

L'AQUILA EARTHQUAKE, ITALY

WILLIS CATASTROPHE EVENT RESPONSE

April 6th, 2009

Headline Points

- Moment magnitude (M_w) 6.3 earthquake struck at 3.32am Central European Time (CET)
- Epicentre near the town of L'Aquila, about 95km northeast of Rome
- Insured loss estimates from AIR Worldwide are between €200 M and €400 M
- Both RMS and EQECAT have not been released official industry loss estimates, due to low penetration and associated uncertainty
- Reports of thousands of structures damaged or collapsed and 250 fatalities
- Earthquake has been accompanied by severe aftershocks in the area
- Most serious event in Italy since the devastating 1980 Irpinia earthquake

Earthquake Discussion & Damage Overview

A powerful earthquake has struck the central Italian province of Abruzzo. The earthquake, according to the United States Geological Survey (USGS), occurred just after 3.30am CET (1.32am UTC). Shaking was felt over a wide area; however, the town of L'Aquila (population approximately 70,000) and nearby smaller towns have borne the brunt of the damage. The extremely broad extent of ground shaking is shown in Figure 1, which shows the earthquake intensity on the Modified Mercalli Intensity Scale (MMI). While the area that experienced the strongest shaking (equivalent to MMI VIII) was centred on L'Aquila, a large part of Italy experienced intensity of MMI II to IV. The earthquake has also been accompanied by a series of severe aftershocks in the area causing further damage. Preliminary reports indicate some significant damage to buildings, churches, and residences throughout the Abruzzo region.

The death toll from the event, which is still expected to rise, stands at 250. Emergency services are currently searching through the rubble of collapsed structures in an attempt to rescue those trapped by the earthquake. The earthquake occurred in the middle of the night when many people were at home asleep and therefore more vulnerable to building collapse. Most buildings that have been damaged are older masonry and concrete buildings. Although there are high standard seismic design codes implemented for the area, most of the older buildings pre-date the design codes.

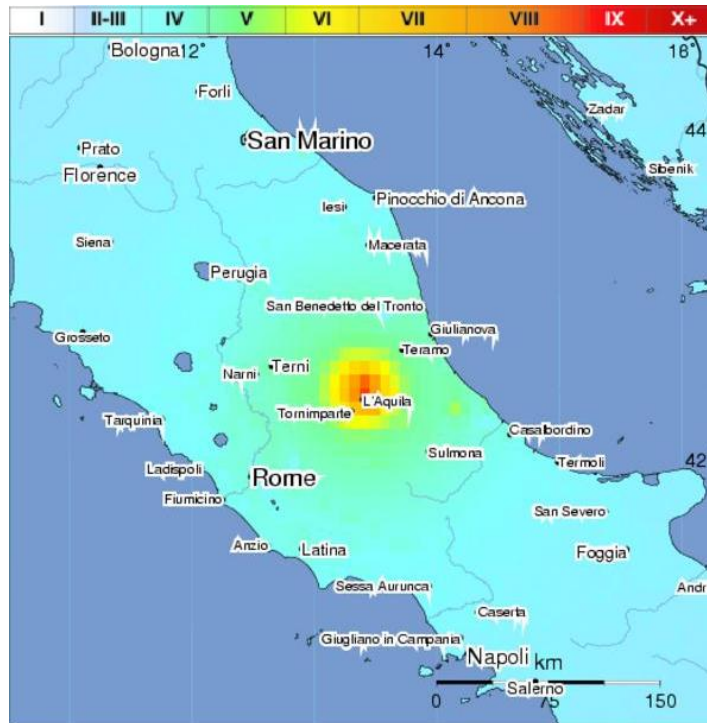


Figure 1. Modified Mercalli Intensity Scale ground shaking map for the L'Aquila earthquake

Earthquake Insurance in Italy

Much of the building stock throughout Italy is considered relatively vulnerable to earthquake ground motion, particularly those buildings constructed before 1996. Despite this, the penetration of earthquake insurance in Italy has historically been low, particularly on the residential side, with less than 5% of the estimated value of the value of properties being insured. Penetration is higher on the commercial and industrial side (up to 50%). While many countries in Europe have natural catastrophe pools to cover earthquake risk, Italy currently does not, despite the approval to set one up by the Italian government in 2004. Much of the cost, of this earthquake will, therefore, be borne by individuals and the government. Economic cost from the earthquake is estimated to be between €2 billion and €3 billion (AIR Worldwide).

The situation throughout Abruzzo is still unclear and information on the damage and fatalities is not by any means complete. The death toll is expected to rise and the extent of much of the damage in smaller towns, while generally reported to be severe, will not be fully known for several days. With respect to insured losses, all of the major catastrophe modelling companies (AIR, EQECAT and RMS) have earthquake models for Italy. AIR estimates insured losses to be between €200 million and €400 million. RMS and EQECAT have not released official industry loss estimates, due to low insurance penetration (particularly as damage has so far has been sustained mainly by residential buildings) and associated uncertainty estimating damage. Willis Re will continue to monitor the situation and will provide updates as necessary.

History of Earthquakes in Italy

Italy has a long and sometimes deadly history of earthquakes. According to the latest seismic map of Italy from the Istituto Nazionale di Geofisica e Vulcanologia (INGV), almost the entire country is susceptible to earthquake risk, with 12% of the land area being in the highest risk zones. Table 1 lists some of the larger earthquakes that have occurred over the past century. In some cases the loss of life has been extremely high, as in the great earthquakes of 1908 and 1915, which between them killed an estimated 120,000 people. In some cases, such as in the Messina earthquake in 1908, the earthquake was followed by a tsunami. With earthquakes that occur in the mountainous geologically complex Apennines region of Italy, like the L'Aquila earthquake, the risk of landslide is particularly high.

Year	Magnitude	Region Affected	No. of Fatalities	Estimated Economic Loss (USD mm)	Estimated Insured Loss (USD mm)
1906	MCS X	Calabria	557	n/a	n/a
1907	MCS IX	Calabria	167	n/a	n/a
1908	7.5	Messina	85,926	116	n/a
1915	7.5	Avezzano	32,610	n/a	n/a
1930	MCS X	Irpinia	1,778	n/a	n/a
1968	MCS X	Val Belice	231	320	n/a
1976	6.5	Friuli	965	2,600	n/a
1980	6.9	Irpinia	2,914	10,000	40
1984	n/a	Perugia	Few	n/a	n/a
1984	n/a	Pescasseroli	3	n/a	n/a
1989	n/a	Potenza	2	n/a	n/a
1990	n/a	Syracusa	n/a	500	n/a
1997	5.6 – 6.0	Umbria	11	4,500	90
2002	5.9	Molise	30	800	n/a
2004	5.3	Sirmione	0	n/a	n/a

Table 1. Notable earthquakes affecting Italy during the last 100 years; magnitudes shown are expressed in terms of maximum intensity or the Mercalli, Cancani, Sieberg (MCS) scale.

Source: International Institute for Applied Systems Analysis; RMS.

Scientific Perspective on the Earthquake

The tectonic environment of Italy is complicated by the geological structures of the region. There are three regional tectonic processes that contribute to seismic events in the area. They are:

- Subduction of the micro-plate beneath the Apennines mountain belt with movement from east to west
- Continental collision between the Eurasia and Africa plates with movement towards the north
- Opening of the Tyrrhenian basin to the west of Italy

The interaction of these processes has led to several different styles of tectonic activity in the region. The L'Aquila earthquake is related to normal faulting and the east-west extensional tectonics that dominate along the entire Apennine belt. This is primarily a response to the Tyrrhenian basin opening faster than the compression between the Eurasian and African plates. The central Apennines is a mountain belt that runs from the Gulf of Taranto in the south to the southern edge of the Po basin in northern Italy.

Seismic hazard is usually assessed by studying recurrence periods and expressed using maps such as Peak Ground Acceleration (PGA). PGA values (in either ms^{-2} or g) usually show the probability of 10% exceedance in a 50-year time period; this approximately corresponds to recurrence in a 475-year return period. The L'Aquila earthquake lies within the highest seismic hazard zone in Italy (Figure 2). However, recent INGV (2004) research on PGA shows the seismic hazard of the area to be lower than in previous studies (e.g. GSHAP, 1998).

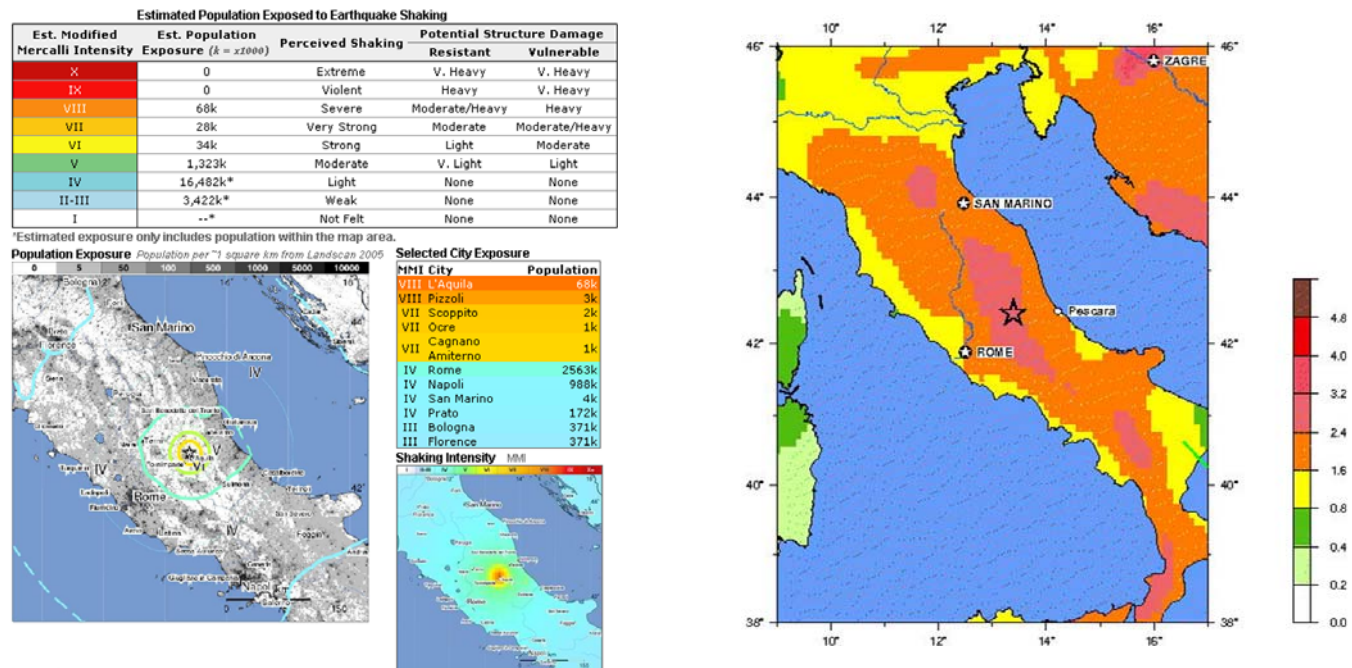


Figure 2: Population exposure and earthquake intensity of the L'Aquila earthquake (Left). Seismic hazard map from USGS, derived from GSHAP PGA (in ms^{-2}) with a 475-year return period (Right).

Contacts:

Contact Name Tony Melia
Position Managing Director
Tel: +44 (0)20 3124 8572
Fax: +44 (0)20 3124 8130
Email: tony.melia@willis.com

Contact Name David Rainbow
Position Deputy Managing Director
Tel: +44 (0)20 3124 8793
Fax: +44 (0)20 3124 8130
Email: david.rainbow@willis.com

Contact Name Ditte Deschars
Position Executive Director
Tel: +44 (0)20 3124 8651
Fax: +44 (0)20 3124 8130
Email: descharsd@willis.com

Contact Name Lucian Chiroiu
Position Divisional Director
Tel: +44 (0)20 3124 8206
Fax: +44 (0)20 3124 8130
Email: lucian.chiroiu@willis.com

Contact Name Rashmin Gunasekera
Position Cat Risk Analyst
Tel: +44 (0)1 4732 23789
Fax: +44 (0)1 4732 23740
Email: gunasekerar@willis.com

Contact Name Brian Owens
Position Executive Director
Tel: +44 (0)20 3124 7637
Fax: +44 (0)20 3124 8130
Email: brian.owens@willis.com

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