SECOND EUROPEAN CONFERENCE ON EARTHQUAKE ENGINEERING
AND SEISMOLOGY, ISTANBUL AUG. 25-29, 2014

THE DISRUPTION INDEX APPLICATION FOR LORCA TOWN (SE-SPAIN)

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Urban environments are complex systems characterized by interconnected sub-systems (e.g. building environment, healthcare system, urban facilities, and lifelines). When an earthquake hits an urban system the exposed elements, services, networks etc. could be affected causing disruption in the functionality of the urban area and surrounding areas.

On 11 May 2011, at 18:47 local time, an earthquake (Mw5.2, I_{EMS98} VII) shook the city of Lorca causing 9 fatalities and more than 300 people injured. The main shock was preceded by a large Mw4.5 foreshock at 17:05 local time. Lorca is a moderate size town (59.683 inhabitants and around 7 square kilometres) located in the Murcia region (SE-Spain). Around 1000 buildings (including residential, cultural heritage, schools, government buildings, healthcare, security facilities etc.) were damaged in different degrees. This event has provided a significant amount of data on direct impact on constructions, urban infrastructures and facilities which were vital for the functionality of the city during and after the main aftershock.

The Disruption Index (DI) approach has been applied for Lorca to analyse the level of disruption of the town for different earthquake scenarios and to compare to the effects of the 2011 Lorca earthquake. Through DI approach the direct impact on analyzed sub-systems and the impact level can be assessed (e.g. Ferreira et al., 2014; Mota de Sá et al., 2013).

Data related to buildings, critical facilities and lifelines has been extracted from Spanish official databases, while data related to observed damage during the 2011 Lorca earthquake has been provided by the DG Citizen Security and Emergencies of Murcia Region. GIS databases have been generated including building data of 7432 buildings referred to 2011-2013 Spanish Cadastral database at building scale (location, shape, year of construction, number of floors, use etc). Residential buildings constitute 70% of the total number of buildings.

The sub-system assessed are those corresponding to residential buildings, hospitals, schools, security facilities (police stations, government buildings), lifeline services (electricity, water) and transportation network (bridges and train stations, bus stations). The components of the sub-systems were grouped into vulnerability classes, following RISK-UE approach for buildings (Milutinovic & Trendafiloski, 1998, 2003), and those in ERSTA project for lifelines (Azevedo et al., 2010).

Results, as obtained through DI approach, for a repetition of the Lorca earthquake, are compared to observed damage and effects to further improve assumptions on vulnerability. Further

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results in terms of direct impact on sub-systems and level of disruption in Lorca for different earthquake scenarios are analysed and discussed, for improvement of seismic risk assessment and future emergency planning.

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