

## Amatrice Earthquake

26.08.2016 – Situation Report No. 1 – 16:00 GMT

### Report Contributors:

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Official Disaster Name	Date	UTC	Local	CATDATEQ_ID
<b>Amatrice Earthquake</b>	<b>24-Aug-2016</b>	<b>01:36:32</b>	<b>+2</b>	<b>2016-228</b>

### Preferred Hazard Information:

EQ_Latitude	EQ_Longitude	Magnitude	Hyp_Depth (km)	Fault Mech.	Source	Spectra
<b>42.704</b>	<b>13.238</b>	<b>6.0Mw</b>	<b>4.2</b>	<b>Normal</b>	<b>INGV</b>	<b>Some avail.</b>

Duration: 15 secs

### Location Information:

Country	ISO	Sub-Province	Most Impact	Building PF	GDP (total USD)	GDP/cap as % of national	Population (2016)
<b>Italy</b>	<b>IT</b>	<b>Rieti</b>	<b>Amatrice, Accumoli</b>	<b>Good</b>	<b>3.58b</b>	<b>74%</b>	<b>160,000</b>
<b>Italy</b>	<b>IT</b>	<b>Ascoli Piceno</b>	<b>Pescara &amp; Arquata del Tronto</b>	<b>Good</b>	<b>5.73b</b>	<b>89%</b>	<b>212,000</b>

### Preferred Hazard Information: (Intensities and Ground Motion)

MCS	EMS-98	Key Hazard Metrics
IX-X	VIII-IX	Amatrice (VIII-IX), Accumoli (VIII-IX), Pescara / Arquata del Tronto (VIII), Norcia (VI)

Intensities reached VIII-IX on the MMI scale – very well built structures received slight damage. Older buildings suffered great damage. The damage seen corresponds to VIII and perhaps very isolated VIII-IX locations on the MMI scale. Over 10 aftershocks > Mw4.0 have occurred, with magnitude 4 and 5 earthquakes continuing to pepper the region NW and SE of the epicenter. The fault sense can be seen well from INGV data. We are currently waiting for more information with respect to ground motions and spectral response.

### Vulnerability and Exposure Metrics (Population, Infrastructure, Economic)

Being August, the population of the mountain top towns would have been higher than at the census, with unknown numbers of people staying in hotels, hostels, with family and other locations throughout the region. The region is a bit poorer than most in Italy with around likely \$2.5-3 billion stock exposed in the intensities over VII. It is important to note that this is a replacement cost as many older masonry buildings may have become dilapidated over the years. Many buildings in the mountains stay vacant during other times. It can be seen that the population is likely underestimated by 3+ times perhaps using building ratios from the V-VI region. The GDP in the region over Int VI is ca. 3.3 bn USD. The Capital stock over VI is in the order of 18 bn USD.

Int.	Pop.	Buildings	Likely Pop.	GDP (USDm)
V-VI	338423	96893	338423	10179
VI-VII	96081	40131	140057	2890
VII-VIII	13354	8197	28608	402
VIII+	3359	4877	17021	101

## What have been the 2 largest comparable damaging events in the past?

There have been 10+ severely damaging events in the last 700 years in this location.

Date - Name	Impact Size	Damage %	Social %	Economic Loss
8&15.10.1639	IX-X	Great damage; buildings & livestock	Ca. 500 deaths	800000 crowns (building)
14.01.1703	IX-X	Much in Amatrice, Accumoli	2000+ deaths	1.4 million crowns

### Preferred Building Damage Information: (Damage states will be filled in later when more info available)

The affected area is sparsely populated and mountainous and around 40 km to the North of the city of L'Aquila that was devastated in the April 2009 earthquake of similar magnitude. From north to south, within a distance of about 15 km, worst affected were the villages of Pescara del Tronto (part of the Arquata del Tronto commune) – population 135, Accumoli – population 670 and Amatrice – population 2650 (incl. the surrounding villages). "All three villages were situated on steep mountain ridges where slope instabilities and ground motion amplification can cause excess damage as has been seen in past events in Italy (e.g. 1976 Friuli and 1980 Irpinia). Inspection of damage photos suggests that Pescara del Tronto and Amatrice were devastated, losing large proportion of their mostly residential building stock. In Amatrice there is a distinct new part of the village, with large public buildings and other facilities that is apparently less affected. The overwhelming majority of the buildings that collapsed were 2 to 4 story unreinforced stone masonry construction with wooden floors. Some severe damage to reinforced concrete or hybrid construction buildings has also been seen, but it is limited in number e.g. Hotel Roma in Amatrice. Most of the masonry buildings are very old (built prior to 1920) and were in need of substantial strengthening. This is a common problem in most of Italy's old rural settlements. In the affected villages most of these buildings collapsed either partly or entirely and very few will be salvaged.

### Secondary Effect Information: For weather impacts see <http://www.wettergefahren-fruehwarnung.de/> but clear skies!

Type	Impact	Damage %	Social %	Economic %
Landslides	Roads blocked	Minor	Low	Low

### Preferred Social Impact Information:

Type	Median	Accepted Range	Description	Source
Deaths (238 extracted alive)	<b>268**</b>	May rise to over 300	59 (18-163) = initial estimates 176 (58-422) = updated intensities & HDI (w/o pop change due to tourists)	Daniell, CATDAT, EQ-report, news
Severe Injuries	<b>400</b>	May rise	400 hospitalised	News
Sheltered Homeless	4000+		Currently unknown number	News, OE

\*\*NB: 208 Amatrice, 11 Accumoli, 49 Pescara and Arquata del Tronto

### Preferred Current Economic Impact Information: \$million int. event-day dollars (USD)

Type	Median	Accepted Range	Description	Source
Total Cost	\$2580m	\$950m-\$6600m	Replacement Cost (without indirect/life)	CATDAT Est.
Total Loss	\$1452m	\$535m-\$3700m	Total estimate (using rapid loss model)	CATDAT Est.
Insured Loss	Ca. \$50-75m	unknown	Business interruption and building damages.	CATDAT Est.

### Direct Economic Damage (Total) - Summary

- There have been only rapid estimates as yet of economic losses resulting from this earthquake. The MDR is a of the gross capital stock of the location, being close to 75% in Amatrice and Accumoli.
- The rapid loss estimation of CATDAT/James Daniell, gives a total damage value coming out to around 2.5 billion USD with a replacement cost totalling ca. 30% of the 2 most affected provinces' annual output.

### Social Sensors & Disaster Response

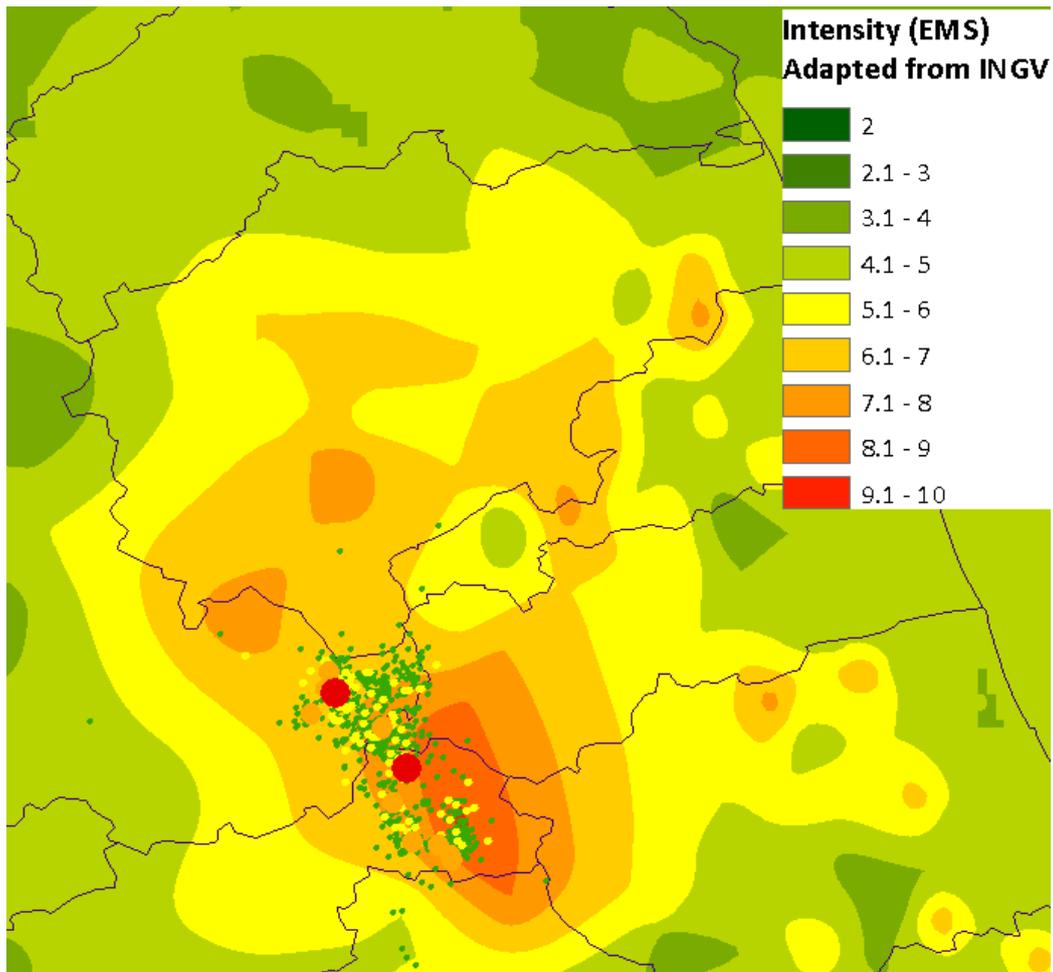
- The alerts came out from twitter, within a couple of mins after the event, similar to the EQ-report alerts.
- Warning email was issued within 4 hrs for an FDA Summary. The event does not exceed Dark Red specifications

### Insured Loss Estimates:

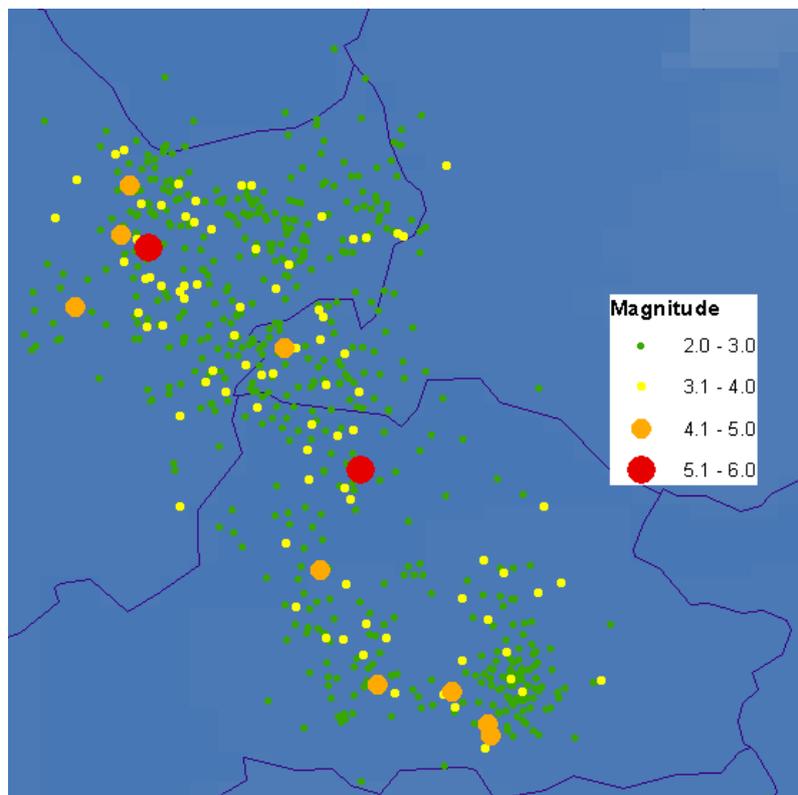
Much public and critical infrastructure damage occurred, and in addition there was damage to tourist facilities in various locations. It is still expected that the damage will be insignificant for the insurance industry. There could be global supply chain issues with export/import often in Italy, but given the GDPs of the 2 major provinces affected the impact should be minor.

<b>CATDAT Economic Index Rank:</b>	8: Very Damaging	<b>CATDAT Social Index Rank:</b>	9: Very Destructive
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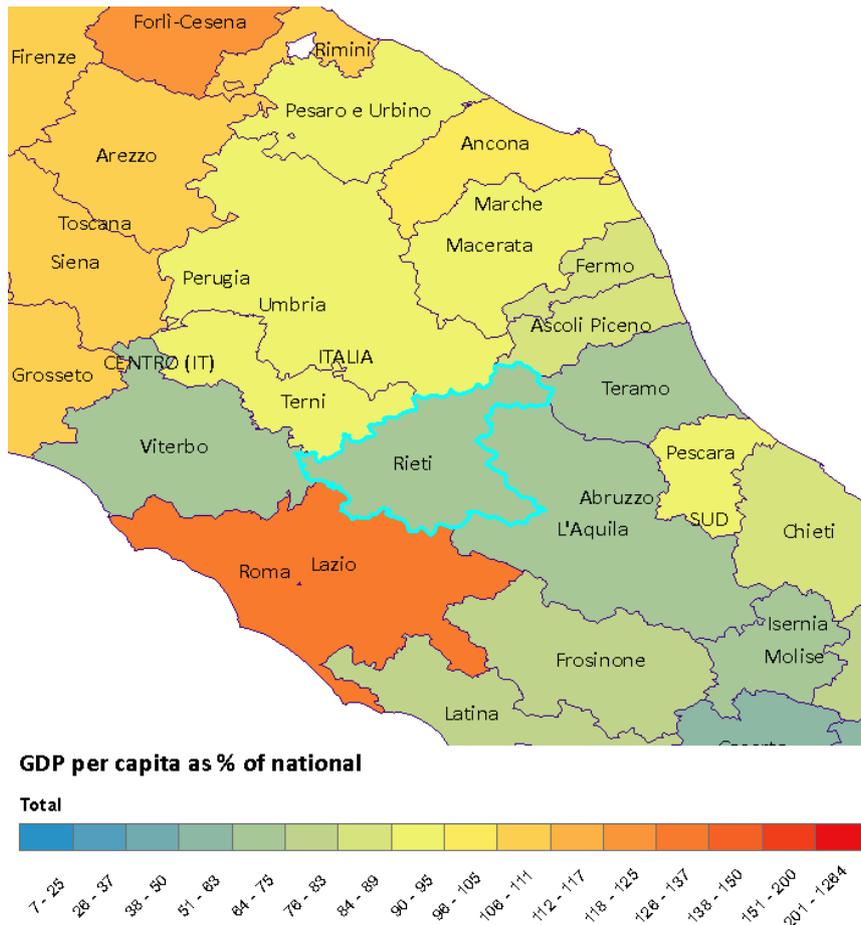
This report was produced in conjunction with the CATDAT database, [earthquake-report.com](http://earthquake-report.com), GEOFON and INGV data. As shown below is full size documentation of the diagrams shown in the summary above. The data is current as of 26<sup>th</sup> August 2016, 4:00pm European Standard Time. For the current data, go to [www.earthquake-report.com](http://www.earthquake-report.com). Authors take no responsibility for misuse and use of above estimates. To the best of their knowledge the current datasets are correct.



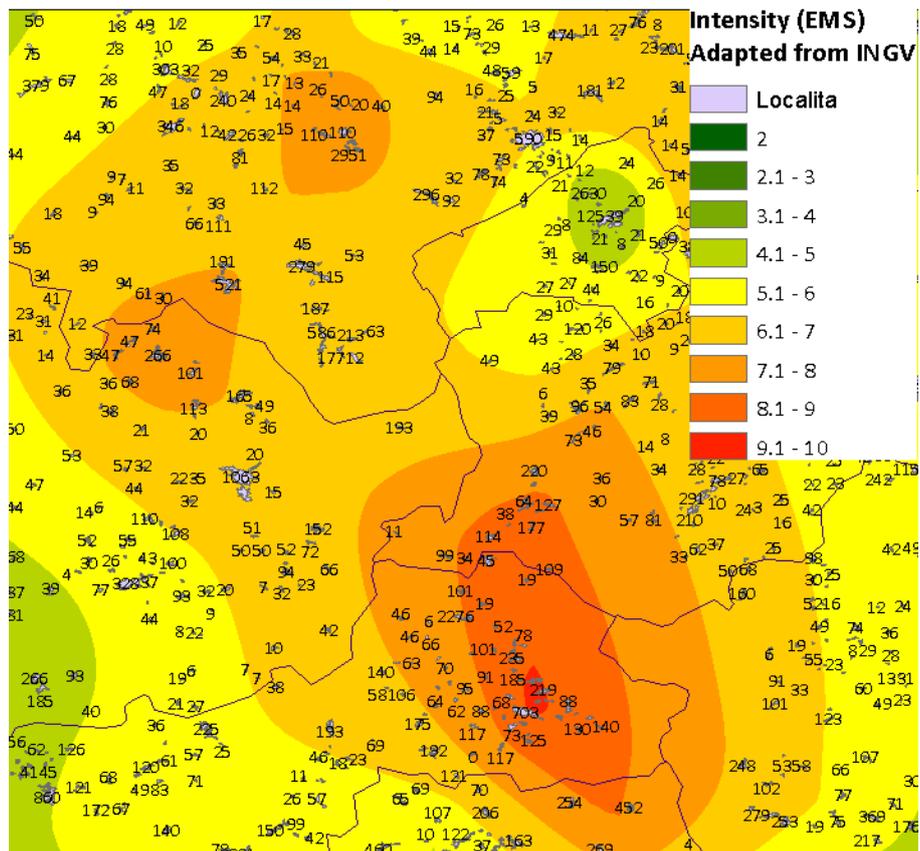
An adjusted INGV intensity map using felt intensities of INGV and near-field intensities.



Magnitudes of the 660+ aftershocks so far (data courtesy: INGV)



GDP per capita per province as a % of the national per capita GDP (CATDAT)



Buildings per town vs. intensity bounds as collected from census data for this earthquake