

SeBS Workshop on Forest Management

The workshop was organised as a virtual meeting taking place on 15th September 2022. Those attending are listed in the annex.

Context:

The goal of the workshop was to bring together experts in forest management in different countries, to understand where and how Sentinel data is being used in products and services to support the management of forests and woodlands across Europe and to consider what benefits this use is bringing already or could potentially bring. The project team are also seeking more cases to analyse.

The project team explained how SeBS cases are being analysed and how the focus which initially was almost entirely on the economic benefits, had shifted to embrace 5 other “dimensions” of value. It is often the case that non-monetary benefits are of more value to public organisations than those which are monetized. For example, to promote the activities of the agency to the general public or to enable more efficient working between organisations by creating collaborative platforms or working practices.

Discussion:

The first case of [Forestry Management in Sweden](#) was published as one of the first cases within the SeBS project in 2016. Forestry is a strategic sector for Sweden, with around 50% of forests owned by private individuals or families who must comply with national and EU legislation regarding the management of their forests. Swedish best practices for forest management foresee forest replanting after clearing, pre-commercial thinning and commercial thinning. To support forest owners in the process, the Swedish Forest Agency (SFA) advises owners when to best cut their trees and get higher long-term returns from their forest assets. Through the use of satellite-based clear-cut maps, the SFA can promote best practice to the 300,000 private owners. This has resulted in increasing forest and timber reserves whilst at the same time preserved natural forest land increasing its value for ecotourism.

Erik Willen from Storaenso and previously with Skogforsk highlighted the benefits of using satellite data at the SFA which was introduced already back in 1999 for yearly coverage. Nowadays, all Sentinel-2 data are collected and made publicly available through free and open change maps, meaning now change maps between all cloud free images are provided monthly or bi-monthly by the SFA. Being partly automated, you can compare between collected imagery and the information submitted by owners. Moreover, the SFA helps and recommends forest owners how to go about (e.g., proposals to forest owners to do pre commercial thinning which increases the value of forests). The benefits are knowing exactly where and when something is happening. The SFA can focus its attention on those cutting locations where it is needed the most (legally, biologically, environmentally) and thus make its operations more efficient.

A second short case focuses on [Forest Monitoring in Portugal](#), this time focusing on the private sector. CELPA (Portuguese pulp and paper industry association) members process great amounts of timber and play an important part in the Portuguese economy. The companies involved manage tree plantations (mainly eucalyptus) covering around 200k ha all over Portugal. To understand more

effectively and on a country-wide scale the state and evolution of the tree plantations, CELPA collaborates with Tesselio, an environmental technology company, to monitor the lifecycle of tree plantations (new plantations, harvest, burnt areas), tree age as well as national land use (change) on the basis of Sentinel-2 data augmented by AI. The forest managers of the member companies can access the Tesselio platform to check tree health remotely, prioritising their work according to urgency and need.

Francisco Goes, from CELPA, shared his perspective from the user side. CELPA's members manage around 200k ha of land (mainly Eucalyptus trees) which makes up 20% of all Eucalyptus forest in Portugal. CELPA regularly conducts forest inventories because the national inventories are not enough and not suitable for its needs. CELPA associate companies need more information to manage and monitor their forests as well as to help private owners to finetune their forest operations. Therefore in 2018, CELPA started a cooperation with Tesselio to see how to get the same information in a more effective way. By using Sentinel data, Tesselio provides information on land use (yearly) and land use changes (quarterly), burnt areas, health index, tree stand age and volume information as well as tree density per hectare throughout the country. This info is available for both CELPA and its members. Francisco explicitly said that the development of this tool has been a "game changer for the industry" and is "the future". At the moment, there is also a process moving from forest level as unit of analysis to the tree level. Furthermore, users are benefitting from a timelier provision of information.

Followed by these insights into the two full case studies around forest management, Geoff Sawyer presented and explained the main benefits and their different dimensions for public authorities.

Ludvig Forslung from the European Environment Agency (EEA) then outlined and explained the various products the EEA is working with. Here, the developments are going in the direction of improved methodologies, increasing degrees of automation as well as annual updates of their products. Use cases are located in forestry, carbon sequestration, productivity monitoring, climate impact (drought, forests) and disturbance monitoring (storms, fires). The EEA also produces vegetation indices and seasonal trajectories as well as phenology and production. In particular, the HR VPP (High Resolution Vegetation Phenology and Productivity) products will continue well past 2023 and move closer to monitoring biomass as well as disturbance monitoring which however is more complicated as local data is needed. Ludvig also presented the HRL Small Woody Features which provides harmonised information on linear structures and focuses on forest connectivity relevant for biodiversity and which will integrate additional landscape features in the future.

Other participants had been asked to provide a one slide summary of the situation in their country answering to 5 questions proposed in advance (see annex).

Alexis Foussard from the French ministry for the environment, gave a good example of the use of Sentinel-2 data. In France, they are monitoring the bark beetle crisis which occurs mainly in pine forests, an intensifying crisis due to recurring droughts. They have a need to map affected areas, however, they face a major limitation: the frequency of revisits enables precise information on the evolution, but the very small areas remain difficult to detect.

Birgitta Ollson from the Swedish Environment Protection Agency stated that the agency is using Sentinel data for their land database and is being used a lot for internal work and analyses. Their first

product was produced in 2018. Currently there are discussions for an updated product to be released in 2023 including much more satellite data including Sentinel-1 and -2. Moreover, they are cooperating with an agriculture university and the forest agency with regards to the use of satellite data.

Marie Hensch from Tühnen Institute in Germany described her organisation's use of Sentinel data which is responsible for the national forest inventory in Germany as well as the Copernicus network office forest, a project that was initiated by the DLR. She mentioned that in fact a lot of research is ongoing in this topics area with a major role of satellite data. Most of the ongoing work is research-based, however slowly the results are becoming more practical-oriented and operational.

Bjorn Wangensteen from the Norwegian Space Office stated that Sentinel data are not yet being used for forest management in an operational manner. The Norwegian Environment Agency is using some (satellite) data, but this is more research-based. A cooperation between Sweden and Norway is planned where both countries will pool resources and map and test using the same methods.

Hugo Costa from the Portuguese National Mapping Agency declared that Sentinel data are used to produce land cover maps (which not only focus on forests). They are currently in the process of releasing new products that make use of Sentinel-2 data such as the annual land cover map. The agency supports various Portuguese institutions and focuses also on the identification of tree species. In that regard, there is some overlap with the Tessel service provided to CELPA (see above). Moreover, their interest is in land cover changes due to e.g. clear cuts or fires. Most of their work is however preliminary and more developments are needed before moving to operational products.

Konstantinos Dimitrakopoulos (Cyprus Department of Forests) stated that his department's main objective is the protection of state forests from forest fires and the preservation of biodiversity. As of late, they started using Sentinel data for habitat and burned area mapping. In the past, the aforementioned mapping was conducted via field visits with GPS. Currently, there are first attempts to map Natura 2000 areas via satellite imagery (Sentinel 2 data).

Erik Willen added that Swedish and Finish Forest organisations are stepping up their use of Sentinel data. This has been in particular due to the ongoing bark beetle crisis. Also, several countries in Central Europe are quite active in this regard.

Yannick Le Page, who is working for the Portuguese agency dealing with forest fires, described that his organisation's main use of Sentinel data is focused on monitoring and detecting fires and clear cuts as well as for fuel management and fuel collection. Another use case is the support of forest management with regards to buffer zones between forests and villages in case of fires.

Due to some technical issues, some participants provided their perspective in writing in the chat.

For example, **Ion Nedelcu** from the Romanian Space Agency (ROSA) stated that in Romania the Ministry of the Environment used to keep track of forest (over)exploitation by using satellite data and making the results publicly available (<https://inspectorulpadurii.ro/#/>). Currently, the entire procedure is reconsidered, and satellite data will come back into the process. The approach proposed to the Ministry of Environment by ROSA in Romania is quite complex. It is a monitoring process aimed at generating monthly monitoring products related to coverage, cuts, disease, fires etc. However, the process is not yet in place.

Andrea Caccioppoli (Italian Ministry of Economic Development MISE) stated that MISE mainly deals with the national industrial policy. Therefore, they do not manage directly EO satellite data but are interested in acquiring a better understanding of the EO value chain. Both use cases mentioned above from Sweden and Portugal are very interesting success stories from his viewpoint.

Pedro Venancio from the Portuguese Forest Agency (ICNF) mentioned that ICNF is using Sentinel-2 data to:

- map all burned areas above 10 hectares, mainly by photo-interpretation;
- burn severity mapping, using automatic algorithms to get severity index;
- monitor fuel breaks and clear cuts (work in progress).

Bjorn Wangensteen added that the Norwegian Institute of Bioeconomy Research (NIBIO) is developing a bark beetle damage monitoring system using Sentinel-2 data to alert forest owners to clear affected areas. For now, a test is running for some Sentinel-2 tiles, while the plan for the future is to scale this up. **Birgitta Olsson** added that there will be two test areas on the border between Sweden and Norway, one in the middle (close to Trondheim) and one further north. The same methods as for the Swedish Land Cover Database will be used.

Lastly, **Lefteris Mamais** from Evenflow stated that at EU level, some interesting [legislation](#) has been passed in relation to deforestation that is supporting the use of Copernicus Sentinel data for its implementation.

Summary of National Situations:

Which organisation(s) in your country is(are) responsible for the monitoring of forest? Is this the same organisation which manages the forests in terms of permits to clear areas and for ensuring replanting?

Sweden	Swedish Forest Agency
Germany	Thünen Institute (at least for forest inventory)
Norway	Norwegian Environment Agency
Portugal	Portuguese Forest Agency / Portuguese National Mapping Agency
Cyprus	Cyprus Department of Forests

Is satellite data used by this (or these) organisations to support their work on forest management? If “yes”, then for which purpose(s) is the satellite data being used?

Sweden	Yes. Monitoring forests for changes and clear-cuts.
Germany	Yes. For national forest inventory. Other work research-based.
Norway	No. Some research work is on-going.
Portugal	Yes. For land cover change maps (clear cuts & fires) and tree species identification; for mapping burnt areas.

Cyprus	Yes. For forest fire mapping and Natura 2000 areas mapping/monitoring.
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Main Findings:

- The utility and potential benefits of using Sentinel data for forest management are mostly understood.
- Whilst the original example was for clear-cut monitoring, many other applications have emerged most notably for monitoring the effects of fires and the spread of infestation of bark beetles.
- Several participants reported on national networks which have been formed responding to the possibilities offered through the use of Copernicus.
- The benefits lie with being able to monitor forests country-wide cost-effectively, more frequently and with a better spatial sampling.

Conclusions:

The experts on both demand and supply sides working on forest management are generally aware of the benefits that can be obtained from the use of satellite-based monitoring of forests. This provides the capability to monitor forests country-wide that is not possible using traditional in-situ measurements. The latter is not replaced but complemented and hence an investment and annual budget is required.

Follow-up will be possible between experts and with the project team which could result in further analysis and a full case study.

- To analyse commonalities and differences among different actors and potential uses of Sentinels data in different countries/regions.
- to establish a benchmark of cases that can allow improving the current understanding related to the use of Sentinels data.

To establish a set of best practices which can inform environmental agencies and on the benefits of using Sentinel data.

Annex

Participants:

Alexis Foussard (French ministry for the environment)
Andrea Caccioppoli (Italian Ministry of Finance)
Birgitta Olsson (Swedish Environmental Protection Agency)
Federica Mastraci (ESA/ASI)
Francisco Goes (CELPA - Portuguese Pulp and Paper Industry Association)
Erik Willen (Storaenso and formerly with Skogforsk)
Hugo Costa (Portuguese National Mapping Agency)
Ion Nedelcu (Romanian Space Agency)
Isabel Pocas (Forestwise, Portugal)
Konstantinos Dimitrakopoulos (Cyprus Department of Forests)
Konstantinos Papisavvas (Cyprus Department of Forests)
Ludwig Forslund (European Environment Agency)
Marie Hensch (Tühnen Institute forest ecosystems)
Matthias Sommer (Beetle for tech, Austria)
Bjorn Wangenstein (Norwegian Space Office)
Pedro Venacio (Portuguese Forest Agency)
Simon Jutz (ESA)
Sofia Souto (Portuguese Space Office)
Stephanie Wurpillat (French Forest Agency)
Yannick Le Page (Portuguese Forest Agency)
Alessandra Tassa (ESA)
Lefteris Mamais (Evenflow)
Lauriane Dewulf (Evenflow)
Christopher Oligschläger (EARSC)
Geoff Sawyer (EARSC)

SeBS Forest Management Workshop

Each participant to the SeBS Forest Management workshop should prepare one slide responding to the following questions:

1. Which organisation do you represent and what is its role?
2. Which organisation(s) in your country is(are) responsible for the monitoring of forest? Is this the same organisation which manages the forests in terms of permits to clear areas and for ensuring replanting?
3. Is satellite data used by this (or these) organisations to support their work on forest management? If “yes”, then for which purpose(s) is the satellite data being used?

(Note this could be for policy development, design of legislation, implementation of the policy, reporting, enforcement, analysis of its impacts, or to support communication with the public)

4. Is satellite data used for other purposes?

(Technically it can concern the management aspects or it could be for inventory, monitoring the mix of species, monitoring for disease, reporting and significant changes (fires))

5. Are there other benefits arising from the use of satellite data?

(Note this could be in terms of communication with the public, to enable co-operation between different public bodies or other non-monetary benefits)

6. Any further comments on your use of satellite data?

(For example: is the use operational or research based? What are the main data being used? What are the main impacts of using the data? What are the main reasons for not using the data?)