

Introduction

As the EU aspires to lead climate mitigation in the face of global warming, it is critical that action be informed by reliable and accurate data and services powered by that data. Thanks to unprecedented technological innovations, EO now allows decision-makers to identify risks, tailor policy response and resource allocation, monitor progress and identify trends. Among them, satellite imagery continues to provide a unique understanding of the Earth, by leaving no feature of the planet unseen. With the threat of climate change continuing to endanger the livelihood of human beings and the biosphere, the European Commission must continue to encourage the use of space technologies and facilitate data access and distribution across sectors if it is to achieve the European Green Deal and protect the planet.

Europe's Climate Ambitions

The European Commission demonstrated unprecedented leadership in December 2019 when it unveiled its flagship action plan to tackle climate change, the European Green Deal. Through this strategy, the European Union (EU) will aim to become the first resource-efficient and competitive economy without net emissions of greenhouse gases by 2050. In a time where the science behind climate change continues to be questioned, initiative and action like this are needed to protect our planet. Currently, almost three quarters of the Earth's surface have been altered, the global population of wild species has fallen by 60% in the last forty years and one million of species are at risk of extinction. The severity of this biodiversity loss leads to food insecurity, malnutrition, and economic loss. Beyond the health of our natural ecosystems, the continued rise of global temperatures has caused new records in extreme weather events, from drought, floods and wildfires to hurricanes and tsunamis, endangering the livelihoods of entire populations.

The European Green Deal sets ambitious objectives to address this existential threat, including restoring degraded ecosystems at land and sea across Europe with the 2030 Biodiversity Strategy and reducing greenhouse gases emissions to zero by 2050 with the European Climate Law. In addition to regional action, part of the action plan is to increase the EU's "green diplomacy" and demonstrate EU leadership in multilateral fora to increase collective effort and reach the objectives of the Paris Agreement and the United Nations Sustainable Development Goals (UN SDGs).

Ambitious action plans like the European Green Deal require an abundance of resources, including viable data. Data allows governments to identify risks, tailor policy response and resource allocation, monitor progress and identify trends. However, serious data gaps remain in the global fight against climate change. For example, the [UN SDGs 2020 Report](#) found that the lack of country-level data, significant time lags, and the lack of data analytics tools prevent the effective assessment of country-level progress towards the SDGs. While some

consequences of climate change are irreversible, data gaps and analytics deficits could be addressed.

While climate change presents the greatest threat to humanity, there is an arsenal of tools to be leveraged allowing us to fight it. The green transition must be complemented by the continued use and improvement of modern technologies. Space technologies, for example, can be used to monitor climate change, help with governments' response to climate change, and track the progress of that response. Satellite instruments can precisely measure global sea levels, and track the presence of carbon dioxide, methane and other greenhouse gases. Optical satellites can monitor extreme weather events by observing sea surface temperatures, wind speed and sea levels. Radar imagery and altimetry monitoring sea ice, polar ice caps, ice sheets and glaciers have told us that polar ice caps in Greenland and Antarctica are [melting](#) six times faster now than in 1990s.

Since satellites were first used for meteorology in the 1960s, the space sector has continued to innovate, surpassing its capabilities from one year to the next. The improvement of both optical and temporal resolutions of satellites has led to real time monitoring and better climate forecasting and modelling abilities. Beyond the space sector, satellite data can be used for research, such as training data for machine learning applications, and development, enabling the discoveries of new tools to fight climate change.

The Role of Earth Observation

All day every day, constellations of satellites rotate around the Earth taking pictures of the same areas to allow for monitoring over-time. The European Commission launched its Earth observation programme, in partnership with the European Space Agency, in 2014. The Copernicus Programme consists of earth observation satellites and in situ sensors such as ground stations, airborne sensors, and sea-borne sensors, supporting a range of applications from security, urban planning, transport to environment protection and climate change. Within industry, Current acquisition capabilities allow to line scan the planet to image the Earth daily. Earth observation is a key tool for the implementation of the European Green Deal as it sees everything from crop health to reef degradation. Indeed, satellite imagery can be leveraged across sectors and produce valuable and unique information that remains unseen from one's feet on the ground.

Agriculture

Within the agricultural sector, earth imaging can be used to monitor crop health, detect in-field variation, and predict yield. For the European Green Deal's flagship Farm to Fork strategy aimed at building a healthier and more sustainable EU food systems, earth observation can enable industry players to ensure effective food productions and policy-makers to monitor compliance with industry standards and track crop growth.

Forestry and Carbon Stocks

Earth observation helps to track deforestation and illegal logging in real-time. High spatial and temporal resolutions are key for the European Commission to meet its reforestation objectives, down to each individual tree. They can help track land use and estimate carbon stocks, allowing policy-makers to develop climate policy uniquely tailored to the climate risks.

Biodiversity and Ecosystems

Daily images of the Earth facilitate the tracking of biodiversity loss and damage to our ecosystems. As the EU embarks on its climate mission, these images can provide useful insight to find a balance between the interests and needs of citizens and health of nature's resources.

Soil Degradation and Marine Protection

As soil degradation and desertification continue to progress in many parts of Europe, geospatial data can help monitor changes and understand the effectiveness of countermeasures. Beyond the land and onto the sea, data can track plastic pollution, spillage and pollutants that threaten the reefs and livelihood of coastal species.

Sustainable Mobility

Real-time and precise urban and rural development monitoring can help policy-makers with the planning of transportation networks and assist to fight climate change and protect our ecosystems.

Encouraging Space Data-based Research

Research allows policy-makers and academics to better understand our ecosystems, identify the most pressing risks to our planet, and alternative solutions to reduce our environmental impact. The European Commission's commitment of public transportation access for inhabitants, in line with changing population growth rates and changing land consumption rates.

Emergency and Disaster Response

With natural and man-made disasters continuing to threaten entire populations, earth observation data can help detect these disasters, tailor governments' response, and assess the impact on ecosystems and infrastructure.

While there are no shortages of use cases of earth observation data, data collection, without analysis, is meaningless. Geospatial data can only be leveraged if translated into meaningful and actionable insights. Machine learning retrieves the information from the image, ensuring smarter decision-making. It helps policy-makers identify which infrastructure survived a flood and which populated area is most at risk of food insecurity. Understanding the biosphere improves modelling and predictive capacities, and allows policy-makers to assess the impact and efficiency of environmental policy.

In a time where information is key, earth observation data drives better decision-making. It can tell policy-makers and researchers which populations are the most vulnerable, which

species are the most threatened, which human activities cause the most, and the least, environmental harm. Not only, data can ensure commitments are met in each individual member state and hold decision-makers accountable and on a level playing field.

Recommendations for Policy-Makers

This Working Group will gather the input from the EARSC members on how the downstream EO sector can aid the European Green Deal and the problems faced by humanity and the planet that demand immediate action. While the European Commission is already using geospatial data for climate policy as part of the Copernicus programme, higher spatial, temporal and spectral resolution and variety of services are required to monitor in detail and across decades to better protect the planet. The European Commission can take additional steps to leverage the newest innovations in Earth imaging, data analytics and indexing.

In the context of an increasing international competition, the collaboration between the space industry and governments becomes more and more important at the European level. Indeed, the Earth Observation sector needs institutional support and funding to develop new innovative solutions and improve their capacity and utilities to better tackle climate change targets. More specifically, governments' support, by playing the role of anchor customer, can help companies demonstrate their business plans and raise further capital. Private and public partnerships are also essential if we want to encourage and make available geospatial data for climate research, not only at the EU-level, but across member states and neighbouring countries. Thanks to these actions and a collaborative effort between the industry and the public sector, there is no doubt that the Green Deal will offer opportunities for the downstream services industry sector to develop innovative products and services and support data-driven decision making and policy-makers.