



ShakeCast

for near real-time rapid assessment of earthquake damage

ShakeCast, short for Shakemap Broadcast, is an automated post-earthquake damage assessment tool, firstly developed by the U.S. Geological Survey (USGS). This freely available tool makes use of seismic data, minutes after earthquake origin time, to estimate risks to population and critical facilities. Potential damage information is sent to registered users by SMS, fax, and email. Bulletins are updated based on improved earthquake parameters for the event.

Information generated by ShakeCast is useful for emergency first responders, loss estimators, and policymakers. Large organizations and/or government agencies can use ShakeCast information to automatically notify their maintenance units and/or rescue teams, based on shaking thresholds set for their critical facilities. Linked to GIS databases, impact on particular facilities could be quickly assessed, and timely information could be provided to ensue safety and efficient response.

ShakeCast Components and Functionality

1. Earthquake Hazard Evaluation and Potential Damage

For estimating ground motion, e.g. intensity, peak ground acceleration, peak ground velocity, or spectral response, after an earthquake event, ShakeCast makes use of ShakeMap, a model based on ground motion prediction equations (GMPEs), fault location for larger events, site condition maps (usually Vs30), and interpolation between strong motion data and estimates. The system then compares the hazard, e.g. areas with low, moderate, or severe shaking, with vulnerable elements in an area, to estimate potential damage to each element, and disseminates advisory for those estimated to have significant potential impact.

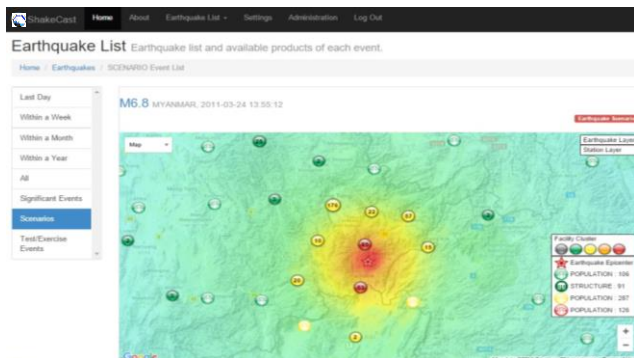


Figure 1. Customized ShakeCast interface for Myanmar

2. Customization of ShakeCast system

The USGS Shakecast system database holds only population information on key cities around the world, using the GeoName global database, which is limited to areas with significant population only. For the system to produce information that is relevant for guiding targeted earthquake emergency response, this dataset is too coarse. Reliability of ShakeCast outputs would increase with increasing quality of exposure data, e.g. population data at village level, or detailed building inventory using appropriate building fragility curves.

RIMES is customizing the ShakeCast system using country-based information. Levels of customization vary from country to country, depending on available data and user specifications. The best available information is recommended, however, for countries that lack good building inventory database, open source application like Google Earth may be used to collect building information, e.g. name, usage, and location.



Figure 3. Population at township level for Myanmar (left) and union level for Bangladesh (right)



Figure 4. Building inventory using Google Earth for Myanmar

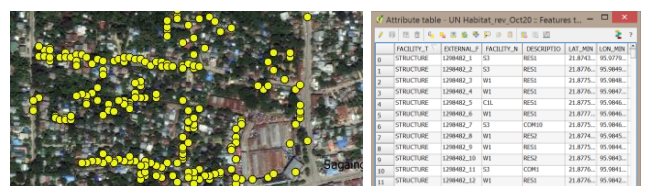


Figure 5. Building inventory from field survey for Myanmar (UN-Habitat)

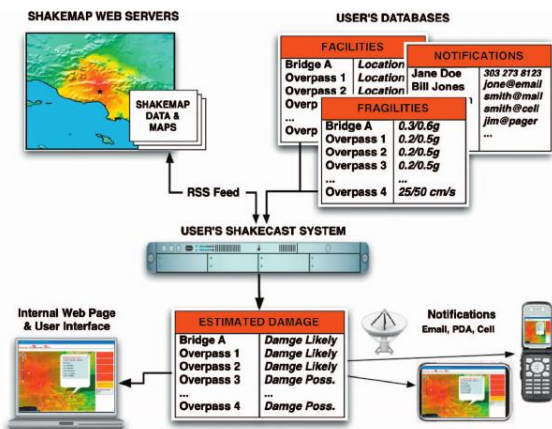


Figure 2. ShakeCast flowchart (USGS)

Additionally, damage to buildings may be different for countries due to differing construction standards and practices. Hence, It is best to use existing building fragilities to improve output accuracy. For countries lacking this data, fragilities of similar buildings in other countries may be adopted. Otherwise, the system uses the Modified Mercalli Intensity (MMI) parameter to estimate potential damage in three categories, by default.

Potential Impact	Intensity (MMI)
High	7+
Moderate	5-7
Low	1-5



Figure 6. ShakeCast estimated potential impact against actual damage during the 2012 Thabbeikyin earthquake in Myanmar

3. ShakeCast products

Information products from ShakeCast include notifications, potential impact bulletins on population and structures, and a summary report, disseminated via email. Generation and dissemination of these products are triggered for earthquake events at certain user specified magnitude. The system can easily be configured for dissemination by SMS.

Subject: New Event: MYANMAR, Magnitude: 6.8

The following new event occurred at 0812 UTC 11 November 2012

Region	MYANMAR
Magnitude	6.8
Latitude	23.007
Longitude	95.880
Depth	13 km

Map

Figure 7. Notification message

Potential Damage Bulletin No.2
ShakeCast@DMH
Issued at 2011-03-24 21:34:36

Event: MYANMAR Magnitude 6.8
Event Date: 24 March 2011
Event Time: 2055 UTC

Damage Summary
Total number of facilities analyzed: 483
Summary by impact rank:

High	126	High impact potential
Medium	284	Medium impact potential
Low	73	Low impact potential

Facility Damage Estimates from ShakeMap
POPULATION presented in the table below are sorted in order of impact potential. The list includes the top 200 facilities in the area of shaking. The complete list is available on the web server.

Description	Facility Name	Location	POTENTIAL IMPACT	MMI
VILLAGE	Kya Ka Ni, Mong Koe	Tachilek	High	9.27
VILLAGE	Law Hkar, Nar Yaung	Tachilek	High	9.27
VILLAGE	Loi Si Mein, Nar Yaung	Tachilek	High	9.27
VILLAGE	Ha Kyar Di Pa (Lower), Aik Long	Monghyak	High	9.21
VILLAGE	Ha Kyar Di Pa (Upper), Aik Long	Monghyak	High	9.21

Figure 8. Potential damage bulletin to population

Potential Damage Bulletin No.8
ShakeCast@DMH
Issued at 2012-11-19 20:27:20

Event: MYANMAR Magnitude 6.8
Event Date: 11 November 2012
Event Time: 0812

Damage Summary
Total number of facilities analyzed: 2159
Summary by impact rank:

High	0	High impact potential
Medium	36	Medium impact potential
Low	2123	Low impact potential

Facility Damage Estimates from ShakeMap
STRUCTURE presented in the table below are sorted in order of impact potential. The list includes the top 200 facilities in the area of shaking. The complete list is available on the web server.

Description	Facility Name	Location	POTENTIAL IMPACT	MMI
RELIGIOUS	Mawdaw Myillar Paya	Shwebo	Medium	6
RELIGIOUS	Pagoda	Singa	Medium	5.96
COMMERCIAL	CB Bank	Shwebo	Medium	5.94
COMMERCIAL	Global Trustee Bank	Shwebo	Medium	5.94
COMMERCIAL	KCB Bank	Shwebo	Medium	5.94
COMMERCIAL	Myanma Economic Bank	Shwebo	Medium	5.94

Figure 9. Bulletin on potential damage to structures

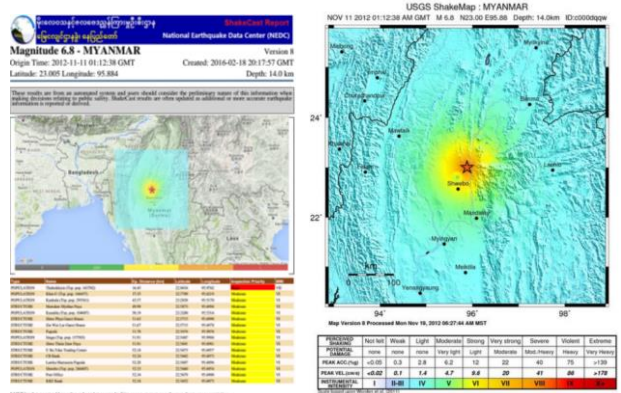


Figure 10. Summary report

The **Regional Integrated Multi-Hazard Early Warning System (RIMES)** is an international and intergovernmental institution that is owned and managed by its Member States for the generation and application of early warning information. RIMES helps to build capacity of Member States in the observation and monitoring of seismic, tsunami, oceanic, meteorological, hydrological, and climate phenomena, and in the evaluation and communication of associated risks, for appropriate and timely user responses to warning.

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