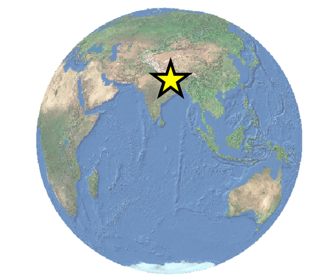
USGS
science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

EARTHQUAKE SUMMARY MAP

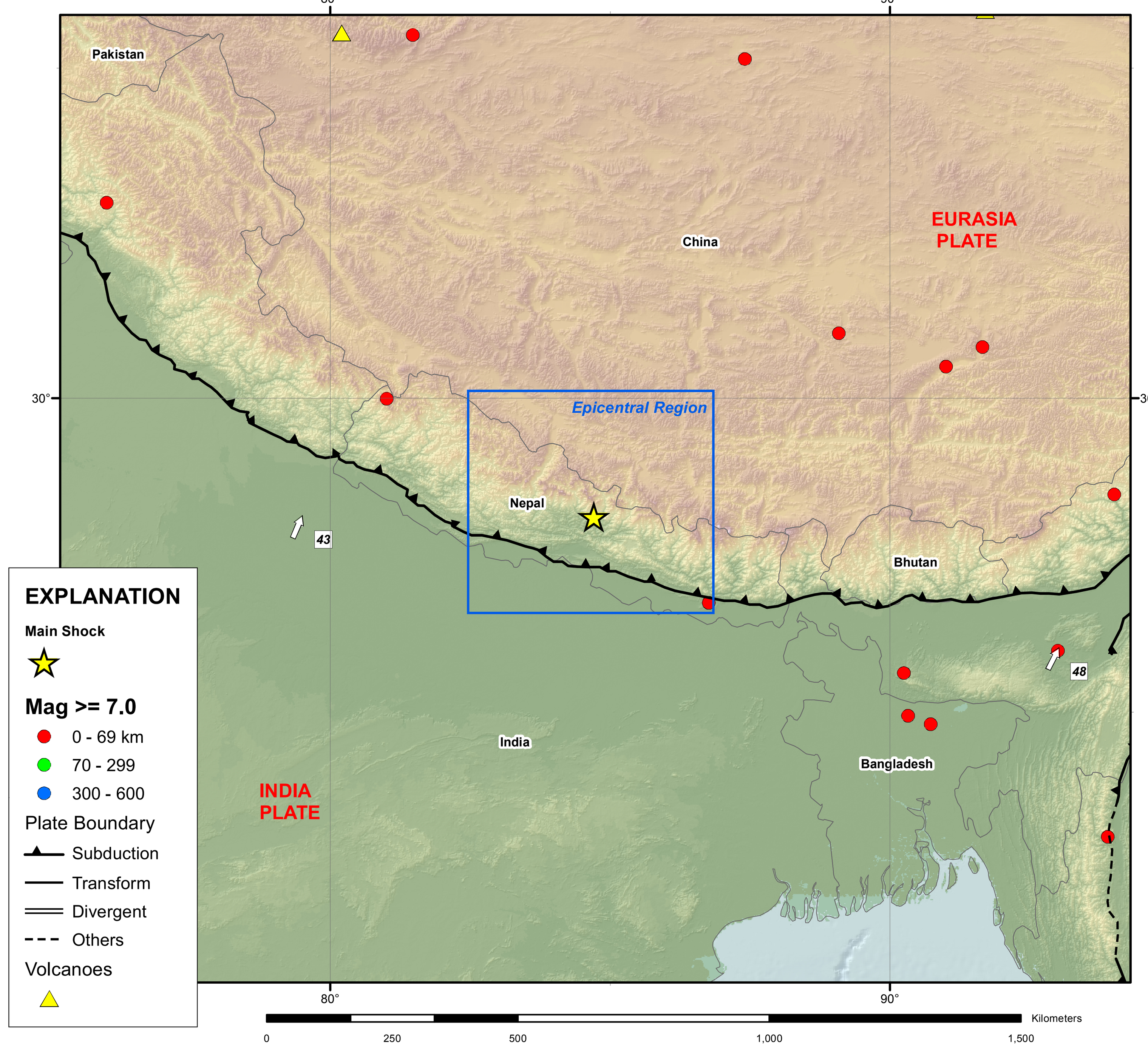
Prepared in cooperation with the Global Seismographic Network

GSN

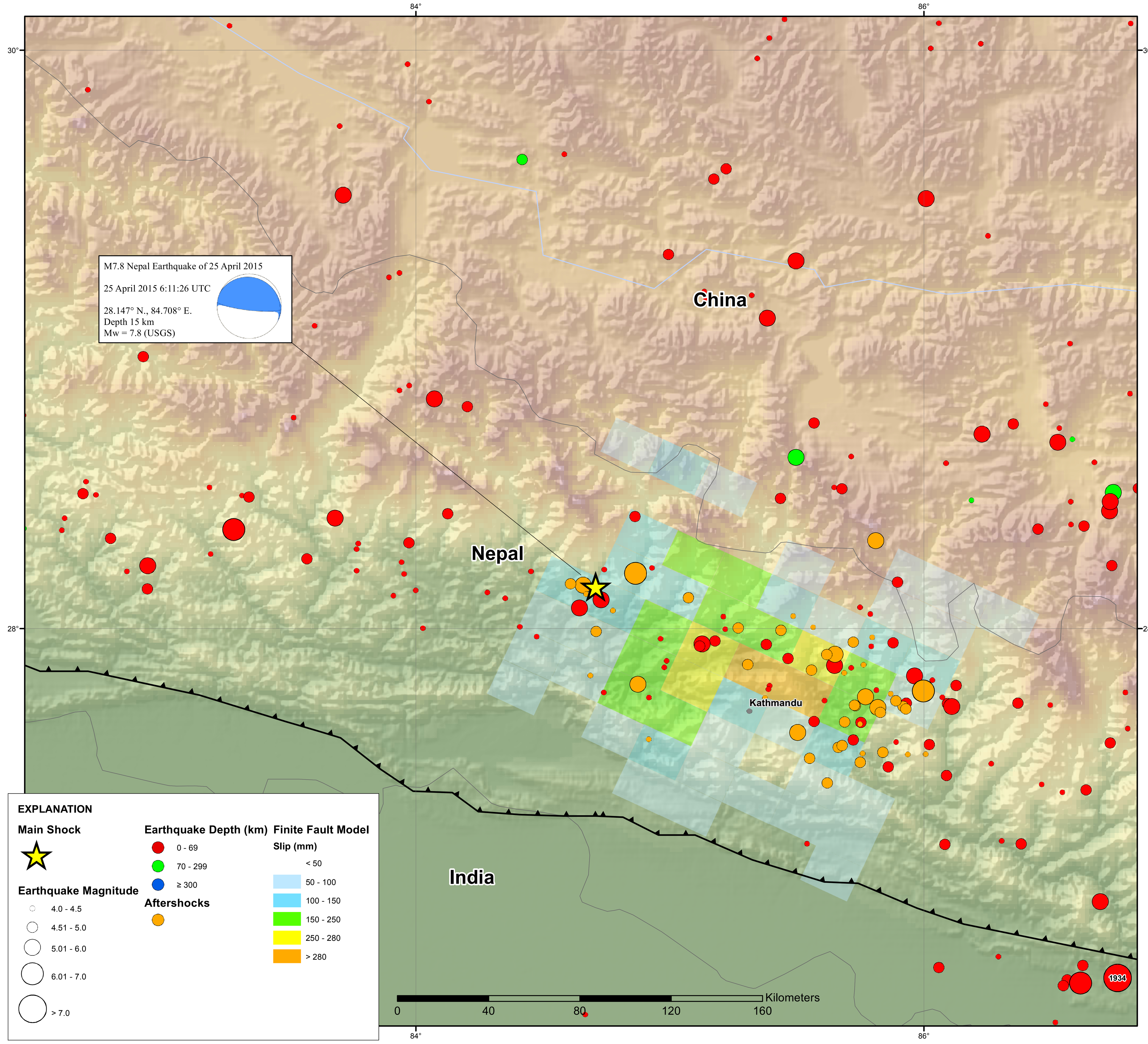


M7.8 Nepal Earthquake of 25 April 2015

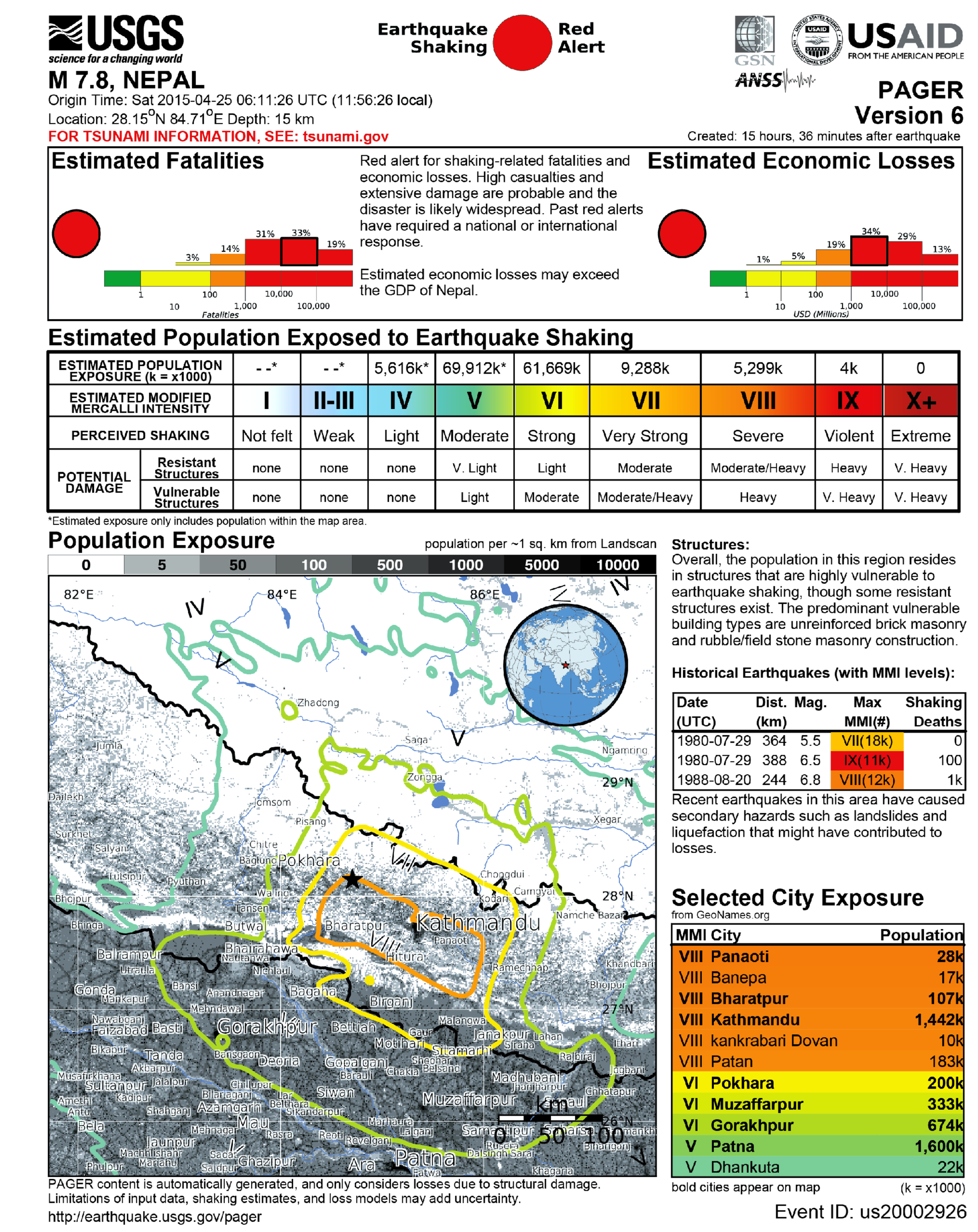
Tectonic Setting



Epicentral Region



PAGER



USGS science for a changing world

Earthquake Shaking Red Alert

PAGER Version 6

M 7.8, NEPAL

Origin Time: Sat 2015-04-25 06:11:26 UTC (11:56:26 local)
Location: 28.15°N 84.71°E Depth: 15 km
FOR TSUNAMI INFORMATION, SEE: tsunami.gov

Created: 15 hours, 36 minutes after earthquake

Estimated Fatalities

Red alert for shaking-related fatalities and economic losses. High casualties and extensive damage are probable and the disaster is likely widespread. Past red alerts have required a national or international response.

Estimated economic losses may exceed the GDP of Nepal.

Estimated Economic Losses

Estimated Population Exposed to Earthquake Shaking

ESTIMATED POPULATION EXPOSURE (k = x1000)		--*	--*	5,616k*	69,912k*	61,669k	9,288k	5,299k	4k	0
ESTIMATED MODIFIED MERCALLI INTENSITY		I	II-III	IV	V	VI	VII	VIII	IX	X+
PERCEIVED SHAKING		Not felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	Resistant Structures	none	none	none	V. Light	Light	Moderate	Moderate/Heavy	Heavy	V. Heavy
	Vulnerable Structures	none	none	none	Light	Moderate	Moderate/Heavy	Heavy	V. Heavy	V. Heavy

*Estimated exposure only includes population within the map area.

Population Exposure

population per ~1 sq. km from Landscan

Structures:
Overall, the population in this region resides in structures that are highly vulnerable to earthquake shaking, though some resistant structures exist. The predominant vulnerable building types are unreinforced brick masonry and rubble/field stone masonry construction.

Historical Earthquakes (with MMI levels):

Date (UTC)	Dist. (km)	Mag.	Max MMI(#)	Shaking Deaths
1980-07-29	364	5.5	VII(18k)	0
1980-07-29	388	6.5	IX(11k)	100
1988-08-20	244	6.8	VIII(12k)	1k

Recent earthquakes in this area have caused secondary hazards such as landslides and liquefaction that might have contributed to losses.

Selected City Exposure
from GeoNames.org

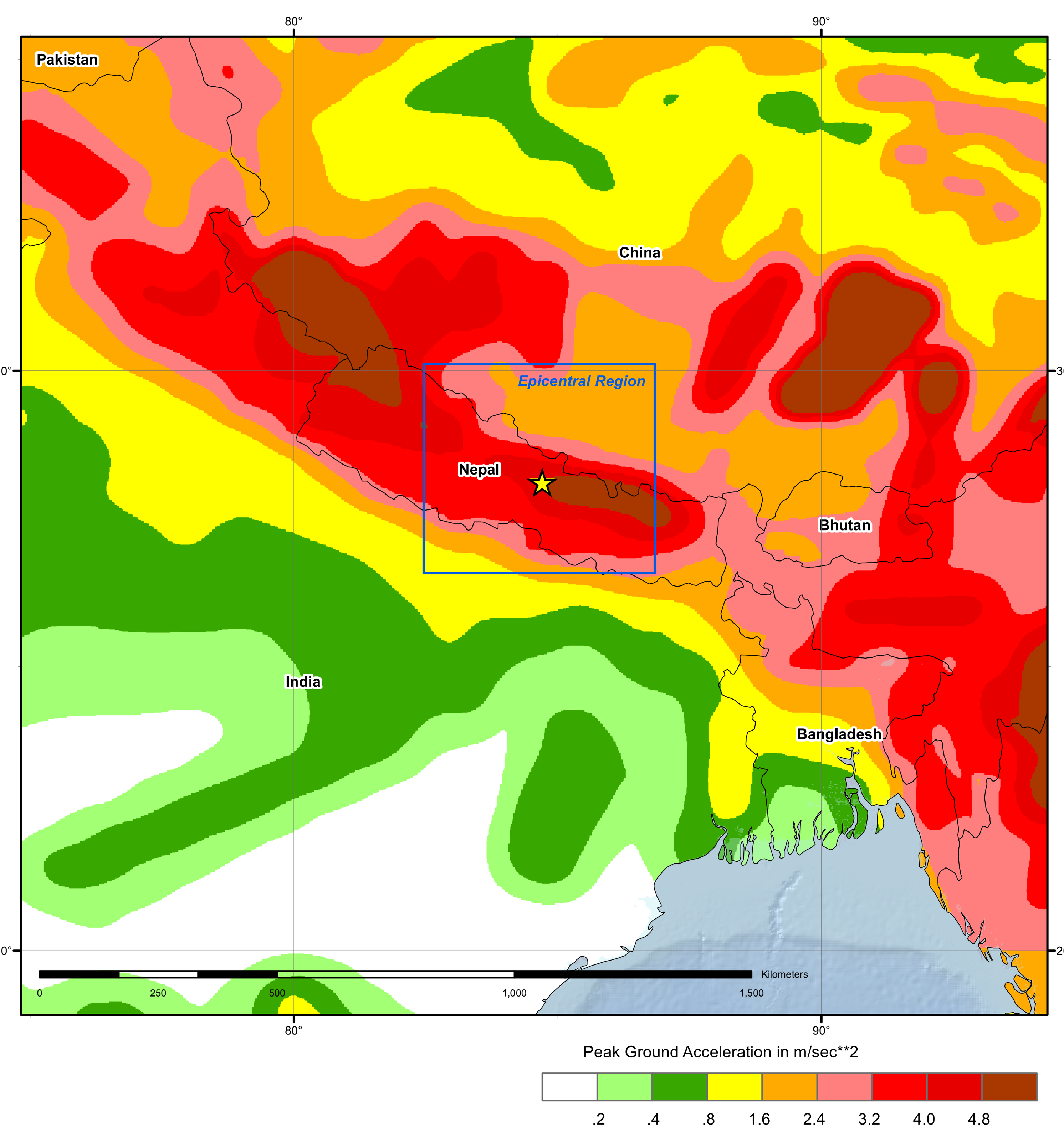
MMI	City	Population
VIII	**Panaoti**	**28k**
VIII	Banepa	17k
VIII	**Bharatpur**	**107k**
VIII	**Kathmandu**	**1,442k**
VIII	kankrabari Dovan	10k
VIII	Patan	183k
VI	**Pokhara**	**200k**
VI	**Muzaffarpur**	**333k**
VI	**Gorakhpur**	**674k**
V	**Patna**	**1,600k**
V	Dhankuta	22k

bold cities appear on map (k = x1000)

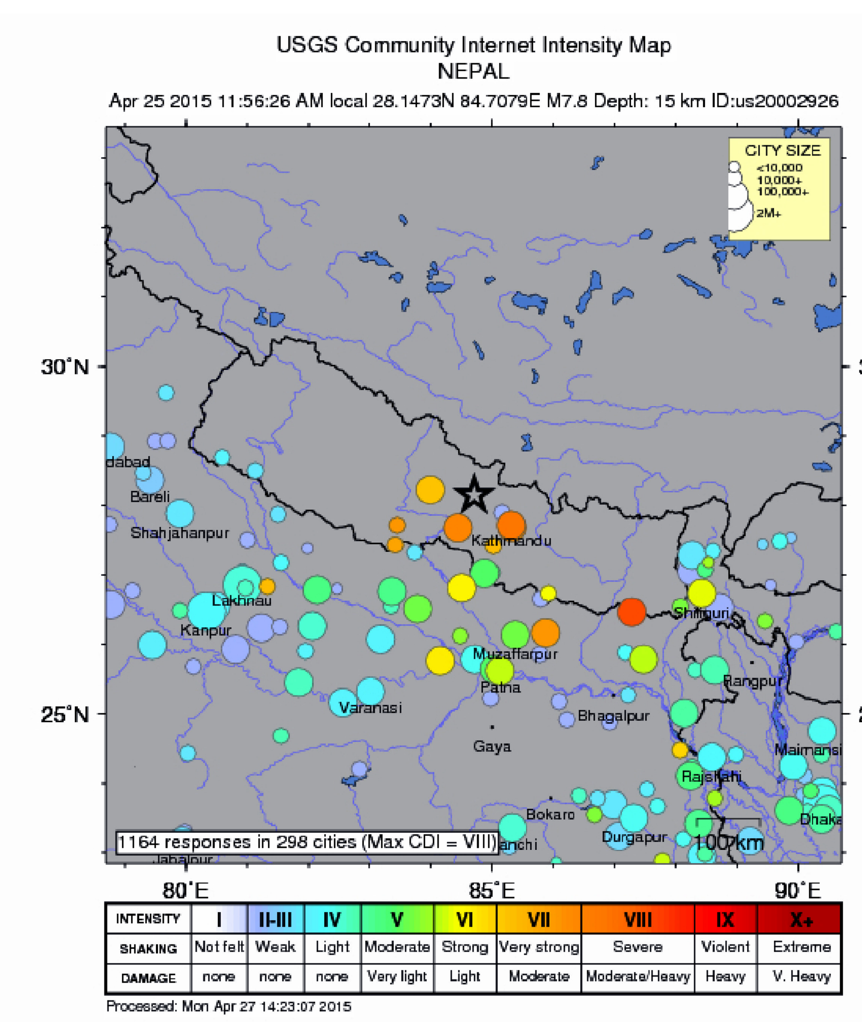
PAGER content is automatically generated, and only considers losses due to structural damage. Limitations of input data, shaking estimates, and loss models may add uncertainty.
http://earthquake.usgs.gov/pager

Event ID: us20002926

Seismic Hazard



DYFI?



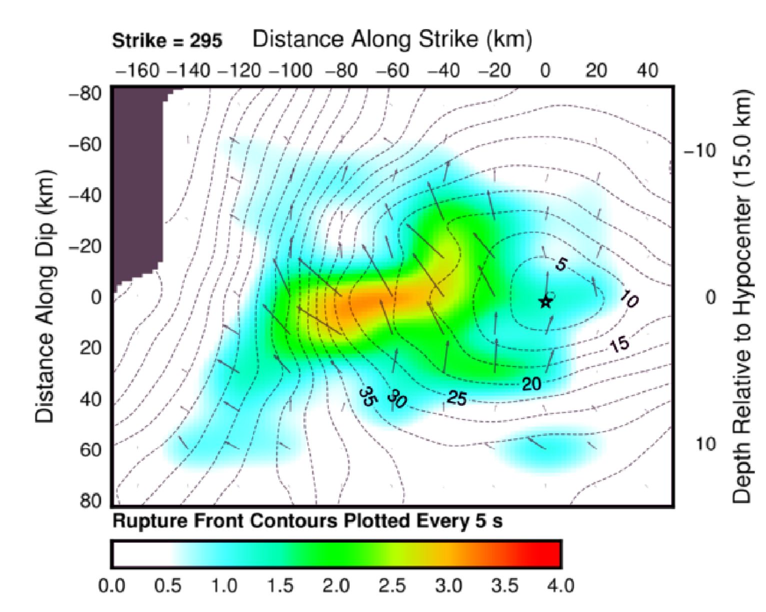
Tectonic Summary

The April 25, 2015 M 7.8 Nepal earthquake occurred as the result of thrust faulting on or near the main frontal thrust between the subducting India plate and the overriding Eurasia plate to the north. At the location of this earthquake, approximately 80 km to the northwest of the Nepalese capital of Kathmandu, the India plate is converging with Eurasia at a rate of 45 mm/yr towards the north-northeast, driving the uplift of the Himalayan mountain range. The preliminary location, size and focal mechanism of the April 25 earthquake are consistent with its occurrence on the main subduction thrust interface between the India and Eurasia plates.

Although a major plate boundary with a history of large-to-great sized earthquakes, large earthquakes on the Himalayan thrust are rare in the documented historical era. Just four events of M6 or larger have occurred within 250 km of the April 25, 2015 earthquake over the past century. One, a M 6.9 earthquake in August 1988, 240 km to the southeast of the April 25 event, caused close to 1500 fatalities. The largest, an M 8.0 event known as the 1934 Nepal-Bihar earthquake, occurred in a similar location to the 1988 event. It severely damaged Kathmandu, and is thought to have caused around 10,600 fatalities.

Finite Fault Model

Distribution of the amplitude and direction of slip for subfault elements of the fault rupture model are determined from the inversion of teleseismic body waveforms and long period surface waves. Arrows indicate the amplitude and direction of slip (of the hanging wall with respect to the foot wall); the slip is also colored by magnitude. The view of the rupture plane is from above. The strike of the fault rupture plane is 295° and the dip is 10°NNE. The dimensions of the subfault elements are 20 km in the strike direction and 15 km in the dip direction. The rupture surface is approximately 100 km along strike and 80 km along downdip. The seismic moment release based upon this plane is 8.1e+27 dyne.cm.



DATA SOURCES

EARTHQUAKES AND SEISMIC HAZARD
USGS, National Earthquake Information Center
NOAA, National Geophysical Data Center
IASPEI, Centennial Catalog (1900 - 1999) and extensions (Engdahl and Villaseñor, 2002)
EHB catalog (Engdahl et al., 1998)
HDF (unpublished earthquake catalog, Engdahl, 2003)
Global Seismic Hazard Assessment Program

PLATE TECTONICS AND FAULT MODEL
PB2002 (Bird, 2003)
Hayes, G. P., Wald, D. J., and Johnson R. L., 2012, A three-dimensional model of globalsubduction zone geometries: Journal of Geophysical Research, v. 117, B01302, doi:10.1029/2011JB008524.
DeMets, C., Gordon, R.G., Argus, D.F., 2010. Geologically current plate motions, Geophys. J. Int. 181, 1-80.

BASE MAP
NIMA and ESRI, Digital Chart of the World
USGS, EROS Data Center
NOAA GEBCO and GLOBE Elevation Models

REFERENCES

Bird, P., 2003, An updated digital model of plate boundaries: Geochem. Geophys. Geosyst., v. 4, no. 3, pp. 1027-80.

Engdahl, E.R., and Villasenor, A., 2002, Global Seismicity: 1900-1999, chap. 41 of Lee, W.H.K., and others, eds., International Earthquake and Engineering Seismology, Part A: New York, N.Y., Elsevier Academic Press, 932 p.

Engdahl, E.R., Van der Hilst, R.D., and Buland, R.P., 1998, Global teleseismic earthquake relocation with improved travel times and procedures for depth determination;Bull. Seism. Soc. Amer., v. 88, p. 722-743.

DISCLAIMER

Map updated by U.S. Geological Survey National Earthquake Information Center
27 April 2015
http://earthquake.usgs.gov/
Map not approved for release by Director USGS