# The Earth Observation Data for Ecosystem Monitoring (EODESM)

What is EODESM?

EODESM facilitates the classification of land cover and change by simply combining environmental variables retrieved from Earth observation data.

Classifications follow the Food and Agriculture Organisation (FAO) Land Cover Classification System (LCCS) taxonomy, and can be generated independent of scale. Changes can be detected by comparing land cover classifications for any two points in time.

EODESM has been used to classify land cover and change for a diverse range of protected areas across Europe but is applicable to any site globally as long as environmental variables are available.
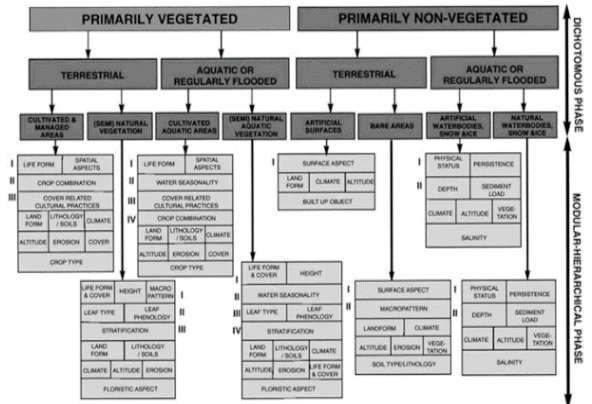
The Food and Agriculture Organisation (FAO) Land Cover Classification System (LCCS) Version 2 taxonomy

Land cover classification of Gran Paradiso National Park in Italy generated using EODESM

How do I access and use EODESM?

Contact richard.lucas@aber.ac.uk or visit https://vlab.geodab.org/, to generate land cover classifications using EODESM (8 land cover and 64 change categories) directly from indices derived from Sentinel-2 data. Updates to EODESM and documentation are available at

https:// essilab.wixsite.com/eodesm.

Why use EODESM?

EODESM routinely and consistently generates maps of land cover and change without the need for complex algorithms.
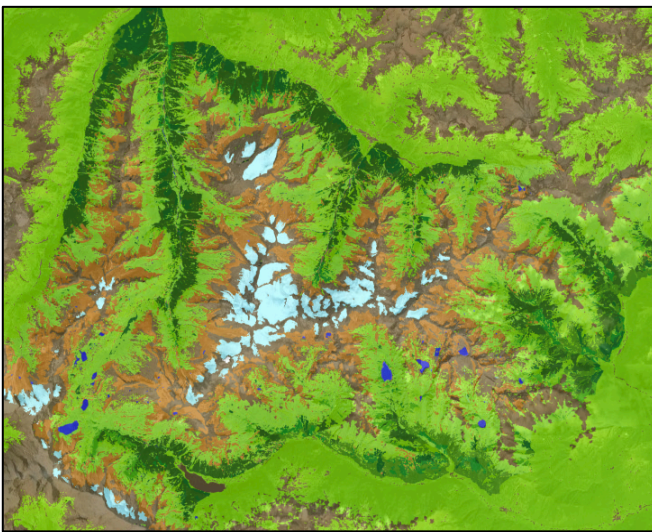
The environmental variables used are widely recognised and have standard units or codes. Hence, the approach is straightforward to implement and outputs are easy to comprehend.

A major advantage of EODESM is that maps can be generated for any site and have a consistent taxonomy. Land managers can therefore compare the extents of different land covers and changes that are occurring within and between protected areas across Europe.

The maps and environmental variables used for their generation can also support conservation of biodiversity and maintenance of ecosystem services.

EODESM is freely available through the ECOPOTENTIAL'S Virtual Laboratory

Keywords: land cover and change classification, Earth observation data, habitat, ecosystems.

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EODESM technical characteristics:

- **Generates consistent classification of land covers for any site globally based on the FAO LCCS-2 taxonomy, and uses environmental variables retrieved primarily from Earth observation data.**

- **Allows both thematic and continuous variables to be integrated, including those derived from time series (e.g., water or snow hydroperiod, vegetation phenology).**

- **Integrates additional descriptors of land covers based on environmental variables external to the FAO LCCS taxonomy (e.g., plant species, land surface temperature).**

- **Allows translation of LCCS classes to habitat and other land cover taxonomies.**

- **Detects change by comparing LCCS class descriptions and environmental variables generated for any two points in time.**

- **Provides an evidence-based approach to detect changes associated with pre-defined categories (e.g., deforestation, flooding).**

- **Attributes change to potential causes and consequences and links directly to policy and land management.**

- Can integrate a wide range of environmental variables into the classification, no matter how derived, and can capture local knowledge.

- Can utilize existing local to global layers representing a diverse range of environmental variables.

- Is applicable at any spatial scale, and hence can be used in conjunction with a wide range of ground, airborne and spaceborne data.

- Facilitates comparison between any two time-separated periods but uses dense time-series to focus on specific change events or processes.

- Can be replicated with in situ data. The Earthtrack mobile App (earthtrack.aber.ac.uk) has been specifically designed to support retrieval of environmental variables and validation of land cover and change classifications generated by EODESM.

- Is simple to use, understand and implement particularly because of the requirement for environmental variables to have defined units (e.g., meters, days, ${}^{o}C$, %).

- Is informative, utilizes ecological knowledge, and allows for targeted applications.

Example: Changes in the hydro-period from year to year (Doñana NP, Spain) can be compared to determine whether inundation or desiccation of the landscape is occurring or whether water within the landscape remains relatively stable.
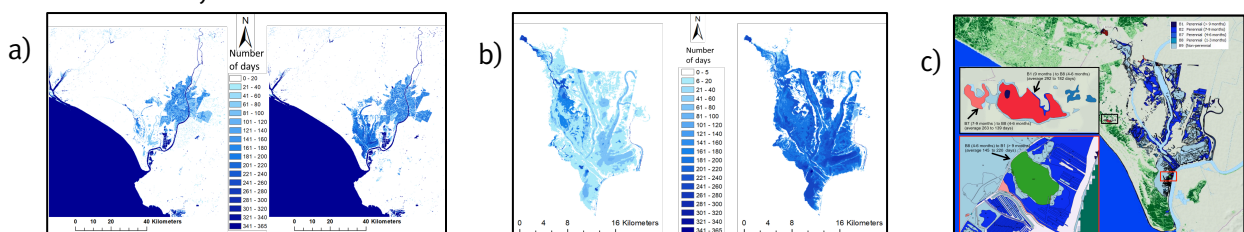
Hydro-period images generated for a) 2015-2016 and b) 2016 and 2017 using Sentinel-2A and Landsat data. c) Changes in annual hydro-period showing areas of net drying (red) and wetting (green) as alerts.