February 2025

EARSC Statement on the Forest Monitoring Law

The European Association of Remote Sensing Companies (EARSC) is a trade association representing over 135 members across Europe in the Earth observation (EO) industry. The European Union is at the forefront of global efforts to address biodiversity loss, climate change, and ecosystem degradation. In alignment with the European Green Deal, the Monitoring Framework for Resilient European Forests aims to establish a comprehensive, science-based system for tracking the health, sustainability, and resilience of forests across Europe.

EARSC is closely following the EU activities relating to the Forest Monitoring Law and has welcomed the efforts to establish an EU-wide forest observation framework with ambitious objectives and exploitation of available technologies. Leveraging timely and accurate forest monitoring facilitated by Earth observation technologies is fundamental. EARSC is concerned about the recent Draft Report from the ENVI and AGRI committees in the European Parliament that downgrades the role of Earth observation in the proposal. An accurate depiction of existing and emerging technologies is essential to ensuring the legislation remains effective, implementable, and aligned with the EU's strategic objectives. We encourage further dialogue and a review of existing capabilities to ensure that the final text is informed by the latest advancements and best practices in the field. EARSC also acknowledges that data privacy concerns from the collected forest data are a key issue in the Forest Monitoring Law proposal and discussions; however, it is important to clarify that while the data is georeferenced-meaning it is linked to specific locations; it is not geographically explicit in a way that would reveal sensitive or private information. Instead, it represents spatially mapped data tied to forest areas rather than aggregated statistics, ensuring a balance between transparency and data protection.

EO has a proven ability to detect and monitor forest disturbances and biodiversity indicators, both directly and through proxy measurements[1]. Public EO missions complemented by high-resolution

[1] Recent scientific publications related to forest disturbances, indicators and feature detection:
- Mapping tropical forest degradation with deep learning and Planet NICFI data (https://www.sciencedirect.com/science/article/pii/S0034425723003498?via%3Dihub)
- Near real-time change detection system using Sentinel-2 and machine learning: a test for Mexican and Colombian forests (https://www.mdpi.com/2072-4292/14/3/707)
- Detecting tropical forest degradation using optical satellite data: an experiment in Peru shows texture at 3 m gives best results (https://www.preprints.org/manuscript/202202.0141/v1)
- Monitoring direct drivers of small-scale tropical forest disturbance in near real-time with Sentinel-1 and -2 data (https://www.sciencedirect.com/science/article/pii/S0034425723002067?via%3Dihub)
- More than one-quarter of Africa's tree cover is found outside areas previously classified as forest (https://www.nature.com/articles/s41467-023-37880-4)
- Improved fine-scale tropical forest cover mapping for Southeast Asia using Planet-NICFI and Sentinel-1 imagery

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private satellite constellations, provide detailed insights into forest change dynamics, canopy structure, and biomass distribution. Advances in data analytics, including machine learning, further enhance EO's capability to identify disturbance causes, detect canopy gaps, estimate deadwood presence, and assess forest naturalness on a large scale. While some ecological parameters may require field validation, EO remains a vital tool for systematic, scalable, and cost-effective forest monitoring, playing a key role in evidence-based decision-making and sustainable forest management.

Forest ecosystems, the challenges of climate variability, and the need for harmonised, cross-border monitoring, Earth Observation (EO) technologies—including high-resolution satellite imagery, radar, and AI-driven analytics—play a crucial role in ensuring the successful implementation of the regulation. The proposed framework aims to: (i) Develop a standardised, EU-wide monitoring system for forest resilience and biodiversity. (ii) Ensure real-time data availability for policymakers, researchers, and national agencies (iii) Strengthen enforcement mechanisms for forest conservation and restoration. (iv) Support EU member states in meeting their reporting obligations under the Nature Restoration Regulation and other relevant policies and (v) Facilitate data-driven decision-making to optimise sustainable forest management and climate adaptation strategies. EO technology offers a cost-effective, scalable, and scientifically robust solution for forest monitoring, ensuring compliance with EU regulations and supporting efficient restoration strategies. Below, industry experts highlight the technological feasibility of the articles where EO is addressed.

(https://spj.science.org/doi/pdf/10.34133/remotesensing.0064)

- Monitoring Tropical Forest Carbon Stocks and Emissions Using Planet Satellite Data (https://www.nature.com/articles/s41598-019-54386-6)
- Forest disturbance alerts for the Congo Basin using Sentinel-1 (https://iopscience.iop.org/article/10.1088/1748-9326/abd0a8)
- Using high-resolution imagery and deep learning to classify land-use following deforestation: a case study in Ethiopia (https://www.tandfonline.com/doi/full/10.1080/15481603.2022.2115619)

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Text proposed by the Commission	Amendment (Draft Report ENV/AGRI Committees)	EO Technological feasibility
Amendment 2 Recital 4 (4) Member States, ***forest owners*** and the Union can take the appropriate actions only if they have coherent, reliable, timely and comparable data, making best use of the digital transition opportunities, including Earth Observation technology. To that end, a European-wide forest monitoring system should be set up to collect and share forest ***data*** that will support informed decision-making, for example by allowing to identify, assess, and address forest hazards, risks and damages in a timely manner. Against that background, the new EU Forest Strategy for 2030 announced a legislative proposal on EU Forest Observation, Reporting and Data Collection including on Strategic Plans for Forests and the forest-based sector.	(4) Member States and the Union can take the appropriate actions only if they have coherent, reliable, timely and comparable data, making best use of the digital transition opportunities, including Earth Observation technology. To that end, a European-wide forest monitoring system should be set up to collect and share forest ***information*** that will support informed decision-making, for example by allowing to identify, assess, and address forest hazards, risks and damages in a timely manner. Against that background, the new EU Forest Strategy for 2030 announced a legislative proposal on EU Forest Observation, Reporting and Data Collection including on Strategic Plans for Forests and the forest-based sector.	Satellite data plays a crucial role in ensuring coherent, reliable, and timely forest monitoring, supporting Member States and the Union in taking informed actions. As 'real eyes in the sky,' EO technology provides essential data to track environmental changes, assess risks, and implement sustainable forest management strategies. Satellite imagery offers a holistic and consistent perspective on territories, human activities, and natural events, enabling policymakers to develop evidence-based and forward-looking strategies. The European-wide forest monitoring system can analyze historical trends in forest cover, detect disturbances, and support carbon accounting supported by long time series which analyse changes in forest cover through time[2], ensuring compliance with EU climate and biodiversity goals.
Amendment 5 Recital 8 (8) The fast developments in monitoring tools and technologies, in particular in Earth observation through space-borne or aerial means, and in Global Navigation Satellite Systems, provide a ***unique*** opportunity to	(8) The fast developments in monitoring tools and technologies, in particular in Earth observation through space-borne or aerial means, and in Global Navigation Satellite Systems, provide an opportunity to ***further***	EO-based rapid detection of forest disturbances through satellite imaging enhances the ability to respond proactively to risks. Ground measurements remain important for calibration, but EO provides the broad spatial coverage needed for large-scale

[2] Constellations by providers: Pléiades 1A & 1B: 2011–Present, Pléiades Neo: 2021–Present, SPOT 1–7:1986–Present, TerraSAR-X & TanDEM-X:2007–Present, PAZ: 2018–Present, Dove & SuperDove: 2014–Present, SkySat: 2013–Present, ICEYE SAR constellation: 2018–Present, GEOSAT 1:2009–Present, GEOSAT 2: 2014–Present, Cosmo-SkyMed (1st Gen):2007–Present, Cosmo-SkyMed (2nd Gen): 2019–Present

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modernise, digitalise and standardise the monitoring of forests, providing a service to ***forest users*** and authorities, and to support voluntary integrated long-term planning, ***while stimulating the Union market growth with regard to those technologies and related new skills, including for small and medium-sized enterprises (SMEs).*** To date rapid changes to forest cover, such as through forest disturbances, can be detected by Earth observation and can improve the efficiency of forest monitoring. However, ground measurements are needed to develop, verify, and calibrate Earth observation data products. Also, many features connected to forest disturbances or biodiversity (e.g. attribution of the forest disturbance causes, quantity of deadwood, forest naturalness, or presence of old-growth forests) are difficult to predict for large areas using only Earth observation.	modernise, digitalise and standardise the monitoring of forests, providing a service to ***policy-makers*** and authorities, and to support voluntary integrated long-term planning. To date rapid changes to forest cover, such as through forest disturbances, can be detected by Earth observation and can improve the efficiency of forest monitoring. However, ground measurements are needed to develop, verify, and calibrate Earth observation data products. Also, ***Earth Observation is unable to detect*** many features connected to forest disturbances or biodiversity (e.g. attribution of the forest disturbance causes, quantity of deadwood, forest naturalness, or presence of old-growth forests).	assessment. Both are complementary. EO has a rich history of detecting features connected to forest disturbances or biodiversity, both directly and via proxy. The combination of interoperable public and proprietary EO datasets are particularly powerful in this regard. The Landsat and Sentinel public missions inform forest change products at 30m and 10m, respectively, while the GEDI dataset [3]informs global 1km biomass products. Proprietary missions[4] complement these missions with higher spatial and temporal resolutions, helping directly detect forest structure (canopy cover and tree height[5]) variables as well as attribution of disturbance. Thanks to European and commercial satellite constellations, the entire globe can be covered with a 5-day revisit. Areas of the world can be covered every day. Thanks to technological advances in Earth observation, every detail of the globe can be observed with a resolution of up to 30cm. These valuable capabilities offer unique and multiple possibilities: tree detection, tree species differentiation, forest disturbance, reforestation activities, etc. Satellite Earth Observation is a gold mine of

[3] Ecosystem Lidar: https://gedi.umd.edu/
[4] Airbus (Pléiades, Pléiades Neo, SPOT, TerraSAR-X, TanDEM-X & PAZ), Planet (Dove & SuperDove constellations, RapidEye, SkySat), ICEYE, GEOSAT, e-GEOS (Cosmo-SkyMed)...
[5] Forest Carbon monitoring: https://www.planet.com/pulse/forest-carbon-monitoring-a-doves-eye-view-of-global-forest-change/

		information that we must exploit. The bottom page included a few recent scientific publications related to forest feature detection *(see ref. 1)*.
Amendment 6 Recital 9 (9) There are several Union policy instruments that directly or indirectly affect forests in the fields of environment and biodiversity, climate, energy, bioeconomy and civil protection. A high-quality forest monitoring system combining ground-based observations with data and products from Earth observation will ***allow*** tracking progress towards Union policy objectives and targets, enabling their successful implementation and evaluation. ***As an example, the implementation of the revised Renewable Energy Directive necessitates that Member States have information on the location of primary and old-growth forests.*** *Moreover,* ***having access to wall-to-wall annual data on*** tree cover changes and extent of forest disturbances can support Member States monitoring and reporting of carbon stock changes for the purposes of the LULUCF Regulation. This approach is in line with other Union instruments such as the EU Observatory on Deforestation, Forest degradation and	 (9) There are several Union policy instruments that directly or indirectly affect forests in the fields of environment and biodiversity, climate, energy, bioeconomy and civil protection. A high-quality forest monitoring system combining ground-based observations with data and products from Earth observation will ***help*** tracking progress towards Union policy objectives and targets, enabling their successful implementation and evaluation. Moreover, ***tracking*** tree cover changes and extent of forest disturbances can support Member States monitoring and reporting of carbon stock changes for the purposes of the LULUCF Regulation. This approach is in line with other Union instruments such as the EU Observatory on Deforestation, Forest degradation and Associated Drivers, as anchored in the 2019 Communication on Stepping up EU action to protect and restore the world's forest[12] , which aims to monitor changes in the world's forest and related drivers by providing global forest maps,	High-quality EO data plays a critical role in tracking of EU policy objectives, such as those in the Renewable Energy Directive and LULUCF Regulation by providing wall-to-wall annual forest cover data. With over 20 years of archived high and very-high-resolution satellite imagery[6], European EO capabilities enable long-term monitoring of land use and land cover changes, observe trends in deforestation, forest degradation, and carbon stock evolution. Operational tools have been in place for nearly a decade, supporting industries in achieving zero-deforestation goals and supported in the mapping of the entire supply chains, detecting land cover changes, and helping companies implement sustainable practices for more resilient agriculture. The European base map layer integrates very high-resolution satellite imagery from private constellations, ensuring accuracy through quality checks and minimizing false positives. Additionally,

[6] European archives have millions of satellite data over more than 20 years of time series of high and very-high-resolution satellite images, gathering data on land use/land-cover (ref. Airbus).

Associated Drivers, as anchored in the 2019 Communication on Stepping up EU action to protect and restore the world's forest[12] , which aims to monitor changes in the world's forest and related drivers by providing global forest maps, information on supply chains and Earth Observation tools for regional to global analysis.	information on supply chains and Earth Observation tools for regional to global analysis.	advanced platforms[7] provide users with access to satellite imagery before and after deforestation alerts, allowing for visual validation and improved decision-making.
Amendment 6 Recital 11 (11) Against that background a forest monitoring system should be established by the Commission in cooperation with Member States, based on three elements that should be gradually made operational: a ***geographically explicit identification*** system for forest units, a ***forest data*** collection framework and a data sharing framework. The forest monitoring system should allow the collection of data based on Earth observation and georeferenced ground observation and should ensure interoperability with other existing electronic databases and geographic information systems, including those relevant for the monitoring of LULUCF activities and for the tracking of deforestation-free commodities in accordance with the Deforestation Regulation. The forest monitoring system should respect the principles laid down by the latest European	(11) Against that background a forest monitoring system should be established by the Commission in cooperation with Member States, based on three elements that should be gradually made operational: a ***geographical information*** system for forest units, a collection framework ***for forest information*** and a data sharing framework. The forest monitoring system should allow the collection of data based on Earth observation and georeferenced ground observation and should ensure interoperability with other existing electronic databases and geographic information systems, including those relevant for the monitoring of LULUCF activities and for the tracking of deforestation-free commodities in accordance with the Deforestation Regulation. The forest monitoring system should respect the principles laid down by the latest European Interoperability Framework[14] .	The proposed forest monitoring system will rely on EO for geospatially explicit forest identification, data collection, and data-sharing interoperability. This ensures seamless integration with existing deforestation tracking tools. To enhance effectiveness, Copernicus EO services, commercial EO data, and AI-driven geospatial analytics should be fully integrated, enabling early detection of forest degradation, illegal logging, and biodiversity threats. EO ensures spatially explicit forest unit identification: Optical and radar-based data (e.g., Sentinel-1 SAR) allow consistent tracking of land cover changes, critical for implementing a geographically explicit identification system for forests. EO data can be fully integrated into digital GIS frameworks:

[7] Starling-Airbus operates a constellation of optical EO satellites offering a range of resolutions and capabilities, from very high-resolution imagery (30 cm with Pléiades Neo) to wide area coverage (SPOT at 1.5 m). Planet Labs also offers platforms that enable users to access satellite imagery before and after deforestation alerts, providing assessment of such events (Uses its Dove and SuperDove satellites (PlanetScope) to provide daily 3–5 m resolution imagery globally and SkySat satellites deliver up to 50 cm resolution)

Interoperability Framework[14] .		Satellite imagery, LiDAR, and UAV-based data are already interoperable with the LULUCF monitoring framework, allowing for automated classification and historical trend analysis.
Amendment 10 Recital 13 (13) Forest data to be collected under this Regulation ***reflects the data needs*** for underpinning Union policies in the areas of climate change mitigation and adaptation, disaster risk prevention and management, biodiversity and ***bioeconomy***. The forest data collection system should be based on different datasets: standardised data, to be operated by the Commission and primarily collected via Earth observation through Copernicus satellites and subject to technical protocols, and harmonised data, *to* which Member States should ***contribute through systematic collection of data*** using their own surveys based on a grid of sampling plots, such as National Forest Inventories or other networks of monitoring sites, and complementing them with Earth Observation tools, where available and applicable.	(13) Forest data to be collected under this Regulation ***are mobilised to calculate the needed indicators*** for underpinning Union policies in the areas of climate change mitigation and adaptation, disaster risk prevention and management, biodiversity and ***forest health***. The forest data collection system should be based on different datasets: standardised data ***on forest fires and other rapid changes due to natural disasters***, to be operated by the Commission and primarily collected via Earth observation through Copernicus satellites and subject to technical protocols, and harmonised data, which Member States should ***collect by systematically*** using their own surveys based on a grid of sampling plots, such as National Forest Inventories or other networks of monitoring sites, and complementing them with Earth Observation tools, where available and applicable.	EO provides standardized datasets for climate mitigation, risk prevention, and biodiversity assessment. Combining Copernicus with commercial EO enables high-frequency, high-resolution data access. Near-real-time forest disturbance detection using Sentinel-2 (optical, 10–20m), Sentinel-1 (SAR, all-weather), and private missions[8] EO-derived data enhances field inventories, optimizing sampling strategies and reducing costs.
Amendment 12 Recital 14 a (new)	*(14a) In order to build a flexible forest monitoring system and reduce administrative burden, there should also be an opt-in possibility open for Member States that would like the Commission to take a larger*	EO standardizes indicator reporting, enabling cost-effective and scalable data collection at national and EU levels. Automated EO analytics (e.g., Sentinel Hub, Google Earth Engine) ensure efficient,

[8] i.e: Pléiades Neo (30cm), Skysat (50cm)

	share of responsibility for the collection of data and calculation of indicators. In the case of indicators where the accuracy of Earth Observation data is acceptable, Member States will be able to give the Commission the mandate to follow their development on their behalf.	unbiased long-term monitoring.
Amendment 30 Article 2 – paragraph 1 – point 1 a (new)	***(1 a) 'geo-referenced' means a reference to a specific geographic area within which data or other information is gathered. The area referred to may be larger than the area or point from which the data/information is gathered, for example in order to ensure anonymity as regards the source of gathered data/information.***	EO inherently provides geo-referenced datasets: Copernicus imagery is spatially explicit, ensuring precise location-based analysis. Allows aggregation at different scales while maintaining data privacy.
Amendment 31 Article 2 – paragraph 1 – point 2 (2) 'geographic information system' means a computer system capable of capturing, storing, analysing, and displaying geographically explicit ***information***;	*(2)* 'geographic information system' means a computer system capable of capturing, storing, analysing, and displaying geographically explicit ***and geo-referenced data;***	EO is fully GIS-compatible, seamlessly integrating into platforms such as QGIS, ArcGIS, and Sentinel Hub to support geospatial analytics for forest health assessment. Maintaining the term 'geographically explicit information' is essential to ensure EO data is accurately mapped to specific forest units, enabling transparent attribution of funding to forest owners through financial regulatory frameworks[9] while ensuring compliance with EU biodiversity and deforestation regulations.
Amendment 32 Article 2 – paragraph 1 – point 3 (3) 'forest unit' means a geographically explicit area	***deleted***	Information that is geographically explicit allows for accurate tracking of forest conditions, enabling effective decision-making, funding attribution, and regulatory

[9] such Payment for Ecosystem Services (PES), carbon credit mechanisms, CAP eco-schemes, and resilience funding,

representing a sufficiently homogenous area of forest as determined by Earth Observation and any other suitable ancillary layer of geographically explicit information, such as tree cover density, administrative boundary, or topographic boundary in a national mapping system;		compliance. EO plays a key role in supporting this by providing high-resolution, georeferenced data layers—such as tree cover density, biomass estimates, and administrative boundaries
Amendment >35 Article 2 – paragraph 1 – point 4 b (new)	*(4b)* ***'forest information' means primary or aggregated forest data, forest statistical data, Earth Observation data, and indicators derived from such data;***	EO ensures the availability of harmonized, scalable, and standardized forest information. It combines satellite-derived EO data[10] with in-situ datasets for comprehensive forest monitoring. It supports real-time tracking of deforestation, biodiversity, and ecosystem services and facilitates automated classification of forest types, carbon stocks, and land use.
Amendment 36 Article 2 – paragraph 1 – point 5 (5) Earth Observation' means the collection of data about the physical, chemical, and biological systems of the Earth through remote sensing technologies such as satellites or airborne platforms carrying imaging or other sensors, ***combined with in situ data, where appropriate***;	(5) 'Earth Observation' means the collection of data about the physical, chemical, and biological systems of the Earth through remote sensing technologies such as satellites or airborne platforms carrying imaging or other sensors;	Defining EO within the regulation formalizes its role in data collection via satellites, airborne platforms and ground-based observations., ensuring a structured and systematic approach. All in a complementary manner.
Amendment 43 Article 3 – paragraph 1 a (new)	***1a. Member States shall set up, or use existing, national forest monitoring systems, in order to collect and process forest data and calculate***	Copernicus Land Monitoring Service (CLMS) supports national monitoring needs and provides harmonized EU-wide datasets. Sentinel-2 and commercial EO platforms

[10] (Sentinel-2, PlanetScope, Pleiades Neo, LiDAR, radar SAR)

	indicators. Those systems shall be based on in situ data, in combination with Earth Observation data.	allow multi-temporal and cross-border assessments, ensuring comparability across Member States.
Amendment 47 Article 3 – paragraph 5 5. The Commission shall share the Earth Observation data it produces free of charge with the Member States' authorities competent for the forest monitoring system or with suppliers of services authorised by those authorities to represent them.	5. The Commission shall share the Earth Observation data it produces ***and give access to the systems used to analyse this data*** free of charge with the Member States authorities competent for the forest monitoring system or with suppliers of services authorised by those authorities to represent them. ***Member States shall be allowed to use that system for other purposes, such as collection of data for the purposes of other legislation.***	The Commission's commitment to sharing EO data with Member States reduces cost burdens and ensures equal access to forest monitoring tools. Copernicus data (Sentinel-1, Sentinel-2) is freely available, reducing Member States' financial burden.
Amendment 48 Article 3 – paragraph 5 a (new)	***5a. Member States may, on a voluntary basis, give access to geographically explicit or georeferenced forest information in order to calibrate the systems used to collect and analyse Earth Observation data.***	EO integration benefits from ground-truthing through Member States' forest inventories
Amendment 52 Article 4 – paragraph 3 *3. The identification system shall:* *(a) enable the precise mapping and localisation of forest areas and, subject to the establishment of methodologies pursuant to Article 8(3), of other wooded land across the Union; (b) uniquely identify forest units on the basis of a combination of forest data referred to in Article 5(2) and Article 8(1); (c) facilitate the detection and location of change between land*	***deleted***	

containing and not containing forest.		
Amendment 55 Article 5 – paragraph 2 – introductory part 2. The Commission shall collect the following ***forest*** data in accordance with the technical specifications set out in Annex I, thereby ensuring the standardisation of the data:	2. The Commission shall collect the following ***Earth Observation*** data in accordance with the technical specifications set out in Annex I, thereby ensuring the standardisation of the data ***for the following indicators*****:**	EO supports standardized data collection through technical specifications, ensuring consistency across Member States. Time-series analysis (20+ years of archived EO data) ensures historical comparisons and long-term monitoring.
Amendment 81 Article 5 – paragraph 4 4. For the purposes of paragraph 3, ***points (a) to (h)***, Member States shall collect in situ data on the basis of ***ground surveys*** in combination with, where available, data from Earth Observation, and data from other relevant information sources. The ***ground surveys*** shall be based on a network of monitoring sites that are representative of, and consistent with, the Member State's forest area referred to in paragraph ***2***, point ***(a)***.	4. For the purposes of paragraph 3, Member States shall collect in situ data on the basis of ***their national forest inventories*** in combination with, where available, data from Earth Observation, and data from other relevant information sources. The *national forest inventories* shall be based on a network of monitoring sites that are representative of, and consistent with, the Member State's forest area referred to in paragraph ***3***, point ***(d)***.	EO complements ground surveys for cost-effective, large-scale monitoring, ensuring representative and reliable forest data. EO enhances national inventories, ensuring consistent data across Member States.
Amendment 84 Article 6 – paragraph 1	***For the purpose of calculating, with an acceptable level of accuracy, and solely on the basis of Earth Observation data, the following indicators in Annex II, Member States may*** **choose** ***to have*** **the Commission** ***collect the relevant data and make the necessary calculations on behalf*** **of the** ***Member State:*** ***Forest area, tree crown cover, forest type, defoliation***	Forest area, tree crown cover, defoliation, and forest type classification can be derived from EO data
Amendment 102 Article 8 – paragraph 2 2. ***For the purposes of***	2. The Commission ***is empowered to adopt***	EO integration into monitoring workflows ensures compliance with LULUCF, biodiversity,

paragraph 1, the Commission ***and the Member States shall make use of the data from Earth Observation or in situ data and, as regards the forest data listed in points (a), (b) and (c) of*** Annex III, ***of a combination of data from Earth Observation, in situ data and*** other ***relevant information sources.***	***implementing acts to modify the indicators specified in*** Annex III***(a), in order to comply with policy developments in any*** other ***forest-related Union legislation. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 15(2)***	and climate reporting obligations. Sentinel-2 and commercial VHR data enable real-time compliance monitoring.
The proposal for a regulation gives the Member States the possibility of producing certain indicators themselves (opt-out). The rapporteurs instead propose to reverse the rule as an opt-in to make better use of the existing knowledge at Member State level, while keeping the possibility for Member State to delegate to the Commission the calculation of the indicators which only requires Earth Observation. Moreover national authorities are offered the possibility to use the services provided by the Commission for the calculation of indicators defined in other forest-related regulations or for national interests. In this case, the competent authorities of the Member States will be given the opportunity to have full access to and be trained to use the Commission's programs directly for better collaboration.		EO-based analytics have proven to be a valuable complement to on-the-ground activities. An example is an open interactive platform that provides timely insights on forest conditions, including disturbances, vitality, and trends. With a growing user base, it has gained significant visibility and media coverage. The platform is continuously evolving, integrating additional features such as biomass estimation and climate resilience indicators. It serves as a strong example of how such initiatives could be scaled up to a broader regional or international level[11]

[11] https://map3d.remote-sensing-solutions.de/waldmonitor-deutschland/#

To fully harness the potential of EO in implementing the FML, the regulation should emphasize the seamless integration of EO data into national and EU-wide forest monitoring initiatives, ensuring consistency with existing EO infrastructures such as Copernicus complemented with third party missions and national forest inventories. Public-private collaboration should be facilitated to leverage commercial satellite services, expanding data availability and analytical capabilities for forest management. Additionally, investing in EO-driven analytics and models will enhance automated forest change detection, predictive analytics, and early warning systems. To ensure effective implementation, Member States must have access to adequate funding for capacity-building, enabling improved EO-based monitoring, reporting, and compliance with EU regulations. Finally, fostering cross-sectoral interoperability will allow EO data to be efficiently shared across forestry, agriculture, and biodiversity monitoring systems, strengthening policy coherence and enhancing Europe's ability to safeguard its forests against environmental threats.

EARSC and its members stand ready to support the EU and Member States in this endeavour by offering innovative EO-based solutions that enhance the efficiency, transparency, and scientific rigour of forest monitoring efforts.

A comprehensive and standardized set of indicators, as outlined in the Annexes to the FML proposal, is essential for ensuring effective forest monitoring across the EU. EO plays a critical role in contributing to these indicators by providing high-resolution, scalable, and near-real-time data for tracking forest health, land-use changes, carbon stocks, and biodiversity dynamics. To enhance the implementation of the FML, the table below is providing a matrix of available EO capabilities and integrated into national and EU-wide monitoring frameworks.

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Indicators from Forest Monitoring Law Proposal

Indicator	Required measurement FML	Available products	Example projects/ initiatives
Forest Area	Spatial Resolution: 10m or finer Frequency: annual	Sentinel-2, Copernicus Global Land Cover, ESA CCI Land Cover	Copernicus Global Land Monitoring, Global Forest Watch
Tree Cover Density	Spatial Resolution: 10m or finer Frequency: annual	Copernicus High-Resolution Layer (HRL) Forests, Hansen Global Forest Change	Copernicus HRL, Global Forest Watch
Forest Type	Spatial Resolution: 10m or finer Frequency: 3 years	ESA WorldCover, FAO FRA, Sentinel-2-based classification	FAO Forest Resources Assessment (FRA), ESA WorldCover
Forest Connectivity	Spatial Resolution: 10m or finer Frequency: annual	Sentinel-2-based landscape fragmentation analysis, Copernicus HRL	JRC Forest Fragmentation Map, Global Forest Watch
Defoliation	Spatial Resolution: 300m or finer Frequency: every 2 weeks		
Forest Fires	Spatial Resolution: 375m or finer Frequency: once per week	MODIS Fire Information for Resource Management System (FIRMS), VIIRS Active Fire Data	Copernicus Emergency Management Service, Global Fire Atlas
Burnt Forest Areas	Spatial Resolution: 20m or finer Frequency: once per week	Sentinel-2 Burnt Area Mapping, MODIS Burned Area Product	Copernicus Global Burnt Area, Global Wildfire Information System (GWIS)
Fire Severity	Spatial Resolution: 20m or finer Frequency: every 2 weeks	Sentinel-2 and MODIS-based burn severity indices	GWIS, Copernicus Emergency Services
Post-fire Soil Erosion	Spatial Resolution: 1km or finer Frequency: Every 2 weeks	MODIS-based erosion risk modeling, Sentinel-2 for vegetation regrowth	JRC Soil Erosion Risk, Copernicus Land Service
Dead Fuel Moisture Content	Spatial Resolution: 8km or finer Frequency: annual	MODIS and SMAP Soil Moisture Products	Global Wildfire Information System (GWIS), ECMWF Fire Danger Forecast
Live Fuel Moisture	Spatial Resolution: 500m or finer	MODIS NDVI-based moisture indices,	NASA ECOSTRESS, Copernicus Vegetation Index

Content	Frequency: monthly	Sentinel-3 OLCI	
Fuel Type Map	Spatial Resolution: 100m or finer Frequency: every 2 years	ESA CCI Land Cover, Copernicus HRL	Copernicus Land Monitoring, Global Wildfire Information System
Tree Cover Disturbances	Spatial Resolution: 10m or finer Frequency: annual	Hansen Global Forest Change, Sentinel-2 Change Detection	Global Forest Watch, European Forest Disturbance Monitoring
Forest available for wood supply/not available for wood supply	Spatial Resolution: national and NUTS2 value Frequency: annual	FAO FRA, national forest inventories, Sentinel-2-based land use	FAO Forest Resources Assessment (FRA), European National Forest Inventories
Growing Stock Volume	Spatial Resolution: national and NUTS2 and monitoring site level Frequency: 5 years	LiDAR-based forest volume estimation, ICESat-2, GEDI Biomass Data	*ESA Biomass*[12], GEDI NASA
Net Annual Increment	Spatial Resolution: national, NUTS2 level and monitoring site level Frequency: 5 years	Sentinel-2 and LiDAR-based forest growth models	FAO FRA, European Forest Observatory
Stand Structure	Spatial Resolution: monitoring site level Frequency: 5 years	LiDAR-based stand structure analysis, Sentinel-2	*ESA Biomass*, GEDI NASA
Tree Species Composition and Richness	Spatial Resolution: monitoring site level Frequency: 5 years	Hyperspectral data (PRISMA, EnMAP), Sentinel-2 classification	
European Forest Type	Spatial Resolution: aggregate national value; monitoring site level Frequency: 5 years	ESA WorldCover, Copernicus HRL Forest Type	Copernicus Land Monitoring
Removals	Spatial Resolution: national Frequency: annual	National forest inventories, Sentinel-2-based change detection	FAO FRA, European Timber Trade Monitoring
Deadwood	Spatial Resolution: national, NUTS2, monitoring site Frequency: 5 years	LiDAR-based deadwood estimation, GEDI biomass loss	ESA Biomass, European Forest Inventory

[12] *ESA BIOMASS mission is planned to be launched in April 2025*

Location of Forest Habitats in Natura 2000 Sites	Spatial Resolution: 1:25,000 scale Frequency: 6 years	Sentinel-2-based land cover mapping, National geoportals	Copernicus Natura 2000 Monitoring
Abundance of Common Forest Birds	Frequency: 3 years	Remote acoustic sensing, eBird satellite data integration	EBCC (European Bird Census Council), Copernicus Biodiversity Monitoring
Location of Primary and Old Growth Forests	Spatial Resolution: 1:25,000 mapping scale or finer	Sentinel-1/Sentinel-2-based classification, LiDAR canopy structure analysis	European Old-Growth Forest Map
Protected Forest Areas	Spatial Resolution: 1:25,000 mapping scale or finer	Sentinel-2 land cover classification, national datasets	Copernicus Natura 2000, WDPA (World Database on Protected Areas)
Production and Trade of Wood Products	Frequency: 2 years	FAOSTAT, National Forest Inventories	FAO FRA, European Timber Trade Monitoring
Forest Biomass for Energy	Frequency: 2 years	*ESA Biomass*, GEDI NASA, Sentinel-2-based biomass models	Copernicus Biomass Monitoring, FAO Forest Energy
Forest Disturbances Caused by Factors Other Than Fires		Sentinel-2-based disturbance mapping, LiDAR	European Forest Disturbance Monitoring
Aboveground Biomass		GEDI, Sentinel-2-based biomass models (with on-site validation datasets), ICESat-2	*ESA Biomass*, NASA GEDI
Forest Structure		LiDAR, Sentinel-2-based canopy height models	*ESA Biomass*, European Forest Observatory
Value of Non-Wood Forest Products		Sentinel-2-based land use classification, national datasets	FAO Forest Products Trade Monitoring
Location of Forest Habitats outside Natura 2000		Sentinel-2-based land cover classification	Copernicus Habitat Mapping
Forest		ESA WorldCover,	European Wilderness Society

Naturalness Classes		Sentinel-2-based land use	Mapping
Presence of Invasive Species		Hyperspectral remote sensing, Sentinel-2-based and commercial satellite based tree classification	ESA BIODIVERSA, Invasive Species Monitoring Network
Diversity of Non-Tree Vegetation			
Threatened Species			
Other Wooded Lands			