Global Earthquake and Volcanic Eruption Economic losses and costs from 1900-2014: 115 years of the CATDAT database – Trends, Normalisation and Visualisation

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Over the past 12 years, an in-depth database has been constructed for socio-economic losses from earthquakes and volcanoes. The effects of earthquakes and volcanic eruptions have been documented in many databases, however, many errors and incorrect details are often encountered. To combat this, the database was formed with socioeconomic checks of GDP, capital stock, population and other elements, as well as providing upper and lower bounds to each available event loss.

The definition of economic losses within the CATDAT Damaging Earthquakes Database (Daniell et al., 2011a) as of v6.1 has now been redefined to provide three options of natural disaster loss pricing, including reconstruction cost, replacement cost and actual loss, in order to better define the impact of historical disasters. Similarly for volcanoes as for earthquakes, a reassessment has been undertaken looking at the historical net and gross capital stock and GDP at the time of the event, including the depreciated stock, in order to calculate the actual loss. A normalisation has then been undertaken using updated population, GDP and capital stock. The difference between depreciated and gross capital can be removed from the historical loss estimates which have been all calculated without taking depreciation of the building stock into account. The culmination of time series from 1900-2014 of net and gross capital stock, GDP, direct economic loss data, use of detailed studies of infrastructure age, and existing damage surveys, has allowed the first estimate of this nature.

The death tolls in earthquakes from 1900-2014 are presented in various forms, showing around 2.32 million deaths due to earthquakes (with a range of 2.18 to 2.63 million) and around 59% due to masonry buildings and 28% from secondary effects. For the death tolls from the volcanic eruption database, 98000 deaths with a range from around 83000 to 107000 is seen from 1900-2014. The application of VSL life costing from death and injury tolls from historic events is discussed.

The CATDAT socioeconomic databases of parameters like disaggregated population, GDP, capital stock, building typologies, food security and inter-country export interactions are used to create a current exposure view of the world.

The potential for losses globally is discussed with a re-creation of each damaging event since 1900, with well in excess of $10 trillion USD in normalised losses being seen from the 115 years of events. Potential worst case events for volcano and earthquake around the globe are discussed in terms of their potential for damage and huge economic loss today, and over the next century using SSP projections adjusted over a country basis including inter-country effects.