BRAIN-be
Belgian Research Action through Interdisciplinary Networks

GEPATAR

GEotechnical and Patrimonial Archives Toolbox for ARchitectural conservation in Belgium

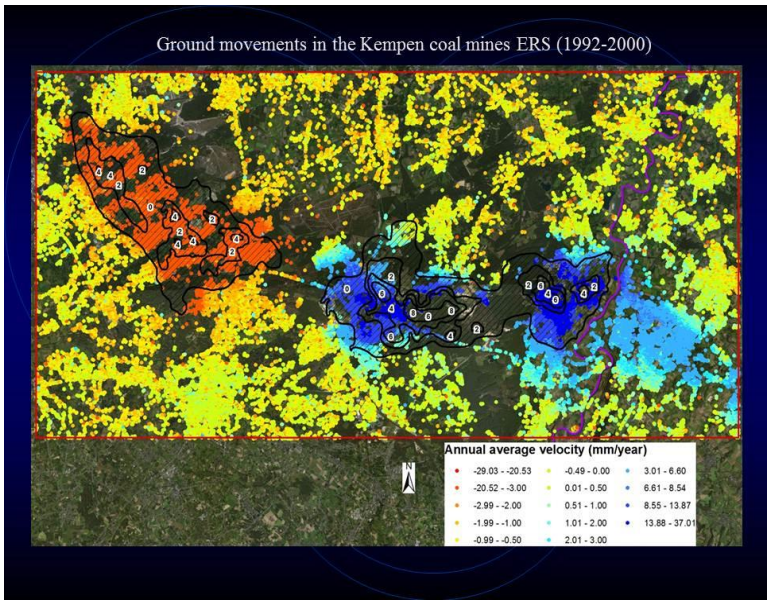
DURATION
1/12/2013 - 28/02/2018

BUDGET
755.781 €

PROJECT DESCRIPTION

Context:

In Belgium, the federal collection of built heritage is one of the largest and diverse in Europe and is visited every year by millions of people. This built heritage is of exceptional cultural and economic importance for the country and its protection is a priority at federal and regional levels. Due to heavy industrial and urban development, cultural heritage buildings suffer from physical, mechanical, chemical, and biochemical pathologies along their history. Furthermore, external human activities such as groundwater extraction, digging of underground galleries and temporary excavations all contribute to structural instability of the buildings. An adequate protection and preservation of the built patrimony requires the integration and the analysis of environmental, architectural and historical parameters.



Description:

The Royal Institute of Cultural Heritage (KIK-IRPA) is the federal scientific institution dedicated to the study, conservation and development of Belgium's cultural heritage. The Royal Belgian Institute of Natural Sciences (RBINS) has a geology department (GSB) in charge of the study of the Belgian subsoil. Both institutes have their own database, data types and methods of work. However, for efficient preservation of the Belgian cultural heritage a collaboration and integration of their data and knowledge are necessary. The project GEPATAR aims the fusion between the archives of RBINS and KIK-IRPA for better management of federal patrimony by estimating the stability of the monuments by radar interferometry.

In the first stage of the project, a dedicated remote sensing image processing tool will be developed by Central Spatial de Liege (CSL) for the exploitation of the Synthetic Aperture Radar (SAR) satellite archive available at RBINS. By the creation of PS-InSAR (Persistent Scatterer Interferometry) processing models, it will be possible to map in accuracy of millimeters, the ground movement trend at local and regional levels. In short, the radar wave emitted by the satellite is reflected by the illuminated objects, they return a signal that is recorded by the satellite and form a SAR image. The satellites in the case of ERS and ENVISAT have a period of 35 days for the same scene. It is then possible to "compare" the radar images acquired and to calculate the movement of an object through the phase difference generated by the distance change between the satellite and the object. The integration of the PS- processing and the geological and geomorphological archive of RBINS will allow the risk assessment of ground movement from national to building levels.

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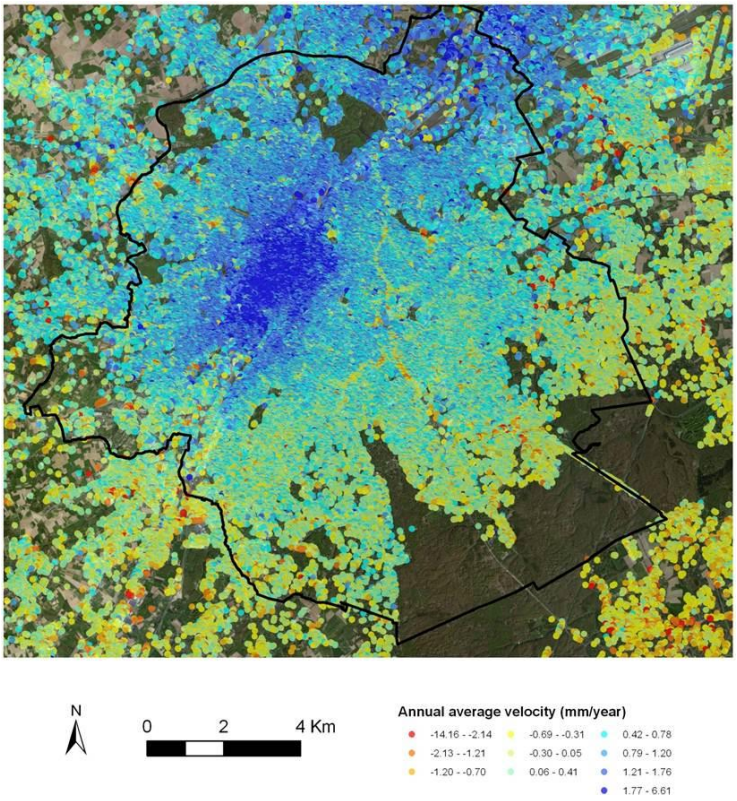
Results:

The GEPATAR toolbox will be created by the Signal and Image Centre of the Royal military Academy (RMA) in GIS environment allowing the integration of data from the KIK-IRPA archive with inputs from RBINS at three scales: national, regional and local. The integration of topographical, cadastral, land cover, geological, geomorphological and ground stability with historical, structural engineering and architectural data will allow the risk analysis for Belgian cultural heritage. At National and regional levels, GEPATAR will provide to the staff involved in defining conservation strategies at KIK-IRPA the possibility to prioritize the conservation actions. At local level (i.e. building level) GEPATAR will provide all the necessary data set to assess the risk for a patrimony building.

Evaluation of GEPATAR toolbox will be done using identified test cases. The selected monuments are located at areas where intensive urbanism and post-industrial activities have occurred. A ground movement risk model will be developed for each building for which a large set of environmental, geographical, historical and architectural data sets needs to be collected. The information will be combined using the GEPATAR modules for further structural engineering analysis, assessing the strength of the building structure by the Katholieke Universiteit Leuven (KULeuven).

Moreover, a dedicated website and a geoportal will be developed to increase the visibility of GEPATAR and to enhance the communication with the end-users at federal and regional administrative levels. The visibility of the project will be reinforced by high level publications in specialized journals.



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