

HUMANITARIAN ENGINEERING: THE ROLE OF  
ENGINEERING AND TECHNOLOGY IN  
LESS-DEVELOPED COMMUNITIES

EFFECTIVELY ADAPTING & ADOPTING RISK REDUCTION  
TECHNOLOGIES IN EMERGING COMMUNITIES:  
EXAMPLE IN WEST SUMATRA, INDONESIA

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APPLIED TECHNOLOGY COUNCIL

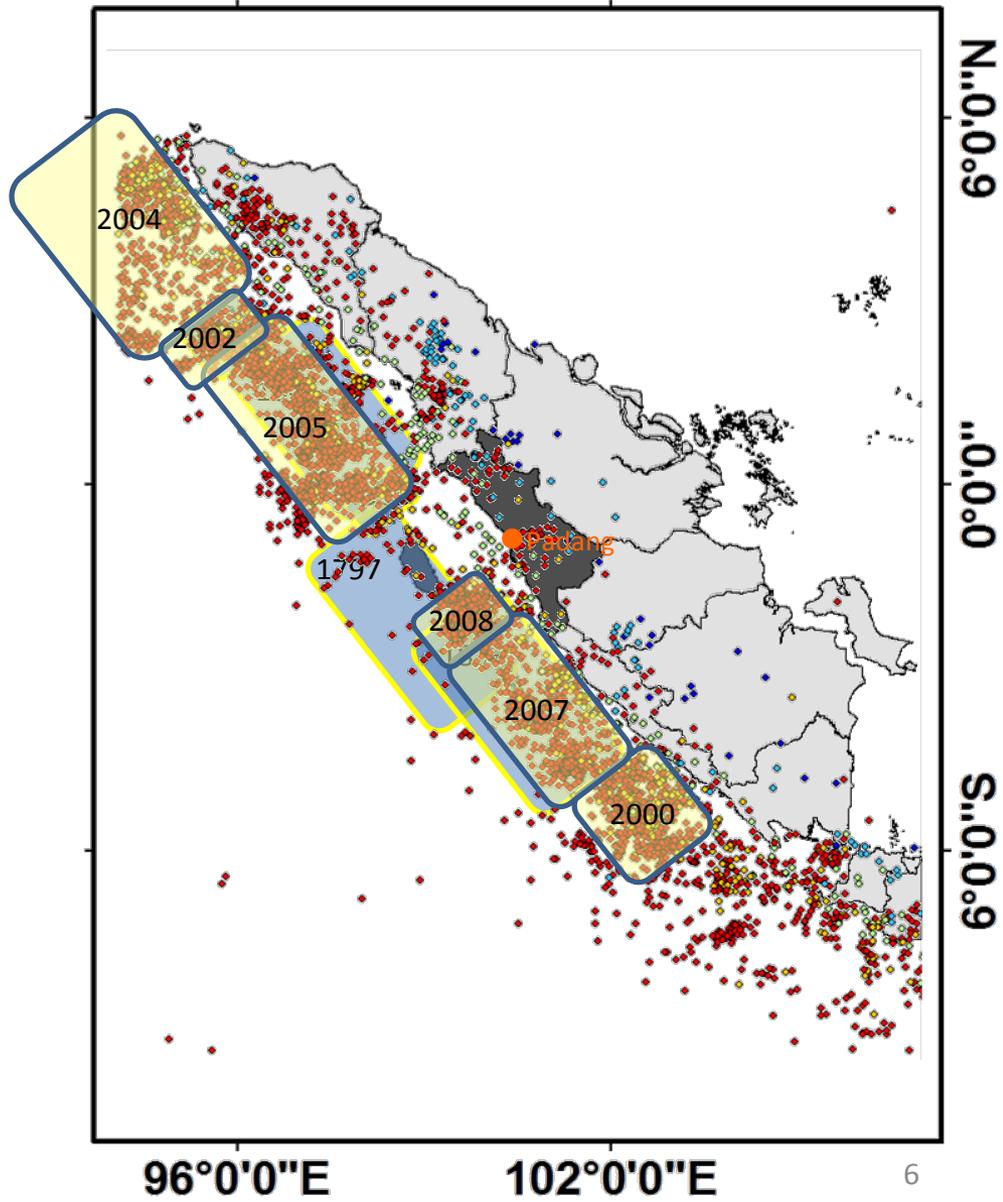
Difficult to achieve lasting impact and long-term  
local adoption of technologies

# Key Aspects

- What are the existing conditions, limitations, and opportunities?
- What does the community value?
- How do we ensure local ownership?

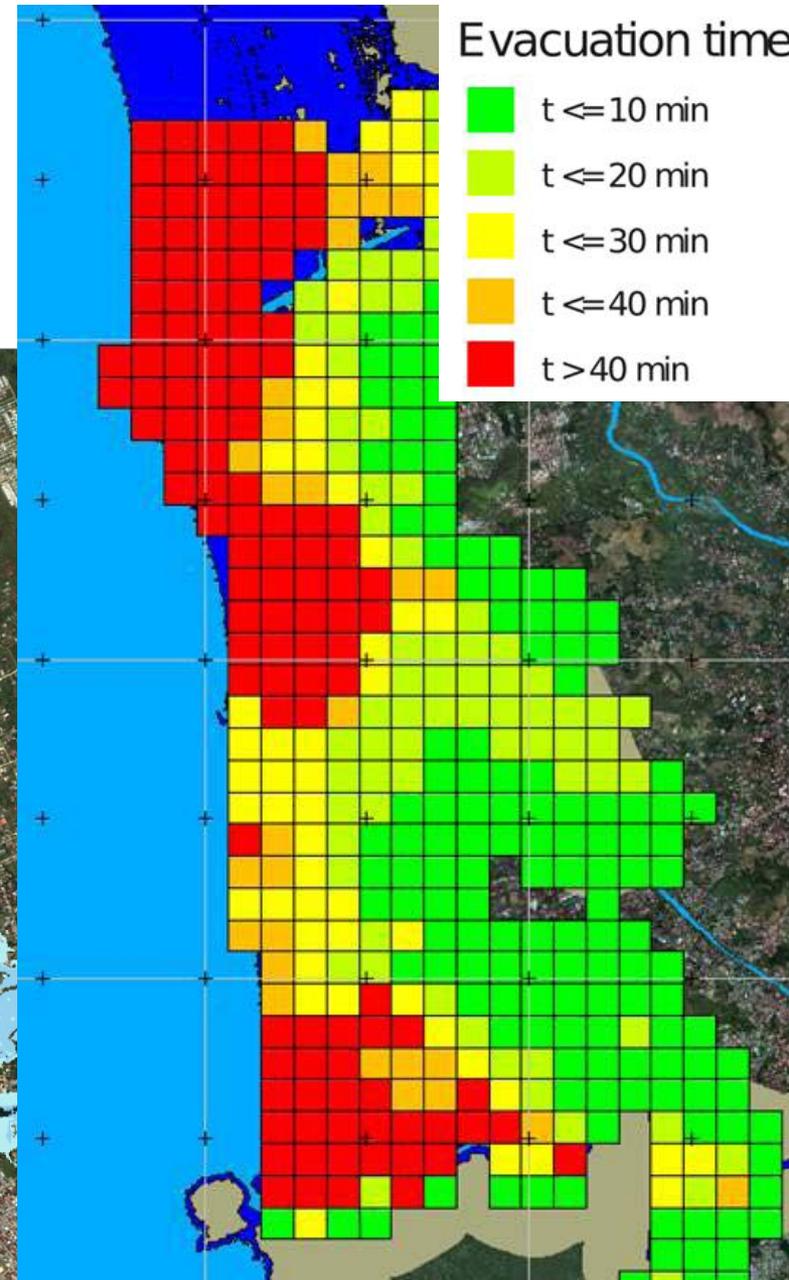
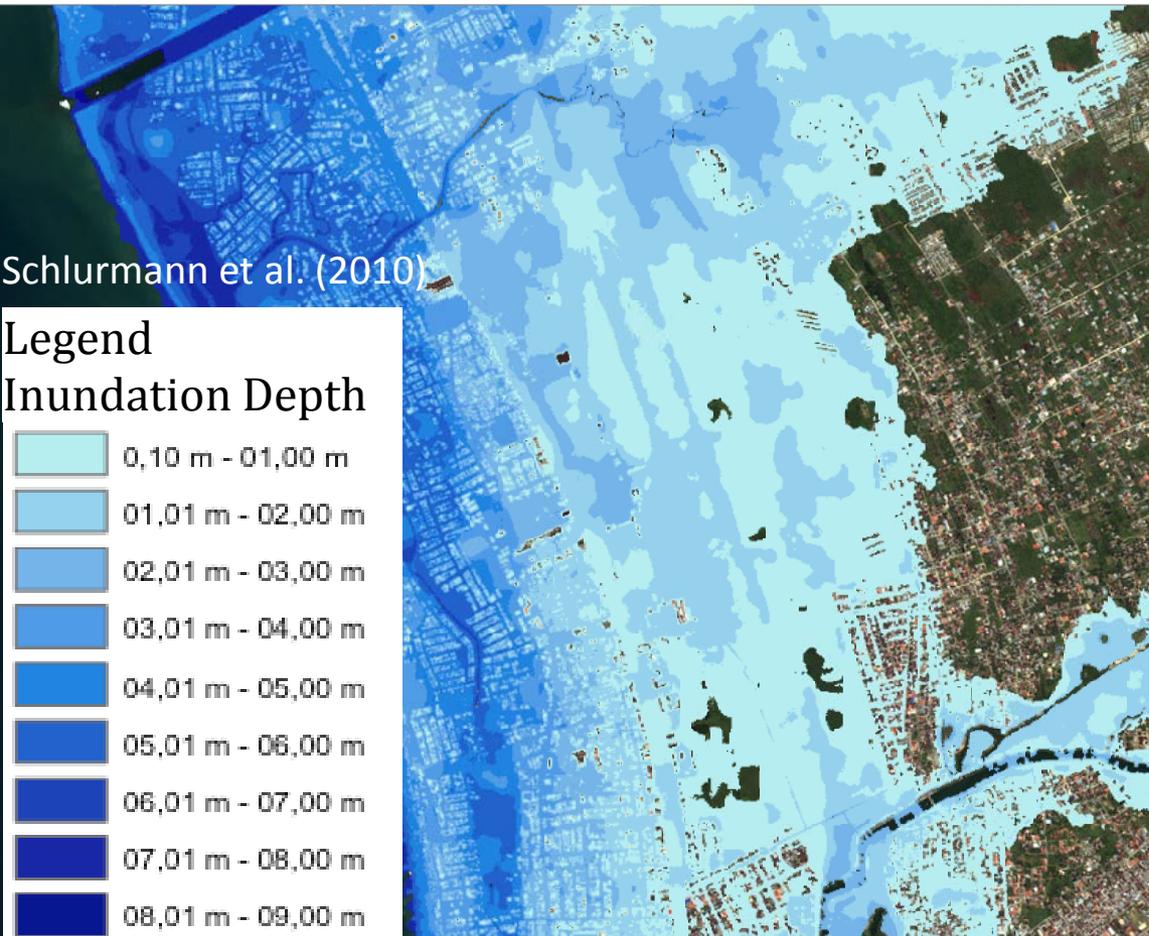
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# Tsunami Inundation Map & Evacuation Models



**2007 earthquake**



**2009 Earthquake**



Other countries face similar problems....

What strategies have they used to overcome them?

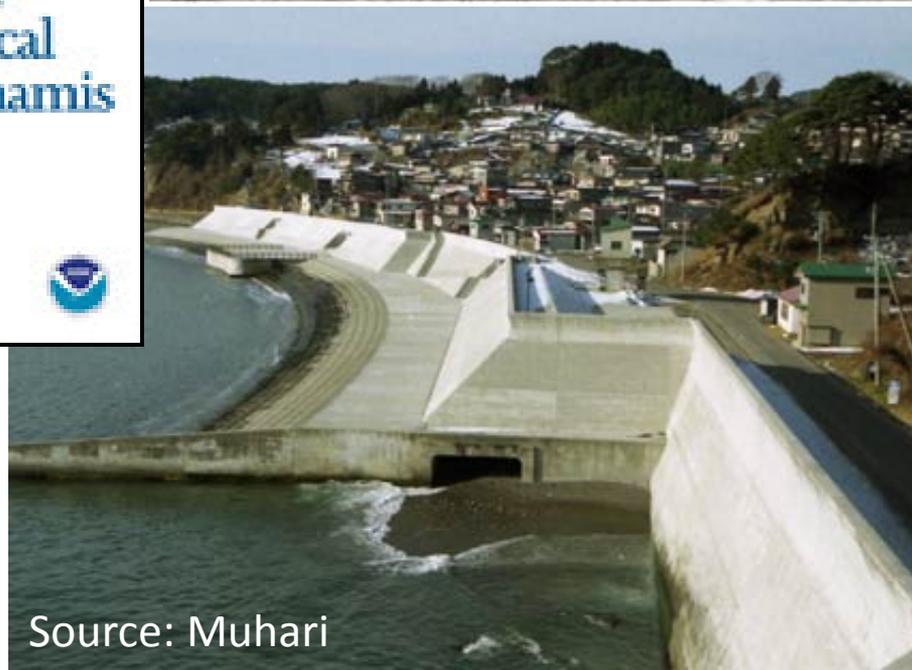


## Guidelines for Design of Structures for Vertical Evacuation from Tsunamis

FEMA 646 / June 2008



赤岡町避難広場建設中(平成18年10月撮影)



Source: Muhari



FEMA 646

## Challenges to implementation

Need to develop locally-appropriate solutions

# Other more pressing needs...

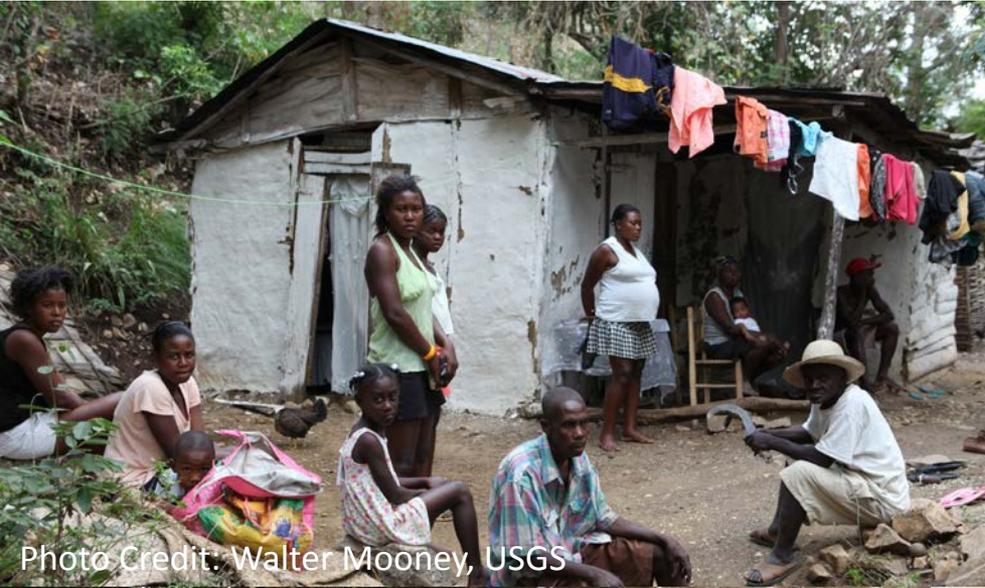


Photo Credit: Walter Mooney, USGS



Photo Credit: Walter Mooney, USGS

# How will you ever get people to care?

Budaya Tidak Sadar Risiko (Pudja, 2010)



<http://penghuni60.blogspot.com/>



<http://www.blogotainmen.com/beginilah-perilaku-penumpang-kereta-api-di-indonesia/>



<http://www.blogotainmen.com/beginilah-perilaku-penumpang-kereta-api-di-indonesia/>

Budaya Tidak Sadar Risiko (Pudja, 2010)



<http://www.kaskus.us/showthread.php?t=5192751>



BlueFame Upload™  
<http://argakencana.blogspot.com/2010/02/angkutan-motor-terunik.html>

# Inadequate construction quality...



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GAMBAR RENCANA

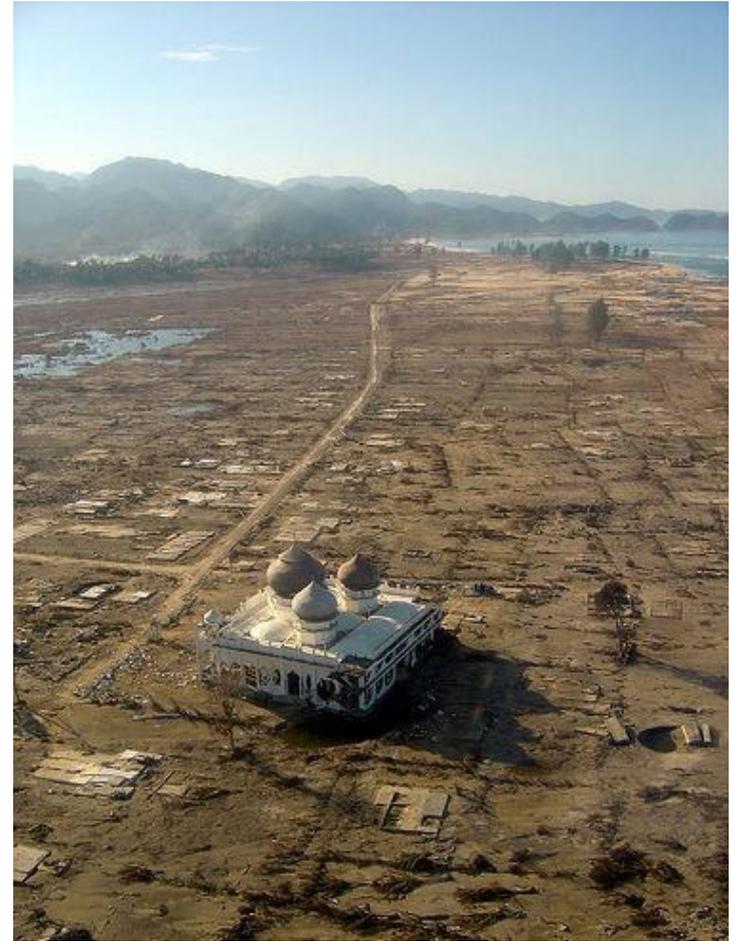


Image Credits: <http://simbi.bimasislam.com/>

> 40 million USD

Funded by West Sumatra Province

# Performance of mosques during 2004 Great Indian Ocean Tsunami



[http://bangladesh2000.com/blog//blog4.php/a-mosque-masjid-save-after-tsunami#.VIHs9WTF\\_pA](http://bangladesh2000.com/blog//blog4.php/a-mosque-masjid-save-after-tsunami#.VIHs9WTF_pA)

# Design Mosques for Vertical Evacuation

- Well-distributed
- Typical design:
  - symmetric layout
  - redundant structures
  - large open prayer areas
  - egress designed for large numbers of people
  - construction quality relatively better than other structures
- Maintenance not an issue
- Vital role in education, awareness



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# Progress from Local Efforts

- Mosques being built for vertical evacuation
- Several major roads widened
- Additional bridges leading to high ground constructed
- Local government offices and EOC relocated outside tsunami inundation area
- Plans to move commercial center, as well



Photo Credit: GeoHazards International

Thank you!