



## **Integrating wireless sensor network for monitoring subsidence phenomena**

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An innovative wireless sensor network (WSN) for the 3D superficial monitoring of deformations (such as landslides and subsidence) is being developed in the frame of the Wi-GIM project (Wireless sensor network for Ground Instability Monitoring - LIFE12 ENV/IT/001033). The surface movement is detected acquiring the position (x, y and z) by integrating large bandwidth technology able to detect the 3D coordinates of the sensor with a sub-meter error, with continuous wave radar, which allows decreasing the error down to sub-cm.

The Estació neighborhood in Sallent is located over the old potassium mine Enrique. This zone has been affected by a subsidence process over more than twenty years. The implementation of a wide network for ground auscultation has allowed monitoring the process of subsidence since 1997. This network consists of: i) a high-precision topographic leveling network to control the subsidence in surface; ii) a rod extensometers network to monitor subsurface deformation; iii) an automatic Leica TCA Total Station to monitor building movements; iv) an inclinometers network to measure the horizontal displacements on subsurface and v) a piezometer to measure the water level. Those networks were implemented within an alert system for an organized an efficient response of the civil protection authorities in case of an emergency.

On 23rd December 2008, an acceleration of subsoil movements (of approx. 12-18 cm/year) provoked the activation of the emergency plan by the Catalan Civil Protection. This implied the preventive and scheduled evacuation of the neighbours (January 2009) located in the area with a higher risk of collapse: around 120 residents of 43 homes. As a consequence, the administration implemented a compensation plan for the evacuation of the whole neighbourhood residents and the demolition of 405 properties.

In this work, the adaptation and integration process of Wi-GIM system with those conventional monitoring network are presented for its testing and evaluation. The knowledge gained in the subsidence process, complemented by the huge availability of data from existing networks constitutes a solid foundation for achieving those objectives. New monitoring points have been identified, constructed, prepared to integrate the conventional monitoring system with Wi-GIM system to build a robust system compatible with WI-GIM requirements.