Center for Disaster Management and Risk Reduction Technology

CEDIM Forensic Disaster Analysis Group (FDA)

Mw 6.9 Earthquake – Lombok, Indonesia

07.08.2018 – Situation Report No. 1 – 00:00 UTC

Authors: James Daniell and Andreas Schaefer

Official Disaster Name	Date	UTC	Local	CATDATEQ_ID
North Lombok earthquake	**5-Aug-2018**	**11:46:35**	**+8**	**2018-197**

Preferred Hazard Information:

EQ_Lat.	EQ_Long.	Magnitude	Hyp_Dep. (km)	Fault Mech.	Source	Spectra
-8.37	**116.48**	**Mw6.9**	**15**	**Thrust**	**BMKG**	**Some avail.**

Duration: 25 secs

Location Information:

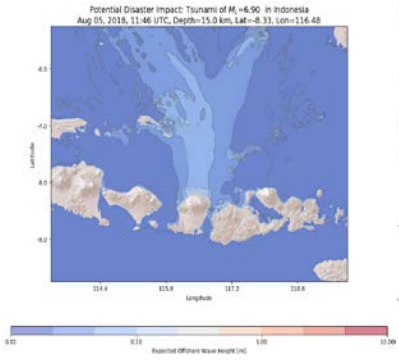
Country	ISO	Province	Most Impact	Building PF	GDP (total USD)	GDP/cap as % of national	Population (2018)
Indonesia	**ID**	**W. Nusa Tenggara**	**Northern Lombok, Gili Islands**	**Moderate-Poor**	**$8.7bn**	**47%**	**5.04mn**
Indonesia	**ID**	**Bali**	**Karangasem**	**Moderate-Good**	**$16.1bn**	**96%**	**4.38mn**

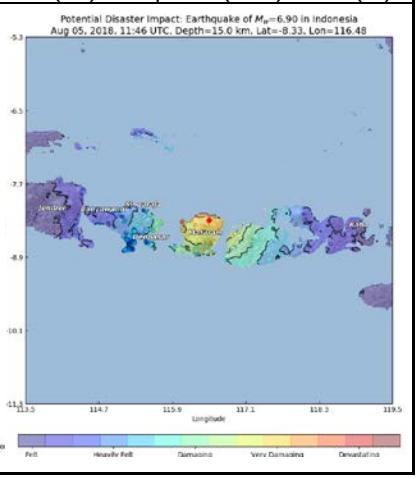
Preferred Hazard Information: (Intensities and Ground Motion)

MMI	EMS-98	**Key Hazard Metrics**
VIII	VIII	Lombok Utara (VIII), Mataram (VII-VIII), Gili Islands (VII), Denpasar (V-VI), Kuta (IV)

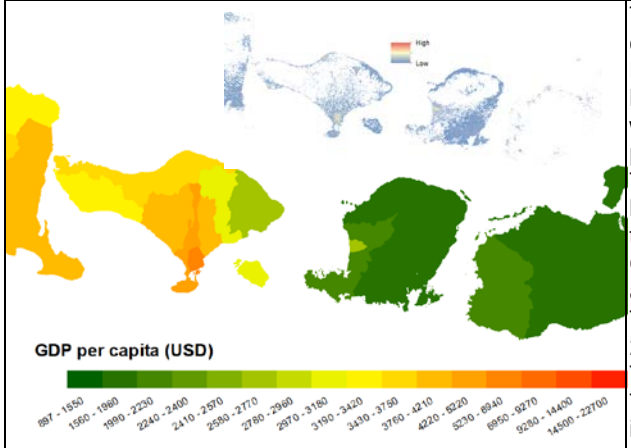
Intensities reached VIII+ on the MMI scale – very well built structures received slight damage. Older buildings suffered great damage. The damage seen corresponds to VII and VII+ and perhaps very isolated VIII locations on the MMI scale.

5 aftershocks > Mw5.0 have occurred, however the foreshock sequence including the Mw6.4 foreshock mean well over 35 magnitude 4 and 5 earthquakes have continued to pepper the region NW and SE of the epicenter, 546 events have been recorded. The fault sense can be seen well from BMKG data. We are currently waiting for more information with respect to ground motions and spectral response. A very small tsunami was expected, and this caused initial issues for evacuation. There exists significant variation in intensities.





Vulnerability and Exposure Metrics (Population, Infrastructure, Economic)



The time of day at 19:46 is one of the big uncertainties in this event with models of population not well constrained for Lombok and Bali. 74% of people were expected to be indoors, however it looks as though this number could be as low as 40% with weather conditions on the day. The area is highly populated with Lombok home to around 3.5 million people.

The capital stock associated with construction is comparatively low and much poor vulnerable construction has been seen due to a lack of significant past earthquake activity on Lombok. The GDP is around half of the national average. (GDP per capita and population density shown).

The population in the region of over VI is somewhere between 2.7 and 4.0 million people.

The GDP in the region over Int VI- is ca. 7.6 bn USD.

The Capital stock over VI- is in the order of 19 bn USD including building and non-building infrastructure.

What have been the 2 largest comparable damaging events in the past from CATDAT?
There have been 15+ damaging events in the last 200 years in this location in the archive. The July 1856 event was the largest of these. The Nov. 22, 1815 event would also have caused VII in Lombok, and VIII+ over Bali.

Date - Name	Impact Size	Damage %	Social %	Economic Loss
30.05.1979	VIII, M6.2	Great damage; foreshock: 21.05.1979	37 dead, 70+ inj	$4.15m in 1979
22.06.2013	VI+, M5.4	Lombok, Mataram	49 injured	8355 damaged, $25m

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

The quality of housing differs across Lombok, but most (ca. 90%) is clay brick or concrete. North Lombok however builds of 12.7% bamboo and other construction (14.9% in rural, 2.6% in Urban). The poor clay construction seems to have been most affected. Considering the vulnerability of the local building stock, over 30,000 buildings are expected to have been damaged or destroyed. Damage distributions are currently being collected by authorities. Many roof collapses have been seen where connections to the structure have failed. Similarly poor quality residential construction appears to be most affected.

Sec. Effect Information: For weather impacts see *http://www.wettergefahren-fruehwarnung.de/ but clear skies!*

Type	Impact	Damage %	Social %	Economic %
Tsunami	Panic, evacuation difficulties	Minor	Low	Low

Preferred Social Impact Information:

Type	Median	Accepted Range	Description	Source
Deaths	**105****	May rise > 200	203 (90-403) = initial estimates 246 (97-451) = updated intensities & HDI	CATDAT, EQ-report, news
Severe Injuries	**250**	May rise	Many more with slight injuries	News
Sheltered Homeless	20000+		Est. 46,000 long term; 200,000+ short	CATDAT

***NB: Homeless estimates based on building distribution losses. Casualty model difficult to constrain due to time of day.*

Preferred Current Economic Impact Info: $million int. event-day dollars (USD) - estimates

Type	Median	Accepted Range	Description	Source
Total Cost	$328m	$110m-$697m	Replacement Cost (without indirect/life)	CATDAT Est.
Total Loss	$201m	$67m-$426m	Total estimate (using rapid loss model)	CATDAT Est.
Insured Loss	minimal	unknown	Business interruption, travel disruption.	CATDAT Est.

Direct Economic Damage (Total) - Summary

- There have been only rapid estimates as yet of economic losses resulting from this earthquake beyond a statement that the damage will exceed 1 trillion rupiah from the government ($67 million USD).
- The rapid loss estimation of James Daniell (Risklayer/CATDAT), gives a total damage value coming out to around 300-400 million USD with a replacement cost totalling ca. 3-5% of the West Nusa Tenggara GDP.

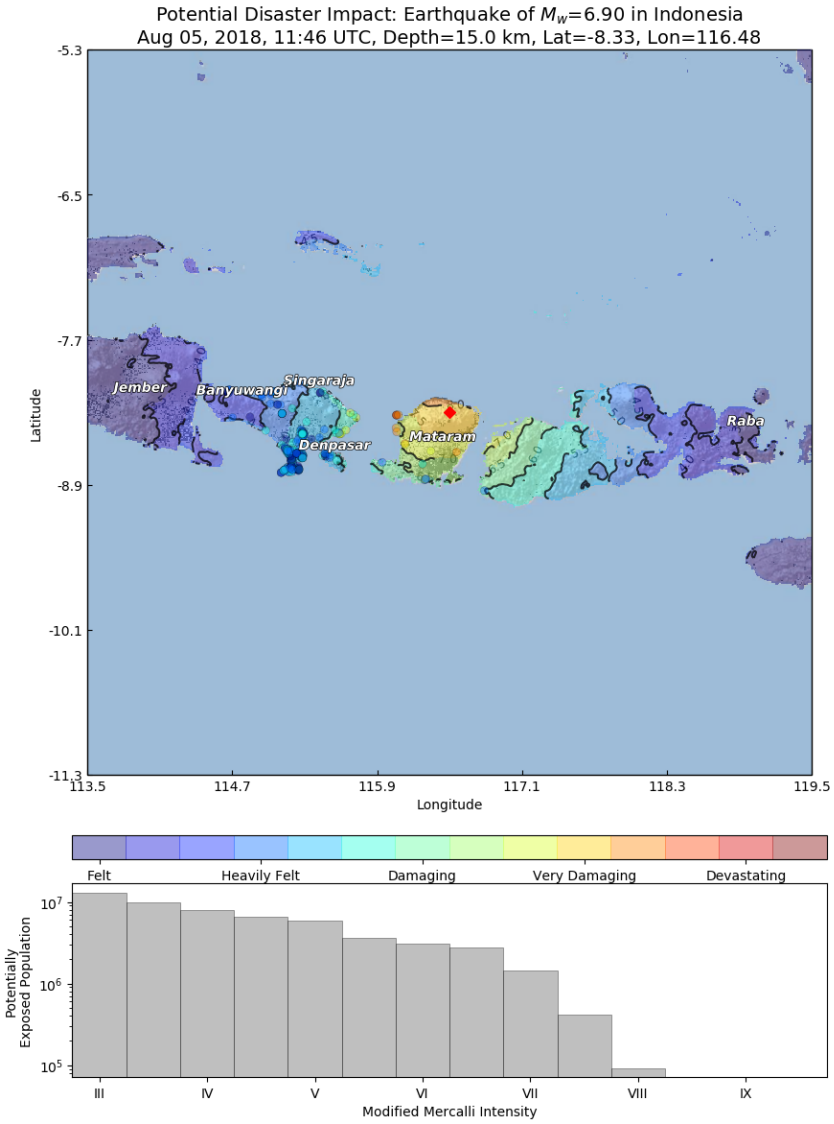
Social Sensors & Disaster Response

- The alerts came out from twitter, within a couple of mins after the event, similar to the EQ-report alerts and later seismometer information.
- Estimates were made a quick succession of the earthquake and subsequently updated including intensity maps from Andreas Schaefer (Risklayer/CATnews).

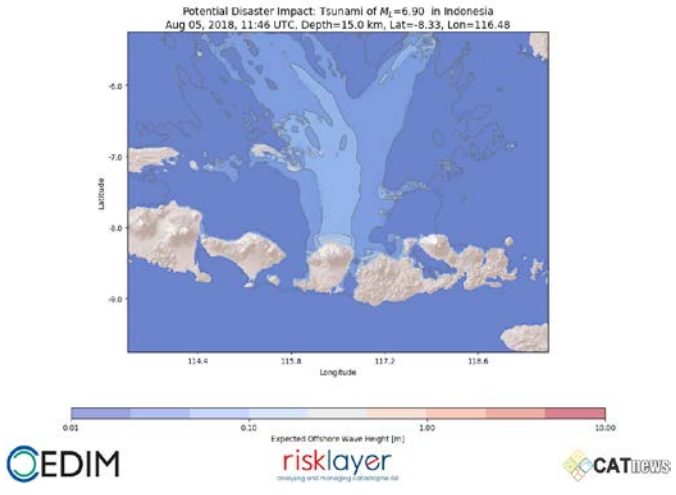
Insured Loss Estimates:

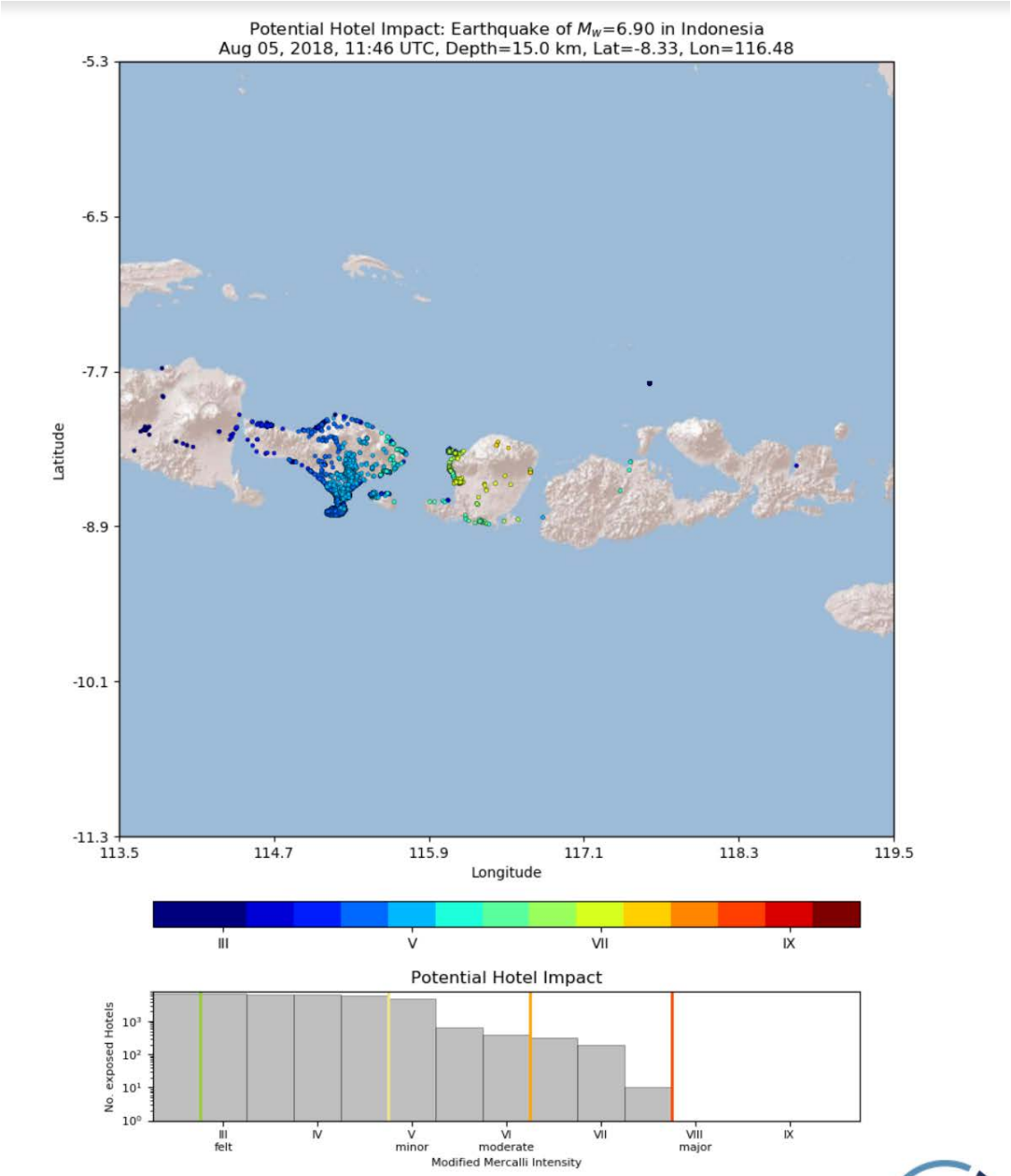
Much public and critical infrastructure damage occurred, and in addition there was damage to tourist facilities in various locations across Lombok especially on the western coast. It is still expected that the damage will be insignificant for the insurance industry.

This report was produced in conjunction with the CATDAT database, CATNews, Risklayer, earthquake-report.com, GEOFON and BMKG data. As shown below is full size documentation of the diagrams shown in the summary above. The data is current as of 6th August 2018, 11:55pm European Standard Time. For the current data, go to 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.

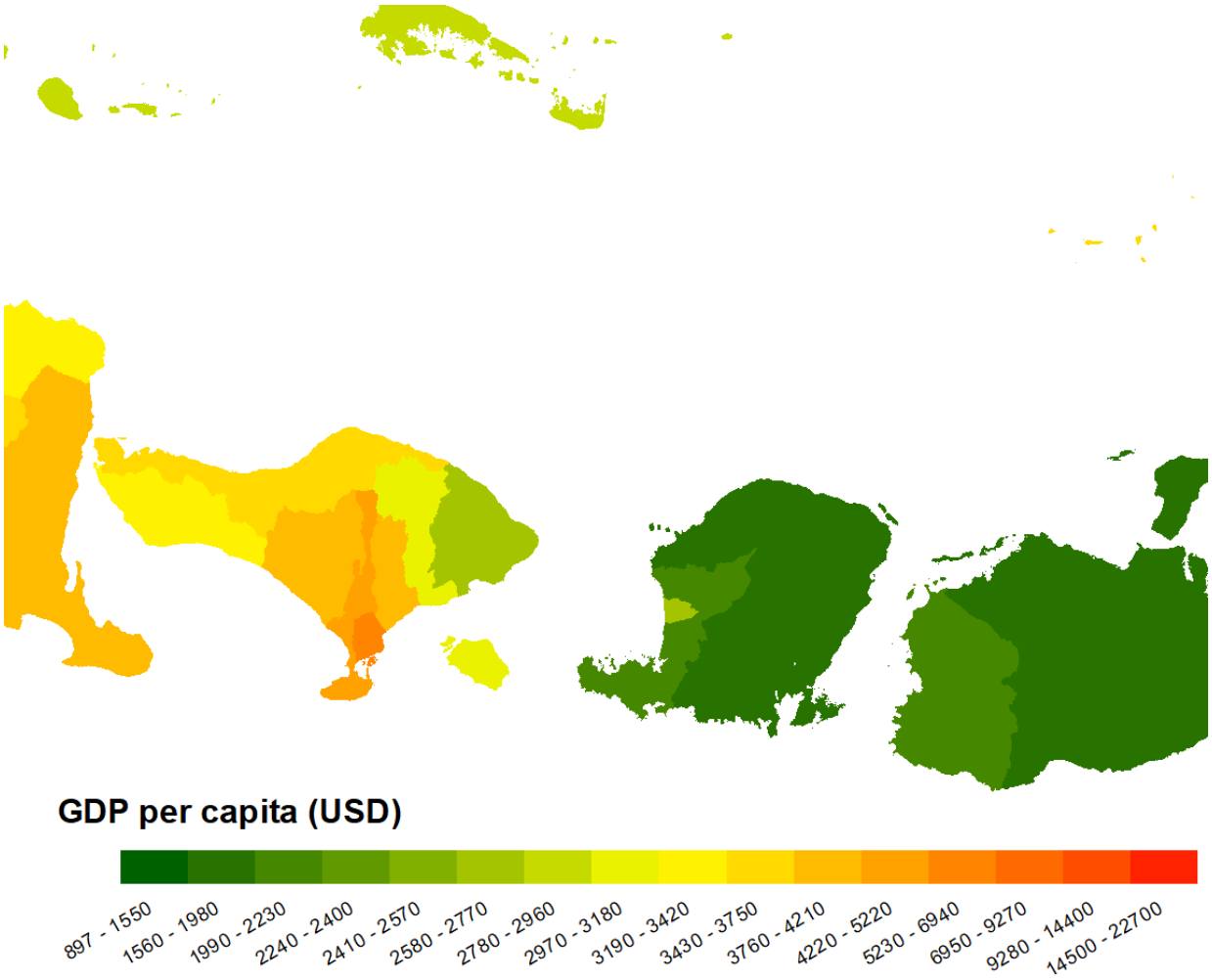


Intensity map in MMI using updated hazard information including felt intensities and below the expected tsunami impact (low)

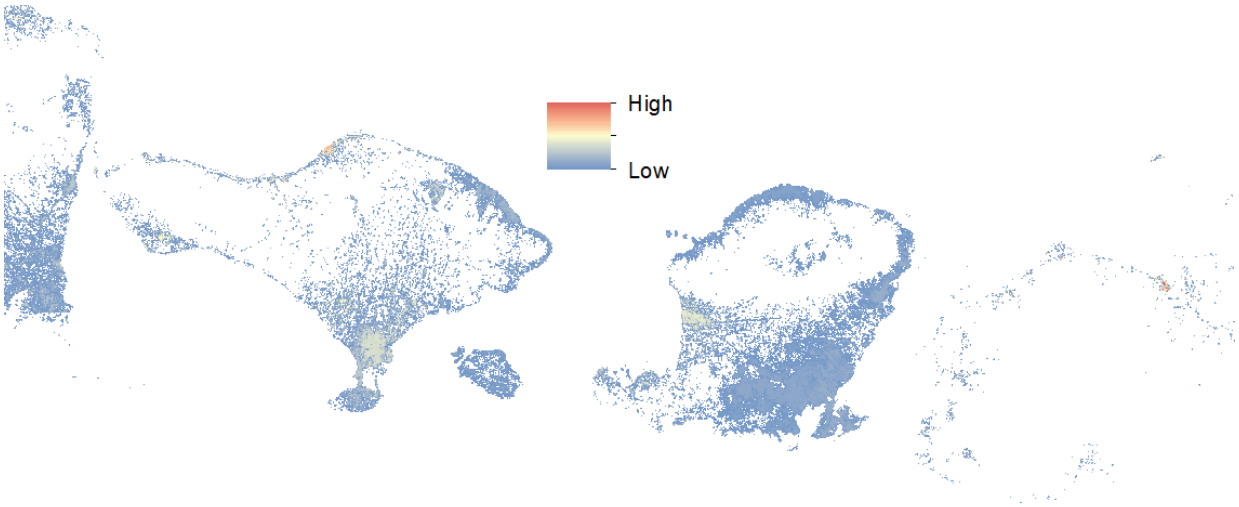




Significant issues for tourism have been seen with over 3000 people evacuated from Gili, and many tourists attempting to leave Lombok and Bali. The hotels in terms of impact in the region are shown here with over 1000 hotels likely affected to some extent. (Source: Hotel Resilient and Risklayer)



GDP per capita in nominal USD per regency (derived from Indonesian Statistics)



Population density showing Mataram, Pemenang and Denpasar (derived from Indonesian Statistics and GHSL)