CATDAT

Integrated Historical Global Catastrophe Database

Damaging Earthquakes Database 2011 – The Year in Review

James Daniell & Armand Vervaeck

General Sir John Monash FOUNDATION

SOS

CEDIM

Center for Disaster Management and Risk Reduction Technology

Forensic Earthquake Analysis Group

CEDIM

KIT

Karlsruhe Institute of Technology

Author's Notes

We hope that you enjoy the **CATDAT Yearly Review of Damaging Earthquakes in 2011**. The CATDAT Database has been built up by collecting earthquake, flood and other natural disaster loss data for quite a few years since 2003 at the University of Adelaide, with a more concerted effort in the past 3 to 4 years to build up the databases further. This report in 2011 only shows a small percentage of the data collected but a new and exciting future in earthquake reporting. In the last 12 months, we have reported constantly on **www.earthquake-report.com**, founded by Armand Vervaeck, and worked tirelessly to provide the best quality scientific reporting of felt earthquake and volcanic events worldwide and CATDAT to provide detailed accounts on every damaging earthquake worldwide.

The purpose of this report is to present the damaging earthquakes in the year 2011 around the world that were entered into the CATDAT Damaging Earthquake Database in terms of their socio-economic effects. This 2011 report showcases the work that CATDAT, in collaboration with earthquake-report.com/SOS Earthquakes, is doing.

A big thanks to Maren for supporting me through the sporadic late nights (when earthquakes have occurred), as well as with SMS updates, translations, constant earthquake discussions and intellectual conversations. I would also like to thank my parents, Anne and Trevor, and also my sister, Katherine, and brother-in-law, Quentin, for the numerous reports and papers I have sent them and they have checked and for the numerous updates as to natural disaster data.

A big thank you goes to the **General Sir John Monash Foundation** (supported by the Australian Government) that has been funding my PhD research at Karlsruhe at KIT/CEDIM and allowed me to choose this location from all worldwide institutions (and in particular I would like to thank Peter Binks). I would like to also thank the University of Adelaide, Université Joseph Fourier Grenoble, University of Pavia and Karlsruhe Institute of Technology for my education and for their promotion of learning and development outside the course environment.

Thank you also to the Center of Disaster Management and Risk Reduction Technology (CEDIM) for supporting me in my research in the natural disaster field. In addition, I would like to thank Friedemann Wenzel, Bijan Khazai and Tina Kunz-Plapp for their interest, support and motivating me to publish my work. I have also been aided by a number of interested individuals for components of the database but with the amount of data around on historical damaging earthquakes, I am always interested in new reports, studies, questions, comments, improvements and collaboration.

I would also like to urge people's involvement with some great worldwide earthquake and natural disaster risk related initiatives out there – just to mention a few; Willis Research Network (WRN), EERI, USGS-PAGER, GEM, EMSC-CSEM, GEO-CAN and WAPMERR.

Many thanks,

James Daniell

SOS Earthquakes and Earthquake-report.com were developed to report about earthquakes and volcanoes in the best possible way and to create value-added information with a scientific and earthquake loss estimation perspective.

Earthquake Report bridges the gap in-between science and basic understanding. News in the site not only appears very quickly, but we will always try to bring "Added Value" and "Scientific/Social Insight" news that you will not find anywhere else, as well as data from CATDAT.

Earthquake Report focusses on the Impact of Earthquakes and Volcanoes on society. We will search, analyse and create in-depth socio-economic reports for unique news, even in the most remote places on Earth. Victims of an earthquake in the jungle of Papua New Guinea merit the same attention as those people living in San Francisco, Tokyo, Port-au-Prince or Concepción.

Earthquake-Report.com is the information part of **SOS Earthquakes**, a **non-profit organization** specializing in earthquakes, with 5 important goals:

-bringing the best possible, highest quality **earthquake information including CATDAT data**
-providing **free or cheap technology tools for mass media** (QuakeSOS iPhone application)
-providing **Quick and Structural aid** to earthquake victims all over the world (still to be organized)
-giving rational unbiased geophysical, seismological, engineering and scientific earthquake details.
-working on earthquake **preparedness and prevention**.
Earthquake Report also supports QuakeSOS, the earthquake emergency iPhone Application.

SOS Earthquakes was founded in August 2010. SOS Earthquakes and Earthquake-Report.com are private initiatives to make the world just a little bit better. Every single donated dollar as a lifeline that strengthens our initiative and is needed for server space, programming and increased data gathering capability.

We welcome also the support of STRATEGIC PARTNERS who will enable us to reach as many people as possible. **Strategic partners can be individuals or companies** who want to make the world less traumatic, just like we do, or people or **companies who require the latest damage, casualty, aid, economic and social data from earthquakes**.

In this respect earthquake-report.com and CATDAT together provide the latest and best up-to-date information post-earthquake with a rapidly growing number of subscribers and data input sources.

Please contact me or James to make a donation or to become a strategic partner. **Without monetary support, this service unfortunately cannot continue.**

Postal address : Cederstraat 21, 2800 Mechelen, Belgium, Phone : +32478299395 Fax : +3215414670

In addition, I would like to thank my wife, Gerda, for her loving support through my 24-hour a day reporting and work with earthquake-report.com, and also to my family and friends as well as the millions of earthquake-report.com readers and subscribers. Thankyou and I hope that we can continue the service in 2012.

Many thanks,

Armand Vervaeck

TABLE OF CONTENTS

LIST OF FIGURES

Page

LIST OF TABLES

Page

1 Introduction

2011 has played host to the largest two earthquakes, economically speaking, in the history of the countries of Japan and New Zealand. The M9.0 Tohoku earthquake and tsunami of 11th March, 2011 proved to be the most expensive earthquake of all time, causing between $400-700 billion USD in total losses and approximately 19000 deaths, while the Christchurch earthquake (a M6.3 quake close to the city of Christchurch) caused a huge building stock loss and approximately $15-20 billion USD damage with around 80% insured losses. Their respective aftershocks caused further damage. Significant losses were also seen in Turkey from the Van earthquake in October, in the India-Nepal-Tibet region in September, in China from numerous earthquakes in the Yunnan and Xinjiang Provinces and in the USA from the Virginia earthquake.

In addition, in the first half of 2011, the news came out that the death toll in Haiti was overestimated significantly. A report from a US-based consultancy group, LTL Strategies, as part of a USAID report, showed that the death toll was between 46190 and 84961. Daniell et al. (2010f, 2011j) using various approaches concluded that a death toll of **136933**, with a range of 121843 to 167082 dead, was reasonable. Both of these totals are a massive reduction on the 316000 deaths quoted by the President on 12th January, 2011.

2011 Damaging Earthquakes in Numbers

Number of CATDAT Damaging Earthquakes:	133+.
Number of Casualty-bearing Earthquakes:	61+ with at least 25 fatal.
Country with the most CATDAT Damaging Earthquakes:	Japan, 27; China, 20; Turkey, 18.
Total Fatalities:	Between 20086 and 20475.
Total Shaking Fatalities:	±1336.
Total Injuries:	±14629.
Total Homeless:	±1.108 million.
Total Economic Losses:	$503.39 billion - $749.51 billion US (Median = $623.50 billion US)
Total Economic Losses (excluding Fukushima Nuclear):	$394.39 billion - $587.51 billion US (Median = $488.00 billion US)
Total Economic Losses (excluding Tohoku):	$24.39 billion - $39.51 billion US (Median = $29.00 billion US)
Total Insured Losses:	$43.26 billion - $67.48 billion US (Median = $52.80 billion US)

Please note that for the purposes of this report due to different meanings of billion and million worldwide:
1 billion = 1,000,000,000 or 10^9 1 million = 1,000,000 or 10^6

Final loss estimates for the 2011 Tohoku EQ disaggregated for tsunami, powerplant and earthquake - Japanese and CATDAT data

In Billion USD	Earthquake	Tsunami	Powerplant
Direct Loss Inland	77	0	58-71
Direct Loss Coastal	48-81	112-145	
Total Direct Loss	**125-158 (42%)**	**112-145 (39%)**	**58-71 (19%)**
Indirect Loss	*69-132*	*64-113*	*51-91*
Total Economic Loss	***194-290 (41%)***	***176-258 (36%)***	***109-162 (23%)***

2 What is CATDAT?

CATDAT originated as a series of databases that has been collected by the author from many sources over the years (2003 onwards). It includes global data on floods, volcanoes and earthquakes (and associated effects). This report will focus on the damaging earthquakes in 2011, and a comparison as provided by the Damaging Earthquakes Database part of CATDAT. This database has been presented at the Australian Earthquake Engineering Society Conference in 2010 in Perth, Australia, in the form of 3 papers, and the data was also used to form an Asia-Pacific comparison of flood and earthquake socio-economic loss in the CECAR5 conference in Sydney, Australia, 2010. The details of the database can be found by typing "CATDAT Damaging Earthquakes Database" into Google and searching for the Daniell et al. (2011) paper in the journal, NHESS.

As of January 2012 in CATDAT v5.0328, over 19000 sources of information have been utilised to present data from over 12300 historical damaging earthquakes, with over 7000 earthquakes since 1900 examined and validated before insertion into the CATDAT damaging earthquakes database.

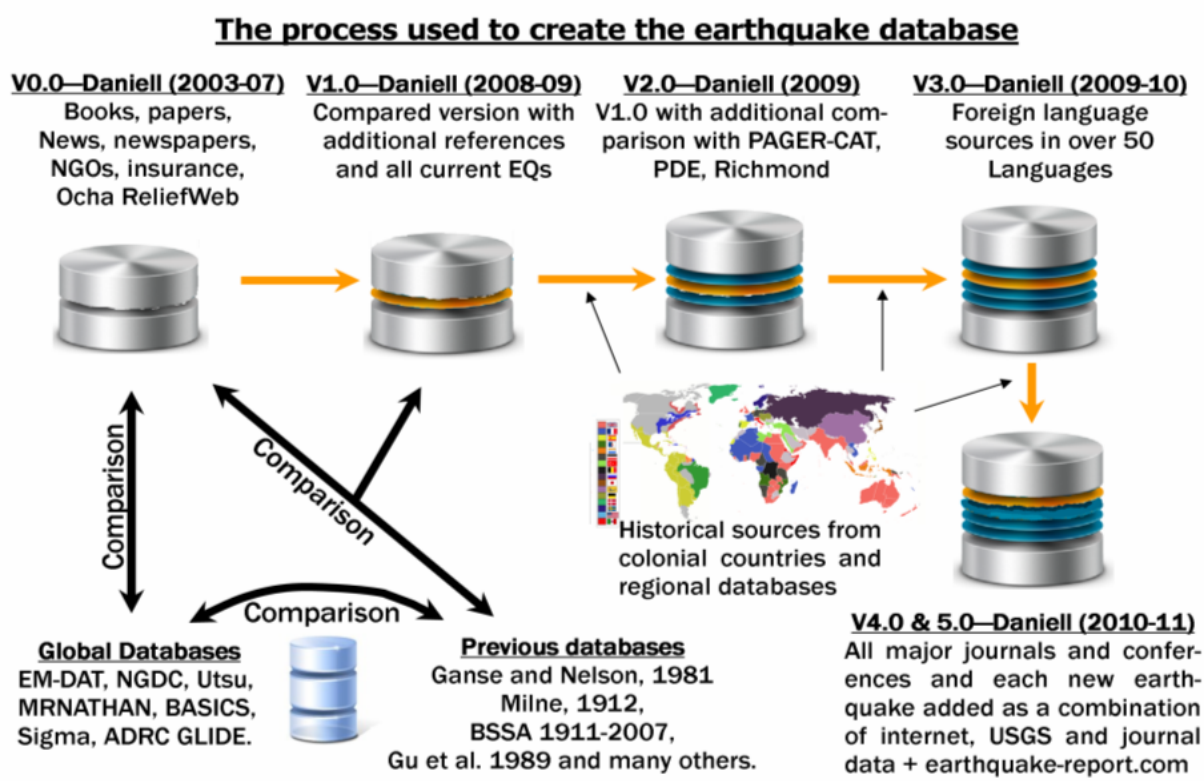


Figure 1 - The process used to create the CATDAT Damaging Earthquakes Database (Daniell, 2011)

2.1 What is contained in the database?

Each validated earthquake includes the following parameters filled in to the best available detail:-

- Date (Day, Month, Year, Time (Local and UTC)).
- Seismological Information (EQ Hypocentre Latitude; Longitude; Depth (km); Intensity (MMI); Magnitude; Magnitude type)
- ISO3166-2 Country code, including Kosovo and South Sudan; ISO Country Name.
- Human Development Index of country; HDI Classification; Economic Classification; Social Classification; Urbanity Index; Population at time of event; Nominal GDP at time of event – split into developed or developing countries.

- CATDAT Preferred (Best Estimate) Deaths; Secondary Effect Deaths; Ground Shaking Deaths; CATDAT Upper and Lower Bound Death Estimates; Global Literature Source Upper and Lower Bound Death Estimates; Severe Injuries; Slight Injuries; CATDAT Upper and Lower Bound Injury Estimates; Global Source Upper and Lower (U/L) Bound Injury Estimates; Homeless (and U/L Bound); Affected (and U/L Bound); Missing.
- Buildings destroyed; Buildings damaged; Buildings damaged – L4, L3, L2, L1; Infrastructure Damaged; Critical and Large Loss Facilities; Lifelines damaged.
- Secondary effects that occurred (Tsunami, Seiche, Landslide (mud, snow, rock, soil, quake lake), Fire, Liquefaction, Flooding, Fault Rupture); % of the social losses that were caused by each secondary effect; % of economic losses that were caused by each secondary effect; Tsunami Deaths; Landslide Deaths; Fire Deaths; Liquefaction Deaths.
- Disease and additional long-term problems.
- Full word description of various sources contributing to the data, including associated references.
- Sectoral and indirect analysis of economic losses.
- Country-based CPI at time of disaster; Country-based Wage Index at time of disaster; Country-based GDP Index; USA CPI for comparison; Hybrid Natural Disaster Economic Conversion Index.
- CATDAT Preferred (Best Estimate) Total Economic Loss; CATDAT U/L Bound of Economic Loss; Global Source U/L Bound of Economic Loss; Additional Economic Loss estimates from varying sources; CATDAT Economic Loss 2011 HNDECI-Adjusted; CATDAT Economic Loss 2011-country based CPI adjusted.
- Insured Loss; Insured Loss In 2011 dollars; Insured estimate source; Estimated Insurance Takeout (or approx. takeout) at time of event.
- Indirect and Intangible economic losses.
- Estimated life cost given social values, working wages etc. at the time.
- Total Economic Loss as a percentage of country's GDP; Social losses trended by population.
- CATDAT Earthquakes ranked via the Munich NatCat Service methodology.
- CATDAT Earthquakes ranked for the CATDAT Economic Disaster Ranking and CATDAT Social Disaster Ranking based on relative values and not absolute values.
- Link to ReliefWeb archive where available.
- Aid contribution; Aid delivered; Aid Source.
- Split country impacts (social and economic) where earthquake has affected more than 1 country.
- Various ratios between components for trends analysis.
- Normalisation strategies for current conditions. (Daniell et al., 2010g)
- Links to the author's global rapid loss estimation model (part of his PhD).

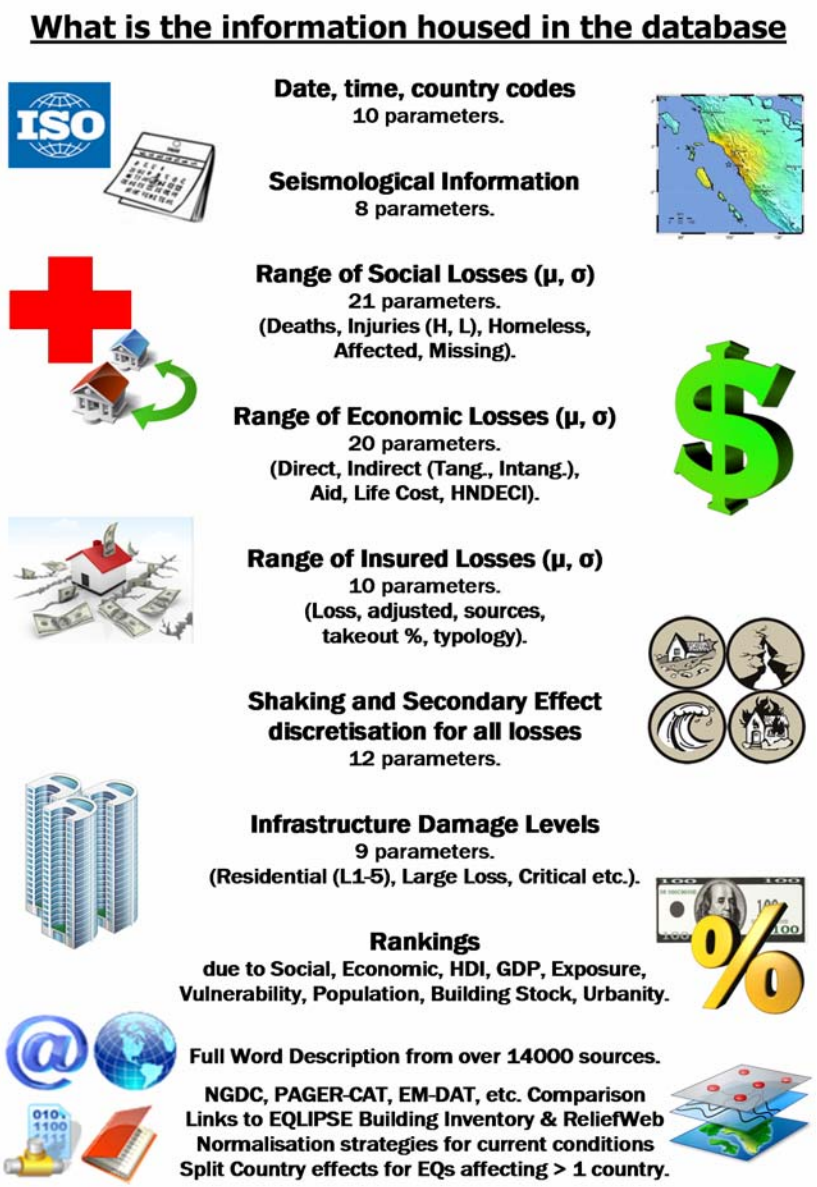


Figure 2 – The CATDAT Damaging Earthquakes Database parameters (Daniell, 2003-2011a)

This is contained in a Microsoft Excel framework with external links to other resources. It is also in SQL format.

2.2 Entry criteria

A damaging earthquake is entered into the CATDAT database by the following criteria in v. 5.03:-

- Any earthquake causing collapse of structural components.
- Any earthquake causing death, injury or homelessness.
- Any earthquake causing damage or flow-on effects exceeding 100,000 international dollars, Hybrid Natural Disaster Economic Conversion Index adjusted to 2011.
- Any earthquake causing disruption to a reasonable economic or social impact as deemed appropriate.
- A requirement of validation of the earthquake existence via 2 or more macroseismic recordings and/or seismological information recorded by stations and at least 1 of the 4 definitions above.
- Validation via external sources if Corruption Index < 2.7, subject to Polity ranking.

3 Damaging Earthquakes from 2011 in the CATDAT Damaging EQ Database

3.1 Where have the CATDAT damaging earthquakes occurred?

There have been at least 133 damaging earthquakes in 2011. These have occurred in the following countries, as shown in the diagram below. Note that events need to correspond to the criteria set out in the section above. It was seen that the Crete earthquake of M6.2, with minor car damage in Iraklion and minor non-structural house damage caused less than the criteria needed to be classified as a "CATDAT Damaging Earthquake". There were many other "nearly" CATDAT damaging earthquakes during the year that are all reported on earthquake-report.com before CATDAT ranking.

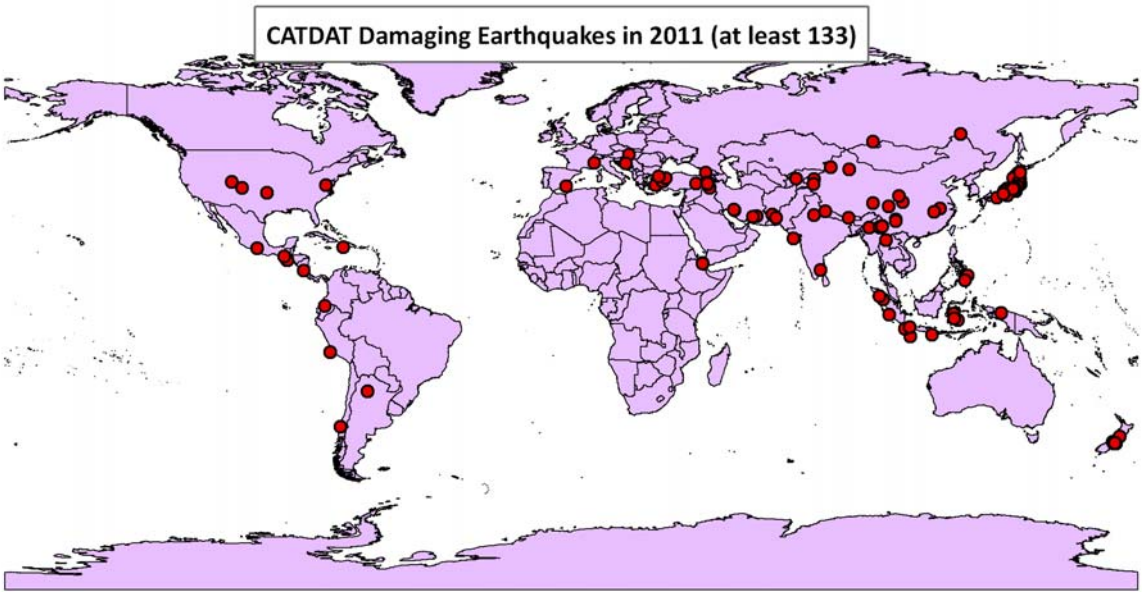


Figure 3 – The location of the 133+ CATDAT damaging earthquakes in various countries during 2011

There have been 27 damaging earthquakes in Japan, mainly aftershocks as a result of the 11th March Tohoku earthquake, 20 damaging earthquakes in China (up from 15 last year) that are classified under the CATDAT criteria, 18 damaging earthquakes in Turkey and 17 damaging earthquakes in New Zealand (mainly in Christchurch and as aftershocks of the 21st February earthquake).

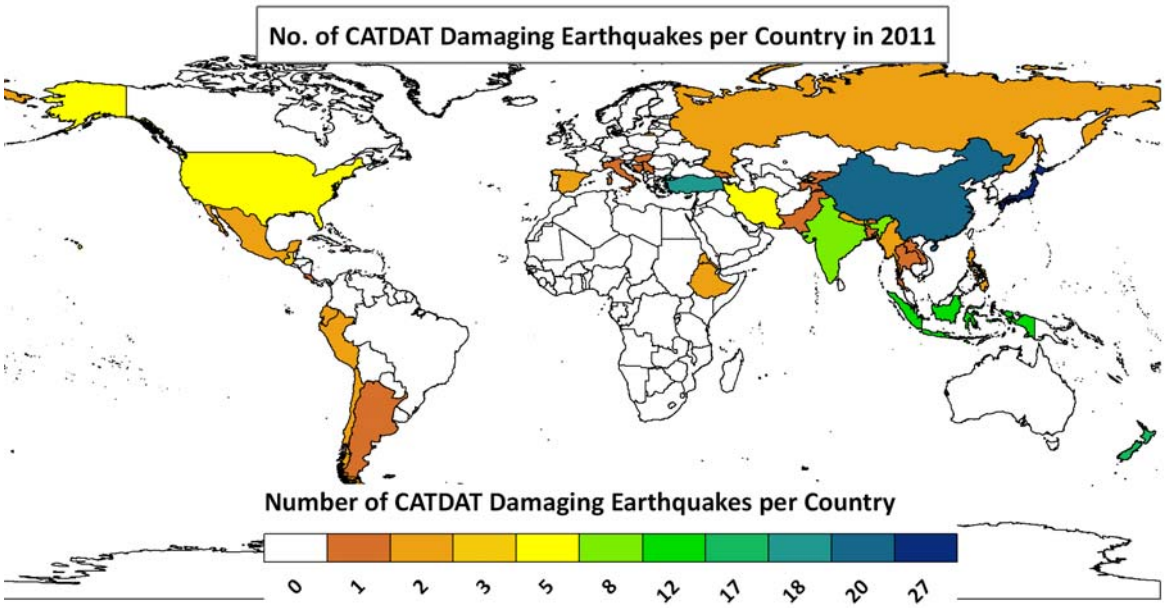


Figure 4 – The number of earthquakes per country in the 133+ CATDAT damaging earthquakes in various countries during 2011

3.2 Casualty-bearing 2011 earthquakes

There have been at least 25 fatal earthquakes in 2011. These are shown on the following diagram.

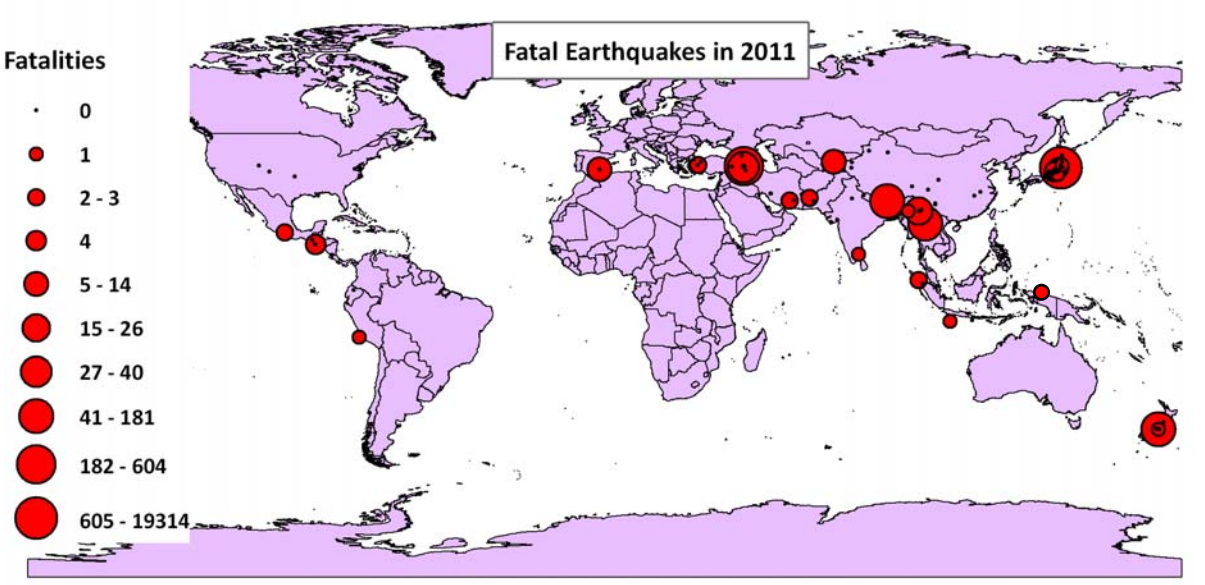


Figure 5 – The fatal earthquakes in 2011 in the CATDAT Damaging Earthquakes Database.

The most fatalities from an earthquake in 2011 were in the Japanese tsunami where over 19000 people were killed. However, most of these fatalities were due to the tsunami which was a result of the earthquake. It is unknown how many victims have died directly due to earthquake shaking action. As was reported by earthquake-report.com from NPA back in April about the first 13135 victims, 92.5% were drowned (12143), 4.4% were crushed to death mainly in tsunami collapsed houses (578), 1.1% were burned to death in various fires (148), with others killed via hypothermia and other causes. It will never be known how many died due to the earthquake, as separated from the tsunami; however, the autopsies give us an indicator that we can expect that about 1.0% of the 4.4% crushed were probably in earthquake collapsed houses.

In addition, we can assume a proportion of the remaining 2% that were unknown were also earthquake-related (a high value of 10% could be assumed). This would leave about 1.2% or about 158. When extrapolating for the final 6000 deaths that were not stress or chronic disease related, then the total is about 210. This value corresponds quite well to the 137 non-tsunami impacted deaths that have been recorded in the non-coastal areas. Some of the non-coastal deaths, however, were due to heart attack, fire or landslide.

As of 1st January 2012, 15844 have been killed and 3451 are missing (19295 in total). Of the 19295, around 600 are assumed to have died from earthquake-related stress and chronic disease. Approximately 210 should be earthquake-collapse related. Around 250 could be related to other causes such as fire, landslides etc. About 94% of deaths were tsunami related.

In addition, at least 36 other injury-bearing earthquakes have occurred in the world, making a total of 61 known casualty-bearing earthquakes for 2011.

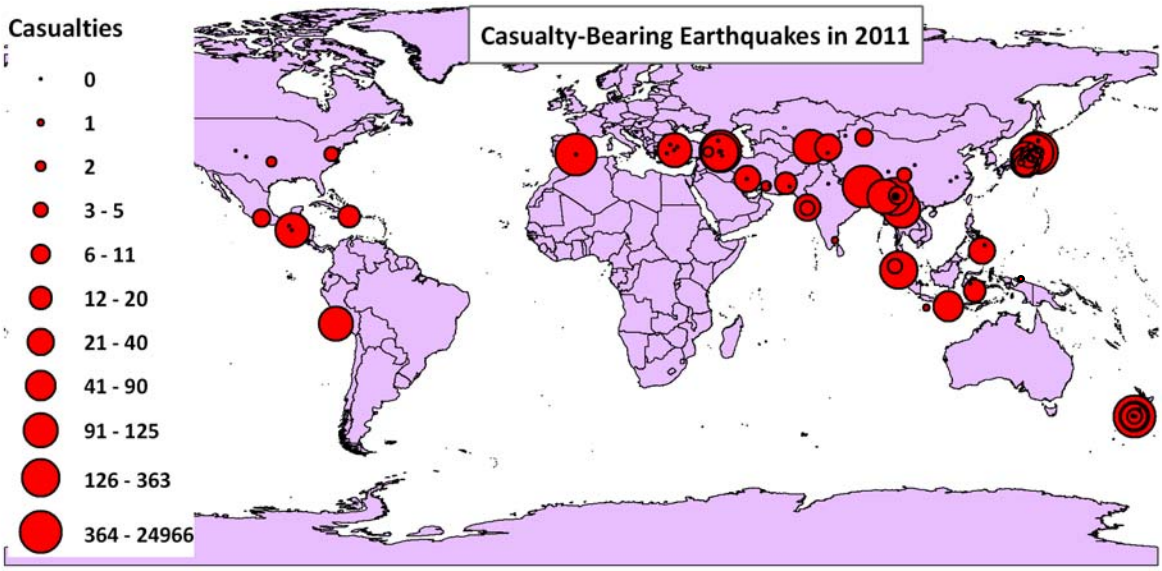


Figure 6 – The casualty bearing earthquakes in 2011 in the CATDAT Damaging Earthquakes Database.

The Van earthquakes in Turkey in October and November caused 604 deaths and 40 deaths respectively. Most of these were due to building collapse, thus causing the largest proportion of the 1335 shaking-related fatalities for the year. Christchurch with 181 deaths, mainly due to the collapse of 3 reinforced concrete buildings, also was a large event.

Table 1 – List of casualty-bearing earthquakes in 2011

EQ Name	Cnt. ISO	Date	Best Estimate of Fatalities	Range of Fatalities	Heavy Injuries	Injuries or Slight Injuries
Haiti	**ZU**	**12.01.2010**	**137000 (6-T)**	**(46000-164000)**		**310928**
Tohoku, Sendai, Great Eastern	JP, US, ID, EC, PE, CL	11.03.2011	19295-JP (18235-T, 210-SHK, 250-F,600-OTH), 1-ID, 1-US	(19000-19295)		5652
Van and Ercis	TR	23.10.2011	604 (2-HA)	(604-604)		4152
Christchurch	NZ	21.02.2011	181 (10-L)	(181-185)	164	2000
Myanmar	MM, TH, LA, CN	24.03.2011	151 (10-L)	(75-151)		212
Sikkim	IN, NP, CN, BT, BD	18.09.2011	111 (97-IN, 7-CN, 6-NP, 1-BD) (some-L)	(111-111)		many
Van Aftershock	TR	09.11.2011	40	(40-40)		260
Yingjiang	CN	10.03.2011	26	(26-26)	134	180
Central Asia	ZU, KG, TJ	19.07.2011	14 (1-HA)	(14-14)	35	66
Lorca	ES	11.05.2011	9	(9-10)	3	400
Sendai Aftershock	JP	07.04.2011	4	(2-4)	28	268
Guatemala	GT	19.09.2011	4 (3-L)	(1-4)		103
Eastern Honshu Aftershock	JP	11.04.2011	4 (3-L)	(3-7)	3	7
Simav Kutahya	TR	19.05.2011	3 (2-HA)	(2-3)	1	121
SW Pakistan	PK	18.01.2011	3 (2-HA)	(3-3)	9	0
Singkil	ID	05.09.2011	3 (2-HA)	(3-3)	0	0
Guerrero	MX	11.12.2011	2	(2-2)	0	4

Kahnuj	IR	15.06.2011	2	(2-2)	0	0
Sendai Aftershock	JP	11.03.2011	1	(1-1)	0	inc. 11/03 Toh.
Miyagi Aftershock	JP	11.03.2011	1	(1-1)	0	inc. 11/03 Toh.
Ica	PE	28.10.2011	1 (1-L)	(1-1)	16	88
Myanmar	MM, IN	04.02.2011	1	(1-1)	unk.	Unk.
10km SE of Christchurch	NZ	13.06.2011	1 (1-HA)	(1-1)	0	45
S Java	ID	03.04.2011	1 (1-HA)	(1-1)	0	0
Tamil Nadu	IN	12.08.2011	1	(1-1)	0	0
Papua	ID	26.06.2011	1	(1-1)	0	0
20km NE Lyttleton Aftershock	NZ	23.12.2011	0	(0-0)	0	inc. 23/12
Nagano Aftershock	JP	11.03.2011	0	(0-0)	0	inc. 11/03 Nag.
Nagano Aftershock 2	JP	11.03.2011	0	(0-0)	0	inc. 11/03 Nag.
Pahae Jae District	ID	14.06.2011	0	(0-0)	0	130
Bali	ID	13.10.2011	0	(0-0)	4	86
10km E Christchurch Aftershock	NZ	23.12.2011	0	(0-0)	0	60
Nagano	JP	11.03.2011	0	(0-0)	1	56
Fujiyama	JP	15.03.2011	0	(0-0)	3	51
Sasan Gir, Junagadh	IN	20.10.2011	0	(0-0)	6	34
Mamasani	IR	05.01.2011	0	(0-0)	22	15
Mindinao	PH	07.11.2011	0	(0-0)	10	21
Christchurch Aftershock 1	NZ	22.02.2011	0	(0-0)	10	20
Atushi City	CN	11.08.2011	0	(0-0)	4	17
Haiti	ZU	24.06.2011	0	(0-0)	0	20
Matsumoto	JP	29.06.2011	0	(0-0)	2	13
Sulawesi	ID	24.04.2011	0	(0-0)	1	13
Suruga Bay	JP	01.08.2011	0	(0-0)	2	11
Kawauchi	JP	30.07.2011	0	(0-0)	0	11
Toksun County	CN	08.06.2011	0	(0-0)	0	7
Tengchong County	CN	20.06.2011	0	(0-0)	3	3
Tengchong County 2	CN	09.08.2011	0	(0-0)	2	4
Southern Ibaraki Prefecture	JP	16.04.2011	0	(0-0)	0	6
Virginia	US	23.08.2011	0	(0-0)	0	5
Luhuo County	CN	10.04.2011	0	(0-0)	1	3
Christchurch Aftershock 2	NZ	22.02.2011	0	(0-0)	1	2
Sasan Gir, Junagadh	IN	12.11.2011	0	(0-0)	0	3
Honshu	JP	09.03.2011	0	(0-0)	0	2
Eastern Honshu Aftershock	JP	12.04.2011	0	(0-0)	0	2
Elazig	TR	23.06.2011	0	(0-0)	0	2
Miyagi Aftershock	JP	19.08.2011	0	(0-0)	0	2
Oklahoma	US	06.11.2011	0	(0-0)	0	2

Gifu Prefecture	JP	14.12.2011	0	(0-0)	1	0
Yangjiang 1	CN	01.01.2011	0	(0-0)	0	1
Yangjiang 3	CN	01.02.2011	0	(0-0)	0	1
Akita	JP	01.04.2011	0	(0-0)	0	1
Ibaraki	JP	20.11.2011	0	(0-0)	0	1

3.3 2011 earthquakes with over 100 people homeless or requiring shelter

The earthquakes which impacted the most people were the Tohoku earthquake/tsunami, the Sikkim earthquake in the India/Nepal/China/Bhutan/Bangladesh region and the earthquake in Van, Turkey. Although generally linked to casualties, some major earthquakes have very few casualties, yet high numbers of respective homeless. For earthquakes with smaller numbers of homeless people, estimates are not usually provided and need to be calculated by red tagged buildings, with a lowest estimate being those people living in destroyed buildings. A number of earthquakes in 2011 had unknown homeless levels.

The number of buildings damaged or destroyed in each of the 133 damaging earthquakes is shown in the following diagram. Over 1,000,000 buildings were damaged in the Japan earthquake/tsunami.

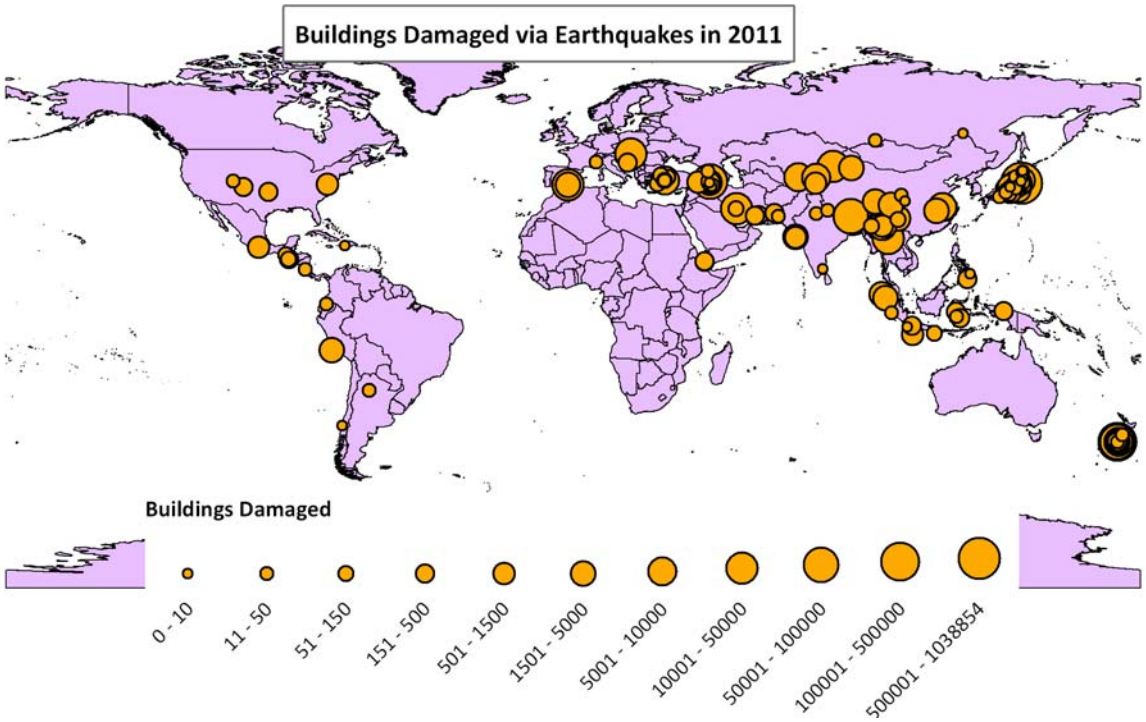


Figure 7 – The number of buildings damaged or destroyed in each 2011 CATDAT damaging earthquake

Also shown is the relative extent of building damage including destroyed buildings, as a ratio of 0.85 and damaged buildings with 0.15. This shows the Van, Sikkim, Christchurch and Japan earthquakes as having the greatest extent of damage this year.

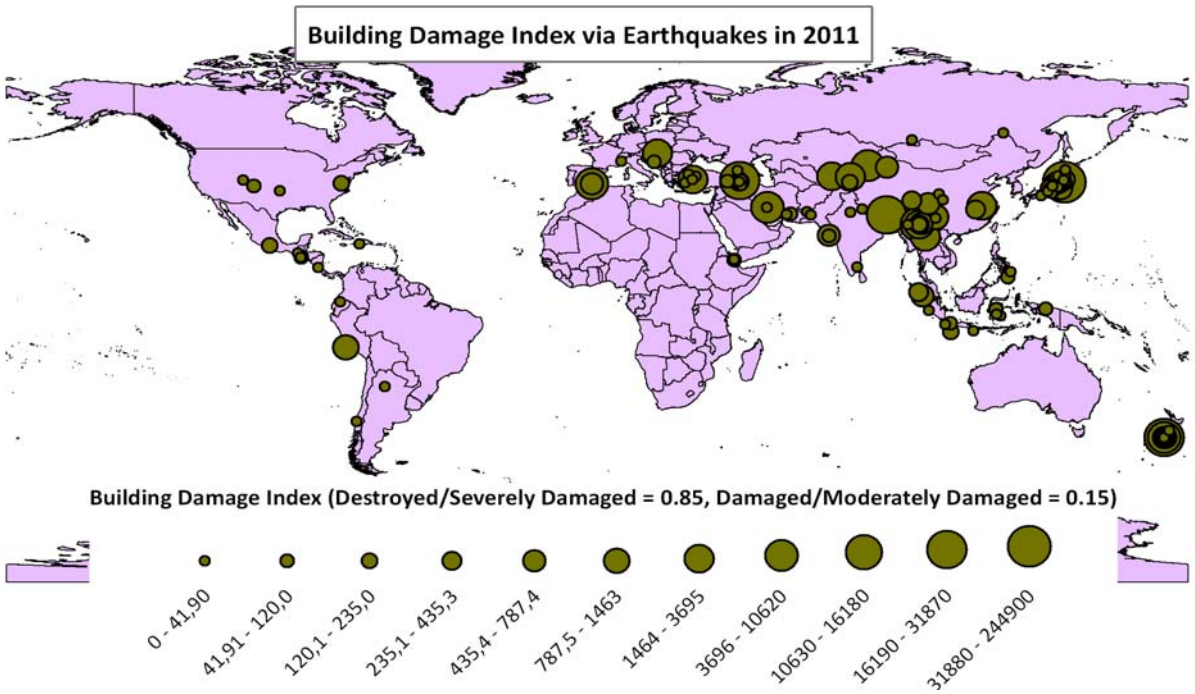


Figure 8 – The relative building damage index in each 2011 CATDAT damaging earthquake

The Japan earthquake caused the most homeless in 2011 with somewhere between 300000 and 550000 people homeless at some point in the disaster. Many moved into other forms of accommodation. Although the casualty toll was not high in Turkey, the calculated number of homeless was about 270000, exacerbated by winter weather conditions and the low development of the region. The Sikkim earthquake also caused just under 100000 homeless. Other major homeless tolls were seen in some Chinese earthquakes.The number of homeless in each damaging earthquake are summarised in the following diagram.

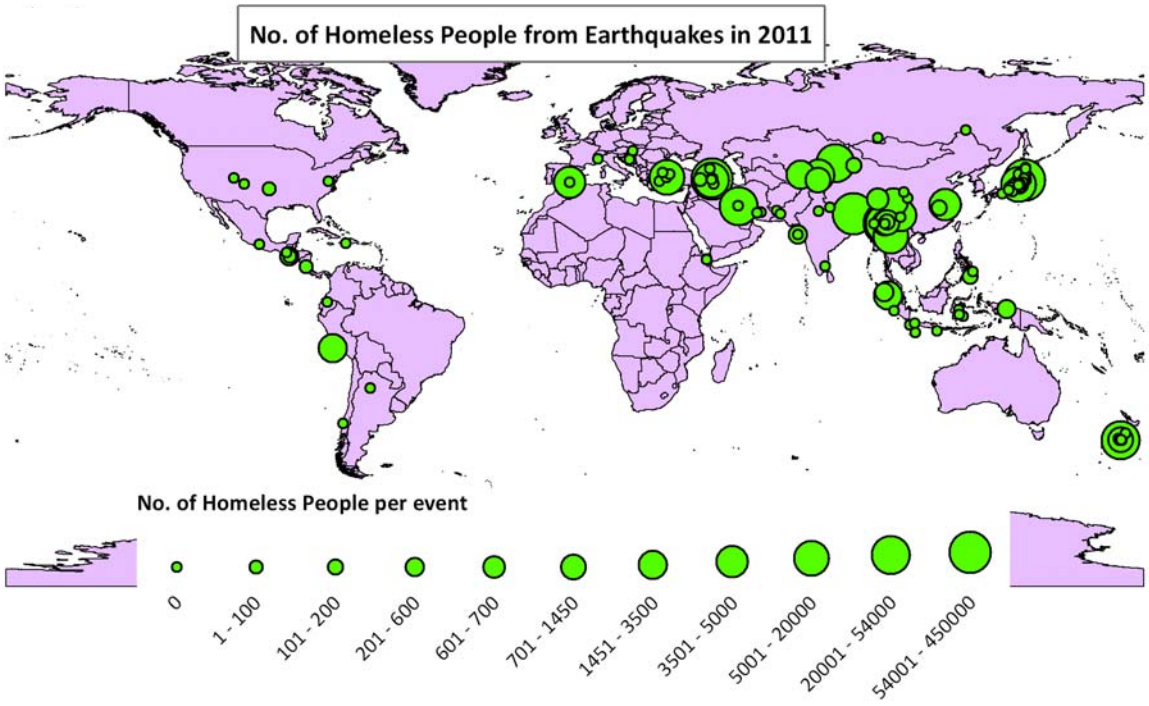


Figure 9 – The number of homeless people in each 2011 CATDAT damaging earthquake

Although the overall damage was much reduced by good earthquake building practice in NZ, due to the red tag level as the result of liquefaction and higher post-earthquake standards in New Zealand than in many other countries, the Christchurch, N.Z., earthquake has a large number of people displaced. Most have moved in with friends and family, or have moved; however, they still count as displaced from their pre-earthquake state. 6592 properties are currently red zoned by CERA.

Table 2 – List of homeless-bearing earthquakes in 2011

EQ Name	Cnt. ISO	Date	Homeless Range	Affected Range
Haiti	**HT**	**12.01.2010**	**1850000 (1000000-2100000)**	**3200000 (3000000-4500000)**
Tohoku, Sendai, Great Eastern	JP, US, ID, EC, PE, CL	11.03.2011	450000 (300000-550000)	20 million +
Van and Ercis	TR	23.10.2011	272157 (200000-320000)	1000000
Sikkim	IN, NP, CN, BT, BD	18.09.2011	85000 (70000-100000)	2000000
Yingjiang	CN	10.03.2011	72460	344600
Yangjiang 1	CN	01.01.2011	54000	148000
Christchurch	NZ	21.02.2011	40000	350000
Mamasani	IR	05.01.2011	35000	Complex: Refer to CATDAT
Nilka, Xinjiang	CN	01.11.2011	20800	450000
Van Edremit	TR	09.11.2011	20000 (inc. In 23/10)	Complex: Refer to CATDAT
Myanmar	MM, TH, LA, CN	24.03.2011	13000	18000
Simav Kutahya	TR	19.05.2011	10000	41000
Lorca	ES	11.05.2011	5000	150000
Atushi City	CN	11.08.2011	5000	45000
Zhaotong City	CN	12.02.2011	4000	19500
Anqing	CN	19.01.2011	3635	37400
Central Asia	ZU, KG, TJ	19.07.2011	3500	Complex: Refer to CATDAT
Ica	PE	28.10.2011	2801	13244
Pahae Jae District	ID	14.06.2011	2000	18000
Luhuo County	CN	10.04.2011	1850	29940
Shache County	CN	01.12.2011	1450	72576
Yangjiang 3	CN	01.02.2011	1000	80600
10km SE of Christchurch	NZ	13.06.2011	1000	Complex: Refer to CATDAT
Tengchong County 2	CN	09.08.2011	1000	180000
10km E Christchurch Aftershock	NZ	23.12.2011	1000	Complex: Refer to CATDAT
Nangqian County	CN	26.06.2011	700	79824
Singkil	ID	05.09.2011	600	Complex: Refer to CATDAT
Sasan Gir, Junagadh	IN	20.10.2011	600	Complex: Refer to CATDAT
Papua	ID	26.06.2011	256	Complex: Refer to CATDAT
Santa Rosa Swarm 19/07-27/08	GT	20.07.2011	250	Complex: Refer to CATDAT
Tengchong County	CN	20.06.2011	200	22000
Toksun County	CN	08.06.2011	168+	16174
Mindinao	PH	07.11.2011	150	1014
Ruichang, Jiangxi	CN	10.09.2011	120	5800
Eastern Honshu Aftershock	JP	11.04.2011	many	Complex: Refer to CATDAT

Eastern Honshu Aftershock	JP	12.04.2011	many	Complex: Refer to CATDAT
Sendai Aftershock	JP	07.04.2011	some	700000
Elazig	TR	23.06.2011	some	Complex: Refer to CATDAT
Oklahoma	US	06.11.2011	100	Complex: Refer to CATDAT
Yangjiang 2	CN	01.01.2011	inc 01/01	inc 01/01
Guatemala	GT	19.09.2011	70	2500
Costa Rica	CR	12.07.2011	50	Complex: Refer to CATDAT
Huehuetenango	GT	29.12.2011	15	125

3.4 Economic Losses from earthquakes in 2011 over $5 million US

Economic losses from earthquakes in 2011 have been dominated by the Tohoku earthquake, tsunami and nuclear disaster. The combination of these direct losses with the predicted indirect losses to be borne over the next few years has been calculated to be around $594 billion US, with a range of between $479 billion US and $710 billion US. Of these, direct losses will reach between $294 billion US and $374 billion US.

Approximately 70% of the capital stock is inland as compared to around 30% of the capital stock on the coast in the provinces of Miyagi, Iwate, Fukushima and Ibaraki, according to the Japanese Cabinet Office. Extrapolating the damage in other prefectures, the Japanese Cabinet Office estimate should be about $231 billion once $23 billion loss in other prefectures is added. In addition, the estimate of the Miyagi Prefecture of incurred direct losses (incomplete as of 17/10/2011) is 11% greater than the original Cabinet estimate. With currency changes and this increase, the direct loss estimate at this point from the Japanese government appears to be $271 billion (without the additional $58-71 billion expected from Fukushima) (Daniell et al., 2011b).

In the case of the 2011 Tohoku earthquake and tsunami, it is difficult to know the final discretisation of earthquake and tsunami losses; however, the possible outcome is about 39% economic losses due to tsunami ($127 billion) and 43% due to the earthquake ($144 billion), with about 18% due to the Fukushima disaster ($59 billion). The data from Miyagi prefecture has shown these percentages to be realistic. On the other hand, approximately 94.5% of the deaths are expected to be tsunami related, with only a small percentage (1.2%) expected due to earthquake shaking. Direct Losses are in the order of $335 billion, with indirect losses around $260 billion expected with all impacts combined (Daniell et al., 2011b).

Table 3 – Final loss estimates for the 2011 Tohoku EQ disaggregated for tsunami, powerplant and earthquake using Japanese and CATDAT data as of 18th October

In Billion USD	Earthquake	Tsunami	Powerplant
Direct Loss Inland	77	0	58-71
Direct Loss Coastal	48-81	112-145	
Total Direct Loss	**125-158 (42%)**	**112-145 (39%)**	**58-71 (19%)**
Indirect Loss	*69-132*	*64-113*	*51-91*
Total Economic Loss	***194-290 (41%)***	***176-258 (36%)***	***109-162 (23%)***

The Christchurch earthquakes on the 21st February, 13th June and 23rd December also had significant economic losses totalling well over $20 billion US. As a % of GDP, this earthquake caused the highest losses in 2011. Much of this damage can be deemed to have been caused by liquefaction, with at least 10000 homes expected to be deemed to be on unliveable land.

The Sikkim earthquake on the 18th September 2011 was deemed to have caused at least 1 lakh crore rupees (1000 billion rupees or $22.3 billion US) damage in Sikkim, as estimated early after the disaster (Sikkim Ministry on 21st September 2011). However, as the net capital stock is at the most approximately $3.9 billion US (about 200 billion rupees) in Sikkim according to CATDAT, it is hard to believe the initial assessment of the ministry; thus this value has been ignored.

However, a more reliable estimate is approximately $1.7 billion US damage for total damage in India. In addition about $200 million US damage was caused in Tibet (China), and slightly higher in eastern

Nepal. As well, losses in Bhutan occurred with around 6000 buildings damaged. In total, an estimated $2.25 billion US damage occurred.

Although not causing a high absolute value of damage, the Van earthquake in Turkey caused a large impact on the Van Province. The Van Province GDP can be assumed to be around 3.3 billion USD (2011). Generally such disasters have taken about 15-33% of provincial GDP in the past, and using a factor system to calculate this in the Van Province, around 550 million-1.25 billion USD is a reasonable estimate. Outlier estimates suggest a higher range of up to 2.2 billion USD. Van is one of the poorest regions of Turkey. In the rural areas, sheep and cattle farming is a common form of income.

The Nagano earthquake of 11th March, Fujiyama earthquake of 15th March and the Tohoku aftershock on the 7th April also caused significant losses.

The damaging earthquakes of China were dominated by the economic losses from the Yingjiang earthquake of $407 million US (2.687 billion CNY or 26.87・元).

In total, 59 earthquakes recorded losses in excess of $5m USD in 2011, as compared to 33 earthquakes in 2010. Many of these recorded losses were caused by aftershocks in Christchurch and Tohoku. Shown in the following diagram are the losses of earthquakes in 2011.

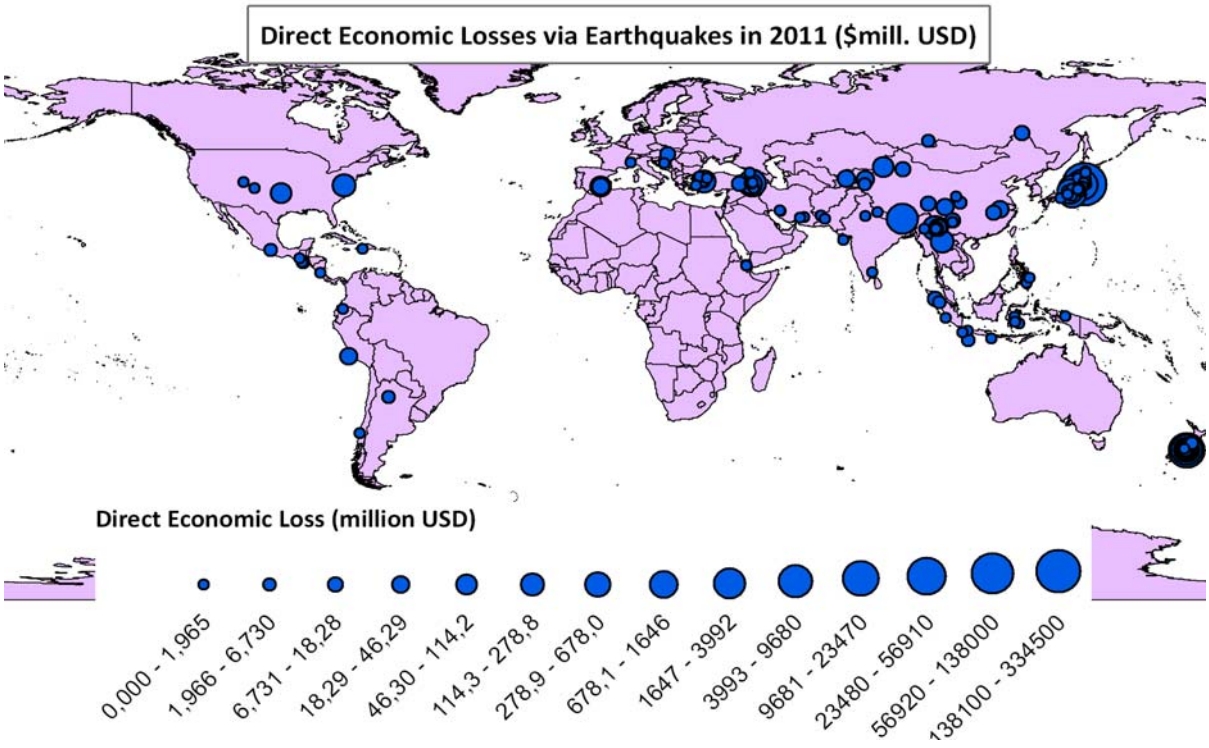


Figure 10 – The direct economic losses in each 2011 CATDAT damaging earthquake

The next table shows the loss range of the major economic loss events in 2011.

Table 4 – List of economic losses in earthquakes in 2011 with over $5 million USD or other notable losses (excluding nuclear disasters)

Earthquake	Country ISO	Date UTC	Total Loss Range (USD)	GDP (PPP) (%)
Maule	**CL**	**27.02.2010**	**$30000m ($27500m-$32500m) Total, $24200m Direct**	**10.86**
Tohoku, Sendai, Great Eastern Earthquake and Tsunami	JP, US, ID, EC, PE, CL	11.03.2011	$411000m ($370000m-$548000m) Total $270300m ($237000m-$303000m) Direct	8.76
Christchurch	NZ	21.02.2011	$16000.00m ($15000.00m-$20000.00m)	12.95
10km SE of Christchurch	NZ	13.06.2011	$3000.00m ($2500.00m-$4830.00m)	2.43
Sikkim	IN, NP, CN, BT, BD	18.09.2011	$2260.00m ($1400.00m-$2700.00m)	<0.1
Sendai Aftershock	JP	07.04.2011	$2000.00m ($1500.00m-$3000.00m)	<0.1
Van and Ercis	TR	23.10.2011	$1100.00m ($550.00m-$2000.00m)	<0.1
Nagano	JP	11.03.2011	$1000.00m ($500.00m-$1500.00m)	<0.1
Fujiyama	JP	15.03.2011	$1000.00m ($700.00m-$2000.00m)	<0.1
Yingjiang	CN	10.03.2011	$408.67m ($408.67m-$408.67m)	<0.1
Matsumoto	JP	29.06.2011	$300.00m ($200.00m-$500.00m)	<0.1
10km E Christchurch Aftershock	NZ	23.12.2011	$300.00m ($250.00m-$500.00m)	0.24
Simav Kutahya	TR	19.05.2011	$260.00m ($260.00m-$260.00m)	<0.1
Virginia	US	23.08.2011	$250.00m ($200.00m-$300.00m)	<0.1
Myanmar	MM, TH, LA, CN	24.03.2011	$120.45m ($120.45m-$120.45m)	0.15
Nilka, Xinjiang	CN	01.11.2011	$106.67m ($106.67m-$106.67m)	<0.1
Lorca	ES	11.05.2011	$90.00m ($90.00m-$215.00m)	<0.1
Van Edremit	TR	09.11.2011	$75.00m ($55.00m-$100.00m)	<0.1
Christchurch Aftershock 1	NZ	22.02.2011	$50.00m ($35.00m-$100.00m)	<0.1
10km E of Christchurch	NZ	13.06.2011	$50.00m ($50.00m-$50.00m)	<0.1
Oklahoma	US	06.11.2011	$50.00m ($15.00m-$75.00m)	<0.1
Tengchong County	CN	20.06.2011	$43.00m ($43.00m-$43.00m)	<0.1
Anqing	CN	19.01.2011	$35.87m ($35.87m-$35.87m)	<0.1
Lorca Foreshock	ES	11.05.2011	$35.00m ($35.00m-$35.00m)	<0.1
10km NE Diamond Harbour Aftershock	NZ	16.04.2011	$30.00m ($7.00m-$40.00m)	<0.1
20km NE Lyttleton Aftershock	NZ	23.12.2011	$30.00m ($20.00m-$50.00m)	<0.1
Atushi City	CN	11.08.2011	$28.53m ($28.53m-$28.53m)	<0.1
10km SW of Christchurch	NZ	19.01.2011	$25.98m ($17.32m-$34.64m)	<0.1
Christchurch Aftershock 2	NZ	22.02.2011	$25.00m ($25.00m-$25.00m)	<0.1
Central Asia	ZU, KG, TJ	19.07.2011	$25.00m ($20.00m-$30.00m)	<0.1
Luhuo County	CN	10.04.2011	$24.69m ($24.69m-$24.69m)	<0.1
Ica	PE	28.10.2011	$24.48m ($12.24m-$48.95m)	<0.1
Tengchong County 2	CN	09.08.2011	$23.35m ($23.35m-$23.35m)	<0.1
20km SW of Christchurch	NZ	04.02.2011	$21.38m ($14.25m-$28.50m)	<0.1
Kecsked	HU	29.01.2011	$15.00m ($5.00m-$15.00m)	<0.1
Hornby	NZ	21.06.2011	$15.00m ($12.00m-$25.00m)	<0.1
Toksun County	CN	08.06.2011	$14.23m ($14.23m-$14.23m)	<0.1
Christchurch Aftershock	NZ	09.10.2011	$13.00m ($10.00m-$18.00m)	<0.1
Ruichang, Jiangxi	CN	10.09.2011	$12.25m ($12.25m-$12.25m)	<0.1
Nangqian County	CN	26.06.2011	$10.04m ($10.04m-$10.04m)	<0.1
10km E Christchurch Aftershock	NZ	20.03.2011	$10.00m ($5.00m-$25.00m)	<0.1

Singkil	ID	05.09.2011	$9.38m ($5.86m-$9.38m)	<0.1
Zhaotong City	CN	12.02.2011	$8.51m ($8.51m-$8.51m)	<0.1
Shache County	CN	01.12.2011	$7.64m ($7.64m-$7.64m)	<0.1
Elazig	TR	23.06.2011	$7.60m ($1.69m-$10.14m)	<0.1
Yangjiang 1	CN	01.01.2011	$7.54m ($7.54m-$7.54m)	<0.1
Van Aftershock	TR	08.11.2011	$6.57m ($1.46m-$8.76m)	<0.1
20km SW of Christchurch	NZ	05.06.2011	$6.00m ($3.00m-$11.00m)	<0.1
Guerrero	MX	11.12.2011	$5.20m ($2.40m-$12.00m)	<0.1
Gifu	JP	26.02.2011	$5.00m ($5.00m-$5.00m)	<0.1
Canterbury	NZ	10.05.2011	$5.00m ($2.00m-$10.00m)	<0.1
Cook Strait	NZ	03.12.2011	$5.00m ($2.00m-$10.00m)	<0.1
Amurskaya Oblast, Russia	RU	14.10.2011	$5.00m ($2.00m-$10.00m)	<0.1
Sendai Aftershock	JP	11.03.2011	inc. 11/3 Tohoku	<0.1
Miyagi Aftershock	JP	11.03.2011	inc. 11/3 Tohoku	<0.1
Nagano Aftershock	JP	11.03.2011	inc. 11/3 Nagano	<0.1
Nagano Aftershock 2	JP	11.03.2011	inc. 11/3 Nagano	<0.1
Van Aftershock 1	TR	23.10.2011	inc. 23/10 Van	<0.1
Van Aftershock 2	TR	23.10.2011	inc. 23/10 Van	<0.1
Van Aftershock 3	TR	25.10.2011	inc. 23/10 Van	<0.1
Kutahya Simav Aftershock	TR	27.05.2011	$3.48m ($0.77m-$4.63m)	<0.1
Van/Merkez Aftershock	TR	15.11.2011	$3.27m ($0.73m-$4.37m)	<0.1
Tcuman	AR	21.02.2011	$2.50m ($1.00m-$5.00m)	<0.1
Cilacap	ID	03.04.2011	$2.44m ($2.44m-$2.44m)	<0.1
Pahae Jae District	ID	14.06.2011	$2.34m ($0.82m-$2.34m)	<0.1
Gansu, Sichuan	CN	31.10.2011	$2.15m ($2.15m-$2.15m)	<0.1
Guatemala	GT	19.09.2011	$2.00m ($1.50m-$2.40m)	<0.1
Myanmar	MM, IN	04.02.2011	$1.10m ($0.20m-$1.50m)	<0.1
Hakkari/Yuksekova	TR	27.10.2011	$0.99m ($0.22m-$1.31m)	<0.1
Hakkari/Cukurca	TR	02.11.2011	$0.99m ($0.22m-$1.31m)	<0.1
Soroako	ID	15.02.2011	$0.93m ($0.79m-$1.07m)	<0.1
Yunnan/Sichuan Border	CN	15.04.2011	$0.91m ($0.91m-$0.91m)	<0.1
Yangjiang 3	CN	01.02.2011	$0.76m ($0.60m-$1.00m)	<0.1
20km N Springfield Aftershock	NZ	29.04.2011	$0.75m ($0.50m-$1.00m)	<0.1
Dingxi City Zhangxian Minxian	CN	01.11.2011	$0.71m ($0.71m-$0.71m)	<0.1
Kutahya Simav Aftershock 3	TR	28.05.2011	$0.62m ($0.14m-$0.83m)	<0.1
Sulawesi	ID	24.04.2011	$0.60m ($0.50m-$0.80m)	<0.1
Kutahya Simav Aftershock 3	TR	03.07.2011	$0.58m ($0.13m-$0.77m)	<0.1
Yangjiang 2	CN	01.01.2011	$0.50m ($0.50m-$0.50m)	<0.1
Coal Bump Paonia	US	17.02.2011	$0.50m ($0.50m-$0.50m)	<0.1
Kecamatan Cisarua	ID	28.08.2011	$0.50m ($0.20m-$0.70m)	<0.1
Santa Rosa Swarm 19/07-27/08	GT	20.07.2011	$0.50m ($0.30m-$1.00m)	<0.1
Marmara Denizi	TR	25.07.2011	$0.48m ($0.11m-$0.64m)	<0.1
Mindinao	PH	07.11.2011	$0.37m ($0.37m-$0.37m)	<0.1
Bali	ID	13.10.2011	$0.35m ($0.35m-$0.35m)	<0.1
Bilecik/Merkez	TR	11.07.2011	$0.27m ($0.06m-$0.36m)	<0.1
Costa Rica	CR	12.07.2011	$0.25m ($0.20m-$0.40m)	<0.1
Ege Denizi	TR	23.04.2011	$0.20m ($0.08m-$0.25m)	<0.1
Eritrea – Nabro Volcano	ER, ET	12.06.2011	$0.12m ($0.04m-$0.38m)	<0.1
Eritrea – Nabro Volcano	ER, ET	17.06.2011	$0.12m ($0.04m-$0.38m)	<0.1

3.5 Insured Losses from earthquakes in 2011 so far.

The losses in the reinsurance domain for 2011 have been the largest cumulative annual loss in history for earthquakes. This will be seen in the following section.

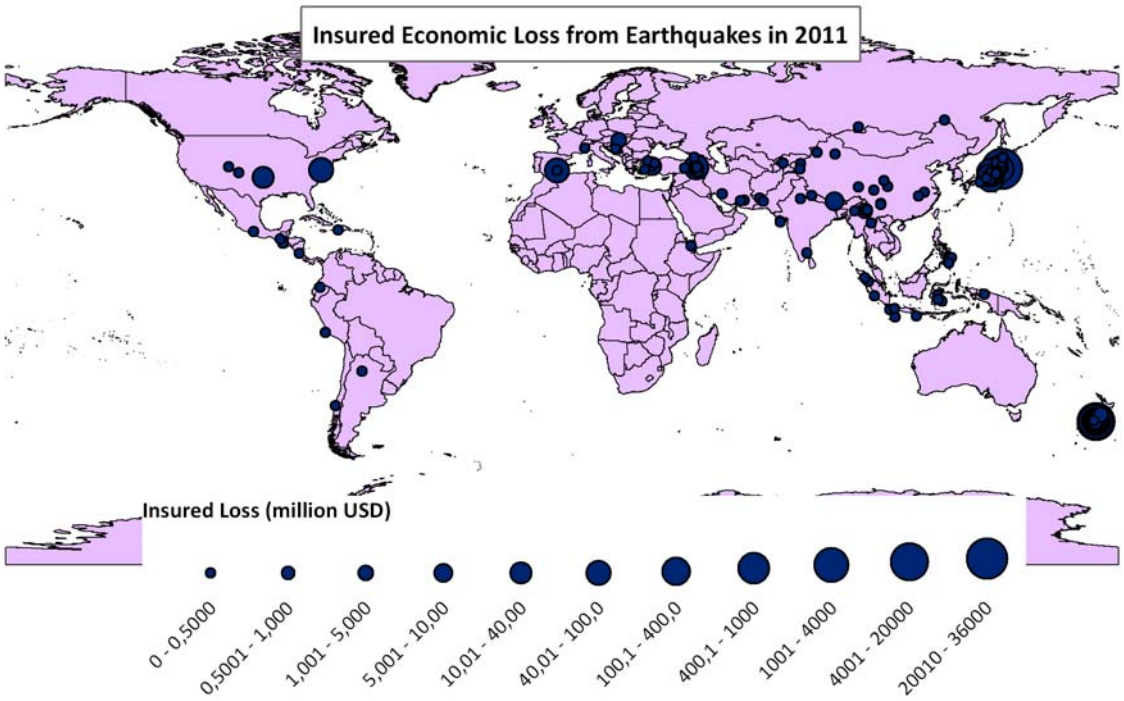


Figure 11 – The insured economic losses in each 2011 CATDAT damaging earthquake

The table below shows the insured loss ranges for each damaging earthquake with insurance loss in 2011. Many more details are available on earthquake-report.com.

Table 5 – List of insured losses in earthquakes in 2011 so far over $1m

Earthquake	Country ISO	Date	Insured Loss Range
Maule	CL	27.02.2010	**$8500m ($7566m-$12000m)**
Tohoku, Sendai, Great Eastern	JP, US, ID, EC, PE, CL	11.03.2011	$36000.00m ($29400.00m-$45000.00m)
Christchurch	NZ	21.02.2011	$13000.00m ($11000.00m-$16250.00m)
10km SE of Christchurch	NZ	13.06.2011	$2340.00m ($1950.00m-$3924.38m)
Fujiyama	JP	15.03.2011	$400.00m ($110.00m-$500.00m)
10km E Christchurch Aftershock	NZ	23.12.2011	$243.75m ($203.13m-$406.25m)
Sendai Aftershock	JP	07.04.2011	$220.00m ($165.00m-$330.00m)
Nagano	JP	11.03.2011	$110.00m ($55.00m-$165.00m)
Lorca	ES	11.05.2011	$99.00m ($99.00m-$125.00m)
Virginia	US	23.08.2011	$50.00m ($50.00m-$100.00m)
Van and Ercis	TR	23.10.2011	$44.00m ($24.20m-$200.00m)
Christchurch Aftershock 1	NZ	22.02.2011	$40.63m ($28.44m-$81.25m)
10km E of Christchurch	NZ	13.06.2011	$40.63m ($40.63m-$40.63m)
Matsumoto	JP	29.06.2011	$33.00m ($22.00m-$55.00m)
10km NE Diamond Harbour Aftershock	NZ	16.04.2011	$24.38m ($5.69m-$32.50m)
20km NE Lyttleton Aftershock	NZ	23.12.2011	$24.38m ($16.25m-$40.63m)
Christchurch Aftershock 2	NZ	22.02.2011	$20.31m ($20.31m-$20.31m)

10km SW of Christchurch	NZ	19.01.2011	$16.88m ($11.26m-$22.51m)
20km SW of Christchurch	NZ	04.02.2011	$13.89m ($9.26m-$18.53m)
Hornby	NZ	21.06.2011	$12.19m ($9.75m-$20.31m)
Oklahoma	US	06.11.2011	$5.00m ($2.00m-$10.00m)
Christchurch Aftershock	NZ	09.10.2011	$10.56m ($8.13m-$14.63m)
Sikkim	IN, NP, CN, BT, BD	18.09.2011	$10.00m ($5.00m-$50.00m)
Simav Kutahya	TR	19.05.2011	$9.75m ($7.00m-$14.00m)
10km E Christchurch Aftershock	NZ	20.03.2011	$8.13m ($4.06m-$20.31m)
Kecsked	HU	29.01.2011	$5.00m ($5.00m-$5.00m)
Yingjiang	CN	10.03.2011	$5.00m ($5.00m-$5.00m)
20km SW of Christchurch	NZ	05.06.2011	$4.88m ($2.44m-$8.94m)
Canterbury	NZ	10.05.2011	$4.06m ($1.63m-$8.13m)
Cook Strait	NZ	03.12.2011	$4.06m ($1.63m-$8.13m)
Van Edremit	TR	09.11.2011	At least $1.65m ($1.21m-$2.20m)

The Maule, Chile, earthquake in 2010 represented the 3rd highest absolute insurance loss from an earthquake. The two major economic loss earthquakes this year (Tohoku and Christchurch) have now slotted into number 1 and number 3 on the all-time insured losses rankings in CATDAT from earthquakes.

Table 6 – List of highest insured losses (1900-2011) in 2011 Country CPI adjusted $ international

Rank	Earthquake	Country	Date	Insured Loss Range	Pref. Source for Event Loss
1	**Tohoku**	**Japan**	**11.03.2011**	**$29.4bn-$45bn**	**CATDAT**
2	Northridge	USA	17.01.1994	$22.92bn	RMS
3	**Christchurch**	**NZ**	**21.02.2011**	**$11bn-$16.25bn**	**CATDAT**
4	Great Kanto	Japan	01.09.1923	$8.73bn-$15.06bn	Daniell (2010b)
5	Maule	Chile	27.02.2010	$7.57bn-$12.00bn	Standard and Poor's
6	Kobe	Japan	16.01.1995	$6.78bn	Horwich (2000), RMS
7	San Francisco	USA	18.04.1906	$5.98bn	Daniell (2008-2010a)
=8	Darfield	NZ	03.09.2010	$3.04bn-$5.50bn	PartnerRe, Catlin
=8	Izmit	Turkey	17.08.1999	$3.38bn-$7.89bn	RMS (1999)
=10	Sumatra	Many	26.12.2004	*$2.311bn-$4.11bn*	CATDAT
=10	Loma Prieta	USA	18.10.1989	$2.51bn	Amer. Ins. Serv. Group
=10	**Christchurch Aftershock**	**NZ**	**13.06.2011**	**$2.031bn-$4.062bn**	**CATDAT**

3.6 A quick comparison of the New Zealand and Tohoku Earthquakes in Numbers

The two most impacting largest earthquakes of the year will now be compared. In comparison to last year, both Japan and New Zealand have very high development and were both able to cover their economic and social losses internally; yet much aid was still given internationally for these disasters.

Table 7 – A comparison of the Christchurch and Tohoku earthquakes in terms of numbers

Parameter	Christchurch, NZ	Tohoku EQ, Japan
Magnitude	6.343Ml	9.0Mw
Hyp. Depth (km)	5, onshore	24, offshore
Max. Intensity	X	IX
Tsunamigenic	Yes (local, landslide)	Yes (Pacific-wide)
Largest Aftershock (Mw)	n/a, since possibly an aftershock	7.7-7.9
Total damaged buildings	156459 (6592 red zone CERA)	1038854 (127185 destroyed)
Fatalities	177 dead, 4 missing = 181	15844 dead, 3451 missing = 19295
Injuries	2164	5652
Homeless	Approx. 40000	Approx. 450000
Economic Losses (USD) incl. nuclear disasters	$16bn ($15bn-$20bn) Direct	$594.5bn ($479bn-$710bn) Total $334.5bn ($295bn-$374bn) Direct
As a % of Nominal GDP (PPP)	9.48% (8.88%-11.85%) Direct	12.66% (10.20%-15.12%) Total 7.13% (6.28%-7.97%) Direct
As a % of Nom. GDP	12.95% (12.14%-16.19%) Direct	9.50% (7.65%-11.34%) Total 5.34% (4.71%-5.98%) Direct
GDP (PPP) per capita highest year, 1980 to 2011	2011	2011
Total Insured Loss (USD)	$13bn ($11bn-$16.25bn)	$36bn ($29.4bn-$45bn)
Total Int. Aid (ReliefWeb)	Approx. $110mn USD (Appeal)	Approx. $4000mn USD (Red Cross)
Transparency International Corruption Index	1st/183, 9.5/10 (Dec. 2011)	=14th/183, 8/10 (Dec. 2011)
Population density in affected regions	Canterbury region (12.4/km^2), 595000	Miyagi (321/km^2), 2337513 Fukushima (154/km^2), 2028752 Iwate (90/km^2), 1330530 Ibaraki (486/km^2), 2964141 Chiba (1203/km^2), 6201046
Population density in most affected cities	Christchurch (843/km^2), 390000	Sendai City (1305/km^2), 1031704
Total Population 2011	4.434 million	127.105 million
Rate of natural increase	7.8 per 1000	-0.02 per 1000
HDI (2011)	0.908 (5th/187)	0.901 (12th/187)
Non-Income HDI (2011)	0.978 (2nd/187)	0.940 (10th/187)
Unemployment Increase	962 (17.88% increase)	70000 in the 3 most affected regions (75% increase)

4 A quick comparison of the 2011 Losses to the CATDAT Damaging Earthquakes Database since 1900

In the next section, a few diagrams will be shown to demonstrate the holistic comparison of the year 2011 in terms of earthquake losses compared with other years. It can be seen quite clearly that the year 2011 has eclipsed all other years in terms of loss, even beating the 2011 dollar-adjusted value of the Great Kanto earthquake in 1923. Since 1900, 2.128 trillion USD (2011) damage has occurred due to earthquakes worldwide, with 17% of it occurring in 2011.

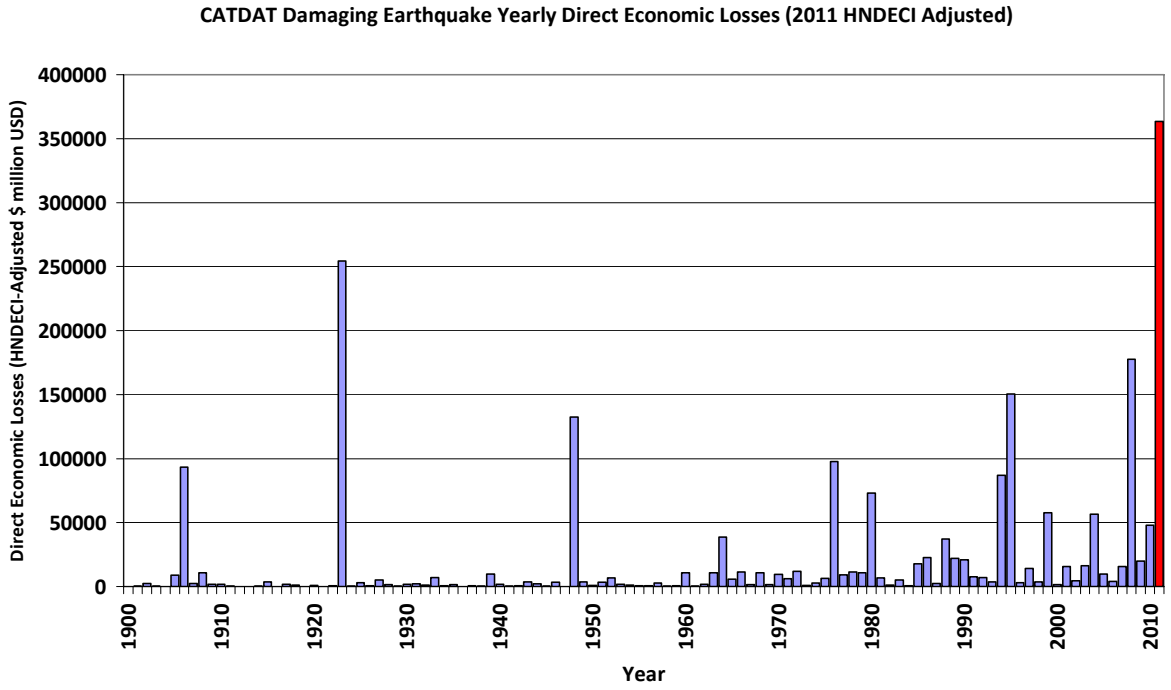


Figure 12 – Yearly Direct Economic Losses from CATDAT Damaging Earthquakes showing 2011 as the highest loss year of the past 111 years.

In terms of total economic losses including indirect effects for major earthquakes, the Tohoku earthquake this year are predicted to have approximately $260 billion US of indirect losses due to global supply chain impacts, business interruption, associated losses and other indirect effects. The overall losses including indirect effects due to earthquakes are now approximately $3.14 trillion US (2011-adjusted) since 1900, of which approximately 20% has occurred in the year 2011 (around $624.5 billion US in total losses).

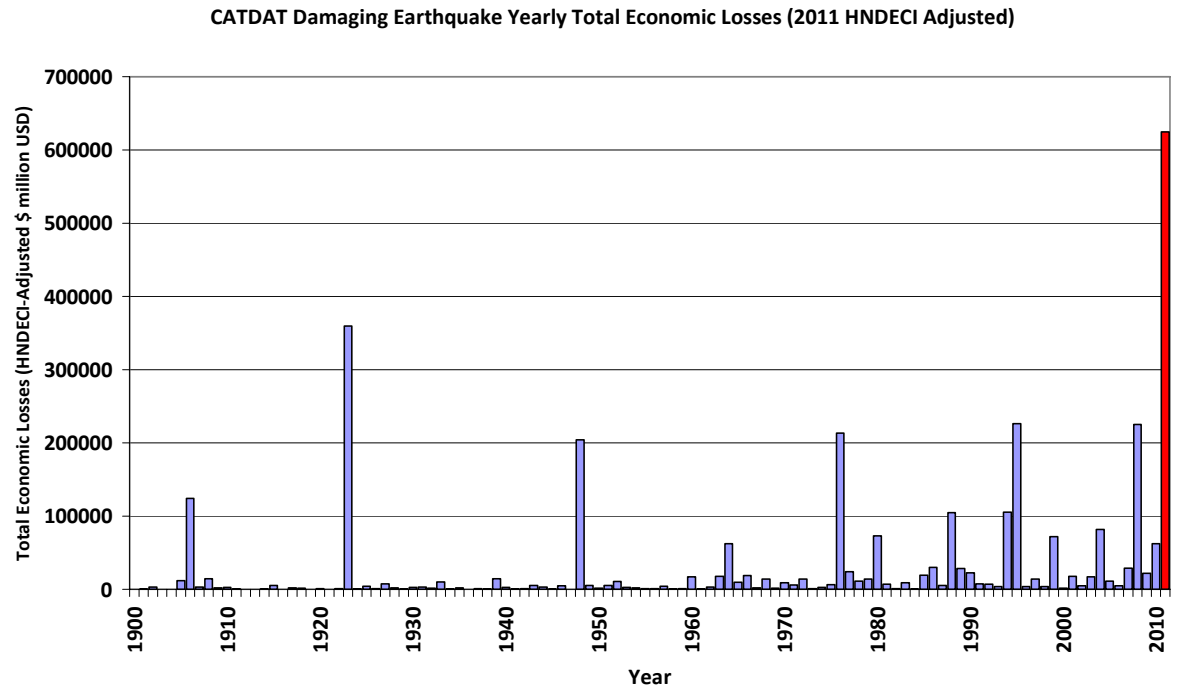


Figure 13 – Yearly Total Economic Losses from CATDAT Damaging Earthquakes showing 2011 as the highest loss year of the past 111 years.

In terms of death tolls, the approximately 20000 killed this year is about on the annual average for the past 111 years. Over the past 111 years, the average death toll has been 21800 deaths per year. The interesting fact is that this was the highest death toll year in developed nations versus developing nations.

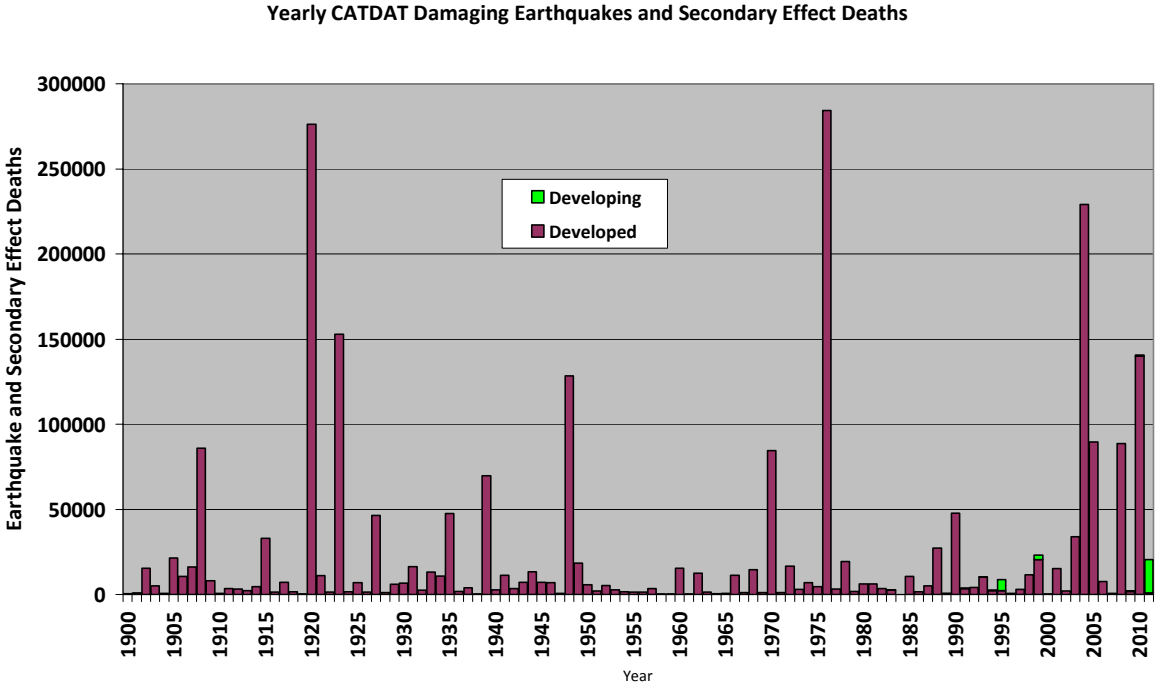


Figure 14 – Yearly Earthquake and Secondary Effect deaths in CATDAT for developing and developed nations through time – 2011 shows the largest death toll from a developed nation (HDI (2011) > 0.8)

A figure showing the effects of worldwide earthquakes in the past in terms of direct economic losses (in this diagram, the Japanese disaster was pegged at $253.5 billion US) and also deaths can be seen.

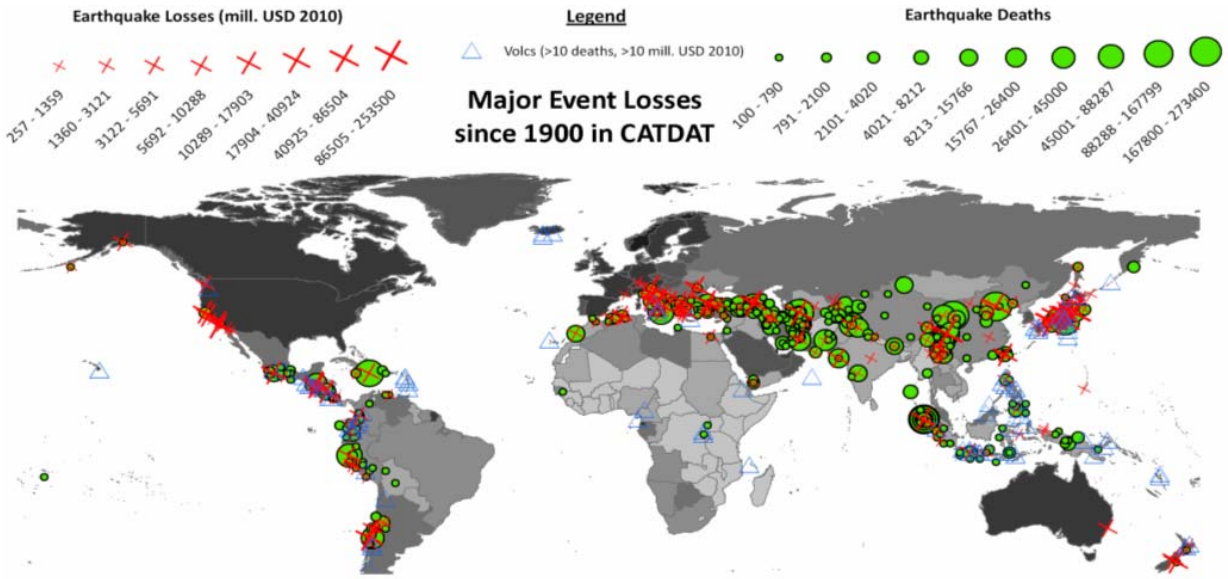


Figure 15 – Major event losses in the CATDAT damaging earthquakes database from 1900-2011 (Daniell, 2003-2011a)

The following diagram shows the worldwide relationship of cumulative deaths versus population, and direct and total economic losses versus worldwide GDP (Purchasing Power Parity adjusted). It can be seen that, currently, the death toll from earthquakes is reducing versus increasing population, hopefully showing that better disaster mitigation, management and preparedness is occurring worldwide, as well as better building practices.

The trend in terms of economic losses was one of a reasonably linear nature until the Tohoku event of this year. The data has been 2011 adjusted in terms of economic losses. The trend now shows an increase with respect to GDP in the last year.

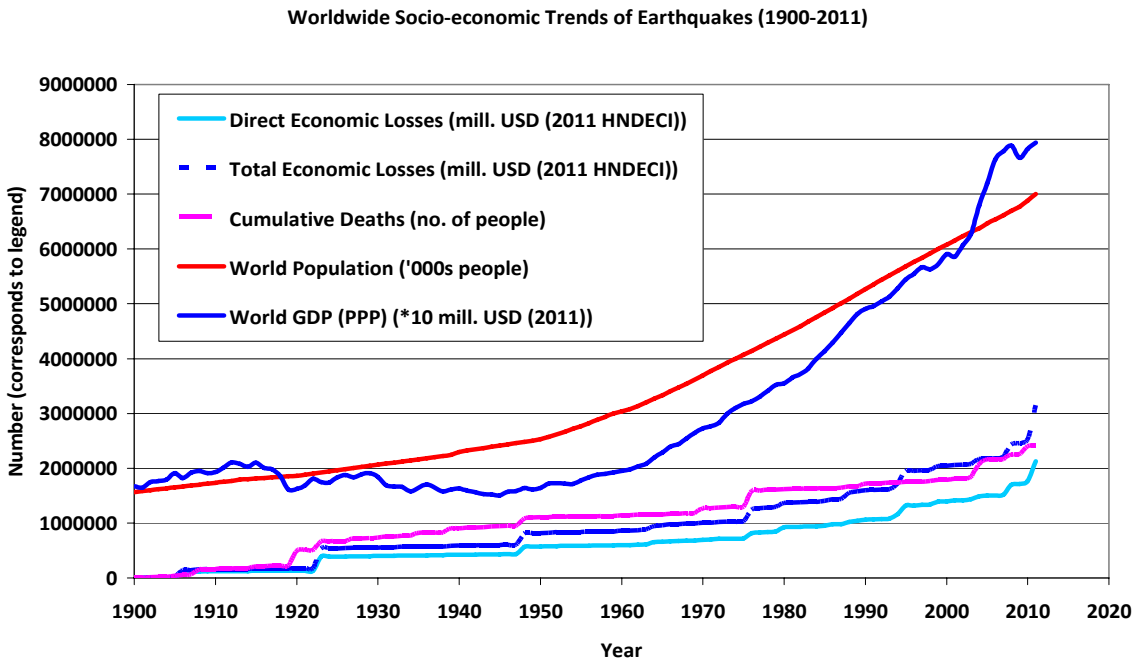


Figure 16 –Cumulative deaths and economic losses related to global 2011-dollar GDP (PPP) and population.

5 Conclusion

2011 has been **the highest economic loss year on record from earthquakes and secondary effects**, but a less than average year for fatalities directly from earthquake shaking. Including tsunami and secondary effects, this represents a below average year for deaths from earthquakes. **With around 57.8 million people dying this year around the world, around 0.035% have been due to earthquakes and tsunamis.**

In Japan, the earthquake and tsunami accounted for 1.6% of deaths in the country in 2011. In NZ, the earthquake accounted for 0.62% of deaths in the country in 2011 or 4.6% of deaths in the Canterbury region in 2011. The Turkish earthquakes of 23rd October and 9th November caused 5.6% of deaths in the Van Province in 2011, yet less than 0.2% of deaths nationally in Turkey.

Direct economic losses for the year **totalled around $365 billion US** ($335 billion US of which was from the 2011 Tohoku Earthquake). This is **approximately 0.37%** of the World GDP this year.

There is also much potential observed through CATDAT earthquake data from the past 110 years for further insurance potential in lower HDI locations where rapid development is occurring, leading to increasing economic losses if an earthquake occurs.

The CATDAT Damaging Earthquake database contains much data suitable for use in many sectors from earthquake loss estimation, to risk mapping, for insurance purposes and simply as a validated dataset to reduce the erratic values of socio-economic losses quoted wrongly throughout a number of sources. It has been shown that the traditional view that social and economic losses are increasing exponentially should be treated with caution. The dataset contains many more earthquakes with socio-economic data than other earthquake databases and additionally much trend analysis and hopefully this has led to more populated trends. Large natural disaster losses are extremely difficult to quantify using a single number. Thus, CATDAT utilises a lower bound, upper bound and best estimate value, using expert judgement; yet also presents all data to the user.

With the advent of **earthquake-report.com** reporting 24 hours a day, 365.2422 days per year, the Worldwide CATDAT Damaging Earthquakes Database is now also updated in real time. 2011 has been the first entire year that has been covered and **we hope that with your support and funding that we can continue the service in 2012** and the coming years.

Over 12300 earthquakes show over 8.49 million deaths since the beginning of earthquake records. Earthquakes in the 20th and 21st centuries have already caused approximately $3.14 trillion (2011 HNDECI-Adjusted int. dollars) damage (of this around 20% has occurred in 2011, mostly due to Tohoku). Collection of building damage for historic earthquakes demonstrates the vulnerability of traditional building stocks such as masonry, adobe and badly constructed reinforced concrete. However, given the population increase around the world, there has been a significant reduction in loss of life due to earthquakes compared to what should be expected. This has come through a combination of country development, implementation of better building practice to resist earthquake forces and a more stable world, allowing for earthquake insurance and protection of financial assets.

Many of the references for this paper are included in associated papers and over 19000 individual sources of information have been used to create the data in the CATDAT damaging earthquakes database.

Man sagt oft : Zahlen regieren die Welt.
Sicher ist nur: Zahlen zeigen wie sie regiert wird.

It is often said: Figures rule the world. The only sure thing is: Figures show how it is ruled.

J.W. Goethe (1749-1832)

6 Main References

Given the fact that over 19000 individual sources of information have been used in the CATDAT Damaging Earthquakes database, only the main references will be shown in this list. Please refer to the following papers for more information or email me to get more details.

Daniell, J.E. [2003-2011a] "The CATDAT Damaging Earthquakes Database"*, searchable integrated historical global catastrophe database, Digital Database,* updates **v1.0** to latest update **v5.0328** – *nb. V0.0-v0.99 refers to all work and updates done 2003 to 2007.*

Vervaeck, A., Daniell, J.E. [2011] "Over 400 earthquake loss estimation related articles on earthquake-report.com related to the rapid loss estimation procedures and calibration of data from 1.01.2011 to 31.12.2011.", **www.earthquake-report.com**.

Daniell, J.E. [2003-2011b] "CATDAT Global Economic Databases"*, Digital Database,* Karlsruhe, Germany.

Daniell, J.E. [2003-2011c] "CATDAT Global Social Databases"*, Digital Database,* Karlsruhe, Germany.

Daniell, J.E. [2011] "The development of socio-economic fragility functions for use in worldwide rapid earthquake loss estimation procedures", PhD Thesis (unpublished), KIT, Karlsruhe

Daniell, J.E., Khazai, B., Wenzel, F., Vervaeck, A. [2011a] "The CATDAT damaging earthquakes database", *Nat. Hazards Earth Syst. Sci.*, 11, 2235-2251, doi:10.5194/nhess-11-2235-2011, 2011.

Daniell, J.E. [2011b] "The CATDAT Damaging Earthquakes Database – 2010 – Year in Review", CEDIM Research Report 2011-01, Earthquake-Report OF Report, Karlsruhe, Germany.

Daniell, J.E. [2011c] "The CATDAT Damaging Volcanoes Database – 2010 – Year in Review", CEDIM Research Report 2011-02, Earthquake-Report OF Report, Karlsruhe, Germany.

Daniell, J.E. [2011d] "The Worldwide CATDAT Damaging Earthquakes and Damaging Volcanoes Databases: Socio-economic trends, values and analysis including 2010", *Geophysical Research Abstracts Vol. 13*, EGU2011-4909.

Daniell, J.E., Vervaeck, A. [2011e] "The 2011 Tohoku Earthquake – CATDAT Situation Reports 1-41", Earthquake-Report.com.

Daniell, J.E., Gibson, G. [2011f] "A review of all Australian Damaging Earthquakes and their contribution to knowledge of earthquake risk in Australia.", *Geophysical Research Abstracts Vol. 13*, EGU2011-4934.

Daniell, J.E., Khazai, B., Slingby, A. and Wenzel, F. [2011g] "A Country-by-Country Building Inventory and a Building Vulnerability Index for use in different Natural Disaster applications" *Geophysical Research Abstracts Vol. 13*, EGU2011-4948-1.

Daniell, J.E. [2011h] "Open Source Procedure for Assessment of Loss using Global Earthquake Modelling software (OPAL)", Nat. Hazards Earth Syst. Sci., 11, 1885-1899, doi:10.5194/nhess-11-1885-2011, 2011.

Daniell, J.E., Wenzel, F. and Khazai, B. [2011i] "The Economics of Earthquakes since 1900: The Hybrid Natural Disaster Economic Index, Historical Loss Conversion, Future Impacts and Insurance Takeout", *Geophysical Research Abstracts Vol. 13*, EGU2011-4923.

Daniell, J.E., Wenzel, F., Khazai, B. [2011j] "Uncovering the mystery of the Haiti death toll"*, Submitted to Disaster Prevention and Management.*

Daniell, J.E., Wenzel, F., Vervaeck, A. [2011k] "The Socio-economic effects of the 2011 Tohoku earthquake", *Geophysical Research Abstracts Vol. 13*, EGU2011-14270.

Daniell, J.E., Wenzel, F., Khazai, B. [2011l] "Die Kosten historischer Erdbeben : Ökonomische Analyse der weltweiten Erdbebenschäden seit 1900", DKKV Paper, DKKV 2011 Conference, Potsdam, Germany.

Daniell, J.E., Wenzel, F. [2011m] "Deterministic Earthquake Scenarios for the Northern Rhine Region (Deterministische Erdbeben Szenarien für die nördliche Rhein-Region", D-A-CH Tagung Proceedings, Hannover September 2011, pp. 13-24.

Daniell, J.E.; Vervaeck, A.; Wenzel, F. [2011n] "A timeline of the Socio-economic effects of the 2011 Tohoku Earthquake with emphasis on the development of a new worldwide rapid earthquake loss estimation procedure", Australian Earthquake Engineering Society 2011 Conference, Nov 18-20, Barossa Valley, South Australia.

Daniell, J.E., Wenzel, F., Khazai, B., Vervaeck, A. [2011o] "A Country-by-Country Building Inventory and Vulnerability Index for Earthquakes in comparison to historical CATDAT Damaging Earthquakes Database losses" Australian Earthquake Engineering Society 2011 Conference, Nov 18-20, Barossa Valley, South Australia.

Daniell, J.E., Khazai, B., Kunz-Plapp, T., Wenzel, F., Vervaeck, A., Muehr, B., Markus., M., Erdik, M. [2011p] "Comparing the current impact of the Van Earthquake to past earthquakes in Eastern Turkey", CEDIM Forensic Earthquake Analysis Group – Report #4, Karlsruhe, Germany.

Khazai, B., Daniell, J.E., Wenzel, F. [2011a] "The March 2011 Japan Earthquake – Analysis of losses, impacts, and implications for the understanding of risks posed by extreme events", Technikfolgenabschätzung – Theorie und Praxis 20. Jg., Heft 3, November 2011.

Khazai, B., Vangelsten, B., Duzgun, S., Braun, J., Daniell, J.E. [2011b] "Social Impacts of Emergency Shelter Provision in the aftermath of Earthquakes: Integrating Social Vulnerability in Systemic Seismic Vulnerability Analysis", *Geophysical Research Abstracts Vol. 13,* EGU2011-7374.

Kunz-Plapp, T., Khazai, B., Daniell, J.E. [2011] "Social Impacts of Earthquakes on Health and Health Care Systems: Integrating Social Vulnerability in Systemic Seismic Vulnerability Analysis", *Geophysical Research Abstracts Vol. 13,* EGU2011-7561.

Slingsby, A., Daniell, J.E., Dykes, J., Wood, J. [2011] "Sharing insights on the impact of natural disasters using Twitter", *Geophysical Research Abstracts Vol. 13*, EGU2011-9171.

Daniell, J.E. [2010a] "Deterministic Earthquake Scenarios for the Northern Rhine Region (Deterministische Erdbeben Szenarien für die nördliche Rhein-Region)", *CEDIM Earthquake Loss Estimation Series, Research Report No. 10-02,* CEDIM, Karlsruhe, Germany.

Khazai, B., Daniell, J.E., Apel, H. [2010b] "Risk Analysis Course Manual", *The World Bank Institute,* Washington DC.

Daniell, J.E. [2010c] "Open Source Procedure for Assessment of Loss (OPAL Project)", *European Geosciences Union General Assembly,* Vienna, Austria.

Daniell, J.E. [2010d] "The socio-economic damage of historical earthquakes and secondary effects on the Asia-Pacific region infrastructure", *Paper No. 0431, 5th CECAR Conference Proceedings,* Sydney, Australia.

Daniell, J.E., Daniell, K.A., Daniell, T.M., Khazai, B. [2010e] "A country level physical and community risk index in the Asia-Pacific region for earthquakes and floods", *Paper No. 0392, 5th CECAR Conference Proceedings*, Sydney, Australia.

Daniell, J.E. [2010f] "The CATDAT Damaging Earthquakes Database"*, Paper No. 6, AEES 2010 Conference*, Perth, Australia*.*

Daniell, J.E., Love, D. [2010g] "The Socio-economic Impact of Historic Australian Earthquakes"*, Paper No. 8, AEES 2010 Conference*, Perth, Australia.

Daniell, J.E., Wenzel, F., Khazai, B. [2010h] "The Cost of Historic Earthquakes Today – Economic Analysis since 1900 through the use of CATDAT", *Paper No. 7, AEES 2010 Conference*, Perth, Australia*.*

Daniell, J.E. [2010i] "A complete country-based temporal and spatial Human Development Index – 1800-2010", *Digital Database and Report,* Karlsruhe, Germany.

Daniell, J.E. [2010j] "EQLIPSE Building Practice Factor and EQLIPSE Seismic Code Index", *Digital Database and Report,* Karlsruhe, Germany.

Daniell, J.E. [2010k] "EQLIPSE Individual Country Building Inventory", *Digital Database and Report,* Karlsruhe, Germany.

Daniell, J.E. [2010l] "Country-based Gross Domestic Product through time (1900-2010) and space (244 discretised nations)", *Digital Database and Report*, Karlsruhe, Germany.

Daniell, J.E. [2009a] "Open Source Procedure for Assessment of Loss Using Global Earthquake Modelling (OPAL Project)", *CEDIM Earthquake Loss Estimation Series, Research Report No. 09-01,* CEDIM, Karlsruhe, Germany.

Daniell, J.E. [2009b] "Open Source Procedure for Assessment of Loss (OPAL Project)", Australian Earthquake Engineering Society 20th Anniversary Conference Proceedings, Newcastle, Australia, 2009.

Other References

AFAD (2011) "Updates, Reports, Damage Statistics – Van Earthquake", various reports and data updates from 23/10 to 2/11, URL:http://www.afad.gov.tr

AON [2011] "Annual Global Climate and Catastrophe Report – monthly reports", *Impact Forecasting-2011.*

Asian Disaster Reduction Center (ADRC) [2011] "GLIDEnumber". *Asian Disaster Reduction Center*. Available from http://www.glidenumber.net/glide/public/search/search.jsp

BSSA (Bulletin of the Seismological Society of America) [1911-2011] "Seismological Notes", *various years,* checked against other data.

BTE [2001] "Economic Costs of Natural Disasters in Australia", *Bureau of Transport Economics Report 103*, Canberra.

Catlin Group Limited [2010] "Catlin News Center", available from URL: http://www.catlin.com/cgl/media/press_releases/pr_2010/

CERA [2011] "Canterbury Earthquake Recovery Authority", URL:www.cera.govt.nz

ChinaLife [2011] "China Life Insurance Company News", available from URL: www.chinalife.com.cn/

EM-DAT [2008, 2011] "Emergency Management Database", *CRED, Catholic University of Louvain*, last accessed 08/2008 and 08/2010 – open data, available from URL: http://www.emdat.be.

FDMA [2011] "Situation Reports 1-142" (in Japanese), FDMA Reports from 11/03/2011 to 01/01/2012, URL:www.fdma.go.jp

Fukushima Prefecture [2011] "Damage, Casualty and Shelter Reports 1-376" (in Japanese), Reports from 11/03/2011 to 28/12/2011, URL:www.pref.fukushima.jp.

Ganse, R.A., Nelson J.B. [1981] "Catalog of significant earthquakes 2000 B.C. to 1979, including quantitative casualties and damage", *Report SE-27*, World Data Center A for Solid Earth Geophysics, 145 pp.

Google News [2011] "Google News", available from URL: http://news.google.com – includes references to all news outlets mentioned in this report.

Gu, G., Lin, T., Shi, Z. [1989] "Catalogue of Chinese Earthquakes (1831 B.C. – 1969 A.D.)", *Science Press*, Beijing, China [English translation].

International Monetary Fund (IMF) [2011] "World Economic Outlook Databases (WEO)", *Online database,* available from URL: http://www.imf.org/external/data.htm#data.

Iwate Prefecture [2011] "Damage, Casualty and Shelter Reports" (in Japanese), Reports from 12/03/2011 to 28/12/2011 (over 200 reports), URL:www.pref.iwate.jp.

Japanese Cabinet Office [2011] "Japan estimates quake damage at 16.9 trln yen", *Reuters*, available from URL: http://www.reuters.com/article/2011/06/24/japan-economy-estimate-idUSL3E7HN3CM20110624.

Japanese Government [2011] "Japan Sees Quake Damage Bill of Up to $309 Billion, Almost Four Katrinas", *Bloomberg*, Keiko Ujikane, accessed March 23, 2011.

KOERI [2011] "Türkiye Deprem Kataloğları", Kandilli Observatory and Earthquake Research Institute, Istanbul, available from URL: http://www.koeri.boun.edu.tr/sismo

Melissen, H-J. [2010] "Haiti quake death toll well under 100,000", *Radio Netherlands Worldwide*, 23 February 2010.

Milne [1912] "Catalogue of Destructive Earthquakes A.D. 7–1899", *Report 81st Meeting*, *Br. Assoc. Adv. Sci.*, Portsmouth 1911.

Miyagi Prefecture [2011] "Damage, Casualty and Shelter Reports" (in Japanese), Reports from 12/03/2011 to 28/12/2011 (over 300 reports), URL:www.pref.miyagi.jp.

MunichRe (MRNATHAN) [2009] "Globe of Natural Disasters", MRNATHAN DVD, *Munich Reinsurance Company*.

MunichRe [2010] "MunichRe Half Yearly NatCat Review", *Webinar*, available from URL: http://www.munichreamerica.com/webinars/2010_07_natcatreview/MR_III_2010_HalfYear_NatCat_Review.pdf

NGDC/NOAA [2011] "Significant Earthquakes Database and Significant Tsunami Database", *2010 online searchable catalogue at http://ngdc.noaa.gov*, last accessed 08/2010.

PAGER-CAT [2008] "PAGER-CAT Earthquake Catalog" *as described in Allen, T.I., Marano, K., Earle, P.S., Wald, D.J., 2009 PAGER-CAT: A composite earthquake catalog for calibrating global fatality models: Seism. Res. Lett., v.* 80, no. 1, p. 50-56.

PartnerRe [2010] "PartnerRe Press Center", available from URL: http://www.partnerre.com/news/

ReliefWeb [2011] "OCHA ReliefWeb", available from URL: http://www.reliefweb.int.

Standard and Poor's [2010] "Global Reinsurance Highlights: 2010 Edition", available from URL: http://www2.standardandpoors.com/spf/pdf/fixedincome/global_reinsurance_2010.pdf

Swiss Re. [1999-2011] "Sigma", *Economic Research and Consulting*, Swiss Reinsurance Company Ltd.

Transparency International [2011] "Global Corruption Report 2011 – Corruption Perceptions Index".

UN Census Round [2011] "UN Census Round 2010", Available from URL: unstats.un.org/unsd/census2010.htm.

UNDP [2011] "Human Development Report 2011", *Oxford University Press*, New York.

University of Richmond [2010] "The Disaster Database Project [database on the internet]", *Richmond (VA): University of Richmond,* available from URL: http://learning.richmond.edu/disaster/index.cfm.

Urbaninfo [2011] "UrbanInfo v2.0", *UN-HABITAT*, available from URL: http://www.devinfo.info/urbaninfo.

USGS [2011] "Earthquake Hazard Programme", available from URL: http://earthquake.usgs.gov.

USGS [2011] "Historic World Earthquakes", available from URL: http://earthquake.usgs.gov/earthquakes/ – links to PDE

USGS PAGER [2011] "USGS Pager Updates", available from URL: http://earthquake.usgs.gov/earthquakes/pager/

Utsu, T. [2002] "A list of deadly earthquakes in the World: 1500-2000", *in Lee, W.K., Kanamori, H., Jennings, P.C., and Kisslinger, C. (eds.), International handbook of earthquake engineering and seismology: Amsterdam, Academic Press, p. 691-717.*

World Bank [2010] "GEM (Global Economic Monitor) & World Development Indicators", *online databases*, available from URL: http://data.worldbank.org/data-catalog.

World Bank [2011] "The Recent Earthquake and Tsunami in Japan: Implications for East Asia", East Asia and Pacific Economic Update 2011, Vol. 1, accessed March 21, 2011, URL: http://siteresources.worldbank.org/INTEAPHALFYEARLYUPDATE/ Resources/550192-1300567391916/EAP_Update_March2011_japan.pdf.

World Gazetteer [2011] "World Gazetteer Population Database", *online database*, available from URL: http://www.world-gazetteer.com/home.htm

Appendix A: Summary pages of each 2011 damaging earthquake

The following section contains a summary of each 2011 damaging earthquake. Much more information is included in the full database and on earthquake-report.com; however, the section below provides a useful overview. It should be noted that much discrepancy is shown in values, and the author takes no responsibility for misuse. Most data is from government sources. Should the reader require more information, much more data on each earthquake is housed in the CATDAT Damaging Earthquakes database.

Simply email me at j.e.daniell@gmail.com, or use the contact details on the back page. Again, I welcome any feedback, as there will no doubt be discrepancies, additions, possible other sources of information and unbeknown data to me. However, I have done my best to minimise errors.

We would appreciate a donation to **www.earthquake-report.com**

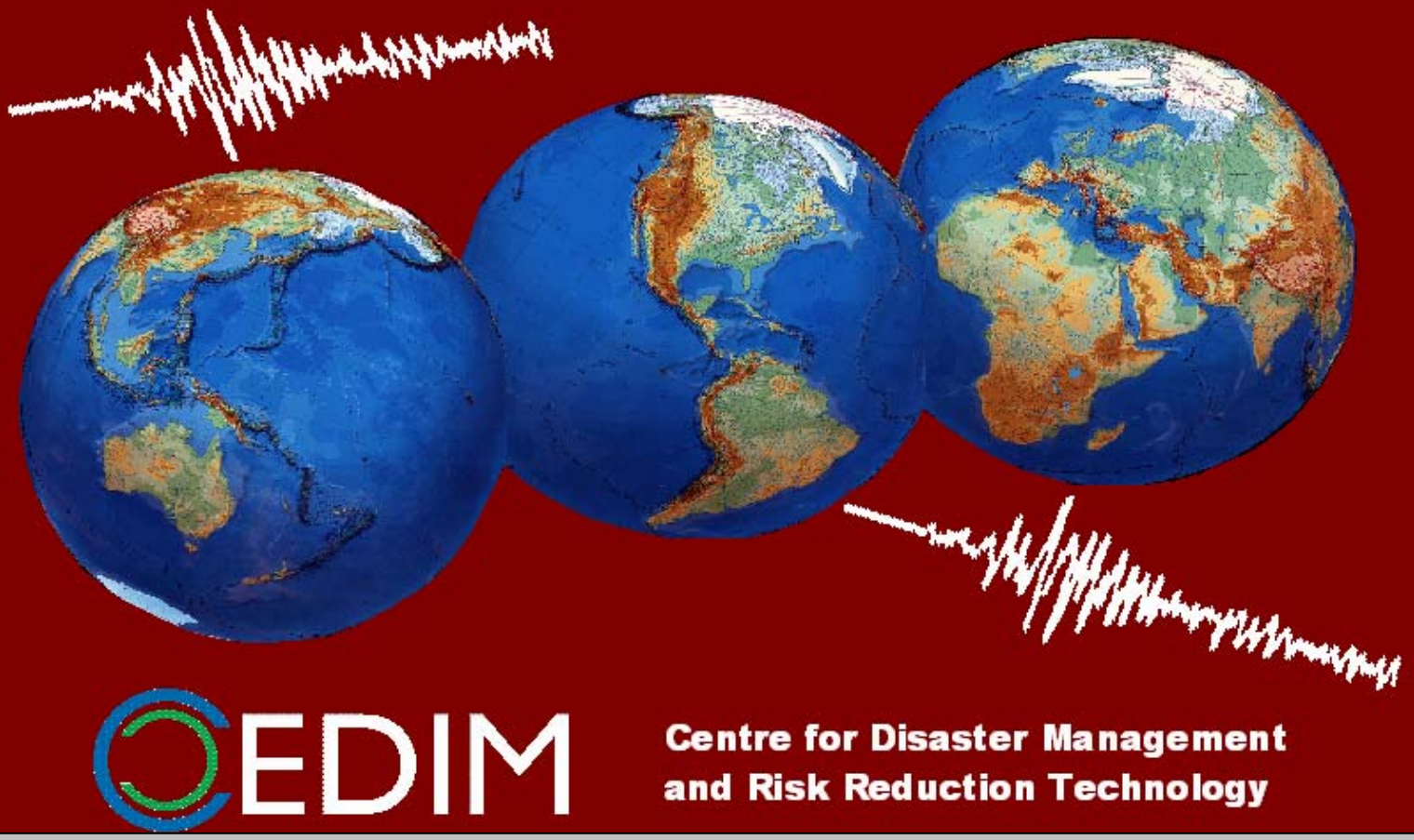
No.	Name	Date	Time (UTC)	LT	Lat.	Long.	H (km)	Mag.	Int.	Ctry	HDI	Fatality Range	Injury Est.	Homeless Est.	Red Build	Yellow Build	Econ. Median $USDm	Econ. Loss Range $USDm	Insured Loss Range $USDm
001	Yangjiang 1	01-01	7:32	+8	24.61	98.03	21	4.7Mw	7	CN	0.687	0-0	1	54000	1605	6531	7.54	7.54-7.54	0 (0-0)
002	Yangjiang 2	01-01	23:33	+8	24.61	98.03	52.7	4.9Mw	7	CN	0.687	0-0	0	inc above	inc. above	inc.above	0.50	0.50-0.50	0 (0-0)
003	Nueva Imperial	02-01	20:20	-3	-38.36	-73.33	24	7.2Mw	7	CL	0.805	0-0	0	0	0	unk.	0	0-0	0 (0-0)
004	Mamasani	05-01	5:55	+3.5	30.15	51.76	10	5.4Mw	7	IR	0.707	0-0	37	35000	7287	0	0	0.01-0.09	0 (0-0)
005	Yasuj 1	07-01	23:53	+3.5	30.20	51.68	16	4.9Mw	6	IR	0.707	0-0	0	0	0	0	0	0.01-0.09	0 (0-0)
006	Yasuj 2	08-01	0:24	+3.5	30.18	51.71	17	5Mw	6	IR	0.707	0-0	0	0	0	0	0	0.01-0.09	0 (0-0)
007	SW Pakistan	18-01	20:23	+5	28.73	63.93	68	7.2Mw	6	PK	0.504	3-3	9	0	0	200	0	0.13-0.26	0 (0-0)
008	Anqing	19-01	4:07	+8	30.61	117.10	16.3	4.9Mb	6	CN	0.687	0-0	0	3635	1154	6005	35.87	35.87-35.87	0 (0-0)
009	sak'art'velo	19-01	9:17	+4	41.96	42.66	14	5.3Mw	6	GE	0.733	0-0	0	0	2	unk.	0	0.01-0.13	0 (0-0)
010	10km SW of Christchurch	19-01	17:03	+13	-43.62	172.55	10	5.1Ml	6.5	NZ	0.908	0-0	0	0	0	2826 claims	25.98	17.32-34.64	16.88 (11.26-22.51)
011	Kerman Province	27-01	8:38	+3.5	28.19	58.97	10	6Mw	6.5	IR	0.707	0-0	0	0	0	300	0	0.01-0.09	0 (0-0)
012	Kecsked	29-01	17:41	+1	47.56	18.32	1	4.3Mw	5.5	HU	0.816	0-0	0	0	0	17000	15	5-15	5 (5-5)
013	Yangjiang 3	01-02	7:11	+8	24.74	98.02	39	4.8Mw	6.5	CN	0.687	0-0	1	1000	230	448	0.76	0.60-1	0 (0-0)
014	20km SW of Christchurch	04-02	4:56	+9	-43.63	172.36	9	4.6Ml	6	NZ	0.908	0-0	0	0	0	748 claims	21.38	14.25-28.50	13.89 (9.26-18.53)
015	Myanmar	04-02	13:53	+6.5	24.62	94.74	88.8	6.4Mw	6	MM, IN	0.483	1-1	some	0	0	10+	1.10	0.20-1.50	0 (0-0)
016	Zhaotong City	12-02	5:44	+8	27.15	103.01	13	4.4Ml	6	CN	0.687	0-0	0	4000	1034 (1967 rooms)	3893 (9063 rooms)	8.51	8.51-8.51	0 (0-0)
017	Soroako	15-02	13:33	+8	-2.51	121.49	14	6.1Mw	5	ID	0.617	0-0	0	0	0	100s	0.93	0.79-1.07	0 (0-0)
018	Coal Bump Paonia	17-02	22:47	-7	38.95	-107.97	1	3.1Ml	5	US	0.910	0-0	0	0	0	some	0.50	0.50-0.50	0 (0-0)
019	Tucuman	21-02	6:58	-3	-27.20	-64.76	10	5.6Mw	6	AR	00	0-0	0	0	1	27	2.50	1-5	0 (0-0)
020	Christchurch	21-02	23:51	+13	-43.60	172.71	5	6.3Mw	9	NZ	0.908	181-185	2164	40000	12000	144459	16000	15000-20000	13000 (11000-16250)
021	Christchurch Aftershock 1	22-02	0:04	+13	-43.60	172.63	6	5.7Mw	7	NZ	0.908	0-0	30	0	inc. above	inc.above	50	35-100	40.63 (28.44-81.25)
022	Christchurch Aftershock 2	22-02	1:50	+13	-43.62	172.72	5	5.5Mw	7	NZ	0.908	0-0	3	0	inc. above	inc.above	25	25-25	20.31 (20.31-20.31)
023	Gifu	26-02	17:18	+9	36.16	137.46	4	5Mjma	4.1JMA	JP	0.901	0-0	0	0	0	38	5	5-5	0 (0-0)
024	Mindanao	03-03	15:12	+8	9.46	125.94	53	5.5Mw	7	PH	0.644	0-0	0	0	0	several	0	0-0.04	0 (0-0)
025	Honshu	09-03	2:45	+9	38.42	142.83	32	7.3Mw	4.7JMA	JP	0.901	0-0	2	0	0	some	0	0-0	0 (0-0)
026	Yingjiang	10-03	4:58	+8	24.73	97.97	10	5.8Ml	8	CN	0.687	26-26	314	72460	15096	22326	408.67	408.67-408.67	5 (5-5)
027	Tohoku, Sendai, Great Eastern	11-03	5:46	+9	38.30	142.34	32	9Mw	6.67JMA	JP, US, ID, EC, PE, CL	0.901	19000-19295	5652	450000	127185	911669	334500	374000-295000	36000 (29400-45000)
028	Sendai Aftershock	11-03	6:15	+9	36.11	141.27	43	7.7Mjma	6.0JMA	JP	0.901	1-1	0	0	some	many	0	0-0	0 (0-0)

029	Miyagi Aftershock	11-03	11:36	+9	39.17	142.62	24	6.7Mjma	4.6JMA	JP	0.901	1-1	0	0	some	many	0	0-0	0 (0-0)
030	Nagano	11-03	18:59	+9	36.99	138.60	8	6.7Mjma	6.4JMA	JP	0.901	0-0	57	0	54	1528	1000	500-1500	110 (55-165)
031	Nagano Aftershock	11-03	19:31	+9	36.95	138.57	1	5.9Mjma	5.5JMA	JP	0.901	0-0	0	0	inc. above	inc.above	0	0-0	0 (0-0)
032	Nagano Aftershock 2	11-03	20:42	+9	36.97	138.59	4	5.3Mjma	5.9JMA	JP	0.901	0-0	0	0	inc. above	inc.above	0	0-0	0 (0-0)
033	Fujiyama	15-03	13:31	+9	35.31	138.71	14	6.4Mjma	6.3JMA	JP	0.901	0-0	54	0	0	521	1000	700-2000	400 (110-500)
034	10km E Christchurch Aftershock	20-03	8:47	+13	-43.52	172.70	10	5.1Mw	6.5	NZ	0.908	0-0	0	0	0	some	10	5-25	8.13 (4.06-20.31)
035	Myanmar	24-03	13:55	+6.5	20.70	99.95	10	6.8Mw	7	MM, TH, LA, CN	0.483	75-151	212	13000	inc. In yellow	17000	120.45	120.45-120.45	0 (0-0)
036	Akita	01-04	10:49	+9	40.26	140.36	12	5Mjma	5.0JMA	JP	0.901	0-0	1	0	0	some	0	0-0	0 (0-0)
037	Cilacap	03-04	20:06	+8	-9.79	107.75	24	6.7Mw	5	ID	0.617	1-1	0	0	0	1245	2.44	2.44-2.44	0 (0-0)
038	Chhapri	04-04	11:31	+5.45	29.68	80.75	12.5	5.4Mw	6	NP, IN	0.458	0-0	0	0	0	48	0	0-0	0 (0-0)
039	Ujungkulon, Prov. Banten	05-04	4:34	+7	-7.38	105.97	23	5.4Ml	6	ID	0.617	0-0	0	0	1	2	0	0-0	0 (0-0)
040	Sendai Aftershock	07-04	14:32	+9	38.25	141.64	49	7.1Mw	6.2JMA	JP	0.901	2-4	296	some	22	2000	2000	1500-3000	220 (165-330)
041	Luhuo County	10-04	9:02	+8	31.30	100.90	7	5.3Ms	7	CN	0.687	0-0	4	1850	300	1500	24.69	24.69-24.69	0 (0-0)
042	Eastern Honshu Aftershock	11-04	8:16	+9	37.01	140.48	10	6.6Mw	5.8JMA	JP	0.901	3-7	10	many	100s	1000s	0	0.11-1.06	0 (0-0)
043	Eastern Honshu Aftershock	12-04	5:07	+9	37.05	140.64	15	6.4Mjma	5.7JMA	JP	0.901	0-0	2	many	10s	100s	0	0.11-1.06	0 (0-0)
044	Yunnan/Sichuan Border	15-04	15:44	+8	26.70	103	19	4.5Ml	6	CN	0.687	0-0	0	0	0	128	0.91	0.91-0.91	0 (0-0)
045	Southern Ibaraki Prefecture	16-04	2:19	+9	36.34	139.95	79	5.9Mjma	5.0JMA	JP	0.901	0-0	6	0	Unk.	Unk.	0	0-0	0 (0-0)
046	10km NE Diamond Harbour Aftershock	16-04	5:49	+12	-43.61	172.79	11	5.3Ml	6	NZ	0.908	0-0	0	0	0	3522 claims	30	7-40	24.38 (5.69-32.50)
047	Ege Denizi	23-04	22:22	+3	38.06	26.76	5	4Ml	6	TR	0.699	0-0	0	0	0	12+	0.20	0.08-0.25	0.01 (0.01-0.01)
048	Sulawesi	24-04	23:07	+8	-4.59	122.81	9	6.2Mw	7	ID	0.617	0-0	14	0	0	200	0.60	0.50-0.80	0 (0-0)
049	Banja Luka	28-04	23:30	+2	44.81	17.32	10.1	4.3Mw	6	BA, RS	0.733	0-0	0	0	0	many	0	0.01-0.13	0 (0-0)
050	20km N Springfield Aftershock	29-04	19:08	+12	-43.18	172.01	9	5.2Mw	6	NZ	0.908	0-0	0	0	0	86 claims	0.75	0.50-1	0.40 (0.08-0.50)
051	Canterbury	10-05	15:04	+12	-43.59	172.41	12	5Mw	6	NZ	0.908	0-0	0	0	0	901 claims	5	2-10	4.06 (1.63-8.13)
052	Lorca Foreshock	11-05	15:05	+2	37.70	-1.67	5	4.5Ml	5.5	ES	0.878	0-0	0	0	inc. Below	inc. Below	35	35-35	0 (0-0)
053	Lorca	11-05	16:47	+2	37.70	-1.67	1	5.1Mw	6	ES	0.878	9-10	403	5000	1761	31000	90	90-215	99 (99-125)
054	Simav Kutahya	19-05	20:15	+3	39.14	29.07	9	5.8Mw	8	TR	0.699	2-3	122	10000	2208	3373	260	260-260	9.75 (7-14)
055	Kutahya Simav Aftershock	27-05	4:43	+3	39.12	29.04	9	4.5Ml	6	TR	0.699	0-0	0	0	0	5+	3.48	0.77-4.63	0.15 (0.08-0.39)
056	Kutahya Simav Aftershock 2	28-05	2:47	+2	39.12	29.04	5	4.7Ml	6	TR	0.699	0-0	0	0	0	5+	0.62	0.14-0.83	0.03 (0.01-0.07)
057	Niigata	02-06	2:33	+9	37.02	138.71	6	4.7Mjma	5JMA	JP	0.901	0-0	0	0	0	3	0	0-0	0 (0-0)

058	20km SW of Christchurch	05-06	21:09	+12	-43.61	172.41	15	5.5Ml	6.5	NZ	0.908	0-0	0	0	0	901 claims	6	3-11	4.88 (2.44-8.94)
059	Toksun County	08-06	1:53	+8	43.03	88.26	26	5.3Mw	6	CN	0.687	0-0	7	168+	50	3978 (23868 rooms)	14.23	14.23-14.23	0 (0-0)
060	Eritrea - Nabro Volcano	12-06	20:32	+3	13.46	41.69	10	5.7Mw	7	ER, ET	0.363	0-0	0	0	Unk.	100s	0.12	0.04-0.38	0 (0-0)
061	10km E of Christchurch	13-06	1:01	+12	-43.58	172.76	9.2	5.646Ml	8	NZ	0.908	0-0	0	0	inc. below	inc. below	50	50-50	40.63 (40.63-40.63)
062	10km SE of Christchurch	13-06	2:20	+12	-43.58	172.74	6.1	6.338Ml	9	NZ	0.908	1-1	45	1000	247	54312 claims	3000	2500-4830	2340 (1950-3924.38)
063	Pahae Jae District	14-06	0:08	+7	1.82	99.08	23	5.5Ml	7	ID	0.617	0-0	130	2000	300	1783	2.34	0.82-2.34	0 (0-0)
064	Kahnuj	15-06	1:05	+4.5	27.94	57.75	18	5.7Ml	7	IR	0.707	2-2	0	0	0	some	0	0.01-0.09	0 (0-0)
065	Eritrea - Nabro Volcano	17-06	9:16	+3	13.30	41.66	10	5.6Mw	6	ER, ET	0.363	0-7	0	0	Unk.	100s	0.12	0.04-0.38	0 (0-0)
066	Tengchong County	20-06	10:16	+8	25.10	98.70	10	5.2Ms	6	CN	0.687	0-0	6	200	22	4739 (35034 rooms)	43	43-43	0 (0-0)
067	Hornby	21-06	10:34	+12	-43.60	172.53	8.3	5.2Mw	7	NZ	0.908	0-0	0	0	0	2241 claims	15	12-25	12.19 (9.75-20.31)
068	Aomori, Hashikami	22-06	21:50	+9	39.95	142.59	36	6.9Mjma	4.8JMA	JP	0.901	0-0	0	0	0	some	0	0-0	0 (0-0)
069	Elazig	23-06	7:34	+3	38.57	39.62	5	5.4Ml	6	TR	0.699	0-0	2	some	some	150+	7.60	1.69-10.14	0.34 (0.17-0.84)
070	Haiti	24-06	14:06	-5	18.41	-72.40	10	3.5Ml	4	HT	0.454	0-0	20	0	0	0	0	0-0	0 (0-0)
071	Nangqian County	26-06	7:48	+8	32.40	95.90	10	5.2Ml	6	CN	0.687	0-0	0	700	144 (647 rooms)	2011 (9050 rooms)	10.04	10.04-10.04	0 (0-0)
072	Papua	26-06	12:16	+9	-2.39	136.65	36	6.4Mw	6	ID	0.617	1-1	0	256	64	unk.	0	0-0	0 (0-0)
073	Matsumoto	29-06	23:21	+9	36.19	137.95	4	5.4Mjma	5.1JMA	JP	0.901	0-0	15	0	3	1730	300	200-500	33 (22-55)
074	Kutahya Simav Aftershock 3	03-07	11:16	+3	39.12	29.02	5	3.9Ml	5.5	TR	0.699	0-0	0	0	0	11+	0.58	0.13-0.77	0.03 (0.01-0.06)
075	Hirokawa, Wakayama	05-07	10:18	+9	33.99	135.23	7	5.5Mjma	5.2JMA	JP	0.901	0-0	0	0	0	21	0	0-0	0 (0-0)
076	Kota Kendari	11-07	8:53	+8	-4.06	121.69	35	5.5Mw	6	ID	0.617	0-0	0	0	2	unk.	0	0-0	0 (0-0)
077	Bilecik/Merkez	11-07	16:09	+3	40.18	29.96	6.4	4.7Ml	0	TR	0.699	0-0	0	0	0	15+	0.27	0.06-0.36	0.01 (0.01-0.03)
078	Costa Rica	12-07	20:11	-6	10.96	-84.96	62.4	5.6Mw	5.5	CR	0.744	0-0	0	50	5	20	0.25	0.20-0.40	0 (0-0)
079	Central Asia	19-07	19:35	+5	40.08	71.41	20	6.1Mw	7	UZ, KG, TJ	0.641	14-14	101	3500	1000	7000	25	20-30	0 (0-0)
080	Santa Rosa Swarm 19/07-27/08	20-07	0:00	-6	14.21	-90.29	5	Swarm of 3 to 4.5 (30 of them)	Swarm	GT	0.574	0-0	0	250	21	59	0.50	0.30-1	0 (0-0)
081	Tono, Iwate	23-07	4:34	+9	38.87	142.09	47	6.4Mw	5.0JMA	JP	0.901	0-0	0	0	0	10	0	0-0	0 (0-0)
082	Coazze	25-07	12:31	+2	44.98	7.38	25.1	4.7Ml	6	IT	0.874	0-0	0	0	0	some	0	0-0	0 (0-0)
083	Marmara Denizi	25-07	12:57	+3	40.81	27.74	17	5.2Ml	6	TR	0.699	0-0	0	0	0	10+	0.48	0.11-0.64	0.02 (0.01-0.05)
084	Kawauchi	30-07	18:53	+9	36.90	141.22	57	6.5Mjma	5.0JMA	JP	0.901	0-0	11	0	0	some	0	0-0	0 (0-0)
085	Suruga Bay	01-08	14:58	+9	34.71	138.55	23	6.2Mjma	4.8JMA	JP	0.901	0-0	13	0	0	15	0	0-0	0 (0-0)

086	Kab. Mukomuko	06-08	2:45	+7	-2.91	101.10	30	5.7Mw	5.5	ID	0.617	0-0	0	0	0	40	0	0-0	0 (0-0)
087	Tengchong County 2	09-08	11:50	+8	25	98.70	11	5.2Ml	6	CN	0.687	0-0	6	1000	284 (2264 rooms)	2249 (17992 rooms)	23.35	23.35-23.35	0 (0-0)
088	E of Washuk, Baluchistan	10-08	0:53	+5	27.70	65.05	54.1	5.8Mw	5	IN	0.547	0-0	0	0	0	some	0	0-0	0 (0-0)
089	Atushi City	11-08	10:06	+8	39.90	77.20	8	5.8Ml	7	CN	0.687	0-0	21	5000	1419 (8517 rooms)	4358 (26144 rooms)	28.53	28.53-28.53	0 (0-0)
090	Tamil Nadu	12-08	6:06	+5.5	11.10	79.10	33	3.5Ml	4	IN	0.547	1-1	0	0	0	minor	0	0-0	0 (0-0)
091	Miyagi Aftershock	19-08	5:36	+9	37.65	141.80	51	6.5Mjma	4.6JMA	JP	0.901	0-0	2	0	0	27+	0	0-0	0 (0-0)
092	Colorado/ New Mexico	23-08	5:46	-6	37.06	-104.70	4	5.4Mw	7	US, MX	0.910	0-0	0	0	0	100s	0	0-0	0 (0-0)
093	Virginia	23-08	17:51	-4	37.94	-77.93	6	5.8Mw	7	US	0.910	0-0	5	0	0	1500	250	200-300	100 (100-100)
094	Kecamatan Cisarua	28-08	9:05	+7	-6.92	107.52	10	3.3Ml	6	ID	0.617	0-0	0	0	6	368	0.50	0.20-0.70	0 (0-0)
095	Singkil	05-09	17:55	+7	2.97	97.89	110	6.6Mw	5.5	ID	0.617	3-3	0	600	133	2148	9.38	5.86-9.38	0 (0-0)
096	Kitada-cho	07-09	13:29	+9	42.26	142.59	10	5.1Mjma	5.2JMA	JP	0.901	0-0	0	0	0	1	0	0-0	0 (0-0)
097	Delhi	07-09	17:58	+5.5	28.62	77.05	10	4.3Ml	5	IN	0.547	0-0	0	0	0	minor, many	0	0-0	0 (0-0)
098	Ruichang, Jiangxi	10-09	15:20	+8	29.54	115.32	10	4.5Ml	6	CN	0.687	0-0	0	120	37	1710	12.25	12.25-12.25	0 (0-0)
099	Sikkim	18-09	12:40	+5.5	27.72	88.06	19.7	6.9Mw	8	IN, NP, CN, BT, BD	0.547	111-111	many	85000	27790	53870	2260	1400-2700	10 (5-50)
100	Guatemala	19-09	18:33	-6	14.19	-90.24	9	5.6Mw	6	GT	0.574	1-4	103	70	11	400	2	1.50-2.40	0 (0-0)
101	Fukushima AS	29-09	10:05	+9	37.13	140.87	9	5.4Mjma	5.1JMA	JP	0.901	0-0	0	0	0	some	0	0-0	0 (0-0)
102	Christchurch Aftershock	09-10	7:34	+12	-43.65	173.03	8	4.7Mb	6	NZ	0.908	0-0	0	0	0	5249 claims	13	10-18	10.56 (8.13-14.63)
103	Bali	13-10	3:16	+3	-9.35	114.59	39	6.15Mw	5.5	ID	0.617	0-0	90	0	0	51+	0.35	0.35-0.35	0 (0-0)
104	Amur Oblast	14-10	6:18	+10	54.14	123.75	13.8	5.9Mw	6	RU	0.700	0-0	0	0	0	Energy	7	3-20	0 (0-0)
105	Sasan Gir, Junagadh	20-10	17:18	+5.5	21.18	70.54	15.5	5Mw	7	IN	0.547	0-0	40	600	144	3374	0	0-0	0 (0-0)
106	Van and Ercis	23-10	10:41	+3	38.76	43.36	5	7.3Mw	8	TR	0.582	604-604	4152	272157	28650	40800	1100	550-2000	44 (24.20-200)
107	Van Aftershock 1	23-10	11:32	+3	38.81	43.30	5	5.5Ml	7	TR	0.582	0-0	0	0	0	additional	0	0-0	0 (0-0)
108	Van Aftershock 2	23-10	20:45	+3	38.63	43.08	5	5.7Ml	7.5	TR	0.582	0-0	0	0	0	additional	0	0-0	0 (0-0)
109	Van Aftershock 3	25-10	14:55	+3	38.77	43.55	5	5.4Ml	7	TR	0.582	0-0	0	0	0	additional	0	0-0	0 (0-0)
110	Hakkari/Yuksekova	27-10	8:04	+3	37.33	43.93	18.3	5.4Ml	6	TR	0.582	0-0	0	0	0	some	0.99	0.22-1.31	0.04 (0.02-0.11)
111	Ica	28-10	18:54	-5	-14.78	-76.53	30	6.7Ml	6	PE	0.725	1-1	104	2801	622	3029	24.48	12.24-48.95	0 (0-0)
112	Pomasqui	29-10	13:50	-5	-0.13	-78.37	3	4Mb	6	EC	0.720	0-0	0	0	0	some	0	0-0	0 (0-0)
113	Gansu, Sichuan	31-10	21:58	+8	32.60	105.30	10	5.4Ml	6	CN	0.687	0-0	0	0	0	agricultural	2.15	2.15-2.15	0 (0-0)
114	Nilka, Xinjiang	01-11	0:21	+8	43.63	82.38	28	6Ml	7	CN	0.687	0-0	0	31100	4870 (19490 rooms)	43178 (142320 rooms)	106.67	106.67-106.67	0.50 (0.50-0.50)

115	Dingxi City Zhangxian Minxian	01-11	17:18	+8	34.50	104.20	8	4.5Ml	6	CN	0.687	0-0	0	0	0	some	0.71	0.71-0.71	0 (0-0)
116	Hakkari/Cukurca	02-11	11:43	+2	37.18	43.99	3.15	4.8Ml	6.5	TR	0.582	0-0	0	0	0	some	0.99	0.22-1.31	0.04 (0.02-0.11)
117	Oklahoma	06-11	3:53	-5	35.53	-96.77	5	5.6Mw	7	US	0.910	0-0	2	100	14	200	75	50-150	12 (10-20)
118	Mindinao	07-11	9:43	+8	7.87	125.17	1	5.2Ms	6	PH	0.644	0-0	35	150	30	190	0.37	0.37-0.37	0 (0-0)
119	Van Aftershock	08-11	22:05	+2	38.72	43.09	4.3	5.5Ml	7	TR	0.582	0-0	0	0	0	many	6.57	1.46-8.76	0.29 (0.15-0.73)
120	Van Edremit	09-11	19:23	+2	38.42	43.22	5	5.6Mw	8	TR	0.582	40-40	260	20000	25+	many	75	55-100	1.65 (1.21-2.20)
121	Sasan Gir, Junagadh	12-11	7:01	+5.5	21.06	70.52	9.9	4.3Ml	5	IN	0.547	0-0	3	0	few	100s	0	0-0	0 (0-0)
122	Van/Merkez Aftershock	15-11	0:08	+2	38.70	43.16	7.8	5.2Ml	6	TR	0.582	0-0	0	0	0	many	3.27	0.73-4.37	0.15 (0.07-0.36)
123	Ibaraki	20-11	1:23	+9	36.77	140.38	9	5.3Mjma	5JMA	JP	0.901	0-0	1	0	0	some	0	0-0	0 (0-0)
124	Hiroshima	24-11	19:35	+9	41.92	142.72	43.1	6.2Mw	5JMA	JP	0.901	0-0	0	0	0	some	0	0-0	0 (0-0)
125	Van Aftershock	30-11	0:47	+2	38.47	43.29	10	5Ml	6	TR	0.582	0-0	0	0	0	some	0.66	0.15-0.88	0.03 (0.01-0.07)
126	Shache County	01-12	12:48	+8	38.28	76.89	10	5.2Ml	6	CN	0.687	0-0	0	1450	166 (828 rooms)	1297 (6487 rooms)	7.64	7.64-7.64	0 (0-0)
127	Cook Strait	03-12	6:01	+13	-41.36	174.32	56	5.7Mw	5	NZ	0.908	0-0	0	0	0	some	5	2-10	4.06 (1.63-8.13)
128	Guerrero	11-12	1:47	-5	18.04	-99.80	64	6.5Mw	7	MX	0.770	2-2	4	0	0	1200	5.20	2.40-12	0 (0-0)
129	Gifu Prefecture	14-12	4:01	+9	35.32	137.24	49	5.1Mjma	5JMA	JP	0.901	0-0	1	0	0	some	0	0-0	0 (0-0)
130	20km NE Lyttleton Aftershock	23-12	0:58	+13	-43.49	172.90	8	5.8Ml	6.5	NZ	0.908	0-0	inc. 23/12	0	inc. below	inc. below	30	20-50	24.38 (16.25-40.63)
131	10km E Christchurch Aftershock	23-12	2:18	+13	-43.53	172.74	6	6Ml	7.5	NZ	0.908	0-0	60	1000	many	3000 claims so far	300	250-500	243.75 (203.13-406.25)
132	Tuva	27-12	15:21	+7	51.84	95.92	15	6.6Mw	7.5	RU	0.700	0-0	0	0	0	34+	5	2-10	0 (0-0)
133	Huehuetenango	29-12	5:19	-6	15.56	-91.15	10.2	4.6Mw	6	GT	0.574	0-0	0	15	3	22	0	0-0	0 (0-0)



This report is also released as:
CEDIM Earthquake Loss Estimation Series Research Report 2012-01

Contacts:-

Mr. James Daniell
CEDIM and KIT
Geb. 6.42, Hertzstraße 16
76187 Karlsruhe

Phone: +49 721 60844609
Fax: +49 721 71173

E-mail: j.e.daniell@gmail.com

CEDIM Head Office
Karlsruhe Institute of Technology
Geb. 6.42, Hertzstraße 16
76187 Karlsruhe

Phone: +49 721 60844436
Fax: +49 721 71173

E-mail: cedim@gpi.uka.de

For Earthquake-Report and CATDAT please visit: www.earthquake-report.com
For further information about CEDIM please visit: www.cedim.de
For General Sir John Monash Awards please visit: www.monashawards.org