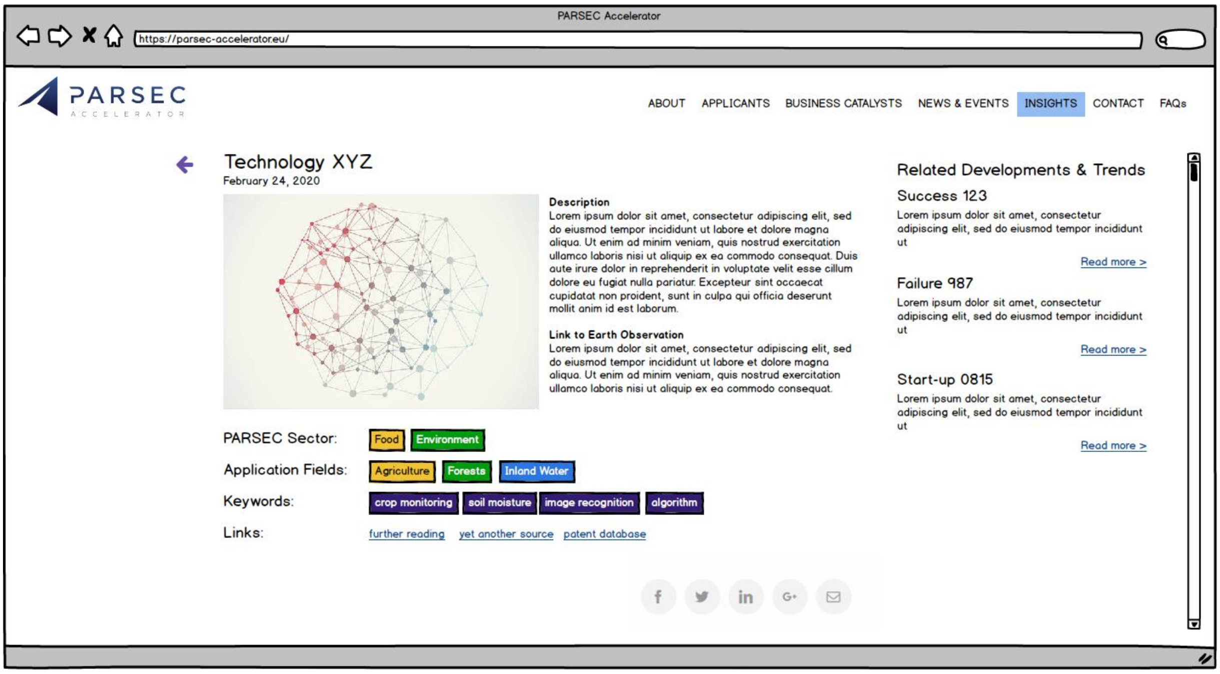

Figure 2: Mockup of article view

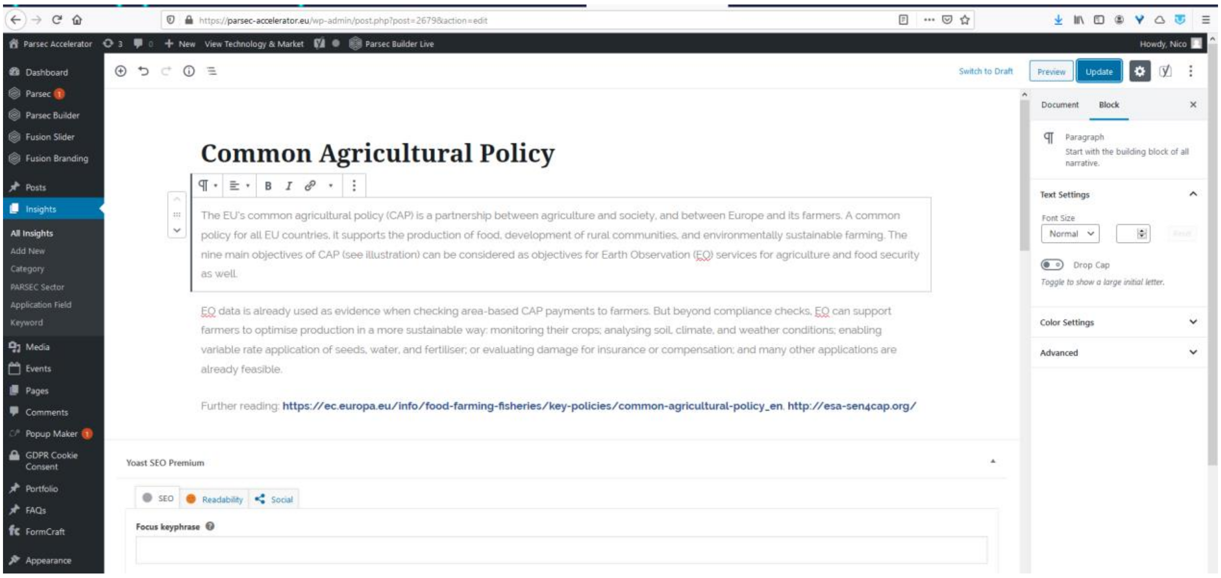

Figure 3: Content Management view (backend) of the Market Trends Observatory

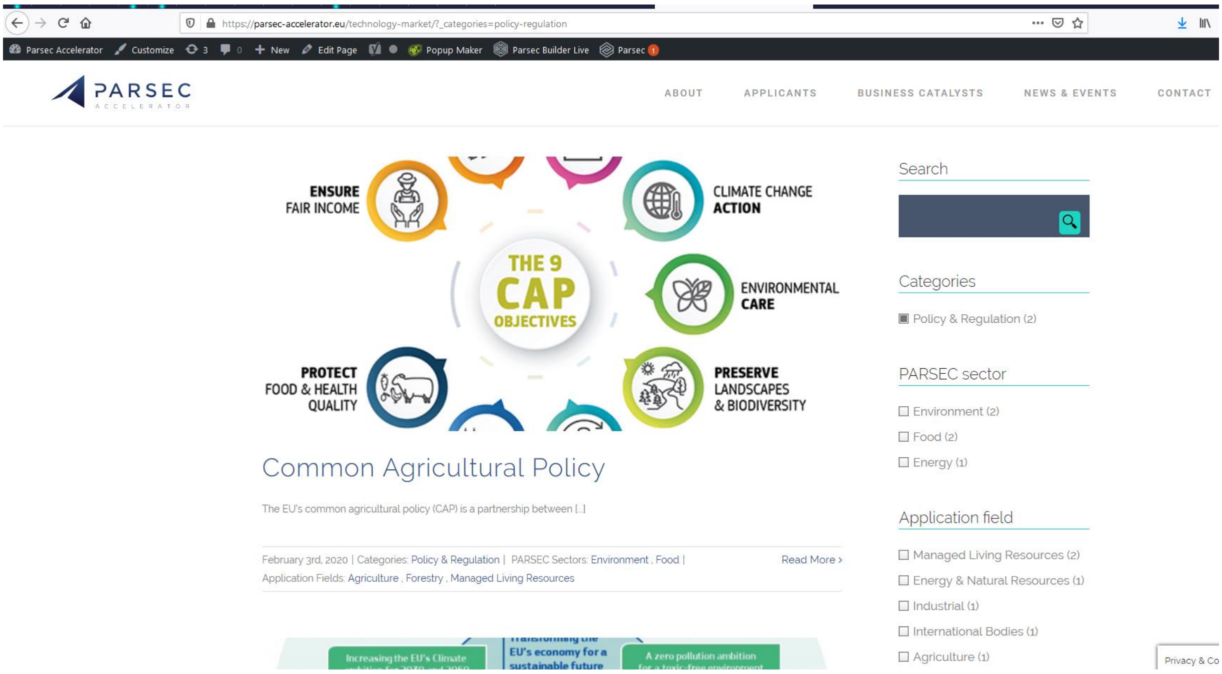

Figure 4: Frontend of Market Trends Observatory

The Market Trends Observatory (and Technology Watch) will be available via the following URL: https://parsec-accelerator.eu/insights. A menu item making this link available for the users of the website will be implemented once the first batch of Technology Watch content has been finalised and integrated.

The WordPress implementation allows for categorisation and tagging of content, providing the users with possibilities to search using keywords, via recommended related content, as well as filtering by application fields, content types, and PARSEC sectors.

1.3 Content Delivery

A structured list of topics (topic repository) has been curated since November 2019 with a continuous review and selection process in place. The Market Trends Observatory has been populated with the first contents for the go-live of its website. An editorial process is in place to ensure regular updates with further content throughout the project. This process ensures an equal coverage of all sectors and aspects as well as a continuous flow of published content. Contents of the Technology Watch will be provided by AVAESEN and entered into the system by Evenflow (EVF).

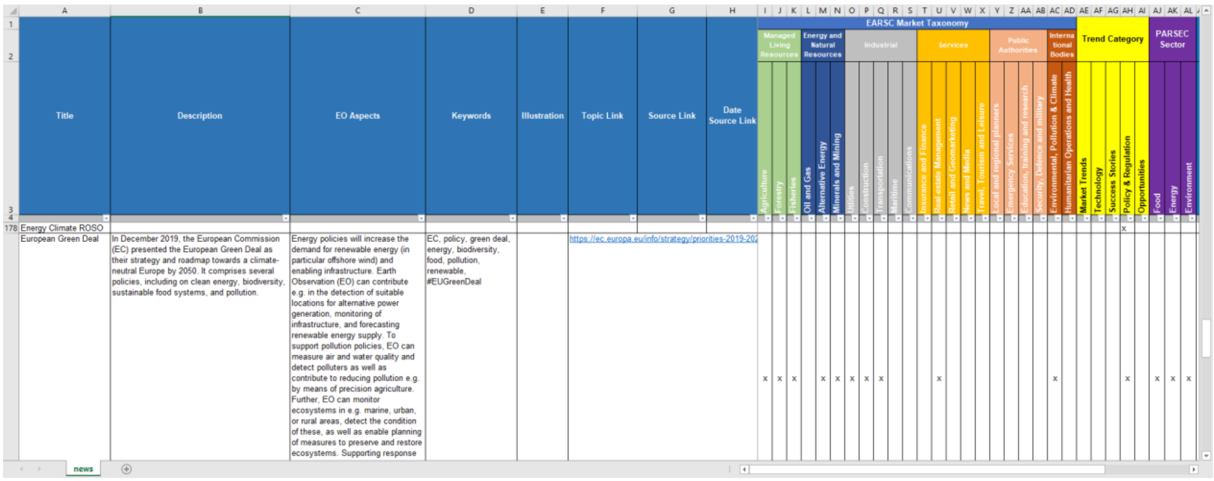

Figure 5: Topic Repository

1.4 Content (Batch 1)

The online solution has been populated with the first batch of contents, which in short form (full version including links and cross-references as well as illustrations in the online environment) is listed in the following. Throughout the lifetime of the project, the MTO will be regularly updated with further content.

Smart Specialisation (Strategy)

Categories: Market Trends, Opportunities, Policy & Regulation
Parsec sectors: Energy, Environment, Food
Application fields: Energy & Natural Resources, Industrial, International Bodies, Managed Living Resources, Public Authorities, Services
Keywords: entrepreneurship, innovation, policy, region

What is smart specialisation (strategy), and why is it important?

The Smart Specialisation Strategy (S3) is a policy concept developed as an instrument for boosting national or regional innovation, specifically focused on the strengths and the competitive advantages of a region, through enhancement of partnerships between businesses, public entities, and knowledge institutions.

The importance of the Smart Specialisation Platforms is underlined by its primary role in the EU's Cohesion Policy: over the programming period 2014-2020, developing a Research and Innovation Strategy for Smart Specialisation Strategy (RIS3) has been a prerequisite in order to receive funding from the European Regional Development Fund (ERDF).

How is smart specialisation relevant to PARSEC?

The strategy has an inclusive nature, which implies that each sector and each territory has a chance to be included in it thanks to the shaping of attractive and promising structural transformation projects. The focus is on entrepreneurial discovery, where entrepreneurs are the moving force of progress, as opposed to a strictly top-down approach from policy and administration. And this does not happen only on paper: there are, in fact, significant indications that thanks to S3, regions and countries have put in place mechanisms that may circumvent the logic of selective intervention.

Nonetheless, this does not mean that all the realms covered by the policy are created equally: in a 2015 report, the Joint Research Centre (JRC) aimed at analysing the S3 of 198 European regions and emphasised the predominance of ICT, agriculture, and energy amongst European research and innovation capabilities, whilst identifying food production as the most common business/market priority. At the same time, at least 20% percent of the EU budget for the period 2014-2020 has been dedicated to supporting climate action.

S3 is therefore yet another niche where the EO-enabled innovations developed under PARSEC (in food, energy, and environment) will be sought. Due to the broad range of fields of application of the policy, the results are expected to be many and diverse: from innovations in precision agriculture to the great potential in the already competitive fields of environment and energy, where Copernicus data has proven to be an irreplaceable source of innovation.

How and where to begin with smart specialisation (strategy)?

The one-stop knowledge shop for S3 is without a doubt the EU-created Smart Specialisation Platform. It is the main tool designated to provide advice to EU countries and regions for the design and implementation of their S3, as well as guidance material and good practice examples, and to support access to relevant data. In line with these objectives, the platform facilitates peer-reviews and mutual learning through, among else, the organisation of Peer eXchange and Learning workshops throughout 2020.

PARSEC will provide further support and information on S3 to second stage beneficiaries through the PARSEC Regional Smart Specialisation Info Card Deck.

In situ: Earth Observation is not only Space

Categories: Market Trends, Technology
Parsec sectors: Energy, Environment, Food
Application fields: Energy & Natural Resources, Industrial, International Bodies, Managed Living Resources, Public Authorities, Services
Keywords: drones, hyperspectral, in situ, IoT, sensors

In the language of Earth Observation (EO), “in situ data” is the common denomination of data deriving from ground-based, sea-borne or air-borne monitoring systems, as well as geospatial reference or ancillary data. In situ sensors can be carried by, among others, air balloons, ground stations, or ferry boxes.

In situ serves validation and calibration of satellite-borne data, and as such are extremely valuable (e.g. in the In Situ Component of the Copernicus programme their use allows acquiring data that satellites cannot due to limited spatial or temporal resolution). Moreover, once Copernicus data is available, in situ can be used to integrate and to build commercial solutions.

In situ sensors, due to their diverse fields of application, are currently a focal point of several very competitive markets (agriculture, marine, environment, energy etc.) and, at least to the extent that they have the readiness to be “plugged in” into networks and communicate within them, have the potential to play a crucial role in Industry 4.0 and the Internet of Things.

Internet of Things (IoT)

Agriculture, smart cities, infrastructure, energy management, and environment are only a few of the possibly endless fields where IoT will thrive. In recent years, in fact, we have observed an explosive growth of devices connected and controlled by the Internet.

It is worth mentioning that the concept of IoT by definition is composed of devices interconnected through a network. However, the different devices may be connected in various types of networks, with regard to their means of exploitation: for instance, against common belief, not all of them could/should be connected to the Internet all the time since (1) some devices have to take instant decisions within a fraction of a second and cannot afford the delay to send the data away to a cloud computer and receive an input (e.g. self-driving cars assessing a possibly dangerous situation), and (2) for others, constant Internet connection may not be needed, for instance, when continuous monitoring and reporting is not necessary, as long as there is a periodic collection of the acquired data.

Despite the increasing trend and exponentially growing number of opportunities for IoT integrated solutions, several challenges remain to be tackled. The vast amount of data generated by IoT prompts the need to develop cloud-computing solutions, and business models shall be created regarding data ownership and data management. This is already prevalent in the EO sector, where the proliferation of platforms is a major driver for the development and delivery of innovative EO-based solutions, which, at an increasing level, rely on in situ sensor data inputs and IoT architectures too. So let’s take a peek at the sensor-side trends.

Hyperspectral is all the hype!

Hyperspectral imagery is one of the most praised trends in EO. Originally developed for remote sensing, it is increasingly used in-situ as well via drones equipped with such sensors. Hyperspectral imaging has confirmed its advantages over the traditional computer vision systems: each pixel contains data from across the electromagnetic spectrum and transmits much more data than an RGB-sensor, and more than multispectral imaging (which only measures a few spaced spectral bands, while in hyper imaging, the measured bands are continuous and contiguous).

The uses of hyperspectral are as abundant as the bands measured:

- In agriculture – crop variety and vegetation mapping, crop disease, stress, and yield detection (chemical composition of plants, pesticides, sugar content)
- Medicine – used in biotechnology, in medicine it can detect early-stage eye disease
- Food processing – e.g. sorting nuts and legumes from stones and sand
- Mining – detect different minerals
- Security – facial recognition
- Environment– land cover, forest health, water quality, surface contamination

The downsides of hyperspectral are elevated costs and processing complexity.

EO Relevance of hyperspectral imagery

While hyperspectral is nowadays used in drones, in satellite observation, multispectral imagery with few channels (ranging to NIR) is considered the high-end norm. Creating an operational satellite system with sufficient ground resolution (less than 10 meters per pixel), good signal-to-noise ratio, and decent revisit times, however, has proven to be a challenge even for government-financed space programmes. They do have hyperspectral sensors in orbit, but with often insufficient for most purposes, spatial and temporal resolutions: PRISMA, SHALOM, Tiangong-1, HYPERION, HISUI, EnMap, NASA's HyspIRI and HypXIM, etc.

Aside from these missions, the commercial availability of their data, as well as the development of private commercial satellites serving the same purposes, remains to be seen. Hopefully, this may happen in the very near future, as the US already awarded the first commercial contracts for hyperspectral imaging from space.

In the Copernicus programme, Sentinel-2 is equipped with a multispectral instrument. Hyperspectral imagery, on the other hand, may complement the Sentinel-2 data if it is to be made available as a part of the free and open data policy through CHIME (Copernicus Hyperspectral Imaging Mission) in Copernicus 2.0.

In situ is a world of fascinating, diverse and fast-developing cutting edge inventions. If you are aiming at building a viable business model with EO and at staying on top of the competition game, you will certainly need to keep an eye on the uprising in situ related market trends. In the meantime, the PARSEC in situ data hub is the just the right place to dive into already existing in situ solutions!

With EO around Europe and beyond

Categories: Market Trends, Success Stories
Parsec sectors: Energy, Environment, Food
Application fields: Energy & Natural Resources, Industrial, International Bodies, Managed Living Resources, Public Authorities, Services
Keywords: Earth Observation, energy, environment, Europe, food, use cases

Innovators seeking for new and marketable EO solutions typically combine the use of free and rich Copernicus Sentinel data with a number of important enabling technologies such as Big Data, Cloud Computing, the Internet of Things, Deep Learning or Artificial Intelligence. There are many examples of successful use of EO enabled solutions across a large variety of sectors and reaching throughout Europe and beyond. This article will provide inspiring success stories of start-ups, SMEs, or other actors using EO to provide concrete solutions to issues in the PARSEC Accelerator focus fields – food, energy or environment.

Food

Public authorities and private companies benefit from EO applications that allow them to save time and costs while simultaneously providing a more precise picture of what is happening on the field(s). For instance, potato growers in Belgium use Copernicus Sentinel-2 data to optimise the use of chemicals and irrigation, as well as to harvest the potatoes at the right time. Similarly, EO-powered advice allows Polish farmers to reduce their environmental impact while increasing their yield. Moreover, such uses of precision farming are strongly encouraged by the European Union’s (EU) common agricultural policy (CAP), which prioritises sustainable agriculture.

Energy

For the energy sector, EO can enable smarter decision making by, for example, improving monitoring of energy production and infrastructure. While in Norway satellite images are used to plan the future production of hydropower, in France EO data allows monitoring the actual performance of photovoltaic systems. Another success story from the Netherlands improves the gas pipeline monitoring process by using satellites instead of helicopters as their data provider. Furthermore, a study carried out in a German region showcases how local authorities can use EO data for policymaking and planning possible transitions to renewable energies. Currently, use cases are less frequently reported in the energy sector than they are in the food or environment sectors, therefore indicating an even greater potential for EO to boost innovation and efficiency in this sector.

Environment

In a wide variety of issues linked to the environment, its protection, conservation, and monitoring the power of EO can bring significant benefits with limited resources. Indeed, the use of Sentinel data has become quite widespread when it comes to managing the “lungs of our planet” – our forests. For Sweden, forests also represent a strategic sector of the economy with half of the forests being owned privately (by 300,000 owners). Therefore, the cost-effective use of the rich EO data is key to more efficient and more sustainable management of the Swedish forestry. In addition, satellite images are used to effectively fight wildfires or illegal logging, proposing solutions that not only help protecting the environment, but also enforce the legislation and limit financial losses caused by such damages or illegal actions. Similarly, in ocean management, the most successful solutions, such as the EO-fuelled dredging in the Maldives combine both economic and societal gains, enabling better coastal protection while maintaining the crucial navigable channels.

All the previously cited examples are the tip of the iceberg of EO-enabled solutions that are currently being used, and even a smaller part of all the innovations that still can be brought to the market. Current and further technological developments alongside European Union's Copernicus programme (and its start-up programme) represent an enormous opportunity for boosting the productivity, innovation and competitiveness of European SMEs and start-ups and for adding many more success stories to the ones cited above.

For further inspirational cases, visit Sentinel Benefits Studies or Copernicus use in Europe's regions. Explore the different EO platforms providing valuable EO data on which most of the aforementioned solutions were based.

If you are a PARSEC beneficiary, you can also reach out to insights@parsec-accelerator.eu for further information.

Drones and HAPS bringing new opportunities closer to the Earth

Categories: Market Trends, Technology
Parsec sectors: Energy, Environment, Food
Application fields: Energy & Natural Resources, Industrial, International Bodies, Managed Living Resources, Public Authorities, Services
Keywords: agriculture, drone, HAPS, monitoring, pseudo satellite, RPAS, satellites, technology, telecommunications, UAV, zephyr

Drones are increasingly used as a source of information that complements data provided by satellite-based remote sensing (e.g. Copernicus Sentinels) and eventually in-situ data sensors. These Unmanned Aerial Vehicles (UAV) enable more flexibility, increased accuracy or specific actions or analyses (e.g. hyperspectral imaging) and their rapidly growing global commercial market size in 2018 had already reached a value of USD 5.80 billion. Similar benefits of flexibility and connectedness are also attributed to a lesser-known market trend, the "stratosphere drone" or High-Altitude Pseudo-Satellite (HAPS). Commercial solutions using HAPS have not just yet been brought to the market, however, they have a clear potential of disrupting the space industry in the nearest future.

Drones and their relevance for PARSEC

Drones are remotely piloted aircrafts that typically fly close to the Earth's surface. Initially developed for military purposes, currently drones are increasingly used in different sectors that include agriculture, mining, construction (e.g. for damage classification), infrastructure monitoring, exploration of resources and surveying, and other. On one hand, the latest market trends indicate a rapid growth of the sector and technological advancement of drones being powered by artificial intelligence and smart sensors. On the other hand, a strict regulatory framework remains the main factor hindering an even faster user uptake of drones (drones can be a danger to airspace, if not used responsibly).

There are many examples of drone use in the PARSEC focus sectors – food, energy, and environment. For instance, in the renewable energy sector, drones have become central to an efficient, intelligent, centralised monitoring system for solar photovoltaic power plant monitoring as well as inspection of wind turbines and power lines. In precision agriculture, drones can even represent an alternative to high-resolution imagery from satellites or be used as farming equipment such as crop-sprayers. Drones can not only enable more efficient field management, but their performance is less susceptible to cloud conditions, while their high-resolution imagery can be made available in near real-time. The near real-time advantage and quality of images enable UAVs to provide an arguably more efficient alternative to satellite-based solutions in forestry for such uses as fighting illegal logging where real-time response is important.

High-Altitude Pseudo-Satellites (HAPS) and their relevance for PARSEC

HAPS are also remotely piloted aircraft (airships, planes or balloons) that fly in the stratosphere and thus are often said to "fill the gap" between satellites orbiting the Earth and drones flying close to its surface. Recent technological advancements and important commercial potential have been speeding up the development of pseudo-satellites and the industry is expected to grow rapidly in the next years. These "drones of the stratosphere" such as Zephyr of Airbus are easy to launch and use solar power to fly and independently operate for periods of up to 25 days (flying periods expected to be extended in the nearest future). In addition, HAPS connectivity enables their use for emergency communications or broadband internet services, therefore making pseudo-satellites very relevant for telecommunications or surveillance. The European Space Agency is leading workshops and initiating studies to guide future R&D related to pseudo-satellites. While industry experts agree on the high potential of the use of pseudo-satellites for such PARSEC focus sectors as agriculture, environmental monitoring, maritime monitoring, but also disaster relief and rescue missions, there is still the need to overcome challenges such as the development of reliable platforms before more widespread use can be enabled.

For other market trends linked to alternatives to traditional satellites that are orbiting the Earth, read how new satellite technologies are creating market opportunities. If you are a PARSEC beneficiary and want to learn more about drones or pseudo-satellites, please reach out to insights@parsec-accelerator.eu.

Innovation Hubs

Categories: Opportunities, Policy & Regulation
Parsec sectors: Energy, Environment, Food
Application fields: Energy & Natural Resources, Industrial, International Bodies, Managed Living Resources, Public Authorities, Services
Keywords: academia, accelerator, business, co-finance, industry, innovation, knowledge, networked organisation, partnering, research, start-ups

Among larger corporations, it is fashionable to have one, whilst many cities are claiming to be one. We are talking of course of “Innovation Hubs”, a widely used term for central places where innovation activities take place. While companies often define these as dedicated offices that are designed, equipped and staffed with creativity in mind, these are usually organised around the individual company itself. Cities, on the other hand, that try to attract innovative companies, often start-ups, prefer to create a suitable ecosystem and then let the innovators thrive. However, Innovation Hubs can be an organised activity across different, networked organisations as well. A prominent example in Europe would be the Knowledge and Innovation Communities (KICs) of the European Institute of Innovation (EIT). These are piggybacking on existing innovation actors from research, industry, and academia to create synergies and combine complementary capabilities for fostering innovation activities in a defined sector (i.e. ICT, Energy, Food, Urban Mobility, Climate, Manufacturing, and Raw Materials). The KICs follow their own Strategic Innovation Agendas with specific thematic action lines. Their activities cover education, start-up acceleration, as well as partnering innovation projects.

The link of EO to the KICs and other innovation hubs

The EIT KICs cover the most important sectors for the European economy. Most of these could benefit from and/or enable Earth Observation (EO) solutions. EO companies are among the start-up portfolios of most of the KICs. With their cross-border setup – each KIC has Co-location Centres across Europe, their network of key players, and their coverage of all the important aspects of a sector – the KICs provide a promising ecosystem to foster EO solutions and companies as well.

A similar setup with a focus on space-related solutions is offered by the European Space Agency (ESA) with their ESA Business Incubation Centres (BICs). This business incubation programme offers entrepreneurs possibilities – finance, office space, training, networks – to realise business ideas based on space technology or data. Each BIC has one or more locations and is either organised by an existing entity (company, cluster organisation, university, or public authority) or a partnership of multiple organisations. Typically, these are located at the premises of the organising entity or business parks that host several space companies, or existing incubation centres. Innovation Hubs such as those of EIT and ESA offer opportunities for entrepreneurs and companies at all stages of their innovation process to develop and commercialise their solutions. Be it participating in their education and start-up programmes or as a partner in a project or of their network. Access to a pan-European network is a major asset. The PARSEC sectors of Food, Energy, and Environment are addressed by many of these hubs, being key sectors of the European economy. If you are a PARSEC beneficiary and want to learn more about possibilities to benefit from Innovation Hubs, please reach out to insights@parsec-accelerator.eu.

EO for Developing Countries

Categories: Market Trends
Parsec sectors: Energy, Environment, Food
Application fields: Energy & Natural Resources, Industrial, International Bodies, Managed Living Resources, Public Authorities, Services
Keywords: agriculture, developing countries, energy, environment, EO

Developing countries are defined as low and middle-income countries that, compared to industrialised countries, have a less developed industrial base relative to their population. They are facing common challenges related to health, food security, lack of infrastructure and utilities (e.g. electricity, water, sewage), or pollution. Given local conditions, they may suffer from natural disasters more often and with a more severe impact.

EO is an essential tool in support of development efforts

Developing countries, by size and needs, represent a significant market for Earth Observation (EO) value-added services. This is because EO has the ability to tackle many of the challenges mentioned above and to support the achievement of development-related objectives in these countries. This ability is being exploited in many areas targeted by development efforts.

Food: The demand for agricultural products in developing countries often outpaces local production capacities. As the pressure for increased food production rises with a growing population, intensified urbanisation and western lifestyle trends, developing countries – predominantly in Asia-Pacific – will be driving the growth of precision agriculture uptake. This is further supported by some of the most widespread precision agriculture solutions becoming more affordable and applicable to smaller land parcels. At the same time, massive government investments in agricultural R&D and country-wide modernisation plans open new horizons. EO helps farmers to increase their yield, whilst achieving better resource efficiency (i.e. use of fertilisers, pesticides) and less negative environmental impact. Typical applications would be e.g. in optimized irrigation and fertilization, crop monitoring (health, yield), or climate and weather forecast. But also in planning e.g. irrigation systems, monitoring land use, and disaster risk reduction and response.

Energy: Likewise, EO can support energy-related needs and investment plans. For instance, EO data can provide maps and parameters for the detection of energy needs and the planning of electricity infrastructure, also in less accessible rural areas. EO can also support prospecting renewable energy resources (e.g. solar, wind, hydropower, geothermal) and assessing the feasibility of installations in terms of resources, required capacity, environmental impact, etc. Moreover, weather forecasts can support improving grid reliability. Outages can be monitored as well as vegetation and other aspects of maintenance.

Environment: Beyond the environmental aspects of agriculture and energy, EO can help to monitor environmental developments. Poor data is a major issue when trying to measure sustainability, especially in developing countries. EO data can fill the gap with indicators for all kinds of environmental issues, such as air quality (main revenue opportunities for EO air quality solutions are considered to be in developing countries), energy consumption, urbanisation, deforestation, illegal fishing, etc. With historical data available, the progress of sustainability efforts can be tracked as well. If you are a PARSEC beneficiary and want to learn more about possibilities related to international development efforts, please reach out to insights@parsec-accelerator.eu.

Copernicus Start-up Programme

Categories: Opportunities
Parsec sectors: Energy, Environment, Food
Application fields: Energy & Natural Resources, Industrial, International Bodies, Managed Living Resources, Public Authorities, Services
Keywords: accelerator, commercialisation, Copernicus, hackathon, idea, incubator, innovation, prizes, prototype, start-ups

Copernicus – the European Union's Earth Observation Programme – invests in different stages of start-ups to support the growth of Copernicus-based businesses in Europe as well as user uptake for Copernicus-based products and services. It is composed of:

- Copernicus Prizes,
- Copernicus Hackathons,
- Copernicus Accelerator,
- Copernicus Incubation.

The Copernicus Prizes innovation competition (aka Copernicus Masters) is designed to support the development of Copernicus-related entrepreneurship by eliciting and rewarding projects and business ideas that make use of Earth Observation data, primarily generated under Copernicus. Enterprises, scientific institutions, and individuals are entitled to participate. Several prizes are awarded within different categories, and an overall winner will be selected to receive a cash prize.

Copernicus Hackathons are sprint-programming events where participants use Copernicus data to develop software solutions (prototype or proof-of-concept) that address defined problems or themes such as sustainability, health and wellbeing, or hunger. Participants receive mentoring during the event, and winning teams may receive cash prices and access to Copernicus data, participation in the Copernicus Accelerator other incubation or acceleration programmes.

The Copernicus Accelerator supports the existing start-up concepts and finetunes the technical and business aspects of their products or services. It is composed of a 12-mont coaching programme, providing mentoring from a personal coach, boot camps, training, and networking opportunities with the Earth Observation community and investors.

The incubation initiative invests in the start-up phase and the international growth of Copernicus-based businesses in Europe. It supports European (legal presence in Europe, Norway, or Iceland required) innovative, commercially promising businesses that make use of Copernicus data and services. Copernicus Incubation provides equity-free funding – awarding 50,000 EUR to 20 European start-ups every year – and is complementary to other support programmes.

The Copernicus Start-up Programme is boosting the use of Copernicus Earth Observation data and services by current or future businesses – supporting different stages from idea to commercialisation. The top domains of start-ups accelerated in 2019 have been agriculture, insurance, energy, maritime, and security. Other common domains include e.g. forestry, transportation, or smart cities. The different challenges of the Copernicus Masters cover thematic areas and application fields, such as Agriculture, Cloud, Big Data, data visualisation, smallsats, urban, disaster, environment, energy, health, and many other. The programme is thus an opportunity for researchers, innovators, entrepreneurs, or enthusiasts from different sectors and with diverse backgrounds to turn innovative ideas into reality. While developed specifically for Copernicus, other such programmes exist such as the PARCEC Accelerator that targets specific types of innovators (i.e. SMEs, start-ups, researchers, and entrepreneurs) and sectors (i.e. Food, Energy, and Environment) or the ESA Business Incubation Centres for more mature start-ups. These programmes are not mutually exclusive but complement each other.

How new satellite technologies are creating market opportunities

Categories: Market Trends, Technology
Parsec sectors: Energy, Environment, Food
Application fields: Energy & Natural Resources, Industrial, International Bodies, Managed Living Resources, Public Authorities, Services
Keywords: cubesat, hyperspectral, nanosat, NewSpace, SAR, Smallsat, synthetic aperture radar

The Earth Observation (EO) industry as a whole is in the midst of a revolution, spurred by deregulation, smaller and cheaper electronics, innovation in launcher and sensor technologies, and advancements in Cloud Computing and data processing. The phenomenon is dubbed "NewSpace", and it covers the whole value chain, from satellite manufacturers and operators to data processors and value-adding service providers. This article is an introduction to the upstream developments: constellations of small, cheap satellites and new, advanced sensors.

Traditionally, EO satellites were enormous, heavy and extremely expensive devices to build and launch, often carrying multiple instruments and servicing a variety of scientific purposes. ENVISAT is the extreme example of this category, weighing 8 tons and costing EUR 2.3 Bn to build and launch. High costs and long manufacturing time-scales (~5 to 10 years) meant that satellites of this type were usually one-offs, or at best, comprising small constellations of 5-10 satellites.

The alternative, burgeoning paradigm is to launch large numbers of much smaller satellites ("smallsats"). These miniaturised satellites, which come in a range of form factors, including cubesats, nanosats and picosats, can be developed in 2-4 years and cost orders of magnitude less. Large constellations of such satellites can provide fresh imagery more often than their larger predecessors could ever hope to achieve. Planet offers daily global coverage at 3.5m resolution, for example.

Being cheaper, smallsats come with a shorter lifetime (around 3 years) – but this is actually a hidden benefit: the capabilities of the constellation as a whole can be upgraded relatively fast. This built-in refresh cycle means that the latest developments in sensor technology can be quickly made available in orbit. Smallsat constellations are making a wide range of data available, for example (a fuller list of small satellite operators is available here):

- Optical: Planet, Satellogic, SatRevolution
- Hyperspectral: NorthStar, Reaktor
- Synthetic Aperture Radar: ICEYE, Capella Space
- Video: EarthNow, Earth-i, SEN
- Thermal: Satellite Vu
- Passive Microwave: Orbital Micro Systems
- Other: Spire

Even without the improved revisit time, some of these sensors already promise to revolutionise the application potential of Earth Observation. Video from satellite is a good example, although it remains to be seen whether the operators fulfil their stated goals. The difficult task of miniaturising Synthetic Aperture Radar sensors has been achieved, and this opens up huge potentials for applications. The barriers of hyperspectral imagery are also being challenged by NewSpace operators, taking advantage of increasingly cheap, small and powerful components. These developments open up significant opportunities for entrepreneurs seeking to bring new value-added services onto the market. The PARSEC Market Trends Observatory will continue to monitor the state-of-the-art in in-orbit technological developments. Customised consultancy and insight generation services are available to PARSEC 2nd Stage beneficiaries on demand.

Bringing the benefits of EO in markets across the globe

Categories: Market Trends
Parsec sectors: Energy, Environment, Food
Application fields: Energy & Natural Resources, Industrial, International Bodies, Managed Living Resources, Public Authorities, Services
Keywords: global, internationalisation, scale-ups, start-ups, upscaling

Among the greatest strengths of Earth Observation (EO) is its universal application. This aspect is manifested in two ways. Firstly, EO satellites allow the monitoring of a wide variety of natural phenomena and operational processes across the whole globe. Secondly, the decisions or actions taken by organsiations organisations dealing with such phenomena or operations are often very similar in different countries. Thus, thanks to this "universality", companies have an enormous opportunity to do business abroad, whether providing farm management support in Australia, dam deformation monitoring in Chile, solar irradiation forecasts in Egypt, or illegal fisheries management in the Philippines, to name a few.

This business opportunity has been significantly enhanced since the advent of the Sentinel era: thanks to the free, full and open data policy, companies are able to utilise high-quality observations to support clients across the world. Of course, this is often complemented by the use of higher-resolution or more frequent observations, accomplished by private-sector satellites. The importance of export is directly reflected in recent economic figures, as shown in the 2019 EARSC Industry Survey: a staggering 63% of sales is done outside of the home country of European EO companies (34% in the rest of Europe and 29% outside of Europe).

Whilst this presents an excellent situation for start-ups and investors alike – given the upscaling perspectives – it also raises a series of important challenges. The most applicable is the ability of small companies (94% overall, with 68% having less than 10 employees) to develop a solid presence in export markets. For this, a series of support mechanisms and funding opportunities are in place. This includes the Clusters Go International effort, which beyond dedicated EO activities (see IDEEO) supports multiple downstream sector-relevant initiatives, the EU IPR Helpdesk with global footprint, Business Beyond Borders offering matchmaking opportunities and country-specific schemes such as Keys to Japan.

At the same time, increased economic diplomacy efforts open new collaboration channels for European companies. This includes activities organised under the Technical Assistance and Information Exchange instrument of the European Commission (TAIEX), whereby multiple missions have had EO representation (e.g. Bangkok and Singapore in 2018, Manilla and Panama in 2019). Finally, an important stream of activity is related to Development Aid for which EO is an essential tool. For instance, under the ESA initiative EO4SD, European companies are assisting International Financial Institutions towards incorporating EO products in their development planning and implementation activities. In parallel, DG DEVCO supports multiple activities in different regions of the world, whilst GEO can be leveraged to support the uptake of EO in SDG monitoring.

In this overall context, it is important for start-ups and entrepreneurs to monitor opportunities, understand dynamics and seek the right type of assistance for their internationalisation. PARSEC will provide such support to 2nd stage beneficiaries. The Market Trends Observatory will aid this process by providing relevant market insights.

High Performance Computing for Earth Observation

Categories: Market Trends, Technology
Parsec sectors: Energy, Environment, Food
Application fields: Energy & Natural Resources, Industrial, International Bodies, Managed Living Resources, Public Authorities, Services
Keywords: Big Data, HPC

The enormous increase of Earth Observation data over the past few years is bringing tremendous business opportunities for start-ups and SMEs but also calls for a fundamental paradigm shift. Thus, making the most of Big EO data, requires disrupting the traditional workflows whereby downloaded datasets are processed locally. Instead, through a multitude of web-based platforms, users gain access to the data, store them, manage them, and process them using provided or own analytical tools, all on the cloud (Sudmanns et al 2019). These platforms follow at least four different provision schemes: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS) and Data as a Service (DaaS). Whilst each scheme involves the provision of different types of resources, they are all interlinked by their reliance on high performance computing. This is performed by offering virtualised computing resources over the internet. In this regard, users can perform computationally-intensive tasks on the cloud, often dividing them in smaller ones that are distributed and performed simultaneously on multiple computing sources.

Why is all this relevant for start-ups and entrepreneurs?

The ability to use high-performance computing resources is intrinsically linked with the volume and nature of the EO data and the processes this data is helping to monitor and understand. Thus, by analysing multi-dimensional and multi-temporal data, innovative companies can build viable business models that rely on the reliable modelling and monitoring of climate change processes, urbanisation, vegetation, dust dispersion and much more. In that regard, several efforts at EU level may present opportunities to learn, collaborate or simply fund activities. For instance, within the Handbook of European High-Performance Computing, one can readily identify multiple EO-related cases, involving for example the development of innovative algorithms for climate prediction (see ESCAPE-2), and the utilisation of supercomputing capabilities for agriculture (see CYBELE). In addition, efforts such as the InDust COST action and the OCRE project, aim to bring together researchers, companies and users and develop EO-based solutions in different domains. So, keeping an eye on both technological and market trends is essential for those dreaming to make a contribution to complex systems using EO data!

The rise of the EO Platform Ecosystem

Categories: Market Trends, Technology
Parsec sectors: Energy, Environment, Food
Application fields: Energy & Natural Resources, Industrial, International Bodies, Managed Living Resources, Public Authorities, Services
Keywords: analytics, Cloud, computing, platform, storage, tools

Since the advent of the Copernicus Sentinels era and the rise of new, venture-backed business models relying on large fleets of small satellites, more and more data is becoming available. To unlock the insights provided by this unprecedented volume of diverse data, users need robust access, powerful computation and innovative processing methods. This need can only be met by a substantial paradigm shift: moving from local storage and in-house processing to distributed, Cloud-based solutions where the data is comfortably sitting next to advanced computational and analytical capabilities.

And this is where the EO Platform Ecosystem comes in the picture. Major ICT providers, traditional Earth Observation (EO) powerhouses, but also some small, innovative and agile companies are today offering online access to data, storage, computation and analytical tools in a very wide range of platforms. Navigating this complex picture and understanding what each platform has to offer is essential for companies and entrepreneurs who want to launch their services into the market.

A good starting point is the "tiered" picture of this ecosystem which is progressively becoming the standard representation:

- The "Data Generation Tier" is essentially where data becomes available. This includes the major open EO data catalogues (e.g. Sentinels, Landsat), proprietary data from private operators and, at times, higher-level/derived products.
- The "Resources Tier" is where Cloud-based computational services are made available, so that users can process the data on the cloud.
- The "Platform Tier" provides standard web-interface services as well as more advanced toolboxes. This is where intermediate users add value to the data and produce or expose services.
- The "Knowledge Tier" is where end-users gain access to the knowledge/insights provided by the services. In that sense, it has "marketplace" characteristics.

Through the PARSEC Market Trends Observatory, we will be producing various insights on the different capabilities presented at each tier and how the beneficiaries of the PARSEC Accelerator or other young entrepreneurs out there can benefit from each resource. As a first step, let us look at some high-level perspectives related to platforms in different or even across tiers.

- The Copernicus Data and Information Access Services (DIAS) have been launched in 2016 to ensure easy, cost-efficient and reliable access to the Copernicus data whilst offering additional resources (storage, computing, processing tools, software packages, etc.). Today, 5 such services are available: Creodias, Mundi, ONDA, Sobloo, and Wekeo, each with a specific value proposition on top of basic access to data. A good overview on the capabilities of each DIAS is being maintained by EARSC.
- Google Earth Engine and Amazon Web Services are the most widely used platforms. They offer access to major open-source EO data catalogues alongside scalable Cloud-based infrastructure.

- Satellite imagery providers are also increasingly shifting to data analytics services executed through their own platforms. This includes, for instance, Maxar's GBDX and Planet's Explorer.
- Sector-specific platforms providing fit-for-purpose analytical tools are also on the rise. Thus, a number of Thematic Exploitation Platforms have been launched, alongside FAO's SEPAL and many other web portals.

More insights on the EO Platform trends will be made available in the coming months. At this point, what is worth noting in this complex landscape is the relative lack of in-situ observations. A concerted effort to address this issue is done within the PARSEC In situ Data Hub, which will be made available to second stage beneficiaries of the PARSEC Accelerator and, at a later stage, to the wider community.

Big Data, big opportunities, big challenges

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Keywords: analytics, Big Data

"Faster, Higher, Stronger" is not only an inspirational call to start-ups and young entrepreneurs to develop and launch EO-based services in the market. It is also the reality experienced today at the interface of Earth Observation with Big Data:

- Higher – the volume of Earth Observation data has grown almost exponentially in the past few years, with the Sentinels alone producing approx. 20TB per day; storing, managing, processing and analysing this data is at the heart of the Big EO data trend.
- Faster – the velocity at which data is being collected has significantly increased both for open (e.g. Sentinels – 5 days) and private datasets (e.g. Planet – daily). This, in turn, requires faster processing capabilities in order to support (near)real time service models.
- Stronger – the possibility to extract additional value associated with insights "hidden" in big data makes for a stronger value proposition; for this to work innovative algorithms and techniques are required.

Alongside these 3 "V's", lie the two remaining ones: the variety of data captured with different sensors at different scales and using different techniques; and the veracity or more simply trust in the accuracy of the data.

Within this Big Data framework, the efforts of the community are focussed broadly on enabling the execution of "any query, anytime, on any size" and on "bringing the user to the data, not the data to the user". In practice, this translates into the proliferation of web-based platforms providing not only access to the data, but also advanced cloud-based or HPC-backed computational resources, innovative algorithms and, in principle, marketplace features.

All this relies on the development of state-of-the-art technical solutions for data access, visualisation, analytics, processing and management. At the same time, intensified efforts on the development of widely adopted standards and solid legal frameworks, are essential.

Recognising the importance of untapping the potential of Big EO data, PARSEC will make available to 2nd stage beneficiaries the Big Data Toolbox. In addition, through the market trends observatory and the technology watch we will be shedding light on some of the key issues associated with this major trend. Stay tuned!

Common Agricultural Policy

Categories: Policy & Regulation
Parsec sectors: Environment, Food
Application fields: Agriculture, Energy & Natural Resources, Environmental, Pollution & Climate, Forestry, International Bodies, Managed Living Resources, Public Authorities
Keywords: agriculture, biodiversity, CAP, climate, compliance, environment, European Commission, food, policy, rural

The EU's common agricultural policy (CAP) is a partnership between agriculture and society, and between Europe and its farmers. A common policy for all EU countries, it supports the production of food, development of rural communities, and environmentally sustainable farming. Since 1962, and throughout a series of reforms, the CAP has not only supported farmers in their efforts to supply EU citizens with good quality and safe food; it has also been guiding the implementation of sustainable agriculture across the EU. The latest amendment on the regulation, introduced in May 2018, attempts to modernise the implementation of checks for area-based payments and for cross-compliance requirements. This landmark change foresees that modern solutions such as geo-tagged photos, E-GNSS enabled receivers, and data from Copernicus Sentinel satellites are used to carry out checks.

The nine main objectives of CAP (see illustration) can be considered as objectives for Earth Observation (EO) services for agriculture and food security as well. The CAP explicitly encourages farmers to apply precision farming, and Member states to use Big Data and new technologies for monitoring and checks. EO data is already used as evidence when checking area-based CAP payments to farmers. The Sentinels for Common Agricultural Policy (Sen4CAP) project, set up by ESA in collaboration with the European commission, aims at providing CAP stakeholders such as Paying Agencies with validated algorithms, products, workflows and best practices for agriculture monitoring relevant for the management of the CAP. The project "PeRsonalised public sErvices in support of the implementation of the CAP" (RECAP) created a Software-as-a-Service platform to facilitate compliance with the CAP. Such projects, but also contracts with public authorities represent great business opportunities for EO service providers.

Beyond compliance checks, EO can support farmers to optimise production in a more sustainable way: monitoring their crops; analysing soil, climate, and weather conditions; enabling variable rate application of seeds, water, and fertiliser; or evaluating damage for insurance or compensation.

European Green Deal

Categories: Policy & Regulation
Parsec sectors: Energy, Environment, Food
Application fields: Energy & Natural Resources, Industrial, International Bodies, Managed Living Resources
Keywords: biodiversity, climate, energy, environment, European Commission, food, policy, pollution

In December 2019, the European Commission (EC) presented the European Green Deal as their strategy and roadmap towards a climate-neutral Europe by 2050. It comprises several policies, including on clean energy, biodiversity, sustainable food systems, and pollution. In December 2019, the European Commission (EC) presented the European Green Deal as their strategy and roadmap towards a climate-neutral Europe by 2050. It aims to tackle climate-environmental challenges, but also to transform the European economy and society towards sustainability and inclusiveness, protecting its natural assets as well as health and wellbeing of its citizens. In December 2019, the European Commission (EC) presented the European Green Deal as their strategy and roadmap towards a climate-neutral Europe by 2050. It comprises several policies, including on clean energy, biodiversity, sustainable food systems, and pollution.

The European Green Deal comprises several policies, including on clean energy, biodiversity, sustainable food systems, and pollution. Energy policies will increase the demand for renewable energy and enabling infrastructure. Earth Observation (EO) can contribute e.g. to the detection of suitable locations for alternative power generation, monitoring of infrastructure, and forecasting renewable energy supply. To support pollution policies, EO can measure air and water quality and detect polluters as well as contribute to reducing pollution e.g. by means of precision agriculture. Further, EO can monitor ecosystems in e.g. marine, urban, or rural areas, detect the condition of these, as well as enable planning of measures to preserve and restore ecosystems. Supporting response to the European Green Deal policies and goals creates demand and thus opportunity for EO-enabled products and services across and beyond all PARSEC sectors.

The European Green Deal will require heavy investment to achieve its goals, a significant amount of which is to be expected to go into monitoring. The necessity of digital solutions such as satellite data contributing to these efforts has been pointed out by numerous actors.

Each of the policies of the European Green Deal, some of which like the Farm-to-Fork Strategy are yet to be published, will have own implications for observation needs. The Market Trends Observatory will follow new developments around this topic.

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