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UAV photogrammetry and thematic maps for environmental risk assessment in construction safety

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The rapid diffusion of UAVs (Unmanned Aerial Vehicles) has played an important role in engineering and assisting a wide range of human activities, often replacing the non-equally cost-effective traditional practices. Apart from the economic advantages, these innovative methodologies have found their maximum application in activities where the direct human intervention might be extremely risky or lead to loss of lives. One of the main aims of the EU Occupational Safety and Health (OSH) Strategic Framework 2014-2020 is to improve implementation of existing health and safety rules, putting in place effective and efficient risk prevention strategies. The easiness of flying COTS (Commercial Off-the-Shelf) UAVs and the quasi-automatic flight plan generation are currently key features for monitoring environmental risks in mid hazardous environments, and these platforms are nowadays widely employed, even by non-professional users, in those fields where an aircraft assessment was considered not economically sustainable in the recent past. For the above reasons, UAVs have been successfully used in construction safety planning applications, with particular reference to the evaluation of the risk factors connected to the site, i.e. the context conditions potentially interfering with the safe execution of the working tasks. In the presented research, UAV photogrammetry has been used as a methodology for the environmental risk assessment of the surrounding area of a construction site of hotel facilities, located in the north of Italy, in a place with a high hydro-geological risk. The intrinsic instability of these areas has been analyzed, and the support offered by this innovative technology has been used, in combination with the existing geological and geotechnical cartography, for tackling or containing the risks of landslide and avalanches. The above analysis is functional to the adoption of precautions for the safety of the construction operators, which is mandatory according to the Italian Legislative Decree no. 81/2008 “Consolidated text on safety at work”, and the subsequent use of the building for the future users, after its completion. The capability of generating a DEM (Digital Elevation Model) of the terrain is a powerful support for large-scale quantitative estimation of volumes, while the possibility of recognizing suspicious terrain conditions can be useful for the early detection of very old or new (and so not already mapped) landslide or avalanches origin points. The above analysis might be shared with the involved professionals in online repositories, using a free and open source 3D model viewer, both for collecting raw data observations and for assisting the decision-making safety planning. The possible future outcomes and the concrete possibility of implementing these technologies in the already existing traditional practices will be then discussed, outlining strengths and weakness of the proposed methodology.