Industry view for systematic inclusion of Earth Observation for forest management.

Position paper from the European Earth Observation Services industry

Summary

The present paper describes the position of the European Association of Remote Sensing Companies (EARSC) on the transformative role Earth Observation (EO) should play in forest management across the EU and outside Europe.

The main points covered in this paper are the following:

- The role of Earth Observation in sustainable forest management
- Current capabilities and availability of data and services
- Recommendations

European Association of Remote Sensing Companies - EARSC:

EARSC represents the Earth Observation geo-information services sector in Europe with today over 135 members coming from 26 different Member States in the EU or in ESA, covering the full EO services value chain, including commercial operators of EO satellites, resellers of data, value-adding companies, geospatial information suppliers, consultancies and system/software providers.
The sector plays a key role in providing value-added, geospatial information to its customers in Europe and the world. In 2021, the sector revenue in Europe was over €1.71b, giving work to over 11600 highly skilled employees[i]. The sector is experiencing a rapid growth and many new company establishments. Hence, it is today dominated by small and medium-sized enterprises with over 95% of the companies employing less than 50 people, and over 60% of the companies employing less than 10.
In November 2021, EARSC launched a Green Deal Working Group with the overall objective of raising awareness on the vast use potential of Earth Observation data and services to achieve the ambitious EU climate targets. The Green Deal requires an abundance of resources, including systematic and reliable data, allowing to monitor and quantify processes on the earth's surface over time. We are convinced that the unprecedented technologies in the EO-based services can play a significant role in a range of Green Deal policy arenas.

For any further information on this position paper, please contact us at: info@earsc.org.

Introduction

Forests cover approximately 30% of the global landmass (FAO) and 40% of the EU's territory (Eurostat). As hosts of enormous amounts of biodiversity and ecosystem wealth, and as net sinks of greenhouse gases, they play a vital role in helping the EU achieve its global and European climate goals. However, the state of the world's forests is deteriorating[ii], with large-scale forest disturbances, including extreme droughts, heat waves, storm damages, pest outbreaks, and more extensive and frequent forest fires. Forest health and biodiversity are at risk not only in Europe but globally, and with them, the wide range of ecosystem services and positive externalities they provide, such as: carbon storage; water provision (i.e. flood prevention and groundwater recharge) ; soil protection; macro and micro climate regulation; air quality improvement; biodiversity conservation, and natural disasters mitigation.

The European Union plays a leading role in global efforts related to the restoration and expansion of forests as part of its obligations under the Paris agreement and as expressed in the European Green Deal. Applicable within and outside Europe, the European Commission has presented a proposal for a regulation on deforestation-free products which aims to reduce deforestation by setting targets for commodities linked to a high risk of deforestation[iii]. Within Europe, the New European Forest Strategy and other various ambitious EU policy initiatives[iv] and strategies are geared towards significantly improving the quantity and quality of Europe's forests by 2030. This drive is very welcome. Yet, time is short. With only 7 years to go, implementation needs to accelerate if we want to meet these objectives. Supporting relevant actors with the right data and tools for policy making, implementation and evaluation, is crucial. Earth Observation, providing near real-time, consistent and tree-level information of the world's forests, is an invaluable tool to deliver Europe's forest goals.

Forest measurements derived from EO data, by employing Artificial Intelligence, big data analysis techniques, and by taking advantage of cloud computing, bring objectivity and transparency to the measurement and allow monitoring of key forest performance indicators[v]. This is particularly relevant for the implementation of the upcoming EU legislation on deforestation-free products and the new EU Framework for Forest Monitoring and Strategic Plans. In the context of monitoring deforestation-free products, EO technologies can support both commodities operators and competent authorities. Commodities operators can use the existing technology to fulfil their due diligence obligations, whilst competent authorities can use it to verify the reported information. These EO technologies can also provide the means for the forest observation, reporting, and data collection framework, which aims at developing an EU-wide, forest observation framework[1]. Without such transparency in the governance frameworks through evidence coming from EO data and products, the EU forest legislation may not meet the expectations of its initiators because *"you cannot manage what you don't measure,"* as Peter Drucker of Business Strategist once said.

How can Earth Observation support meeting the needs generated by the forest policies?

[1]They provide open access to detailed, accurate, regular, and timely information on the condition and management of forests

Present times are characterized by an unprecedented provision of digital tools and big data which can empower Europe to achieve the forest-related goals set forth by the European Commission. Notably, Copernicus, the EU's Earth Observation Programme, is a crucial component on the path to success. The Copernicus Programme, at the heart of the development of the European Space Policy, provides unique EO data through its fleet of Sentinel satellites and the Copernicus Contributing Missions as well as a set of six worldwide thematic services, such as Land Monitoring and Emergency Management. Moreover, it fosters the growth of current and emergence of new EO-based value-added services in the Union and worldwide, supporting different sectors and developing the EU industry.

Complementary commercial Earth Observation missions, designed to be interoperable with Copernicus datasets, have a crucial role to play in enhancing Copernicus data and information. Contributing with frequently refreshed (up to daily), global, highly detailed (up to sub-meter per pixel) data, commercial satellite imagery can offer additional spatial and temporal resolutions to allow EU policymakers and Member State authorities particularly gain very detailed and near real-time insights into regional and fast-developing changes to the state and health of forests in Europe and globally[vi].

In a nutshell, Earth Observation data and services derived from **public and private satellite missions**, provide:

- **Forest-related information** enabling the management of forests following the principles of sustainable development[vii] and allowing the monitoring of changes in forest state and structure, as well as the capacity to accurately identify threats and damages coming from biotic (e.g. pathogens) or abiotic factors (e.g. fires, storms, droughts and floods, unsustainable logging or clear-cutting).
- **Information in near real-time** for timely decision-making. Daily imagery enables the identification of changes that appear and/or disappear fast, as well as monitoring disaster risks and impacts in near real-time[viii].
- **Historical information** based on a rich archive of EO data time-series, to monitor forests over long time frames (reaching back as far as required by relevant policies) and train models to enable before-after comparisons and measure trends of any plot of land at the level of granularity and acquisition frequency needed to measure relevant parameters of forest state and health.
- **Harmonized information** by transforming valuable global data into geoinformation services, providing a common reference for international cooperation and policy implementation, ensuring a level playing field and offering actionable insights to stakeholders.

In terms of the transformation of Earth Observation data into forest monitoring services, the table below offers an overview of **practical service examples currently implemented**:

EO service	Added value
Forest cover extent mapping and monitoring & further characterisation Mapping and monitoring forests in terms of tree-covered area, tree cover density and main tree species	• Forest resources inventorying • Monitoring of large-scale land cover/use change processes, e.g. due to climate change • Inform forest management plans, biodiversity conservation strategies, environmental impact assessments, and carbon offset programmes.

EO service	Added value
	• Inform natural hazards prevention and climate adaptation strategies • Natural capital assessments
Forest damage assessment Mapping and monitoring of forest fires and damages caused by extreme weather events and pests in terms of extent and intensity	• Inform climate mitigation and adaptation strategies • Support sustainable forest management and sustainability assessments • Support reforestation/afforestation plans
Forest condition evaluation Mapping and monitoring of forest health conditions	• Build calibration of forest fire and pest outbreaks (risk) models • Monitor forest damages (extent, impact, recovery) • Inform forest management and conservation plans • Support habitats and biodiversity conservation strategies
Deforestation and forest degradation assessment Early warning and detection of forest area losses, deterioration or the substitution of primary forest by other vegetation forms.	• Enable due diligence and reporting processes gearing towards deforestation-free supply chains • Support environmental law enforcement • Monitor sustainable forest management • Detect illegal forest activities, including forest degradation caused by selective logging
Monitor forest carbon stocks Measure and monitor above-ground biomass and forest carbon.	• Monitor vegetation productivity and the carbon cycle • Monitor CO2 emissions avoidance and/or removal in support of climate change mitigation programmes (such as UNFCCC REDD+, LULUCF) and green finances markets
Identification and valuation of other ecosystem services	• Support flood control and flood risk models • Support soil erosion risk models • Support the design and implementation of recreational/touristic and educational programmes • Support of climate and weather forecast models

Table: Non-exhaustive list of current Earth Observation services for forest monitoring

As exemplified above, the vast amount of nowaday's capabilities in the Earth Observation domain presents an opportunity to greatly enhance our ability to develop an efficient, reliable and consistent forest observation system. These capabilities are offering insights in the timeframe and with the accuracy required by national, European and international regulations and policies, supporting different management scales. In addition, the United Nations Framework Convention on Climate Change (UNFCCC) and the World Bank, specifically prescribe the use of EO-derived geoinformation to support and feed forest information systems.

The value of using EO and its associated technologies for forest monitoring has been widely proven in Europe and worldwide. The technology has demonstrated its readiness and maturity to monitor, protect and support restoring our forests, today and at scale. Earth Observation information and services[ix] are already operational and implemented in a number of countries and regions[x] as well as in some global-scale services. Further successes integrating public and commercial data into forest systems include the work by multilateral bodies like United Nations Food and Agriculture Organization (FAO), which has helped countries combine forest field inventory data with Earth Observation data, leveraging cloud computing for cost-efficient, shared and improved insights on forest resources and Nationally Determined Contributions (NDCs). Digital services using satellite imagery have equally been set up with agro-industry stakeholders to support them further in reaching their zero-deforestation commitments. [xi]

Recommendations

Homogeneous intelligence on the world's forests is a fundamental prerequisite for effective legislation and decision-making. Satellite-based geospatial EO products address this need, detecting and classifying forest cover and condition changes, globally and down to the individual tree level where needed. This can be done now, at scale and with unprecedented precision, at high cost efficiency. There is an urgency to act and we have the tools available to take action.

EARSC members thus urge the European Commission to systematically integrate Earth Observation data and services from public and commercial sources as key operational tools in the design, implementation and evaluation of all ongoing and upcoming legislative and policy initiatives in the field of environmental protection, with particular regards to forests, biodiversity and the sustainability of supply chains.

End Notes

[i] EARSC Industry Survey 2021

[ii] According to the Forest Europe Report , the condition of European forests is deteriorating, with increasing mean defoliation of the main tree species. This article refers to the German case.

[iii] The commodities covers by the Proposal are cattle, soy, beef, palm oil, wood, cocoa, coffee; the Parliament wants to include pigmeat, sheep and goats, poultry, maize and rubber, as well as charcoal and printed paper products.

[iv] Europe's forest policy is being developed within the framework of the European Green Deal and the subsequent new EU forest and biodiversity strategies for 2030.

[v] i.e. forest resources: contribution to global carbon cycles (forest area, forest carbon…), forest ecosystem health (soil condition, defoliation, forest land degradation…), conservation of biological diversity (protected forest, forest fragmentation, diversity of tree species…).

[vi] In the context of the Deforestation-free products Proposal for Regulation, it is worth mentioning that when combined with machine learning and other advanced algorithms, data acquired from Copernicus Sentinel missions and commercial satellites, can effectively support the traceability of forest-risk commodities and products.

[vii] Sustainable development can be defined (UNESCO) as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs

[viii] By using SAR or high revisit optical data it is possible to detect these changes even in very cloudy regions.

[ix] See the EARSC European Observation Services Booklet for the EU Forestry Strategy to have examples of operational EO services for forest management.

[x] Notably, the opening-up of the Norway's International Climate and Forest Initiative (NICFI) data, combining Copernicus and high resolution commercial data over the global tropics has led to widespread integration of EO technology into national forest management systems, as it is the case in Mozambique# and Panama.# Services offered by the EO industry make use of Copernicus and commercial data to support sustainable forest management and enable natural capital approaches.

[xi] Digital services combining Copernicus Sentinel, Landsat and high resolution commercial Earth Observation imagery, supply chain data from different agro-industry players, as well as additional open and proprietary data to understand the dynamics of forest cover change, clean their supply chain from deforestation and drive action locally.