

## COPERNICUS DATA USED TO UNDERSTAND LANDSCAPE HISTORICAL TRANSFORMATIONS

*The ENERJIC OD Virtual Hub is a point of access to Sentinel Data and other geographic information lowering the barriers to the integration of geospatial data.*

### The challenge

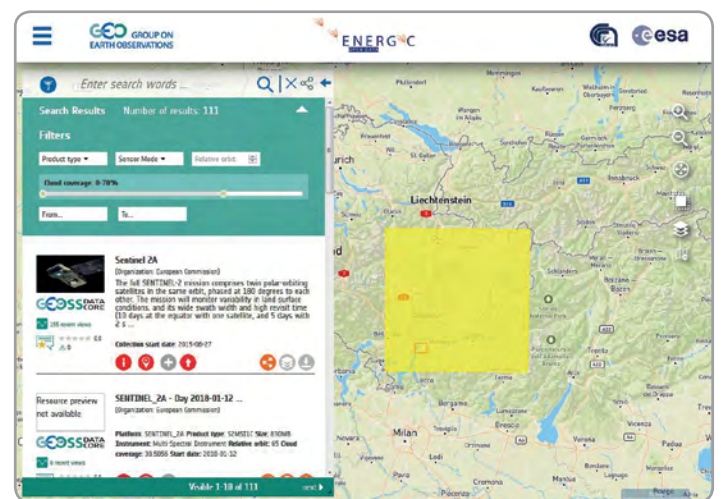
The world of geographic information (GI) is currently extremely heterogeneous. User and system requirements, too varied to be satisfied by a single system or technology, have led to an utter lack of agreement on interoperability standards, creating a barrier to the full exploitation of GI by application developers. For this reason, the integration between Copernicus data, geospatial data (GIS and crowdsourcing data) as well as unconventional GI data like historical maps, remains highly underexploited. The Pan-European Virtual Hub (PEVH) and GeoPAN application provide a solution for tracking riverbed changes by integrating heterogeneous geospatial data such as Copernicus data, information from local Spatial Data Infrastructures (SDI) and digitised historical maps.

### The space based solution

The PEVH is a single point of access to both Copernicus datasets, open geospatial datasets and unconventional GI data. Through it, an end user or a developer is able to access datasets provided by remote and heterogeneous systems, as if they were provided by a unique system. In particular, the PEVH is linked with the Sentinels Open Hub to get access to Copernicus Sentinels data.

GeoPAN is an example of application developed using the PEVH APIs. Thanks to the Virtual Hub, the development of GeoPAN application did not require the resolution of complex interoperability issues, such as the transformation of the reference system or encoding the format. Moreover, the PEVH introduces value added services, such as the support of multilingual search through GEMET vocabulary. GeoPAN allows the tracking of changes of

riverbeds by integrating various data sources. In particular, initially Sentinel-2A data were used to identify possible former riverbed areas considering soil moisture indexes (NDMI, NDWI). Then, GeoPAN enables access to high resolution seismic classification of land parcels provided by Lombardy region SDI. It has long been recognised that unconsolidated sediments, like the ones that can be found in former riverbed areas, are found to amplify ground motion during earthquakes more than ground with hard strata. For this reason, GeoPAN was designed in close cooperation with the Lombardy Order of Geologists (more than 1000 geologists) to help in seismic microzonation. Historical data are also analysed. Thus, in order to evaluate if a parcel of land has been traversed by a riverbed in the past, numerous heterogeneous data sources are needed and these very often oversee different local, regional even national PAs. GeoPAN collects a set of these sparse information and allows visualisation and data investigation within one unique tool. The application is currently undergoing testing in other European countries.



Search through the Pan-European Virtual Hub of Sentinel-2A data ([www.vh.enerjic-od.eu](http://www.vh.enerjic-od.eu)) in Lombardy (Italy).

Thematic Area



**TERRITORIAL MANAGEMENT AND URBAN PLANNING**

Region of Application



**LOMBARDY**

Sentinel mission used



**S2**

Copernicus Service used



**-**

Usage Maturity Level

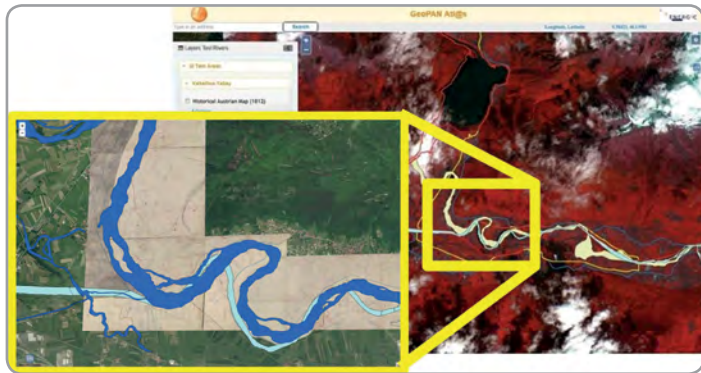


**2**

## Benefits to Citizens

The ENERGIC-OD PEVH facilitates the development of new and multidisciplinary applications based on the full exploitation of (open) GI, including INSPIRE-compliant systems, Sentinel data and Copernicus services. Such an approach is stimulating for business innovations that increasingly rely on Earth Observation information, especially for the market of geospatial open data applications.

The GeoPAN application has been extremely well received in professional environments such as the Association of Geologists as it provides a quick and easy way to track landscape transformations that have occurred across the centuries. Monitoring of such changes enables PAs to make more informed decisions regarding environmental monitoring and risk mitigation actions.



GeoPAN APP: integration of Sentinel-2A data, historical maps and shapefiles from the local (Lombardy) SDI to track riverbed changes.  
*Credit: Contains modified Copernicus Sentinel data [2016]*

“Thanks to GeoPAN it is possible to discover that today the course of the Adda river is displaced laterally towards the left bank with respect to the XIX Century one.”

*Egidio De Maron,  
Vice president of “Ordine dei Geologi della Lombardia*

## Outlook to the future

The concrete example of GeoPAN application can be replicated in other geographical areas and during emergencies caused by geo-hazards, with potential new features. In such cases, the use of PEVH could be extremely important in order to overcome bottlenecks given by lower level of data openness or be exploited to access datasets at local level (municipalities).

## Acknowledgements

The research leading to the results of this paper has been partially funded under the ICT Policy Support Programme (ICT PSP). The ENERGIC OD Pan-European Virtual Hub was developed within the ENERGIC OD European project.

Mattia Previtali<sup>1</sup>, Paolo Mazzetti and Stefano Nativi<sup>2</sup> and Miguel Ángel Latre<sup>3</sup>

1. Politecnico di Milano DABC, Italy
  2. National Research Council of Italy, (CNR-IIA), Italy
  3. Universidad de Zaragoza, Spain
- Email: [mattia.previtali@polimi.it](mailto:mattia.previtali@polimi.it)

## ABOUT COPERNICUS4REGIONS

This Copernicus User Story is extracted from the publication “**The Ever Growing use of Copernicus across Europe’s Regions: a selection of 99 user stories by local and regional authorities**”, 2018, Edited by NEREUS, the European Space Agency and the European Commission.

The model cases focus on local and regional authorities who successfully applied Copernicus data in 8 major public policy domains. The views expressed in the Copernicus User Stories are those of the Authors and can in no way be taken to reflect the official opinion of the European Space Agency or of the European Commission.

Funded by the European Union, in collaboration with NEREUS. Paging, printing and distribution funded by the European Space Agency. IPR Provisions apply. Copernicus4Regions material may be used exclusively for non commercial purposes and provided that suitable acknowledgment is given.