



Flood risk assessment for industrial plants. A case study

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Several records reported in the literature and in accident databases evidenced that flood events may trigger severe accidents in industrial plants and storage sites where relevant inventories of hazardous substances are present. The flood impact may cause severe damages to process equipment and to storage tanks, resulting in multiple and extended releases of hazardous materials. The industrial accidents triggered by flood events may be a relevant cause of direct damages to the population in nearby residential areas, due to the effects of the event (blast waves, toxic releases, water and soil contamination, etc.), and of indirect damages due to the delay of emergency rescue operations following the event. The severity of possible accidental scenarios depends on the type of flood events and on the different modalities of water impact (e.g., floodplain inundation with high water level or flash flood with high water velocity). Nevertheless scarce attention was devoted to the assessment of the risk related to accidents triggered by natural events. The available information is often fragmented, thus it is not possible to obtain a precise quantification of the hazard and risk associated to these events. In the present study a general framework is proposed in order to identify the reference flood scenarios. The consequent credible modes of structural damage of equipment items were defined using simplified damage models. The consequences of the credible scenarios caused by the release of hazardous substances were assessed, also considering the specific scenarios due to the interaction of hazardous substances with water. An approach to the assessment of risk associated to industrial accidents triggered by floods was also proposed. The procedure developed was applied to a case-study derived from an actual site of the Emilia-Romagna region in Italy. Reference flood scenarios were simulated using a two-dimensional hydraulic model. The results obtained allowed a

preliminary identification of possible damage to equipment and of the consequence of the release of hazardous materials. The results evidenced the value of the approach in the perspective of a quantitative risk assessment of accidental events triggered by floods in industrial sites.