Case Study

LESSON LEARNT FROM MENTAWAI

Based on Mentawai Earthquake, 2 Maret 2016

Acknowledgement to the assessment and survey team of

Ardito M. Kodijat
Head of Indian Ocean Tsunami Information Centre, IOC - UNESCO
National Professional Officer - UNESCO Jakarta Office
Disaster Risk Reduction and Tsunami Information Unit
a.kodijat@unesco.org
Introduction

West Sumatra Tectonics and Tsunami Hazard

The EOS Education and Outreach group has been working with provincial to local stakeholders in West Sumatra Province for the past year. We bring this simple message: A large earthquake (M 8.8) and tsunami are likely sometime in the coming decades in West Sumatra Province, though scientists cannot predict the exact day, month, or year when this may happen. The earthquake itself would damage or destroy many existing buildings and bridges; people can protect themselves by using earthquake-resistant construction techniques for new buildings and reinforcing existing buildings. The tsunami would reach the shores of the Mentawai Islands within 5-10 minutes and would reach the mainland West Sumatran coast, including Padang, within 20-30 minutes of the earthquake.
Mentawai Tsunami
25 October 2010
• 7.7 Mw
• Death + 500 People
• 1st wave in + 7 Min
• Run-up 2 – 12 m
• Inundated ~ 450 m
• # Waves 3-4 waves

Introduction

(Yudhicara et al)
Introduction

The Mentawai people has experienced successive earthquakes.

Aceh Earthquake
11 April 2012
8.5 M
± 700 km from Banda Aceh

NTWC, NDMO, LDMO, Media

Mentawai Earthquake
2 Maret 2016
7.8 M
± 700 Km from Mentawai
0.21 cm tsunami

NTWC, NDMO, LDMO, Media, and community
Evacuation Case

Evacuation in Padang City

- **Did not Evacuate** 65%
- **Immediately Evacuate** 23%
- **Not immediately Evacuate** 12%

- They did not feel the EQ
- They did not receive the warning message neither hear the siren
- They feel it is necessary to evacuate
- Because they feel the EQ
- They received the early warning
- They hear the siren
- Following others that evacuate
- They did not feel the EQ
- They feel the EQ is weak (not strong)
- Having doubt if need to evacuate
- Did not receive the warning
- Did not hear the siren
Introduction

In Padang City
**Evacuation Case**

Evacuation in Siberut Island

- **50%** Immediately evacuate
- **29%** Evacuate but not immediately
- **21%** Did not evacuate
Evacuation Case

Evacuation in Siberut Island

Did not Evacuate

- 21% Did not Evacuate

Did not Evacuate

- 5% Did not hear the siren
- 29% EQ is weak (not strong)
- 19% Did not received the warning
- 10% Doubt if need to evacuate
- 32% Others

Evacuated

- 50% Immediately evacuate
- 40% Received the early warning message
- 30% Because they feel the EQ

Others

- 9% Following others
- 4% Traumatic
Evacuation Case

Evacuation in Sipora Island

Evacuation in Pagai Island
Development vs Disaster

Profil dan Potensi Kabupaten Kep. Mentawai, Sumatera Barat

- Sumber Daya Manusia
  - Jumlah Penduduk: 35.508 jiwa
  - Jumlah Nelayan: 2.970 jiwa

- Sarana dan Prasarana
  - JML PERAHU: 606 unit
  - ALAT TANGKAP: 234 unit
  - PABRIK ES: 1 unit

- Perikanan Tangkap
  - Produksi Penangkapan: 4.701 ton

- Perikanan Budidaya
  - Kerapu: 151.20 ton
  - Kepiting: 69.460 ton
  - Nil: 153.19 ton
  - Lele: 103.83 ton

- Ekosistem Pesisir dan Laut
  - Lamun: 24.619.43 Ha
  - Terumbu Karang: 17.636.72 Ha

Komoditas Unggulan
- Ikan Kerapu
- Budidaya Rumput Laut
- Budidaya Mutiara
- Surfing: 27 spot
- Diving: 14 spot
- Birding: 11 spot
- Petualangan Laut: 28 spot

Potensi Perikanan Tangkap: 270.269.8 ton/thn

Sumber: KKP
Development vs Disaster

The local Government

- Want to build and increase their Tax Income
- Invite external investors
- Promote the potentiality of the region.

Disaster Risk Reduction

Reduce the economic and life loss due to disaster

- Avoid activities in high risk zones
- Implement build better ➔ Required big resources
- Research and Mitigation ➔ but can not be specific (When, Where, How big, etc.)

Tourism will attract people to come (national and International)
Will increase industry ➔ facility ➔ infrastructure ➔ work force
Will attract people to build and live near the coastal area
RISK INDEX WILL INCREASE RATHER THAN DECREASE
Evacuation Map in Sipora

Inundation Map of Sipora Island
The GPS system installed in the islands for the tsunami early warning system was thought, by the locals, as sirens that will give warning sound when earthquake occurs.
Tsunami Early Warning Context

The tsunami early warning system is (still) at the local disaster management at the province level. The 8 sirens installed by district local disaster management does not link to the tsunami early warning system at the province level.
Tsunami Evacuation Place

- 40% Higher Ground
- 43% Designated tsunami evacuation place
- 17% Others (2-3 story building, Mosques, Churches)

81% who evacuated

- 41% Walking
- 35% Bike or Motor Bike
- 20% Running
- 4% Car
Tsunami Evacuation Time

Using Open Street Map

Walking speed: 3.6 KM/H
Climbing: 1 KM/HM
Distance: 1.4 KM
One Tsunami Signs available

Questions:
- Warning Chain ➔ Self Evacuation Protocol
- Evacuation route condition
- Evacuation at night ➔ Dark
Tsunami Evacuation Route

2m
Improving Tsunami Evacuation Map

Drone

- Become more popular lately.
- Possible to bring many kinds of camera and sensor.
- Can produce very good image with photogrammetry technology
- Good mosaic and possibility to create 3D image
- Can generate dem, dsm, dtm and contour.
- Can be used with various software such as: 3d software, gis, google earth, web, etc.
Improving Tsunami Evacuation Map
Improving Tsunami Evacuation Map
Improving Tsunami Evacuation Map
Improving Tsunami Evacuation Map

Photogrammetry
Improving Tsunami Evacuation Map

Inundation Map in Tua Pejat
Improving Tsunami Evacuation Map

Overlay with Drone Image
Identify Building under Inundated Area

487 houses inside the Inundated Area
Improving Tsunami Evacuation Map
Thank you

Ardito M. Kodijat,
Udrekh,
Irina Rafliana,
Rahma Hanifa,
ITB - Students

IOC UNESCO Indian Ocean Tsunami Information Centre
IOTIC-BMKG Programme Office

Disaster Risk Reduction and Tsunami Information Unit
UNESCO Jakarta Office

UDREKH,
IRINA RAFLIANA,
RAHMA HANIFA,
ITB - STUDENTS