USM Disaster Research Nexus: Development of Tsunami Research and Resilience

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A Rude Wake Up Call: The Earthquake on 26 December 2004 In Aceh Indonesia
Triggered A Global Tsunami
After an earthquake, a tsunami may follow.

Move quickly to higher ground.
Climb Upward?
Roads Flooded

Cars been moved

Great distances

PENANG Gurney Drive

SCSTW3 Participants Visited This Site
Muddy water

SCSTW3 Participants Visited This Site
More Gloom
Penang Gurney Drive Road
Our Research Team
Tsunami scientists from Korea

John

Choi
理大教授：菲吕宋岛地震活躍
沿岸面對海嘯危險

《環球12日訊》馬來西亞理科大学数学系教授李福来表示，菲吕宋岛及南中国海域的地震相当活跃，令周边专家担心它会引发灾难性的大海啸，大马沙巴沿海将直接受海啸袭击。

李指出，该地区专家对大海啸的担忧，于2007年12月5日至7日在台北首度召开南中国海啸工作营寻求对策，以确保海啸发生时能采取有效性的破坏。

他说，去年11月1日至3日在上海召开第二度工作营，至今将于11月3日至5日在理大召开第三度的工作营，显示周边国家和地区专家和政策官员的忧虑。

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第三度办海啸工作营

李福来今日在理大校长范雨 sistemas举行新闻发布会，宣布举办第三度南中国海啸工作营之后，受媒体发问述谈话。

他说，2004年苏门答腊安达曼大海啸引发大海啸，造成了20万。沿海8层楼高的海啸，以每小时800公里的啸射机速度，向印度洋沿海扑去，夺走数以万计的生命及严重财物损失。
專家關注南中國海地層情況

馬發生大地震可能性不高

理大成立拯救管理災難單位

奧

專家指出，根據地理情況來看，如果發生海嘯，可能是在5公尺的巨浪。不過，這會對中國海南島、呂宋島、婆羅、香港及台灣帶來破壞。若沙巴是大馬最接近馬六甲檳島的州屬，沿岸海嘯會直接沖過去。
Disaster Research Nexus: Mission

• To advance and communicate knowledge on natural disasters research and mitigation;
• To promote community preparedness, response, and recovery during a natural disaster;
• To foster integration of activities among researchers, practitioners, and policy makers;
• To support and conduct research on natural disasters;
• To provide educational opportunities for next generation of hazards professionals;
• To produce results which are reliable and of practical use to both society and industry.
The Mission of DR Nexus is to:

- Coordinate development of technology and expertise on natural disasters;
- Conduct cutting-edge research on natural disasters, damage monitoring and risk assessment;
- Collaborate with other institutes to extend research to a broad social, economic and financial context;
- Provide resources and support services for companies working on projects that require natural disasters considerations.
Role of DRN

1. Disaster Management for Safe and Secure Society;
2. Research for Disaster Reduction Systems;
3. Integration of Arts and Sciences for Effective Communication;
4. Community resilience and Education.
1. Management for Safe Society

- Management focusing on disaster resilient living spaces and communities;
- Scientific analyses and predictions;
- Investigation of Vulnerability and Risk inherent in society with high population density;
- Give priority to: Cultural aspirations, sustainable development, community safety and comfort;
- Conservation of environment;
- Preservation of community harmony.
2. Disaster Reduction System

• Promote emergency preparedness, prediction and management;
• Create safe urban social structures;
• Reduce disaster vulnerability;
• Engage NGOs;
• Consider economic conditions;
• And social-environmental Issues.
3. Integrating Arts and Sciences for Disaster Reduction

- Education, community awareness and preparedness will be a focus of this approach;
- Involvement of Various segments of Society;
- Importance of NGOs.
Methodologies

• Good communication between academic scientists and on-site communities;

• Adequate/timely hazards prediction, community preparedness and mitigation during emergency;

• Information dissemination and services, regular training workshops, scientific research and dedicated consultancy services.
Research Activities

Understand the Generation, behavior and impacts of natural disasters:
• Earthquakes and Tsunamis;
• Hydrospheric Disasters: Flood;
• Water Resources Optimization:
  – Water security will determine the future of mankind.
  – Social and ecological risk management
• Wetlands and Mangrove Ecosystem
  – Wetlands/mangroves are important ecosystems;
  – Physically based models and monitoring is essential to protect and enhance their ecological functions
Annual Events

• Open Lecture

• Open Campus

• Annual Conference
Tsunami Wave Time series
TUNA-M2: Staggered Scheme
\[
\frac{\partial \eta}{\partial t} + \frac{\partial M}{\partial x} + \frac{\partial N}{\partial y} = 0
\]

\[
\frac{\partial M}{\partial t} + \frac{\partial}{\partial x} \left( \frac{M^2}{D} \right) + \frac{\partial}{\partial y} \left( \frac{MN}{D} \right) + gD \frac{\partial \eta}{\partial x} + \frac{gn^2}{D^{7/3}} M \sqrt{M^2 + N^2} = 0
\]

\[
\frac{\partial N}{\partial t} + \frac{\partial}{\partial x} \left( \frac{MN}{D} \right) + \frac{\partial}{\partial y} \left( \frac{N^2}{D} \right) + gD \frac{\partial \eta}{\partial y} + \frac{gn^2}{D^{7/3}} N \sqrt{M^2 + N^2} = 0
\]
Rhizophora stylosa
Bruguiera gymnorrhiza
Penang Study for Tsunami Mitigation
TUNA Simulations for Evacuation
Workshops & Conferences

2. International Round Table Dialogue on Earthquake and Tsunami Risk in Southeast Asia and the South China Sea Region, Kuala Lumpur 27-28 April 2006
5. IOC Seminar on Tsunami Warning Operation under PTWS, Kuala Lumpur 2 - 3 April 2007
Thank You
To ISGC Secretariat
Academia Sinica Grid Computing

Have a good day