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# Incorporating natural hazard assessments into municipal master-plans; case-studies from Israel

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The active Dead Sea Rift (DSR) runs along the length of Israel, making the entire state susceptible to earthquake-related hazards. Current building codes generally acknowledge seismic hazards and direct engineers towards earthquake-resistant structures. However, hazard mapping on a scale fit for municipal/governmental planning is subject to local initiative and is currently not mandatory as seems necessary. In the following, a few cases of seismic-hazard evaluation made by the Geological Survey of Israel are presented, emphasizing the reasons for their initiation and the way results were incorporated (or not).
The first case is a seismic hazard qualitative micro-zonation invited by the municipality of Jerusalem as part of a new master plan. This work resulted in maps (1:50,000; GIS format) identifying areas prone to (1) amplification of seismic shaking due to site characteristics (outcrops of soft rocks or steep topography) and (2) sites with earthquake induced landslide (EILS) hazard. Results were validated using reports from the 1927, M=6.2 earthquake that originated along the DSR about 30km east of Jerusalem. Although the hazard maps were accepted by municipal authorities, practical use by geotechnical engineers working within the frame of the new master-plan was not significant. The main reason for that is apparently a difference of opinion between the city-engineers responsible for implementing the new master-plan and the geologists responsible of the hazard evaluation.
The second case involves evaluation of EILS hazard for two towns located further north along the DSR, Zefat and Tiberias. Both were heavily damaged more than once by strong earthquakes in past centuries. Work was carried out as part of a governmental seismic-hazard reduction program. The results include maps (1:10,000 scales) of sites with high EILS hazard identified within city limits. Maps (in GIS format) were sent to city engineers with reports explaining the methods and results. As far as we know, widespread implementation of the maps within municipal master plans never came about, and there was no open discussion between city engineers and the Geological Survey. The main reasons apparently are (1) a lack, until recently, of mandatory building codes requiring incorporation of EILS hazard; (2) budget priorities; (3) failure to involve municipality personnel in planning and executing the EILS hazard evaluation.
These cases demonstrate that for seismic hazard data to be incorporated and implemented within municipal master-plans there needs to be (1) active involvement of municipal officials and engineers from the early planning stages of the evaluation campaign, and (2) a-priori dedication of funds towards implementation of evaluation results.