



## **Earthquake Hazard and Risk Assessment based on Unified Scaling Law for Earthquakes: State of Gujarat, India**

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The Gujarat state of India is one of the most seismically active intercontinental regions of the world. Historically, it has experienced many damaging earthquakes including the devastating 1819 Rann of Kutch and 2001 Bhuj earthquakes. The effect of the later one is grossly underestimated by the Global Seismic Hazard Assessment Program (GSHAP). To assess a more adequate earthquake hazard for the state of Gujarat, we apply Unified Scaling Law for Earthquakes (USLE), which generalizes the Gutenberg-Richter recurrence relation taking into account naturally fractal distribution of earthquake loci. USLE has evident implications since any estimate of seismic hazard depends on the size of the territory considered and, therefore, may differ dramatically from the actual one when scaled down to the proportion of the area of interest (e.g. of a city) from the enveloping area of investigation. We cross compare the seismic hazard maps compiled for the same standard regular grid  $0.2^\circ \times 0.2^\circ$  (i) in terms of design ground acceleration (DGA) based on the neo-deterministic approach, (ii) in terms of probabilistic exceedance of peak ground acceleration (PGA) by GSHAP, and (iii) the one resulted from the USLE application. Finally, we present the maps of seismic risks for the state of Gujarat integrating the obtained seismic hazard, population density based on 2011 census data, and a few model assumptions of vulnerability.