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Natech events in mud flow prone areas. Methods and tools for risk prevention and mitigation

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The main objective of the present work, which is part of a National Research Project running between 2007 and 2009, is to develop methods and tools towards a better knowledge and mitigation of the Natech risk.
The work grounds on the deeping of a case study: the Municipality of Siano, in the Campania Region (Italy), located in a valley area often subjected to hydro-geological events. More specifically the examined area is periodically affected by significant hydro-geological events that trigger rapidly evolving destructive phenomena (mud flows). A liquefied gas deposit (LPG), classified as a hazardous industrial plant (according to the Seveso II Directive and the Italian Law 334/99), is also localized in the town, in an area potentially affected by mud flows, next to a residential zone and to the main way of access and escape from town. In order to single out possible strategies of mitigation and emergency management, a scenario hypothesis of events, impacts and damages was outlined, starting from singling out possible mud flows triggering points. The complexity of the problem, characterised by simultaneous mud flow events and potential secondary technological hazards, required the implementation of a GIS capable of integrating not only data deriving from different disciplinary areas (geology, land use planning) but also automatic algorithms to estimate the possible impacts and damages of each chain generated from each mud flows and taking into account the potential of secondary hazards (technological accidents). Furthermore, because the evolution of these phenomena (mud flows) highly depends on the morphology of the territory and position of the buildings, it seemed appropriate to set up a tridimensional model of the area. The scenario is sketched as a logical-conceptual chain that, grounding on the characterisation of the primary event (mud flow) and on the tridimensional model of the site and buildings, leads to single out the possible impacts of the event on the different territorial targets, including the industrial plant. Therefore, in light of these exposed targets and of their vulnerability both to the primary event and to the triggered technological one, some rates of damage were determined, with particular reference to structural damages, damages to population and possible systemic damages (blockage of escape routes, interruption or loss of industrial activities etc.). According to the outlined scenario, some possible preventative and mitigation strategies were therefore defined. These strategies are addressed both to secure the hillside and improve the current Early Warning systems, and both to reorganise, from a land use planning point of view, the area surrounding the plant.