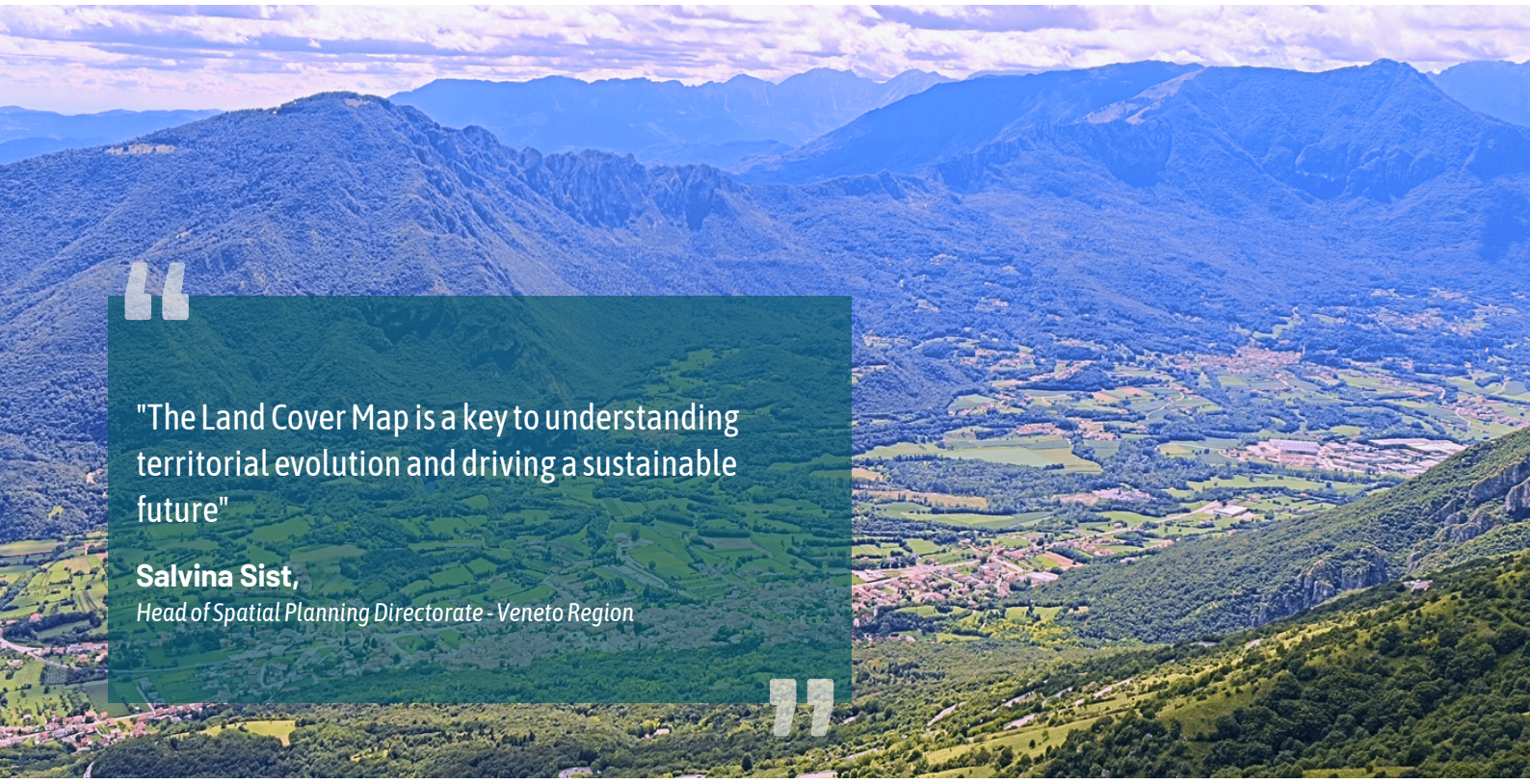
PROGRAMME OF THE EUROPEAN UNION

co-founded with esa

COPERNICUS4REGIONS 2025

EARTH OBSERVATION DATA FOR REGIONAL LAND COVER MAP UPDATING

Carlo Masetto, Umberto Trivelloni, Silvano De Zorzi, Alessandra Amoroso, Daniele Savio, Laura Magnabosco, Simone Rinaldo
Regione del Veneto - Direzione Pianificazione Territoriale | Corvallis S.p.A./TinextaCyber S.p.A. | Italy



Representative photo of the Veneto foothill area, showing natural and artificial features that contribute to the heterogeneity of land cover classesz | Own Work

The 2020 Land Cover Map update stands out for its extensive integration of Earth Observation data and the application of advanced machine learning techniques. Updating the Land Cover Map is crucial to maintaining coherence across different levels of land management. The resulting dataset is an integral part of the Regional Territorial Data Infrastructure, guaranteeing interoperability and open data access for local authorities, citizens, and professionals.

THE CHALLENGE

Since 2007, the Veneto Region has been producing a Land Cover (LC) Map at regional scale to support territorial monitoring and sustainable planning. The LC Map offers consistent, reliable data to evaluate policies, identify critical issues, and track land-use trends at both regional and local levels. Thanks to the increasing availability of satellite data—such as Sentinel missions and high-resolution imagery—the update process is now more timely, flexible, and cost-effective. One of the main challenges is to ensure spatial resolution appropriate for the regional scale and local needs (minimum mappable unit: 0.25 ha), while providing more frequent updates than national and European products, in response to the fast-changing dynamics of land use. The LC Map complies with European harmonisation standards and is interoperable with international frameworks such as the INSPIRE Directive.

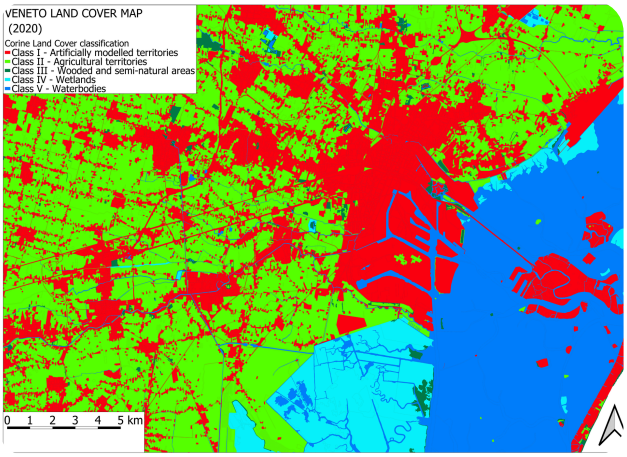
THE SPACE SOLUTIONS

The first Veneto Region Land Cover Map was produced in 2007 at a 1:10,000 scale, following the Corine Land Cover (CLC) classification. This consistency enables monitoring of territorial changes over time, with updates focusing on artificial surfaces (CLC Class I). The 2012, 2015, and 2018 editions primarily relied on aerial imagery photointerpretation.

The 2020 update introduced a more advanced workflow, integrating Sentinel-2 data and high-resolution imagery. Machine learning algorithms enabled multispectral-based change detection, while Copernicus CLMS products like CLC and HRL Imperviousness were used to support interpretation.

High-resolution SPOT imagery (1.5 m) and 20 cm orthophotos were employed to improve spatial accuracy and polygon delineation, maintaining the 1:10,000 scale. Sentinel-1 data were also considered experimentally for urban area delineation.

Change hotspots between 2018 and 2020 were identified via Sentinel-2 analysis and refined through visual interpretation to ensure accuracy. Copernicus CLMS datasets, while not the primary mapping input, provided essential reference information and helped verify trend consistency.



Example of the updated 2020 land cover classification for Veneto (Class I level shown for clarity) | Screenshot

THEMATIC AREA

Territorial Management and Urban Planning

REGION OF APPLICATION

Veneto Region

SENTINEL MISSION USED

S1, S2

COPERNICUS SERVICE USED

CLMS

THE BENEFITS AND THE BENEFICIARIES

The integration of Earth Observation (EO) data, including Sentinel missions, with traditional cartographic methods has significantly increased the value and operational potential of the Land Cover Map. This hybrid approach enables more frequent and cost-effective updates by leveraging the wide spatial and temporal coverage of freely accessible satellite data, drastically reducing the need for extensive field surveys and aerial campaigns. This supports land-use planning and environmental assessment processes with timely, consistent, and scalable information.

Reliable and up-to-date data facilitate the evaluation of public policies, the design of adaptive strategies, and the implementation of sustainable development actions. planning.

The availability of multi-temporal land cover data also allows for change detection, predictive modeling, and more transparent, evidence-based decision-making, especially in urban.

Moreover, the map contributes to environmental monitoring, risk assessment, and the verification of regulatory compliance, while promoting open access to knowledge and citizen engagement. The updated Land Cover Map is made available through a dedicated webGIS hosted on the Veneto Region Spatial Data Infrastructure (IDT-RV), ensuring widespread access for public bodies and agencies, researchers, professionals, and citizens. The entire dataset is published as open data and can be freely downloaded. Currently, the map is used by regional departments, local authorities, and sectoral planning bodies, with the platform registering about 8,000 unique visits annually.

	TIER 1 SERVICE PROVIDER	TIER 2 PRIMARY USER	TIER 3 SECONDARY USER	TIER 4 END USER BENEFICIARIES
SERVICES AND BENEFITS	Open satellite data (Sentinel-2, Sentinel-1) data, high resolution data (SPOT), aerial images (orthophotos)	Updated Land Cover Map in vector format (2020, Class I CLC). Dedicated webGIS on Veneto Region Spatial Data Infrastructure	Reference data for the territory management and spatial/urban planning at the provincial or municipal level. Input data for research purposes	Positive impact on environment, society and citizens' quality of life through the adoption of data-driven sustainable development policies
BENEFICIARIES	Corvallis S.p.A. (technical solutions) and Veneto Region (Spatial Planning Directorate - responsible for updating the Land Cover Map and maintaining the Spatial Data Infrastructure)	Veneto Region (other Directorates), Regional Environmental Agency (ARPAV), other regional agencies/public bodies	Municipalities, Districts (Province), companies & professionals working on urban planning and territorial design, universities and research structures	Citizens (regional level), society (sustainable development, economic resilience), environment

EU POLICY / DIRECTIVE

INSPIRE Directive

TYPE OF SERVICE PROVIDER

Public Service

TYPE OF FUNDING SOURCE

National or regional Non Space Programme

USAGE MATURITY LEVEL

4



A FUTURE WITH COPERNICUS

The use of satellite data is expected to increase in the Veneto Region to support the production of geospatial data and services. A new update of the Land Cover Map is currently in progress, confirming the integrated approach that includes Sentinel-2 and high-resolution satellite imagery. The 2021 edition will soon be finalized, along with speditive updates for 2022 and 2023. A 2024 edition is also planned, aiming for futher annual updates. Future editions will benefit from the use of data from the Copernicus Data Space Ecosystem, enhancing the accuracy and detail of the map.



DID YOU KNOW?

According to the Land Cover Map analysis, 14.5% of the Veneto territory is classified as artificially modified areas, 48.9% as agricultural land, 30.4% as forest and semi-natural areas, 1.7% as wetlands, and 4.5% as water bodies (2020).
More: https://idt2.regione.veneto.it/portfolio/webgis-carta-copertura-del-suolo-regione-del-veneto/

Acknowledgements

Thanks to the staff and technicians of the Veneto Region at Spatial Planning Directorate, ICT and Digital Agenda Directorate. Thanks to professionals of Corvallis S.p.A.(TinextaCyber S.p.A.) for their expertise in data editing and the final product development.

Contacts

Carlo Masetto | carlo.masetto@regione.veneto.it
Umberto Trivelloni | umberto.trivelloni@regione.veneto.it
Silvano De Zorzi | silvano.dezorzi@gmail.com
Alessandra Amoroso | alessandra.amoroso@regione.veneto.it
Daniele Savio | daniele.savio@regione.veneto.it
Laura Magnabosco | laura.magnabosco@regione.veneto.it
Simone Rinaldo | simone.rinaldo@tinextacyber.com

ABOUT COPERNICUS4REGIONS

This user story is part of the Copernicus4Regions collection, which is managed by NEREUS under an assignment from ESA. 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. Copernicus4Regions is funded by the European Union, in collaboration with NEREUS. Paging, printing and distribution funded by the European Space Agency. Graphical design by the ESA EO Graphics Bureau.
IPR Provisions apply. Copernicus4Regions material may be used exclusively for non commercial purposes and provided that suitable acknowledgment is given.

www.copernicus.eu
www.nereus-regions.eu/copernicus4regions

Browse this story at :
https://www.nereus-regions.eu/copernicus4regions/2024-user-stories-2