DFG roundtable-meeting, 23-24 April 2007

Capacity Building and Issues related to the “Last-Mile”

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Requirement of an “end-to-end” TEWS (UNESCO-IOC)
German Indonesian Tsunami Early Warning System (GITEWS)

Lenkungsausschuss
Federführung GFZ-Potsdam
(GFZ, DLR, AWI, GKSS, KDM, GTZ, UNU)

Programmmanagement
GFZ-Potsdam (Lauterjung)

Wissenschaftlicher Beirat
(Konrad-Zuse-Inst., Uni Bochum, acatech, DKKV, Uni Bremen)

Workpackages

Earthquake Monitoring System
GFZ (Zschau)

Ocean Instrumentation
KDM (Suess)

GPS-Technologies
GFZ (Rothacher)

Early Warning and Mitigation Centre, Risk Modelling and Earth Observation
DLR (Dech)

Modelling & Simulation
AWI (Schroeter)

Capacity Building (CB)
UNU, GTZ (Schlurmann & Schaef)
General components of an Early Warning System
(here: Tsunami Early Warning System)

Level 1: Continuous data collection/monitoring (Seismology, Ocean buoys, GPS-data, etc.)

Level 2: Data processing, risk-based forecasts of potential tsunami scenarios -> Initialization of warning/alert

Level 3: Dissemination of warning messages (top-down)

Level 4: Perception of warning & anticipate response -> Initiate evacuation

Level 5: Sequence of evacuation (Tsunami inundation dynamics, Human reaction dependent on time, day & social status)

Chronological interdependence of levels 1 to 5 guarantee overall success! -> Requirement for integrated design of „end-to-end“ TEWS
Capacity Building (CB) workpackage in GITEWS

Component 6100
- Academic programmes (PhD, PostDoc, Guest lecturers)
- Technical Training and Workshops

Components 6200 & 6300
- Strengthening organizational structures & interinstitutional communication
- Warning and disaster preparedness mechanisms in 3 pilot areas

Capacity Building Unit (CBU)
"Last-Mile" aspects

Definition „Last-mile“: Earthquake Bam, Iran, 2003

- Missing-link in between communication technologies and recipients (human beings)
  
  (...) we are reaching the people and doing the right actions for nearly all the miles, but we should help communities reducing (...) their risks and (...) reach the people who represent and live on the ‘last mile’ of for an effective disaster risk mitigation? Shah, H. (2006)

Research & Development “Last-Mile” component

- Organisational structures and communications on national level
- Dissemination of warning messages, e.g. FM-RDS Systems (2wcom)
- Mandate, Contingency Planning & Disaster preparedness for local authorities
- Trained & drilled population for anticipated response, adequate risk perception
- Detailed sequence of tsunami inundations, vulnerability indicators and optimized evacuation simulation incl. recommendations (Padang, West-Sumatra) („Last-mile – Evacuation“, BMBF/DFG 03G0643A-E)
„EARLY WARNING SYSTEMS IN EARTH MANAGEMENT“
In the context of BMBF/DFG special programme „GEOTECHNOLOGIES“

* Numerical „Last-mile“ Tsunami Early Warning and Evacuation Information System“

**Co-ordination and management:** Prof. Schlurmann (Franzius-Institute)

**Co-operating partners:**
- Leibniz University Hannover (Dr. Matheja, Prof. Schlurmann)
  - Nearshore bathymetries, Tsunami inundation scenarios, Run-up sequences in detail
- United Nations University (Prof. Bogardi, Dr. Birkmann)
  - Socio-economic vulnerability & risk indicators, Critical infrastructure, Questionnaires
- University Würzburg (Prof. Dech, Prof. Strunz)
  - Physical vulnerability, GIS & 2D DEM (Satelite), Evacuation recommendations
- Technical University Berlin (Prof. Nagel)
  - Mobility pattern and traffic flow of Padang, Numerical evacuation simulation
- Remote Sensing Solution & DLR (Prof. Siegert, Dr. Lehmann, etc.)
  - HRSC camera (air-borne), Highly resolved 3D DTM/DEM, Webapplication

International review committee: „….highly innovative approach!“
Tsunami-prone coastal stretch in West-Sumatra near city of Padang

3rd largest city of Sumatra
approx. 1 mio. inhabitants, area 650 km²
built environment 350 km²
flat coastal areas, net of urban waterways

Major Tsunamis: 1797: 9m and 1833: 6m
Regional tsunami simulation \textit{(case scenario)} taken from Borrero \textit{et al.} (Dec. 2006)

Close-up of tsunami inundation at Padang (Scenario 3, $M_w = 9.3$)
Rough and detailed tsunami inundation modelling
Numerical last-mile Tsunami Early Warning and Evacuation Information System (last-mile)

Tsunami inundation modelling (rough/coarse)
off Wollongong (NSW), Australia,
© Dr. John Schneider, GEOSCIENCE AUSTRALIA

Tsunami inundation modelling (detailed)
off Wollongong (NSW), Australia,
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Capacity Building – „Last-mile“ aspects

Prof. Dr. T. Schlurmann

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Risk and Vulnerability assessment in Padang
Identification of infrastructure & degree of exposure to tsunami inundation

Coupling:
- Mobility assessment
- Road system
- Socio-Economics
- Response behaviour (Resilience)
Evacuation simulation in department store (floor)
© Dr. Hubert Klüpfel, TraffGO, Germany
Simple evacuation map of the city of Padang

Published in local Newspaper, April 30 2005
Overall project objectives, and „long-term“ goals

Key objective: Achieve final level of TEWS chain in Padang, West Sumatra

• In what respect is (after succession of levels 1-4) the initiated request for evacuation and the chronology of this procedural instruction including the inherent physical-technical susceptibility and the socio-economic vulnerability of the population in the coastal region integrating the respective daytime and weekday feasible at all? How to achieve optimized result?

• Characteristic tsunami inundation dynamics in Padang and consequences for optimization of evacuation schemes and SOP.

• Approximate time frames due to tsunami inundations to successfully organize evacuation routines.

• Bottlenecks during evacuation? What time of the day and what day of the week specific dependencies emerge during evacuation?

• How is vulnerability of population and critical infrastructures be exemplified and measured? Indicators for hotspots of vulnerability?

• Scenario-specific decisions and recommendations, e.g. vertical evacuation, tsunami shelters, etc., to be met technically and within administrative spatial planning processes (ICZM) to minimize the tsunami disaster risk in Padang, i.e. to reduce the susceptibility of Padang’s coast and the vulnerability of its people?
RD Attempt **demands** networks, co-operations with local partners, Capacity Building

**Partnership for implementation!**
Thanks for your kind attention!

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