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Land cover and land use products in service of agriculture and ecosystem monitoring EuroGEO showcases

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e-shape is a "unique initiative that brings together decades of public investment in Earth Observation and in cloud capabilities into services for the decision-makers, the citizens, the industry and the researchers".

Services are no longer defined in a data-centric approach but directly by the users.

E-shape envisions to foster the development of valuable Earth Observation services with and for the users and to streamline the access to key resources (knowledge, technology, markets and capital).

Seven showcases address societal challenges, foster entrepreneurship and support sustainable development, in alignment to the three main priorities of GEO (SDGs, Paris Agreement and Sendai Framework)

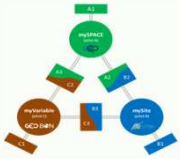


Dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (Convention on Biological Diversity-CBD)



Farmers have a double challenge – to produce food whilst simultaneously protecting nature and safeguarding biodiversity. Using natural resources prudently is essential for our food production and for our quality of life – today, tomorrow and for future generations (European Commission)

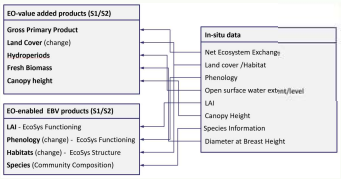




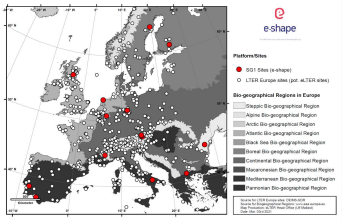
myECOSYSTEM consists of three highly complementary pilots, developed to maximize services to user groups both in their specific topical areas, but specifically through integrating and jointly using information from remote sensing (mySPACE), in-situ observation (mySITE) and high-level indicators verification and testing with an exemplary focus on biodiversity (myVARIABLE). All pilots pull together experts from the former H2020 project ECOPOTENTIAL, the emerging eLTER Research Infrastructure and GEOBON to maximise the outcome and the user community of the showcase.

Services and products are initially developed in the Virtual Laboratory (VLAB):

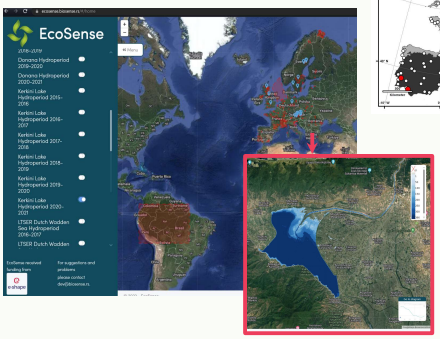




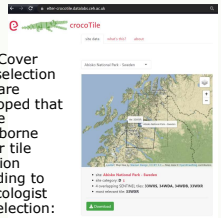
Services and products are initially developed for selected sites (in red):



Land Cover products have been integrated in EcoSense platform in support of biodiversity and habitat monitoring across regions:



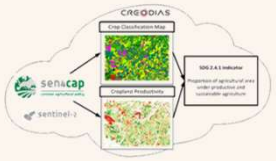
Land Cover area selection tools are developed that enable spaceborne sensor tile selection according to the ecologist site selection:



Pilot 1.1 | GEOGLAM
Pilot 1.2 | EU-CAP Support
Pilot 1.3 | Vegetation-Index Crop-Insurance in Ethiopia
Pilot 1.4 | Agro industry
Pilot 1.5 | Linking EO and Farm IoT for Automated Decision Support
Pilot 1.6 | Service for SDG 2.4.1 and 15.3.1 indicators assessment:
Pilot 1.7 | DynaCrop- unlocking EO intelligence across the food value chain

The showcase on Food Security and Sustainable Agriculture largely contributes to SDG 2. It consists of the 7 pilots, which all showcase that Copernicus data sets combined with the necessary in-situ data, weather and soil data can deliver improved information at global, national and local scale, exploiting the processing infrastructures offered by Copernicus DIAS.

Within Pilot 1.6 'Service for SDG 2.4.1 and 15.3.1 indicators assessment' colleagues from the NTUU "Kyiv Polytechnic Institute" NTUU Kyiv Polytechnic Institute and the Space Research Institute NASU-SSAU prepared recent maps of the damaged fields in Ukraine:





Tools for cultivation map creation are using both in situ and spaceborne data in order to reply to the questions:

Matter - energy interactions are crucial for agriculture, which make the land cover and use knowledge irreplaceable:





Success stories

Remote Sensing Enabled EBVs for Understanding Terrestrial Ecosystem Dynamics

Pilot 4.3 https://e-shape.eu/index.php/showcases/pilot4-3-myvariable

"Remote Sensing Enabled EBVs for Understanding Terrestrial Ecosystem Dynamics" portal has been launched by the University of Twente, Faculty of Geo-information science and Earth observation (ITC) since July 2022 in order to generate leaf area index and canopy chlorophyll content as two of the prioritized remote sensing-enable essential biodiversity variables.

The portal establishment is aligned with the aims of the "myEcosystem" showcase and "myVARIABLE" pilot. The portal enables retrieval of leaf area index and canopy chlorophyll content using Sentinel-2 imagery with 10-meter resolution at the European scale. The portal provides general information regarding the e-shape initiative

in addition to a calculator for the leaf area index and canopy chlorophyll content products. A wizard is initiated that allows selection of location, date, and product type. The Copernicus hub is accessed to download the Satellite imagery and apply it for generating the desired product. When the product is complete, it is available for download.
The created products will be maintained on the server for 48 hours before removal, allowing end-users to download and use them in their investigations or research projects.

Remote Sensing Enabled EBVs For Understanding Terrestrial Ecosystem Dynamics
http://rsebv.itc.utwente.nl/

Water extent mapping for wetland monitoring



Pilot 4.1 https://e-shape.eu/index.php/showcases/pilot4-1-myspace

Wetlands are ecosystems of high biodiversity and are fundamental for maintaining life on Earth as we know it. Wetlands are in danger of rapid decline as a result of human-induced pressures and climate change, and the needfor their efficient monitoring becomes even greater. Earth Observation data can offer a powerful approach for accurate and cost-effective monitoring of hydrological regimes and seasonal inundated transition zones. Automatic services building on the capacity provided by the Sentinel-2 and Sentinel-1 missions, without any human supervision, can serve protected areas by monitoring the extent of wetlands and inland water bodies; greatly supporting Protected Areas management and monitoring actions. WaterMasks inundation mapping service, developed by CERTH's Earth Observation Services team, utilizes Sentinel-2 multispectral images for the creation of highly accurate inundation maps. It integrates an unsupervised local-thresholding methodology, based on the physics of light interaction with water, for the classification of an area into inundated and non-inundated regions.To further overcome the limitations imposed by unfavourable weather conditions in multispectral data, WaterMasks may fuse information originating from Sentinel-1 and Sentinel-2 images together.
This allows for the monitoring capacity even under complete cloud coverage, provided that the Sentinel-2 and Sentinel-1 data used are in close temporal proximity. These unique services have been applied effectively to provide high-quality multi-temporal monitoring to numerous wetlands and protected areas, with the latest achievement being Kerkini lake, where results were promising and provided valuable insight to the area's understanding.

GEOGLAM



Pilot 1.1 https://e-shape.eu/index.php/showcases/pilot1-1-geoglam

A GEOGLAM success story: the GEOGLAM Crop monitor for the Agricultural Market information system (AMIS) and the Crop Monitor for Early Warning. GEOGLAM provide a framework that strengthens the international community's capacity to produce and disseminate relevant, timely and accurate forecasts of agricultural production at national, regional and global scales. These forecast are based Earth Observations (EO) including satellite and ground-based observations. Since their start, the Crop Monitors for AMIS and Early Warning have evolved tremendously. Especially through their collaborative set-up, bringing experts from all over the world together at a monthly basis, they become an internationally recognized source of information.
As example, in Uganda, the Ministries were able to act proactively based on the information on crop failure which were provided by the crop monitor, and by doing so saved 2.6M USD. However it is recognized that the information can be even more detailed. This is where the EAV's come in play. More, accurate and timely data on crop status, improving crop calendars at a global scale will refine even more the information we can provide to ministries, industry and farmers, further increasing the impact of the provided information.

Disaster early warning for cotton



Pilot 1.2 | EU-CAP Support, https://e-shape.eu/index.php/showcases/pilot1-2-eu-cap-support

Crop yield is exposed to a number of risks that imply farm profit uncertainty and in turn unstable income for the farmers. Adverse weather events can cause significant yield losses; nevertheless, the mere knowledge of the probable occurrence an event, from Numerical Weather Predictions (NWP), is not enough. Yield loss is greatly dependent on the phenological stage of the plant at the instance of the event. Therefore, the combination of early warning for imminent disasters and dynamic phenology predictions at the parcel level can provide trustworthy consultation on early action and evidence-based assessment for the expected yield loss. Big Earth Observation (EO) data that frequently cover very large areas, at high spatial resolution, together with state-of-the-art Artificial Intelligence (AI) models have introduced new opportunities for resilient agriculture.
The utilization of the timely knowledge of crop growth and the occurrence of upcoming weather perils is significant information for the development of risk management tools, but also the optimization of farm management and the control of inputs. In this context, farmers, agricultural consultants (GAIA EPICHEIREIN) and agricultural insurance companies (Interamerican and ELGA) benefit greatly.

Vegetation-Index Crop-Insurance in Ethiopia



Pilot 1.3 https://e-shape.eu/index.php/showcases/pilot1-3-vegetation-index-crop-insurance-in-ethiopia

Farming is a risky business, especially for small holder farmers in rainfed systems who are exposed to drought risk. Farmers are often unwilling to invest in their land due to such risks. Insurance is one way to increase the willingness of farmer by insuring agricultural credit or loans at the start of the season. These loans are used to purchase seeds, fertilizer, or equipment and increase their productivity and income

The Vegetation Index Crop Insurance (VICI) service in e-shape protects Ethiopian farmers from shocks caused by drought. VICI is based on long term timeseries of Normalised Difference Vegetation Index (NDVI) data from European Space Agency satellites that provide over 20 years of historical observations and also ensures continuous monitoring in the future. In VICI, timeseries of NDVI data is used to assess the impact of drought on crops. When the NDVI falls below a threshold value an insurance pay-out is triggered, with higher pay-outs for more intense and/or longer duration droughts.

Starting in 2019, the Index-based Crop Insurance Promotion Project (ICIP) included VICI in their Resilience Enhancement Package in Ethiopia. ICIP is a Japan

EuroGEO Showcases: Applications Powered by Europe

Project identity:

Starting date → 01 / 05 / 2019
Project information → 48 months | 68 partners | EU contribution 14 998 976.27 €.
Call (part) identifier → H2020-SC5-2018-2
Topic → SC5-15-2018 - Strengthening the benefits for Europe of the Global EarthObservation System of Systems (GEOSS) - establishing 'EuroGEO'
Coordinator → ARMINES
EU Project Officer → Erwin Goor