Eoforest

EARTH OBSERVATION SERVICES FOR FOREST MANAGEMENT

gmv®
INNOVATING SOLUTIONS

Eoforest for sustainable forest management

We present ***Eoforest***, GMV solution to support forestry, in all its different forms. We will show how ***Eoforest*** contributes to **address forest management challenges** and **supports** the implementation of the **Sustainable Development Goals**.

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SUSTAINABLE DEVELOPMENT GOALS

***Eoforest* support for societal issues**

- Promotes sustainable forest management
- Fosters industry innovation.
- Supports reforestation plans
- Analyses deforestation and degradation
- Monitors forest health for natural perturbations
- Estimates biomass and carbon stock

CHALLENGES

Forest ecosystems are under increasing pressure from climate change and a growing anthropogenic action. We need to protect and enhance forests, both in quality and quantity, to reach climate neutrality and a healthy environment. In parallel, it is essential to maintain and reinforce the role of productive forests sustaining industries, based on pulp, energy, timber and non-wood products, that are key to local and national wealths.

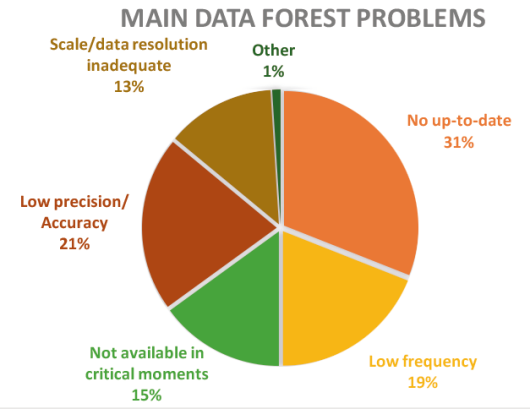
Today, more than ever, sustainable forest management is a challenging task that requires reliable data on which to ground sound decisions and develop appropriate policies. However, regarding data, foresters face issues like poor temporal availability, low accuracy and inadequate scale resolution. This is partially due to the cost and time inherent to traditional field data collection approaches, especially burdensome when managing large areas.

SOLUTION

Sustainable forest management can largely benefit from remotely sensed data. Satellite, LiDAR and climate –based products contribute to tackle day to day challenges by reducing operation costs and increasing performance, enhancing accessibility and usability of data, and enabling management innovative solutions. These remote sensing based products allow customisable outputs to the areas of interest. In addition, silvicultural management based on remotely sensed data is an instrument aligned with the European Green Deal and the United Nations' Reduction of Emissions from Deforestation and Degradation (REDD+) Programme.

Eoforest is **GMV's catalogue of forestry-related geo-information products** to facilitate the management of forest resources by those organizations involved: public sector with management and reporting commitments, private forest owners, forest-based industry, and environmental and conservation agencies.

Eoforest meets all currently existing geospatial data standards so, our geospatial products can be downloaded into and/or consumed by any geo-viewer through Open Geospatial Consortium (OGC) standard services.



Source: MySustainableForest survey on data problems for forestry stakeholders (Portugal, Jan 2020).

EOFOREST SUPPORT TO FORESTRY MARKETS

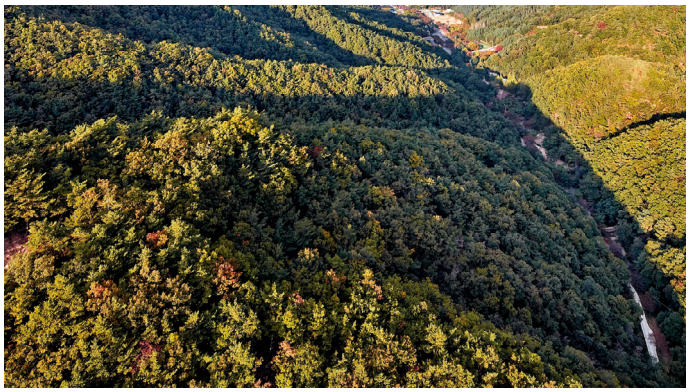
Eoforest products support silvicultural planning, management, evaluation and reporting in markets such as:

Forest Monitoring

- Forest inventory
- Deforestation and degradation analyses
- Biotic Damages caused by pest & diseases
- Drought damage assessment
- Land Use Planning and Land Use and Land Cover Dynamics Monitoring
- Regional forest fire prevention action plans and fire damage assessment and delineation
- Environmental Impact Assessment

Carbon Accounting /Carbon markets:

- Biomass and carbon offsets estimation



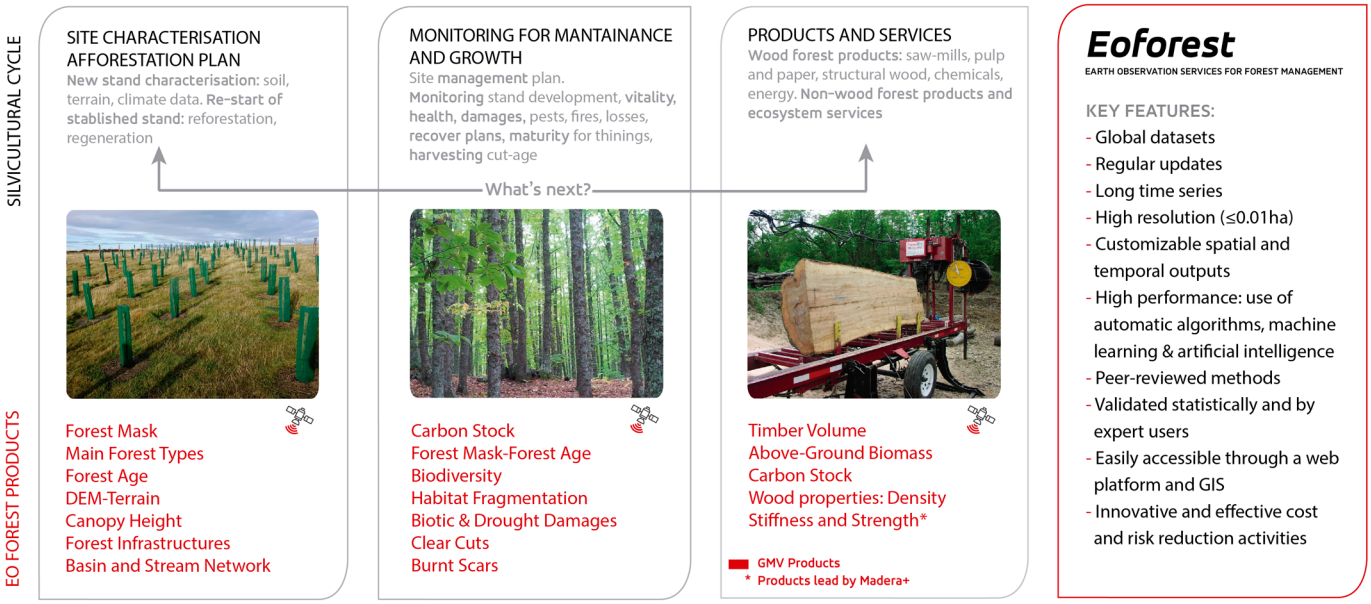
REDD+ / Climate change:

- Forest Inventory
- Deforestation and degradation analyses
- Biomass and carbon stock estimation
- Biodiversity conservation and Ecosystem Restoration

Forest-based industry

- Forest mensuration
- Forest and natural resources management - reforestation plans
- Industry Innovation

EARTH OBSERVATION SUPPORTING THE FOREST MANAGEMENT CYCLE

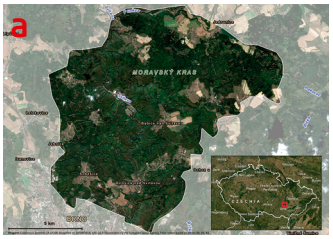


USER CASE: ASSESSING BARK BEETLE DAMAGE IN CENTRAL EUROPEAN FORESTS

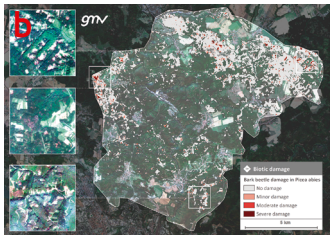
The accelerated spread of insect pests in woodlands around the world has been of particular concern to forest owners and managers in recent decades. Bark beetles that feed on live tissue are major contributors to global tree mortality and the collapse of the wood market[1]. The bark beetle breading-cycle is temperature dependent; longer, warmer and dryer summer periods have favoured and multiplied the breading cycles by a factor of four, boosting the bark beetle population to unknown dynamics.

Since 2003, the Czech Republic has experienced extreme summer weather conditions; the bark beetle pest (Ips typographus) has become an emergency across spruce forests (Picea abies). The most affected area is the North-East Moravian-Silesian Region and the Olomoucký Region, with 66% (1,46 mil. m^3) of all timber infested by bark beetles recorded by the Czech Republic forest authorities[2]. Using Sentinel-2 **satellite images, GMV analysed** the **biotic damages** bark beetle caused on the Nature Reserve of U Výpustku, just NE to Brno City. The analysis was carried out in the context of the H2020 project MySustainableForest and the area of interest was selected for validation purposes by the University Forest Enterprise Masaryk Forest Křtiny of Mendel University in Brno (UFE).

The Reserve covers 10.228 ha across broken-karstic relief. Forest associations are: oak (4%), beech-oak (27%), oak-beech (53%) and beech (16%). Fertile soils (63%) prevail over acid (10%) or bare (27%) soils. Natural conditions are most varied in mixed stands, averaging to 38% coniferous and 62% deciduous trees. Dominant conifers are spruce (18.8% stand area), pine (8.3%) and larch (8.1%), while deciduous are beech (34.0%), oak (14.7%) and hornbeam (7.9%). The average growing stock reaches 266 m^3/ha, the overall current increment of 7.4 m^3/ha, the annual harvesting volume of 69.000 m^3/ha.



a) Area of Interest: Nature Reserve of U Výpustku



b) Output of the Biotic Damage layer showing Forest/ Non-Forest mask and areas damaged by bark beetle

c) Spruce forest patch dried out by bark beetle

d) Nesting galleries opened on the bark

Damaged areas characterised by dead trees were clearly detected with relatively high accuracy using simple multi-temporal analysis techniques. This late detection is useful to assess economic and ecological losses caused by the pest in a specific period of time. However, an earlier detection is needed to avoid pest spread and mitigate potential losses. Therefore, GMV carried out a preliminary analysis on early pest detection trying to raise an alert at least 2 months before the dead of trees. Areas affected by the bark beetle were detected on Sentinel-2 images 70 days before clear signs of decay using Artificial Intelligence, with a final precision of 80% for this case study.

[1]https://www.sciencedirect.com/science/article/pii/B9780124171565000137

[2]https://informar.eu/sites/default/files/pdf/Presentation%20CZ%20062018.pdf

Remote Sensing
&
Geospatial Analytics

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