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Quantifying risk to natural hazards - what can VHR imagery provide

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The losses due to natural disasters are on the increase also because mitigation or prevention measures are not put in place even in disaster hotspots regions. Mitigation and prevention can be implemented if disaster risk assessments are computed. Often, especially in developing countries there are no resources, datasets or expertise that can be used for assessing disaster risk.

For this reason an urban risk assessment methodology was developed based on very high resolution (VHR) satellite imagery as well as field information both integrated in a GIS environment. The GIS provides the framework for integrating field information, maps and geospatial data. One important source of information used in this methodology is optical very high resolution satellite imagery with spatial resolution of 1 m x 1 m. First, it provides selected parameters to hazard modeling. Second, VHR imagery allows to quantifying the element at risk that in this study is both the building stock and the population total. Population totals is indirectly derived from the building stock. Third, VHR provides information on the physical - often referred also as structural - vulnerability of the building stock that relates to building type its construction material and building codes. In fact, vulnerabilities are indirectly measured from a number of parameters derived from imagery that are coded into the GIS. These include size of the building – measured as the footprint- , its age – measured from change detection analysis with older imagery, the geographical settings, the spatial arrangement and the density of buildings. Vulnerability is always measured and/or validated through field surveys. Other data sources required to support local risk management complement and integrate satellite imagery.

The model output quantifies potential financial losses in relation to different hazard intensities and provides facilities for better managing such risks. Results can be further used by local governments for risk mitigation, disaster response and recovery planning, public awareness campaigns up to micro-insurance programs.
The method developed is reproducible and easy to implement. The generic model can be applied for different hazard types in all regions of the world. Nevertheless the challenges for wider implementation of high resolution spatial data and geographic analysis are related to cost, technical expertise and political support.