CATDAT

Integrated Historical Global Catastrophe Database

Damaging Earthquakes and Volcanoes Databases

EGU 2011-4909

abstract

Problem Definition

With the increasing number of earthquake and volcano effect databases and reports worldwide, the number of erroneous and contradicting figures is increasing. The exact number of deaths can never be exactly quantified post-disaster due to quick burials, decomposition, inaccurate counting and other reasons; however, with careful analysis of all sources detailing effects relating to an earthquake, an educated judgement can be made as to a range of fatalities. This can be similarly undertaken for estimates of injured, homeless, affected, building damage, economic losses and other socio-economic consequences of earthquakes & volcanoes.

What is CATDAT?

The newly built global CATDAT damaging earthquakes and secondary effects (tsunami, fire, landslides, liquefaction and fault rupture) and damaging volcanoes databases were developed to validate, remove discrepancies and expand greatly upon existing global databases; and to better understand the trends in vulnerability, exposure and possible future impacts of such historic earthquakes.

Over 17000 sources of information have been utilised primarily in the last few years to present data from over 12200 damaging earthquakes historically with over 7000 earthquakes since 1900 examined and validated before insertion into the database. For volcanoes, over 1700 damaging volcanic incidents have been recorded with 950+ since 1900. Each validated disaster includes seismological/volcanological information, building damage, ranges of social losses to account for varying sources (deaths, injuries, homeless and affected) and economic losses (direct, indirect, aid and insured).

A damaging earthquake or volcano is entered into the CATDAT database by the following criteria:-

- Any disaster causing collapse of structural components.
- Any disaster causing death, injury or homelessness.
- Any disaster causing damage or flow-on effects exceeding $100,000 international dollars, Hybrid Natural Disaster Economic Conversion Index adjusted to 2011.
- Any disaster causing disruption with a reasonable economic or social impact as deemed appropriate.
- Further validation of macroseismic, corruption and socio-economic parameters.

How does CATDAT help the community?

CATDAT provides a significantly increased database of historic earthquake information combined with socio-economic analysis not before undertaken, including the creation of country-based Human Development Index, GDP, wages, exchange rate, and other indices not only spatially or for current conditions but also back through time. This provides a unique view of historic losses and creates more comparisons between events. The database is also being used in the creation of advanced earthquake and volcano loss estimation algorithms.

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Database Development

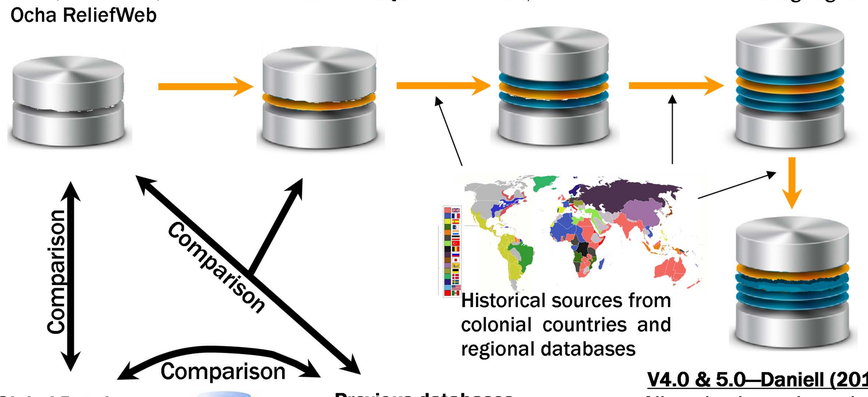
The process used to create the earthquake database

V0.0—Daniell (2003-07) Books, papers, News, newspapers, NGOs, insurance, Ocha ReliefWeb

V1.0—Daniell (2008-09) Compared version with additional references and all current EQs

V2.0—Daniell (2009) V1.0 with additional comparison with PAGER-CAT, PDE, Richmond

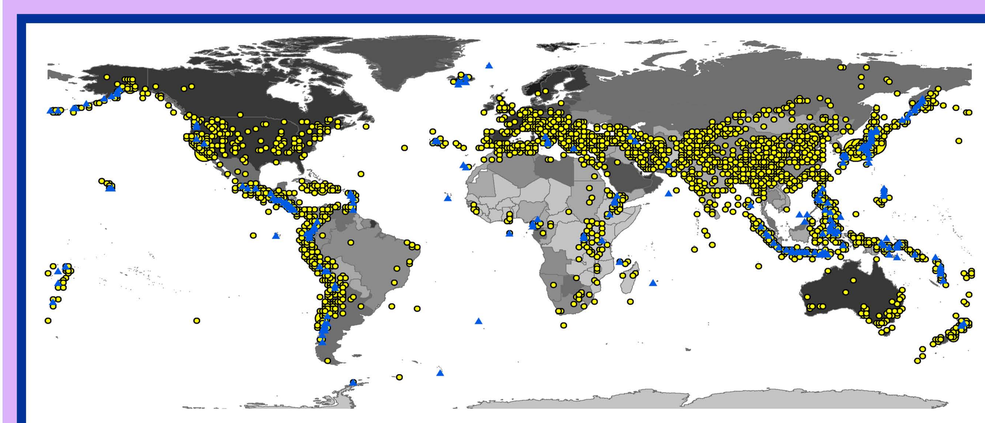
V3.0—Daniell (2009-10) Foreign language sources in over 50 Languages



Global Databases EM-DAT, NGDC, Utsu, MRNATHAN, BASICS, Sigma, ADRC GLIDE.

Previous databases Ganse and Nelson, 1981 Milne, 1912, BSSA 1911-2007, Gu et al. 1989 and many others.

V4.0 & 5.0—Daniell (2010-11) All major journals and conferences and each new earthquake added as a combination of internet, USGS and journal data + earthquake-report.com



The no. of damaging EQs (over 7000) and Volcs (over 950) housed in the database between 1900 & 2011 in each country. Pre-1900, there are over 6000 more records.

What is the information housed in the databases

Date, time, country codes 10 parameters.

Seismological Information 8 parameters.

Range of Social Losses (μ, σ) 21 parameters. (Deaths, Injuries (H, L), Homeless, Affected, Missing).

Range of Economic Losses (μ, σ) 20 parameters. (Direct, Indirect (Tang., Intang.), Aid, Life Cost, HNDECI).

Range of Insured Losses (μ, σ) 10 parameters. (Loss, adjusted, sources, takeout %, typology).

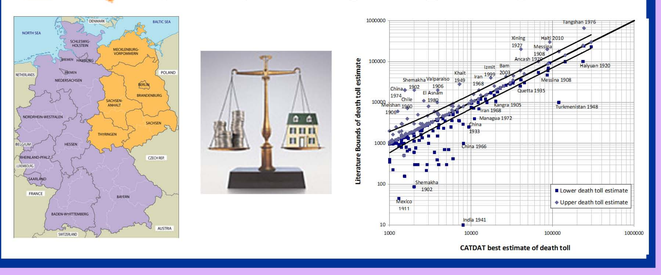
Shaking and Secondary Effect discretisation for all losses 12 parameters.

Infrastructure Damage Levels 9 parameters. (Residential (L1-5), Large Loss, Critical etc.).

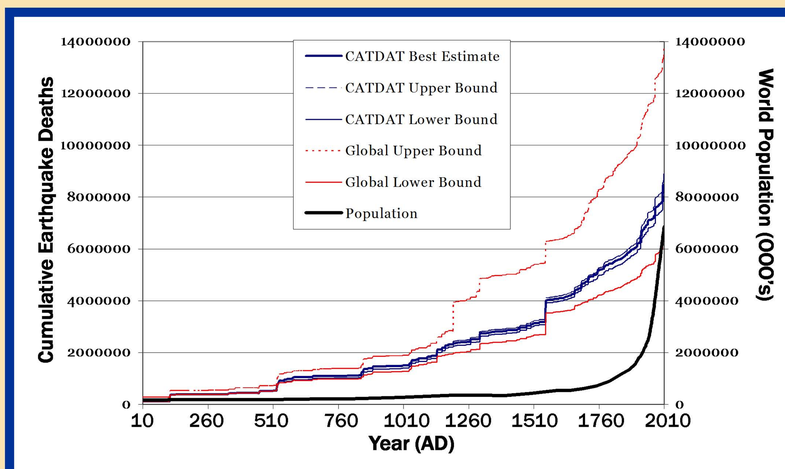
Rankings due to Social, Economic, HDI, GDP, Exposure, Vulnerability, Population, Building Stock, Urbanity.

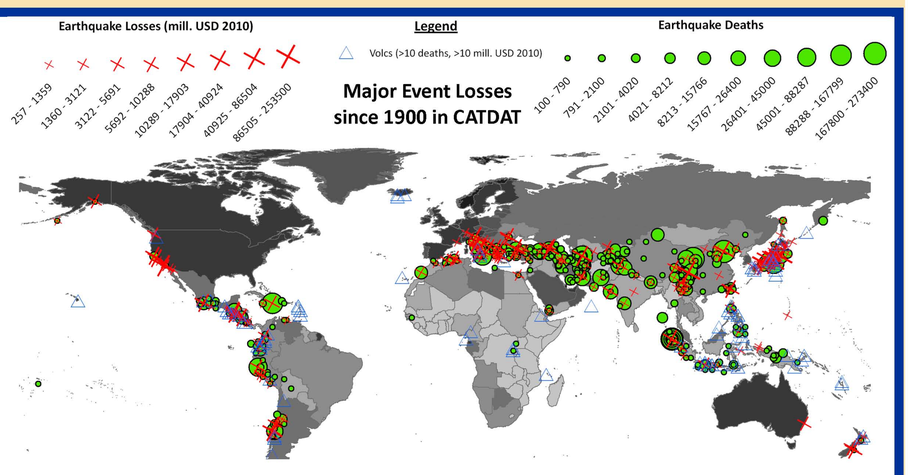
Full Word Description from over 14000 sources.

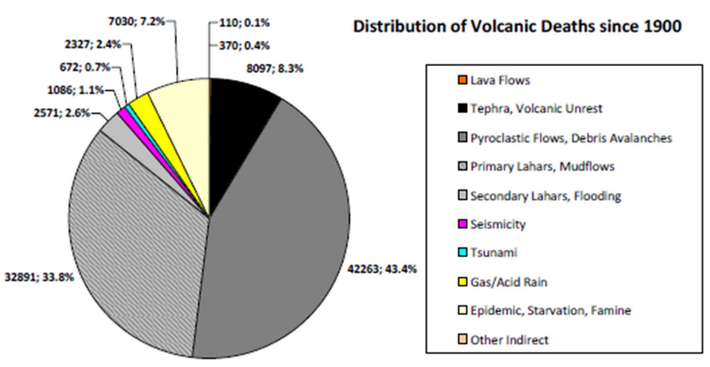
NGDC, PAGER-CAT, EM-DAT, etc. Comparison
Links to EQLIPSE Building Inventory & ReliefWeb
Normalisation strategies for current conditions
Split Country effects for EQs affecting > 1 country.

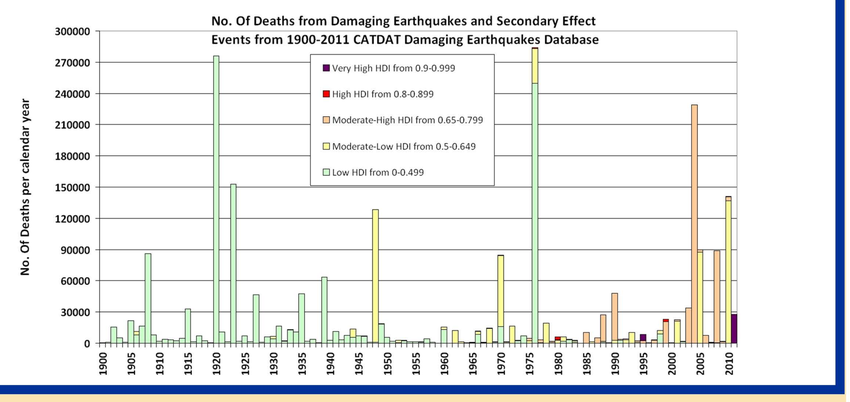


A quick glimpse of the global losses picture









Socio-economic Indices & future directions

Many other socio-economic indicators and global indices through time have been created in order to analyse losses from each event along with re-creation of each historic disaster.

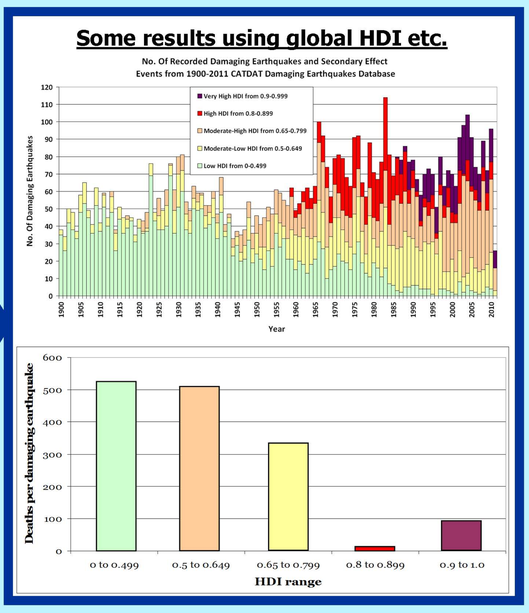
Indices created so far for use in CATDAT from 1900-2011, for 244 disaggregated countries

- Human Development Index (Life Expectancy, Literacy Rate, GDP per capita, Enrolment Ratio).
- Gross Domestic Product (PPP and Nominal).
- Consumer Price Index, Wages, Exchange Rates.
- Hybrid Natural Disaster Economic Conversion Index.
- Urban and Rural Population.
- Building Inventory, Codes and Practice.
- Other construction-based indices.

Other Socio-Economic Indices created so far for use in CATDAT for 244 disaggregated countries

- 120+ Social Indicators for poverty and inequality, education, health, development/infrastructure, governance, population.
- 90+ Economic Indicators for economy, employment, energy, growth and income.

Some results using global HDI etc.



Future directions for CATDAT

The CATDAT database of historical damaging earthquakes and volcanoes is a dynamic entity and will continue to be updated with each new worldwide earthquake with socio-economic loss.

- The socio-economic indices will continue to be combined with the database to produce socio-economic functions for earthquake loss estimation.
- Development of links with global entities.
- Continued expansion from historical sources for v6.0EQ and v3.0VOLC and trend analysis.
- Continued conversion into an easy to use, display format and integration with OPAL, Earthquake-report and EQLIPSE.

CATDAT aims to provide an extensive, validated database of historic & current disaster tools for use in socio-economic earthquake loss estimation methods.

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