Geophysical Research Abstracts
Vol. 16, EGU2014-15707, 2014
EGU General Assembly 2014


# Application of the GEM Inventory Data Capture Tools for Dynamic Vulnerability Assessment and Recovery Modelling

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A set of open-source tools to create building exposure datasets for seismic risk assessment was developed from 2010-13 by the Inventory Data Capture Tools (IDCT) Risk Global Component of the Global Earthquake Model (GEM). The tools were designed to integrate data derived from remotely-sensed imagery, statistically-sampled in-situ field data of buildings to generate per-building and regional exposure data. A number of software tools were created to aid the development of these data, including mobile data capture tools for in-field structural assessment, and the Spatial Inventory Data Developer (SIDD) for creating "mapping schemes" - statistically-inferred distributions of building stock applied to areas of homogeneous urban land use. These tools were made publically available in January 2014. Exemplar implementations in Europe and Central Asia during the IDCT project highlighted several potential application areas beyond the original scope of the project. These are investigated here.
We describe and demonstrate how the GEM-IDCT suite can be used extensively within the framework proposed by the EC-FP7 project SENSUM (Framework to integrate Space-based and in-situ sENSing for dynamic vUlnerability and recovery Monitoring). Specifically, applications in the areas of 1) dynamic vulnerability assessment (pre-event), and 2) recovery monitoring and evaluation (post-event) are discussed. Strategies for using the IDC Tools for these purposes are discussed.

The results demonstrate the benefits of using advanced technology tools for data capture, especially in a systematic fashion using the taxonomic standards set by GEM. Originally designed for seismic risk assessment, it is clear the IDCT tools have relevance for multi-hazard risk assessment. When combined with a suitable sampling framework and applied to multi-temporal recovery monitoring, data generated from the tools can reveal spatio-temporal patterns in the quality of recovery activities and resilience trends can be inferred. Lastly, this work draws attention to the use of the IDCT suite as an education resource for inspiring and training new students and engineers in the field of disaster risk reduction.