Assessing and mapping of land subsidence risk at different scales in major urban areas in Italy

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Enhancing our understanding of Subsidence RISK induced by groundwater exploitation towards sustainable urban development

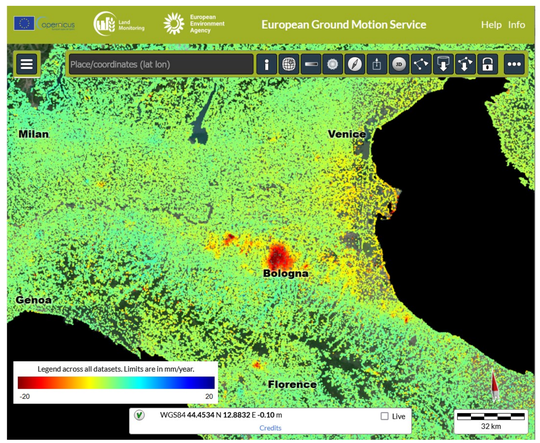
INTRODUCTION

High to very high susceptibility and hazard levels of land subsidence have been identified in several Italian regions: Emilia-Romagna and Veneto regions, where loss of land elevation up to 7 cm/year in the Po River Plain impacts 30% of the Italian population since the 1950s.

Assessing the contribution of urbanization and the growth in urban population to this process is still a challenging task.

The SubRISK+ project is aimed to provide new Earth observation-derived products and tools to improve the comprehension of current and future land subsidence in major urbanized areas of Italy.

The risk associated to land subsidence will be investigated for the 15 metropolitan cities of Italy and the Emilia Romagna region by exploiting Copernicus' European Ground Motion Service (EGMS) data.



Zoom onto the Copernicus Land Monitoring - EGMS dataset. https://egms.land.copernicus.eu/

Vertical land deformation in 2018-2022 over northern Italy.

METHOD

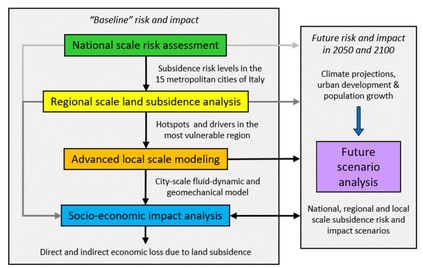
Satellite-based Interferometric Synthetic Aperture Radar (InSAR) observations will be employed to map the current land subsidence and assess the potential induced damages to urban infrastructures.

Then, a multidisciplinary approach incorporating geological, hydrogeological, geotechnical, land use data, and ground displacement observations will be implemented to disentangle the contribution of various processes and evaluate the associated triggers.

The activities will be performed across national, regional, and local scales. The use of advanced groundwater flow and geomechanics model for a "hotspot city" case study will allow to quantify the effects of groundwater exploitation and estimate uncertainties in land subsidence.

Market and non-market direct/indirect losses will be assessed at national, regional, and local scales via a newly developed socio-economic impact analysis, based on the exposure, vulnerability, and resilience of the investigated areas.

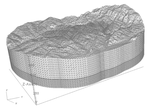
Finally, future land subsidence risk scenarios will be estimated in the medium (2050) and long term (2100).

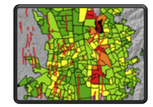


Flowchart of the SubRISK+ project methodology

EXPECTED RESULTS

- Understanding on present-day land subsidence rates and patterns across the 15 metropolitan cities of Italy, with identification of the most affected sectors and estimation of the induced risk levels for urban infrastructure
- EO data analysis methods and advanced 3D models to make them suitable to carry out region-wide and local scale assessments for the characterization of subsidence hotspots, accurate identification of key drivers and components, and the quantification of the effects of groundwater usage to land deformation
- The analysis scale of EO-based risk assessment methods, by incorporating input layers and datasets at enhanced spatial resolution and information-depth, such as cadastral and land use datasets made openly available for Emilia Romagna region, thus enabling more accurate and reliable site-specific assessments
- Assessment workflows to quantify the current and future socio-economic impact (namely market and non-market direct/indirect losses) that land subsidence already causes and may cause in the long-term in Italy.





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