ENABLING EARTH OBSERVATION FOR PROTECTED AREAS

Providing land managers with an easy and accessible tool to address land cover change in Europe's protected areas.

The challenge

For many years, the uptake of Earth observation (EO) data for managing Europe's protected areas has been relatively limited, with this leading to missed opportunities for conserving landscapes and the ecosystem services they provide.

Nowadays, the public availability of satellite data makes it possible to significantly increase our understanding of Europe's changing landscapes. However, the sheer volume of data involved and the steps required for their processing is overwhelming for many and hence not often undertaken. The challenge therefore was to provide a tool that converted these data into useable and standardised products that could be easily generated and accessed by a wide range of users.

The space based solution

The Horizon 2020 ECOPOTENTIAL project has developed a Virtual Laboratory (VL) to host data and software to support protected area management using EO data. Within the VL, the EO Data for EcoSystem Monitoring (EODESM) stores environmental variables extracted from EO data and uses these to automatically generate classifications of land cover and change according to the Food and Agriculture Organisation's (FAO) Land Cover Classification System (LCCS; Fig. 1). Whilst some variables (e.g., vegetation canopy cover and height, water turbidity) are used directly as input to the classification of land covers, others (e.g., sea surface temperature, plant species, snow depth) provide additional information on their states and dynamics. The EODESM system also generates historical and near real time alerts through daily to annual comparison of land covers and environmental variables (Fig. 2). These change alerts are described on the basis of accumulated evidence from EO data and other sources. The resulting classifications are comprehensive and detailed. Mobile applications have also been developed to support calibration of variable retrieval algorithms or validation of classifications.

Benefits to Citizens

The VL and the EODESM system are open to users, allowing the retrieval of environmental variables and EO data, including Copernicus datasets. A particular advantage for those charged with protecting landscapes is that consistent land cover and change classifications can be generated for landscapes across Europe. This allows better comparison of area estimates and impacts of change events (e.g., storms, fire) and processes (e.g., forest succession) between sites, including protected areas. The tools have already been applied to classify over 15 large national parks in Europe and are being increasingly adopted, as the approach to generating relevant classifications is easy to understand. The EODESM system is also scalable to any country or region worldwide and, because of its robustness and versatility, is adaptable to use data from

EODESM classification of land covers in Gran Paradiso National Park (NP), Italy.

| Thematic Area	Region of Application	Sentinel mission used	Copernicus Service used	Usage Maturity Level
BIODIVERSITY AND ENVIRONMENTAL PROTECTION	EUROPE	S2	–	3

a diverse range of present and future airborne and spaceborne sensors regardless of their spatial resolution.

Outlook to the future

The land cover classifications generated by the EODESM system can be translated to different habitat taxonomies, which is anticipated to increase uptake by a wide range of conservationists and ecologists. Furthermore, environmental variables predicted from process (e.g., forest growth, hydrology) can be used to generate classifications of future landscapes. This significantly increases the potential use of EODESM as a planning tool. This will assist in better planning of environmental resource use and may contribute to reverse losses of biodiversity and degradation of landscapes, in Europe and beyond. To assist EODESM users, training workshops and material are being developed and delivered to interested parties.
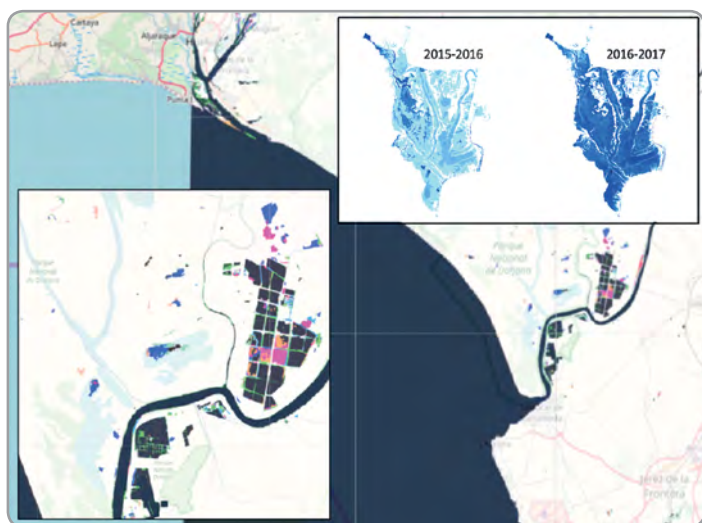
Annual hydroperiods for Doñana NP provide input to the EODESM change detection and alert system.
Credit: Contains modified Copernicus Sentinel-2 data [2015, 2016, 2017]

"The EODESM system provides timely information on wetland conditions and dynamics that determine the distribution of flora and fauna species. This can assist in efforts to ensure planning of conservation management."

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