



Assessment of infrastructure functional damages caused by natural-technological disasters

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The assessment of infrastructure damages caused by technological disaster poses several challenges, from gathering needed information on the territorial system to the definition of functionality curves for infrastructures elements (such as, buildings, road school) that are exposed to both natural and technological event. Moreover, areas affected by natural or natech (technological disasters triggered by natural events) disasters have often very large extensions and a rapid survey of them to gather all the needed information is a very difficult task, for many reasons, not least the difficult access to the existing databases and resources. We use multispectral optical imagery with other geographical and unconventional data to identify and characterize exposed elements. Our efforts in the virtual survey and during the investigation steps have different aims: to identify the vulnerability of infrastructures, buildings or activities; to execute calculations of exposition to risk; to estimate physical and functional damages. Subsequently, we apply specific algorithms to estimate values of acting forces and physical and functional damages. The updated picture of target areas in terms of risk-prone people, infrastructures and their connections is very important. It is possible to develop algorithms providing values of systemic functionality for each network element. The methodology is here applied to a natech disaster, arising from the combination of a flood event (specifically, the January 2010 flooding of Drin and Buna rivers, with a worsening in the road safety levels in the Shkoder area) with and the subsequent overturning of a truck transporting hazardous material.

The accident causes the loss of containment and the total material release. Once the release has taken place, the evolution will depend on the physical state of the substance spilled (liquid, gas or dust). As a specific case we consider the rupture of a trucks transporting liquid fuels such as gasoline through Shkoder downtown. Goods entering in Albania from north pass through Shkoder, indeed a high traffic road that connects Albania with Montenegro and Kosovo crosses Shkoder downtown. We consider a truck overturned in downtown Shkoder during the flooding of January 2010; the gasoline transported by the truck is completely released and a pool fire develops damaging roads. We use the model CHESRM (Chemical Spill Risk Mapper) for identify the threat zones of the accident and as a basis for assessing the potential leads to functional damages to other elements of the considered system.

The application of the methodology shows the potential use not only on real time emergency management or prevention but also during post-event management for the evaluation of the functional damage to the affected infrastructure (villages isolated from the rest of the network, villages unable to reach schools, hospitals or other services...) and to set a hierarchy in restoration activities, giving priority to the reconstruction of links between primary nodes.