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Disaster Management Approach for Planning an Early Response to Earthquakes in Urban Areas

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Abstract : Determining appropriate measures to face earthquakesarea challenge for practitioners. In the literature, some analyses consider disaster scenarios, disregarding some important field characteristics. Sometimes, software that allows estimating the number of victims and infrastructure damages is used. Other times historical information of previous events is used, or the scenarios'informationis assumed to be available even if it isnot usual in practice. Humanitarian operations start immediately after an earthquake strikes, and the first hours in relief efforts are important; local efforts are critical to assess the situation and deliver relief supplies to the victims. A preparation action is prepositioning stockpiles, most of them at central warehouses placed away from damage-prone areas, which requires large size facilities and budget. Usually, decisions in the first 12 hours (standard relief time (SRT)) after the disaster are the location of temporary depots and the design of distribution paths. The motivation for this research was the delay in the reaction time of the early relief efforts generating the late arrival of aid to some areas after the Mexico City 7.1 magnitude earthquake in 2017. Hence, a preparation approach for planning the immediate response to earthquake disasters is proposed, intended for local governments, considering their capabilities for planning and for responding during the SRT, in order to reduce the start-up time of immediate response operations in urban areas. The first steps are the generation and analysis of disaster scenarios, which allow estimatethe relief demand before and in the early hours after an earthquake. The scenarios can be based on historical data and/or the seismic hazard analysis of an Atlas of Natural Hazards and Risk as a way to address the limited or null available information.The following steps include the decision processes for: a) locating local depots (places to prepositioning stockpiles)and aid-giving facilities at closer places as possible to risk areas; and b) designing the vehicle paths for aid distribution (from local depots to the aid-giving facilities), which can be used at the beginning of the response actions. This approach allows speeding up the delivery of aid in the early moments of the emergency, which could reduce the suffering of the victims allowing additional time to integrate a broader and more streamlined response (according to new information)from national and international organizations into these efforts. The proposed approachis applied to two case studies in Mexico City. These areas were affectedby the 2017's earthquake, having limited aid response. The approach generates disaster scenarios in an easy way and plans a faster early response with a short quantity of stockpiles which can be managed in the early hours of the emergency by local governments. Considering long-term storage, the estimated quantities of stockpiles require a limited budget to maintain and a small storage space. These stockpiles are useful also to address a different kind of emergencies in the area.

Keywords : disaster logistics, early response, generation of disaster scenarios, preparation phase
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