ASIA EARTHQUAKE & TSUNAMI
December 26, 2004

OVERVIEW AND COMPARISON TO THE
CASCADIA SUBDUCTION ZONE

Contributed by ASCE/TCLEE Reconnaissance Team members
Curtis Edwards, team leader

*material is compiled from publicly available sources
World’s Worst Subduction Zone Quake Disaster

What was it?
- Magnitude 9.0 Subduction Zone Earthquake

What Happened?
- Strong Ground Shaking for 3-7 Minutes
- Local and Distant Tsunamis
- Extensive human losses

(Photo Source: unknown)
Hotel That Survived

- Nicest Hotel in Banda Aceh, Sumatra
- 5-Story Concrete Hotel performed well

(Lia Cut correspondence to YW, 1/20/05)
Two Mosques That Withstood The Tsunami Forces
Banda Aceh, Sumatra

(Lia Cut correspondence to YW, 1/20/05)
Banda Aceh Shore, Indonesia
AFTER

(http://homepage.mac.com/demark/tsunami/2.html)
Slope Failures & Tsunami Flooding

Slope failures along the bases of the hills

(Lia Cut correspondence to YW, 1/20/05)
Tectonic Setting and Historic Seismicity (Indian plate under Burma plate)

Magnitude 9.0 Earthquake Shaking Felt Across the Indian Ocean

Tsunami Travel Times and Estimated Wave Heights

Total Destruction at Phi Phi Island, Thailand

Film location for “The Beach” starring Leonardo DiCaprio

(Asian Institute of Technology, Working paper on AIT’s Response to the Earthquake and Tsunami in South and Southeast Asia, 2005)
Sites to be investigated by U.S. engineering team from ASCE and EERI

(Source: Thailand DMR and AIT seminar)
Sumatra-Andaman Islands Earthquake & Tsunami Statistics

- **Date:** Sunday, December 26, 2004
- **Region:** Off W Coast of N. Sumatra, Indonesia
- **Magnitude:** 9.0, **Type:** Subduction Zone
- **Depth:** about 30 km (18.6 miles)
- **Rupture Length:** >700-mile section plate shifted
- **Tsunamis:** Caused massive tsunamis
- **Direct Fatalities from shaking and tsunami:** Over 225,000
- **Indirect Losses:** Infrastructure continuity, fire, disease, looting, food-water-fuel-medical shortages
Fires

Flames spread on the debris-strewn coast of Aceh Province

CStrand correspondence to YW, 1/25/05
Hazardous Fuels

Scattered Drums from Government-owned Pertamina Oil company

Unsafe distribution of fuel, Aceh Province, Indonesia

(CStrand correspondence to YW, 1/25/05)
Comparison of Plate Tectonic Settings

Cascadia

Sunda Trench

Comparison of U.S. & Indonesia

Shaking Maps

PGA 10% probability of being exceeded in the next 50 years on rock site


PGA 10% probability of being exceeded in the next 50 yrs on rock site

Comparison of Statistics

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<thead>
<tr>
<th>Sumatra Earthquake</th>
<th>Cascadia Model Quake</th>
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<tr>
<td>Magnitude 9.0</td>
<td>Magnitude 8.5</td>
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<td>Shaking for 3-7 minutes</td>
<td>Minutes of Shaking</td>
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<tr>
<td>Generated Tsunami</td>
<td>Generates Tsunami</td>
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<td>High Consequence event</td>
<td>High Consequence event</td>
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<td>Long term recovery</td>
<td>Long term recovery</td>
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<tr>
<td>About 225k fatalities</td>
<td>Est. &gt;5k fatalities (in OR)</td>
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<tr>
<td>Cost unknown</td>
<td>Est. building damage</td>
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<td>Tsunami Hit 11 countries</td>
<td>$12 billion</td>
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Sumatra-quake Rupture Length (arrow) Compared to Cascadia Subduction Zone