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Theoretical framework for environmental risk assessment due to Natech event

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Natural hazards pose a significant threat to industrial areas and their surrounding environment, in particular considering that extreme natural events are expected to occur more frequently and exposure will increase due to urbanization growth. A NATECH event is defined as a NAtural hazard triggering TECHnological disasters which could affect people, the environment, other facilities and systems. NATECH research began less than thirty years ago and in the last decade these complex phenomena have been investigated by academia and industry. However, NATECH knowledge and methodology have some gaps that must be filled for better risk prevention and management. In fact, it is mainly focused on technological vulnerability or assessing its occurrence probability, yet possible consequences are only partial investigated. The aim of this study is to develop a theoretical framework to assess the environmental impact on soil and groundwater due to NATECH events triggered by flood. This is accomplished by harmonizing existing algorithms and methods for the natural and technological risk component with the new developed environmental soil and groundwater risk component into a coherent modelling chain. The proposed framework utilizes data from natural driven forces (e.g. flood height and velocity) and their probabilities of occurrence. These driven forces are applied to storage tanks through an existing vulnerability model. In order to evaluate resistance pressures, the model requires tank geometries and hypothetical filling level distribution. In addition, a simplified environmental risk model is applied at site scale depending on the stored product (e.g. gasoline, petroleum, etc.) in order to evaluate an affected area and its potential degree of contamination of soil and groundwater. The proposed framework is applied to a realistic case study and results and critical points would be discussed. We believe that the general theoretical framework could be adapted to any natural triggering phenomena (e.g. earthquakes, lighting, etc.), in order to assess environmental impacts due to NATECH events.