

# Policy Recommendations

- (1) Promotion of basic science
- (2) Interaction between scientists and policy makers
- (3) Outreach activity to public about scientific knowledge
- (4) Interdisciplinary collaboration
- (5) International collaboration

# Policy Recommendations

## **(1) Promotion of basic science**

At the time of 1960 Chilean tsunami, scientists knew little about earthquake and tsunamis.

Because of seismological developments since 1960, we can find not only the occurrence but also size, mechanism, and possibility of tsunami generation within a few minutes to hours of earthquakes.

After the 2004 Sumatra-Andaman earthquake, many paleoseismological studies made in Asia revealed that a similar gigantic earthquake occurred several hundred years ago.

# Seismological Developments

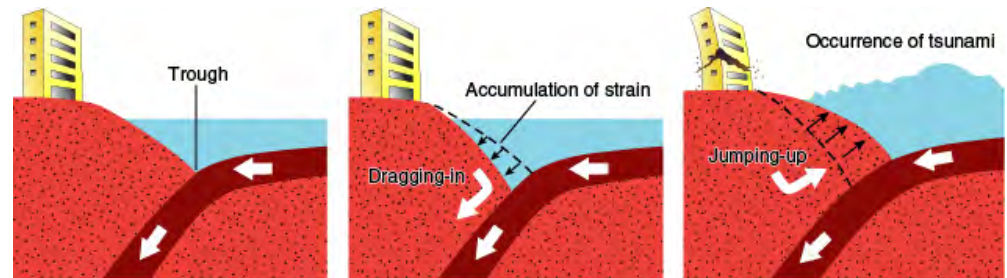
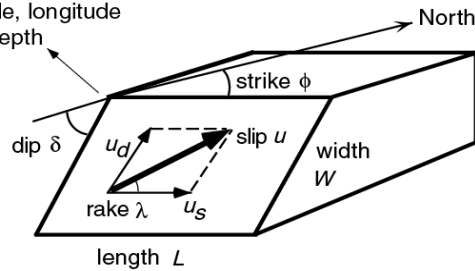
- Plate tectonics theory  
Recurrence of interplate earthquakes



- Mathematical modeling of Eq. source  
Fault model, seismic moment

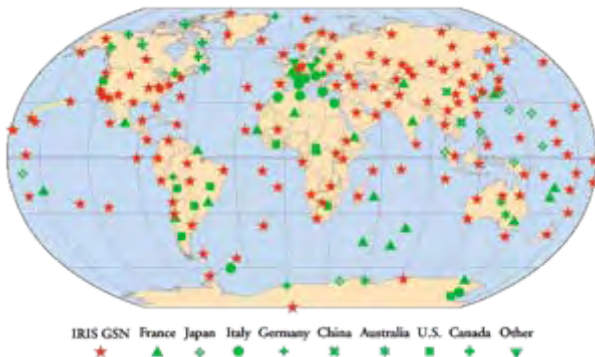
CMT

latitude, longitude and depth



- Global Digital Seismographic Network

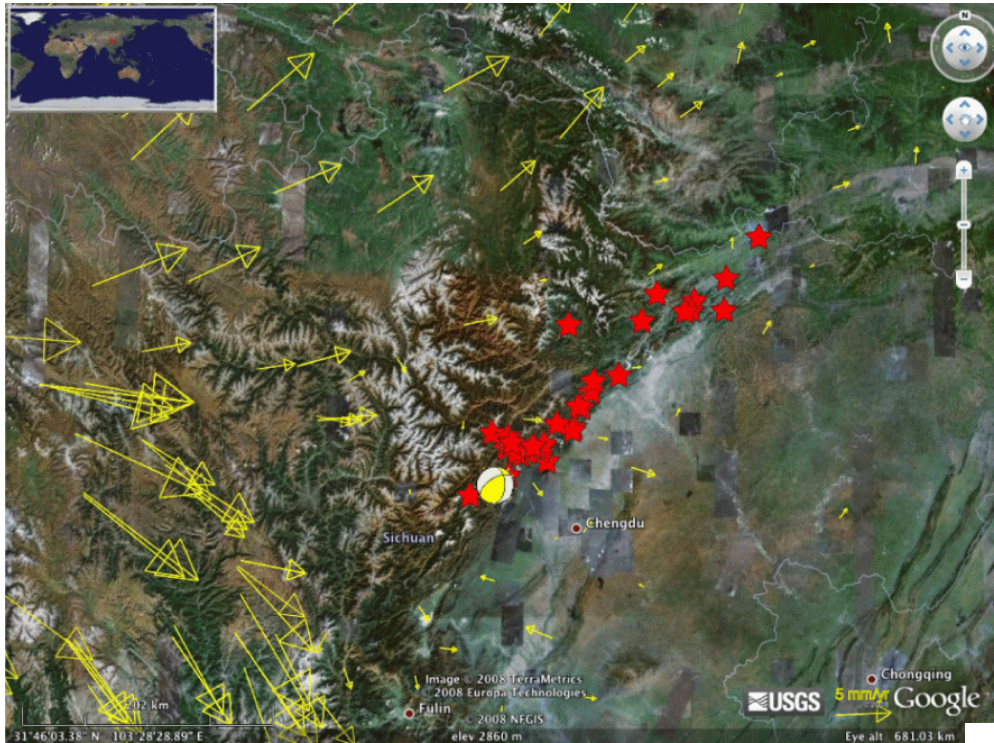
GSN & FEDERATION OF DIGITAL BROADBAND SEISMIC NETWORKS (FDSN)



Earthquake Occurrence, Size, Fault Parameters and Tectonic Background

“published” on websites within a few hours

# 2008 Wenchuan earthquake



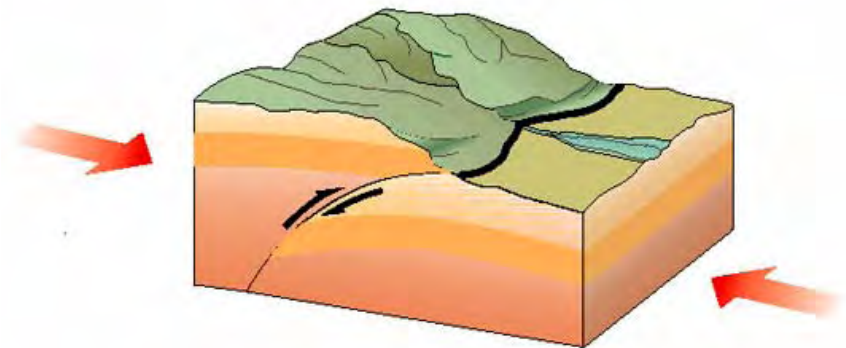
USGS website

Magnitude

Focal mechanism

Aftershocks

Reverse motion on Longmenshan fault

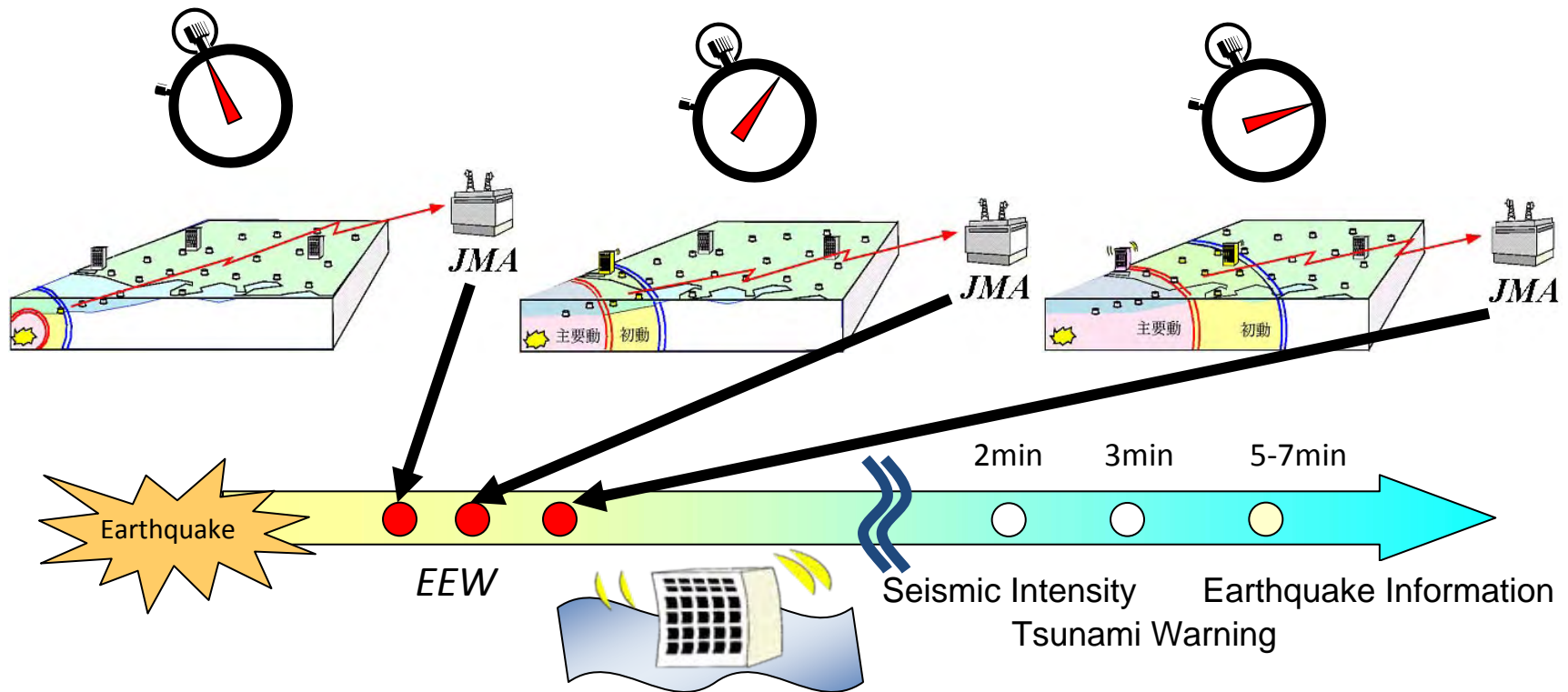


# Earthquake Early Warning

Estimation of hypocenter, magnitude and seismic intensity within seconds of P wave arrival.

Dissemination of the results to general public before ground shaking.

Adopted by Japan Meteorological Agency in 2007.



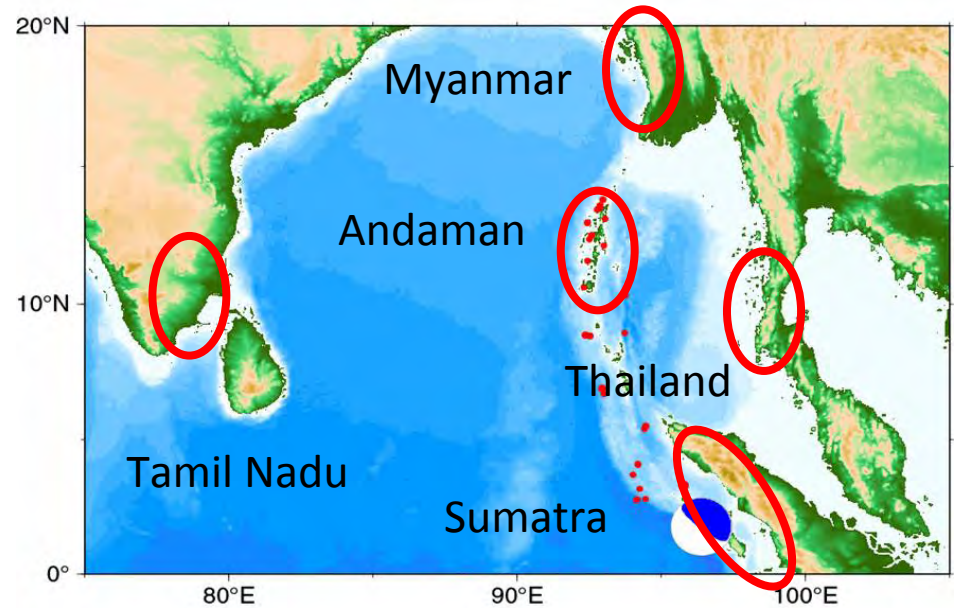


# Paleoseismology since 2004

## Marine terrace in Myanmar



## Tsunami deposits in Thailand



After the 2004 Sumatra-Andaman earthquake, many paleoseismological studies made in Asia revealed that a similar gigantic earthquake happened several hundred years ago.

# Policy Recommendations

## **(2) Interaction between scientists and policy makers**

The 2008 Wenchuan earthquake occurred on Longmenshan fault system, on which recent paleoseismological studies indicated possibility of large earthquake. Furthermore, the seismic risk in Sichuan basin has been evaluated as high in 1990's.

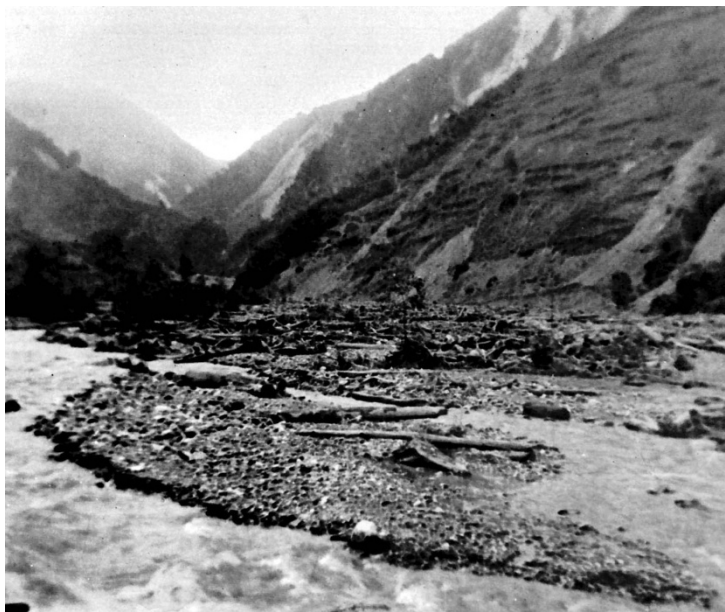
Practical countermeasures, such as retrofitting schools or hospitals could have been made before the earthquake.







# Similar earthquake and damage in 1933, 1976



304. 平武县黄羊公社草原大队

北。地震后因连续暴雨，引起泥石流暴发，冲毁了大量农田和木材。

305. 平武县白马公社祥述家沟，

泥石流形成的杂乱无章堆积物。

306. 地点同上。地震形成的小型

堰塞湖。



# Paleoseismology of Longmenshan Fault

## Active tectonics of the Beichuan and Pengguan faults at the eastern margin of the Tibetan Plateau

Alexander L. Densmore Durham University, Durham, UK

Michael A. Ellis University of Memphis, Memphis, Tennessee, USA

Yong Li Chengdu University of Technology, Chengdu, Sichuan, China

Rongjun Zhou Seismological Bureau of Sichuan Province, China

Gregory S. Hancock College of William and Mary, Williamsburg, Virginia, USA

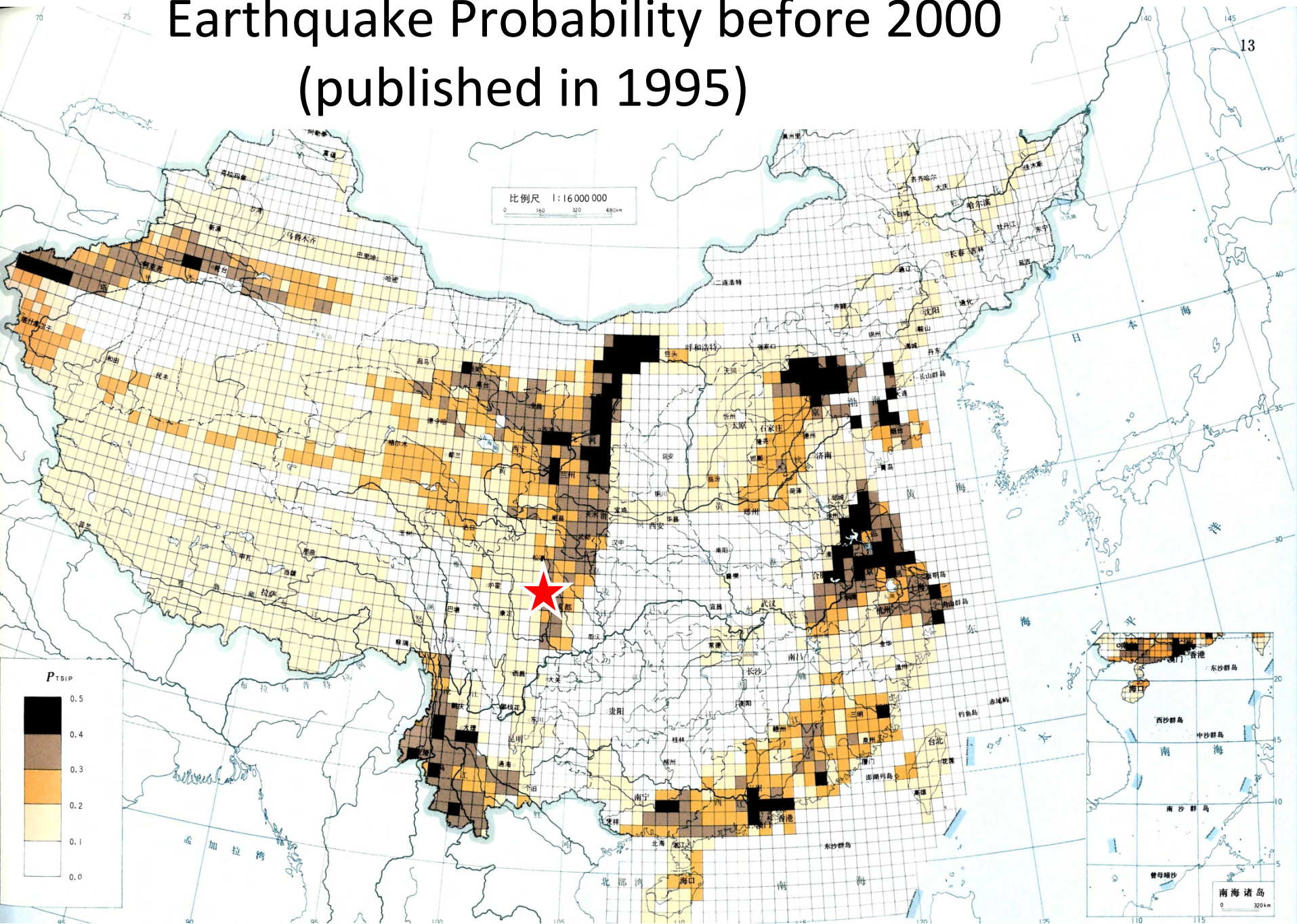
Nicholas Richardson Swiss Federal Institute of Technology, Zurich, Switzerland

*TECTONICS, VOL. 26, TC4005, doi:10.1029/2006TC001987, 2007*

They [the observations in this study] also suggest that activity on the margin-parallel faults in eastern Tibet may represent a significant seismic hazard to the densely populated Sichuan Basin.



# Earthquake Probability before 2000 (published in 1995)





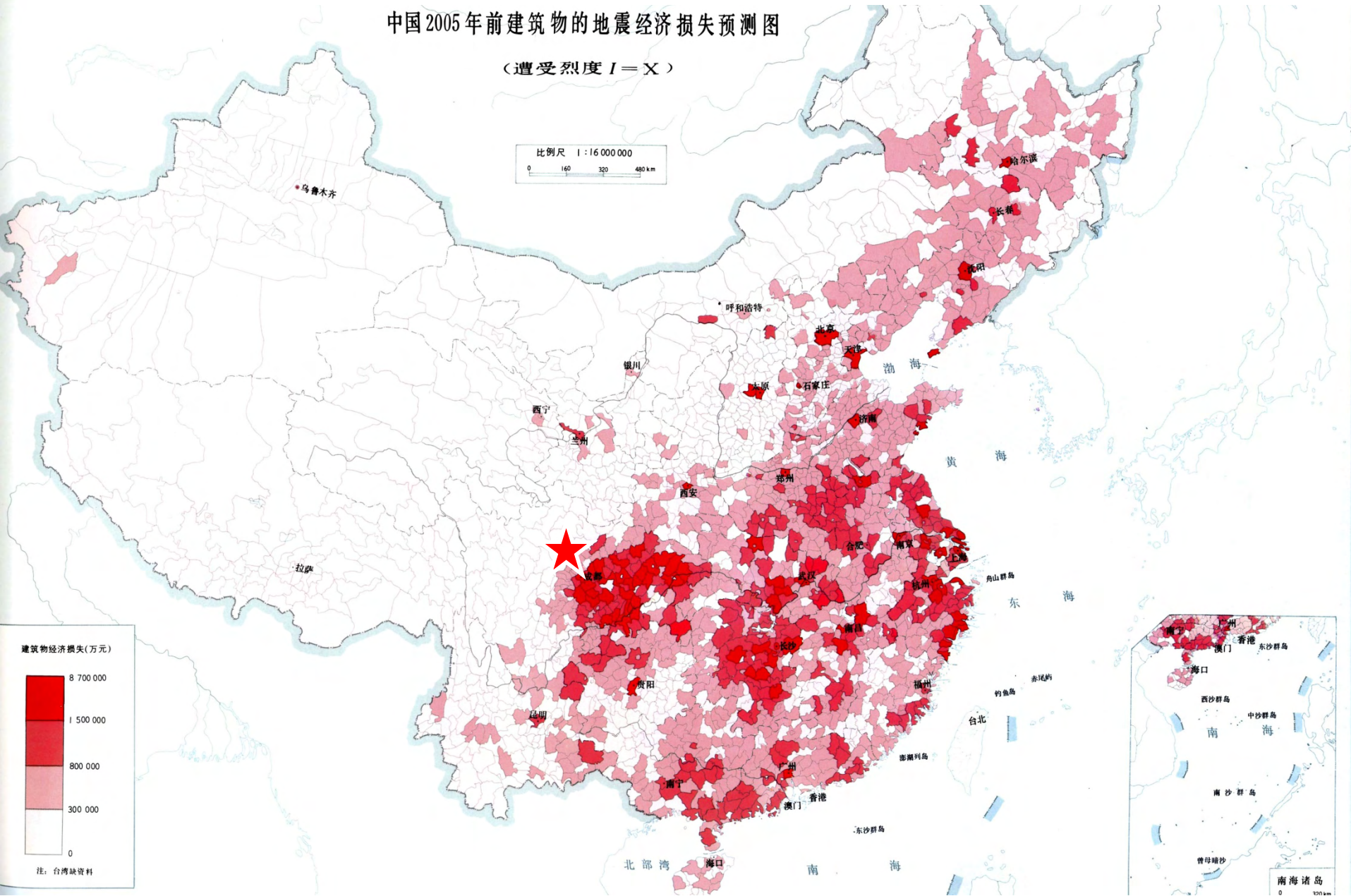
# Predicted Economic Loss by 2005 (max intensity = X)

中国2005年前建筑物的地震经济损失预测图

(遭受烈度  $I = X$ )

比例尺 1:16 000 000

0 160 320 480 km





# Predicted Casualties by 2005 (max intensity = X)

中国 2005 年前地震死亡人数预测图

(遭受烈度 I = X)



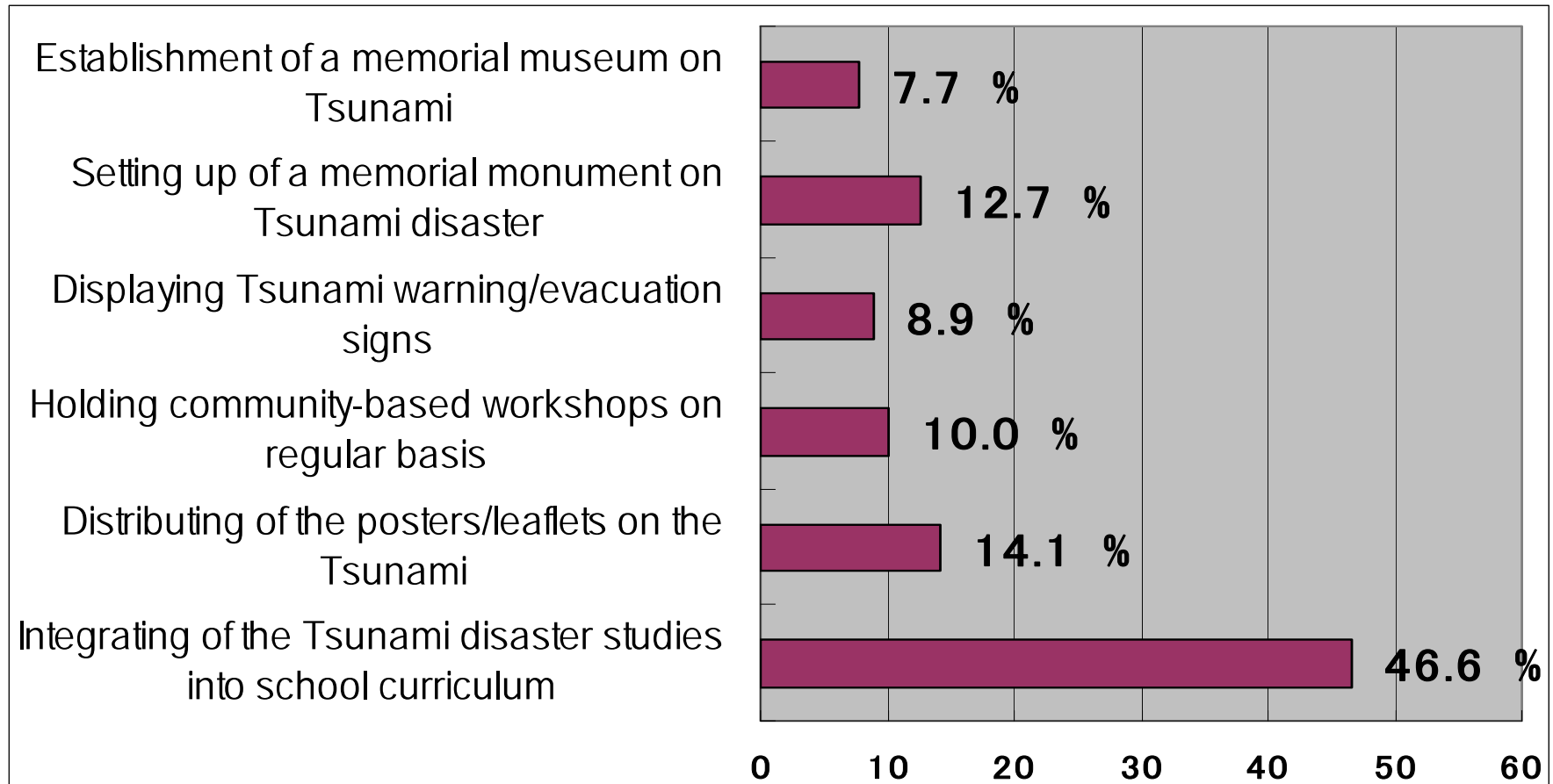
# Policy Recommendations

## **(3) Outreach activity to public about scientific knowledge**

Residents of tsunami-affected coasts of Sumatra, Thailand or Sri Lanka had little knowledge of tsunami, because it is one of such infrequent natural hazards.

Interviews and questionnaire indicate that school education is most effective for preventing future disasters.

# Effective ways to remember the tsunami disaster: Lessons from the 2004 tsunami in Banda Aceh

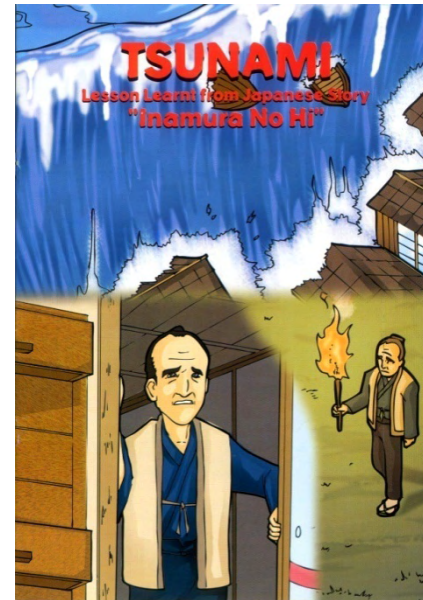


✓ *Integrating disaster studies into school curriculum is the most effective*

Suzuki (2008)

# Education in schools

## Education materials



## Training Teachers

## Teaching in classrooms





# Policy Recommendations

## **(4) Interdisciplinary collaboration**

Risk = Hazard x Vulnerability

Hazard: earthquakes or volcanic eruptions cannot be prevented, but may be predicted

Vulnerability:

Houses and other construction can be strengthened for earthquakes

People can also be prepared

# Policy Recommendations

## **(5) International collaboration and network of scientists**

Some countries have more experiences on particular hazards than other countries (e.g., earthquakes in Japan, China and India, tsunami in Japan, volcanoes in Japan, Indonesia, Philippines)

# Phuket Symposium (Jan. 2008)

The international symposium on the restoration program from giant earthquakes and tsunamis as held in Phuket, Thailand, in January 2008. About 120 participants from 10 countries attended, and about 70 presentations were made on the following topics.

1. Keynote Lectures
2. Giant earthquakes and tsunamis around the Indian Ocean
3. Hazards due to earthquakes and tsunamis
4. Restoration from earthquake & tsunami disasters and planning
5. Community preparedness and education
6. Tsunamis: their hazards , modeling , monitoring and warning

The papers will be published in special issue of J. Earthquake and Tsunami.

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