



G I T E W S

German-Indonesian Tsunami Early Warning System



Bundesministerium
für Bildung
und Forschung

DFG roundtable-meeting, 23-24 April 2007

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

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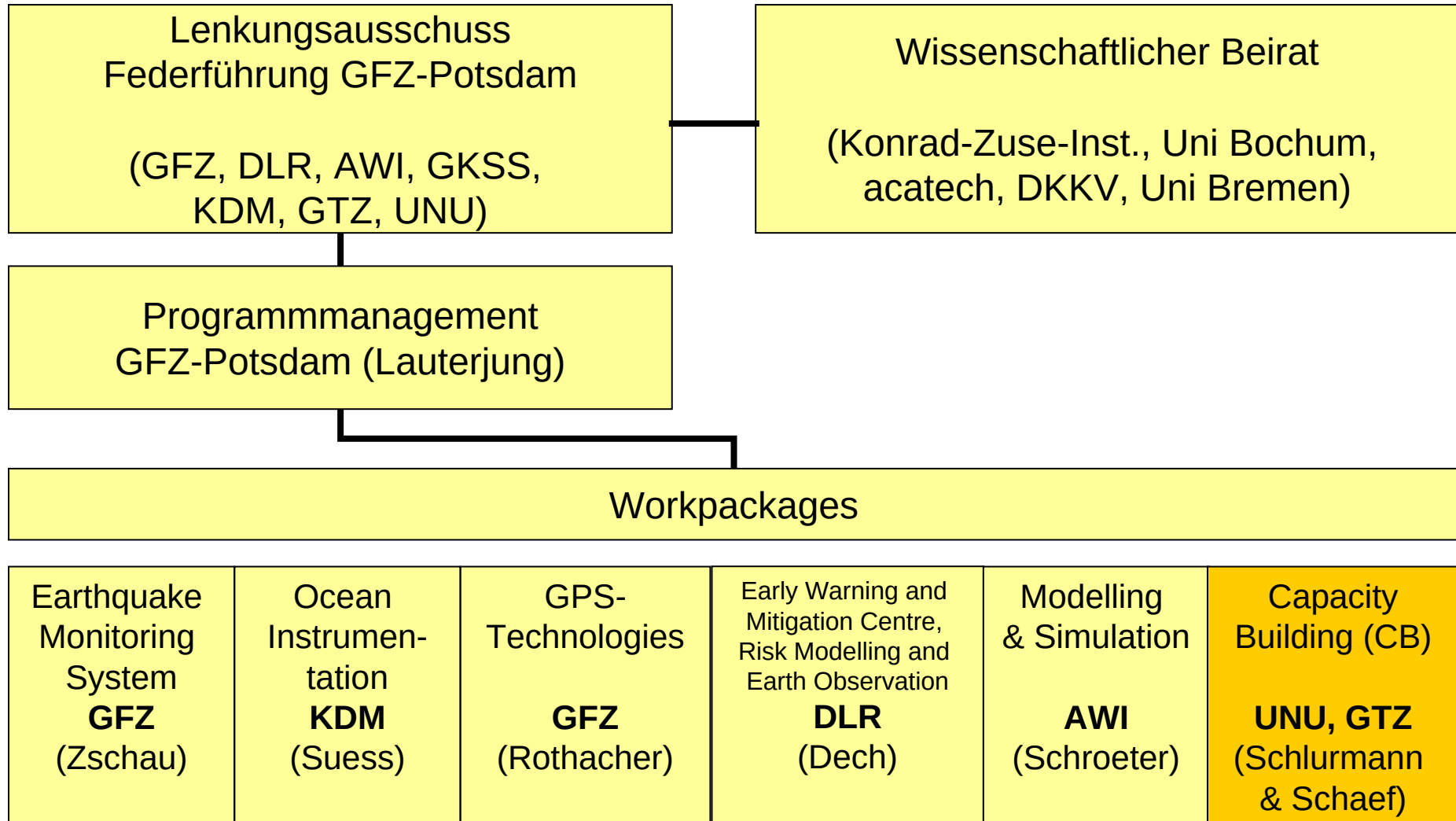
UNITED NATIONS UNIVERSITY

Institute for Environment and Human Security (UNU-EHS)
Bonn, Germany

Requirement of an “end-to-end” TEWS (UNESCO-IOC)



German Indonesian Tsunami Early Warning System (GITEWS)



General components of an Early Warning System

(here: Tsunami Early Warning System)

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

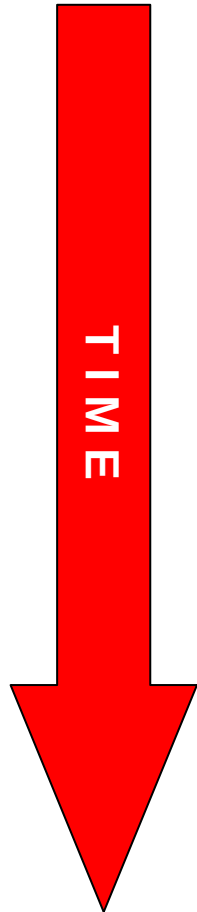
Level 2: Data processing, risk-based forecasts of potential tsunami scenarios -> Initialization of warning/alert

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

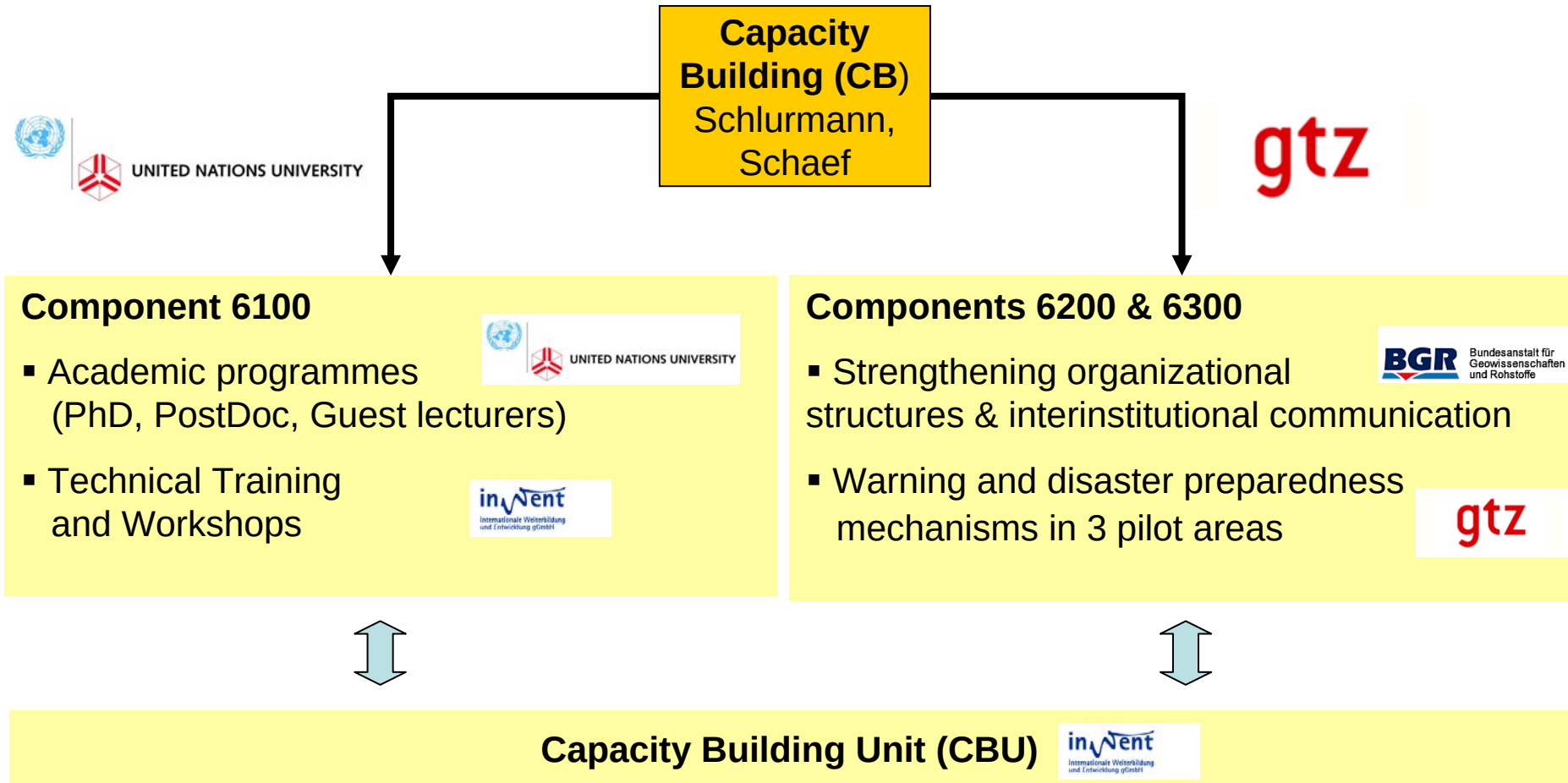
**Level 4: Perception of warning & anticipate response
-> Initiate evacuation**

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



“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 anticated 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“

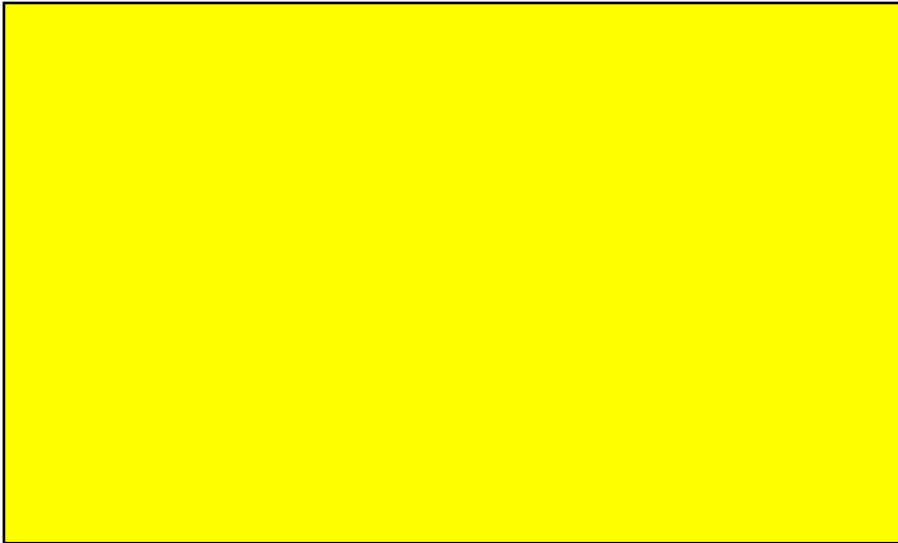
Numerical „Last-mile“ Tsunami Early Warning and Evacuation Information System“

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

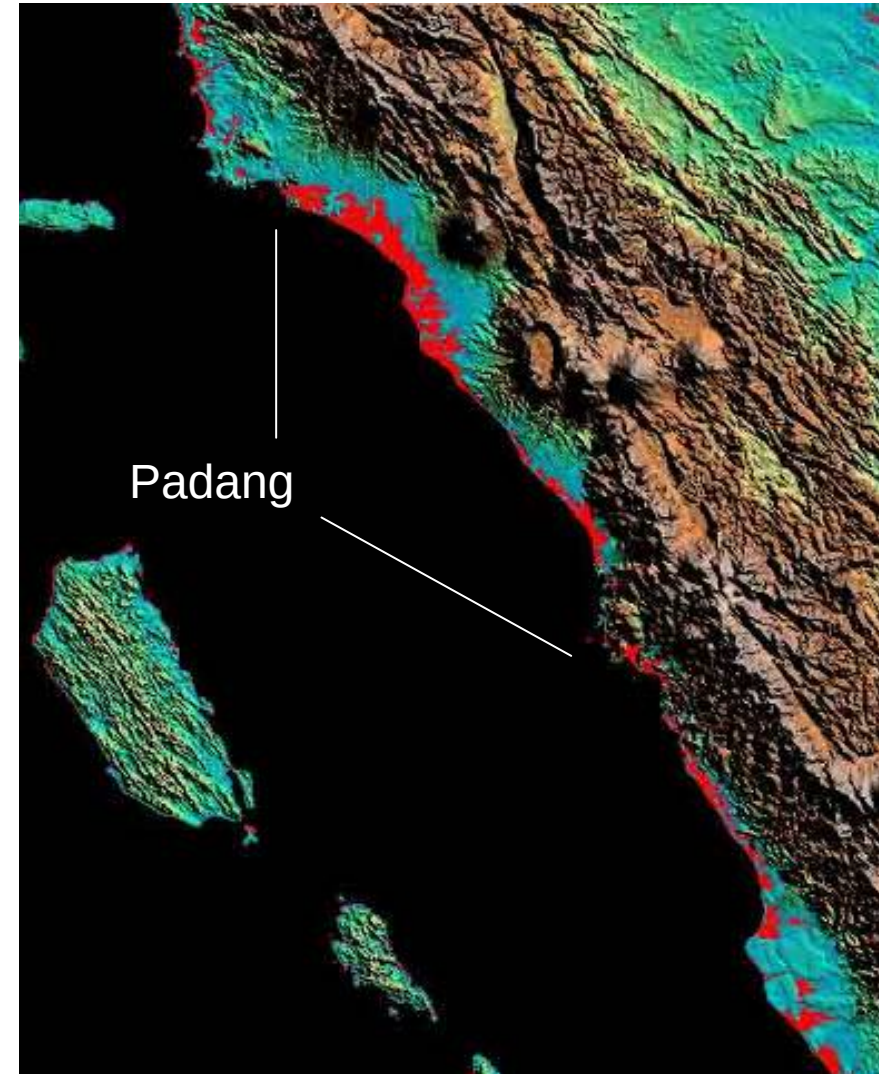
International review committee: „...highly innovative approach!“

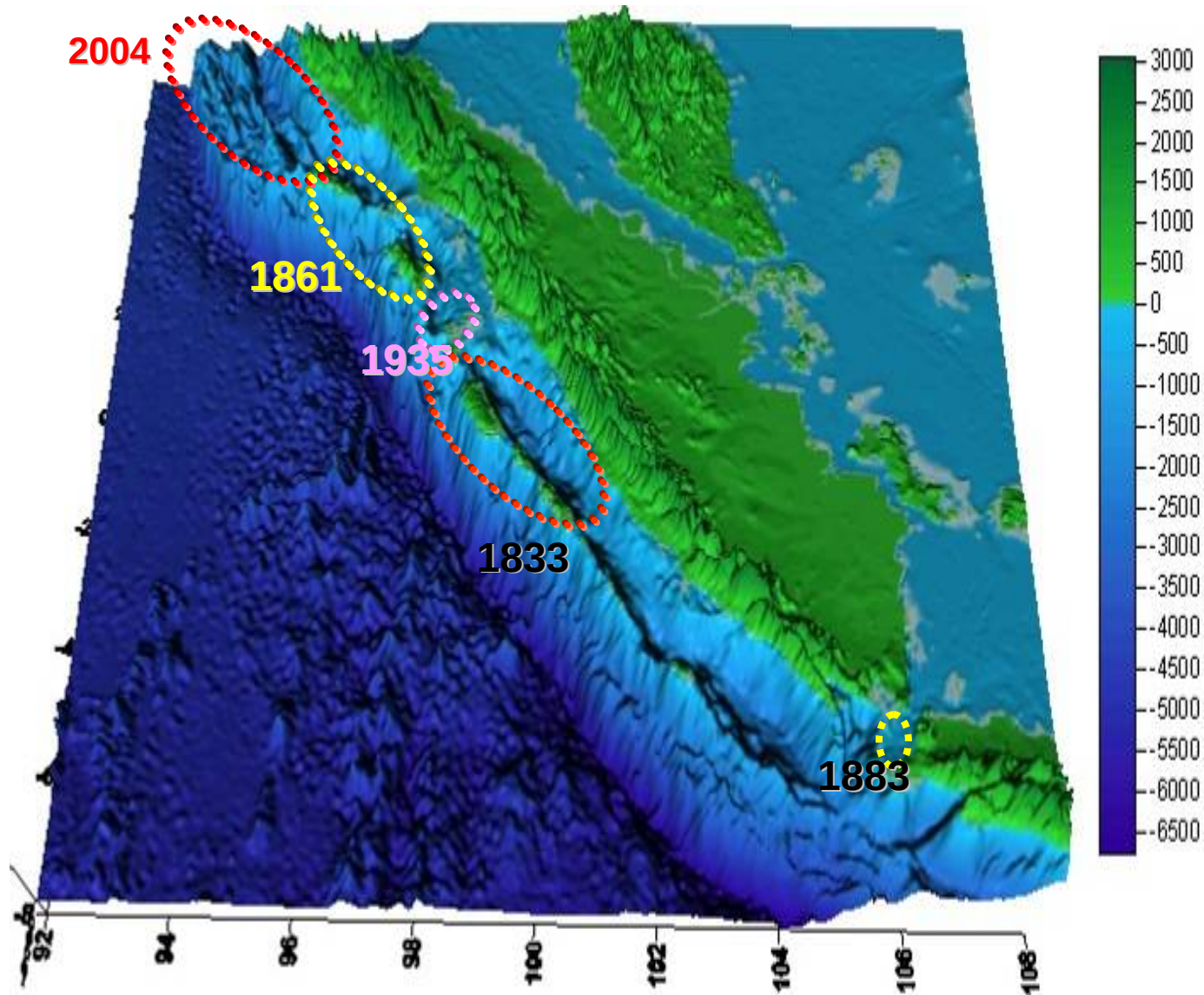


Tsunami-prone coastal stretch in West-Sumatra near city of Padang

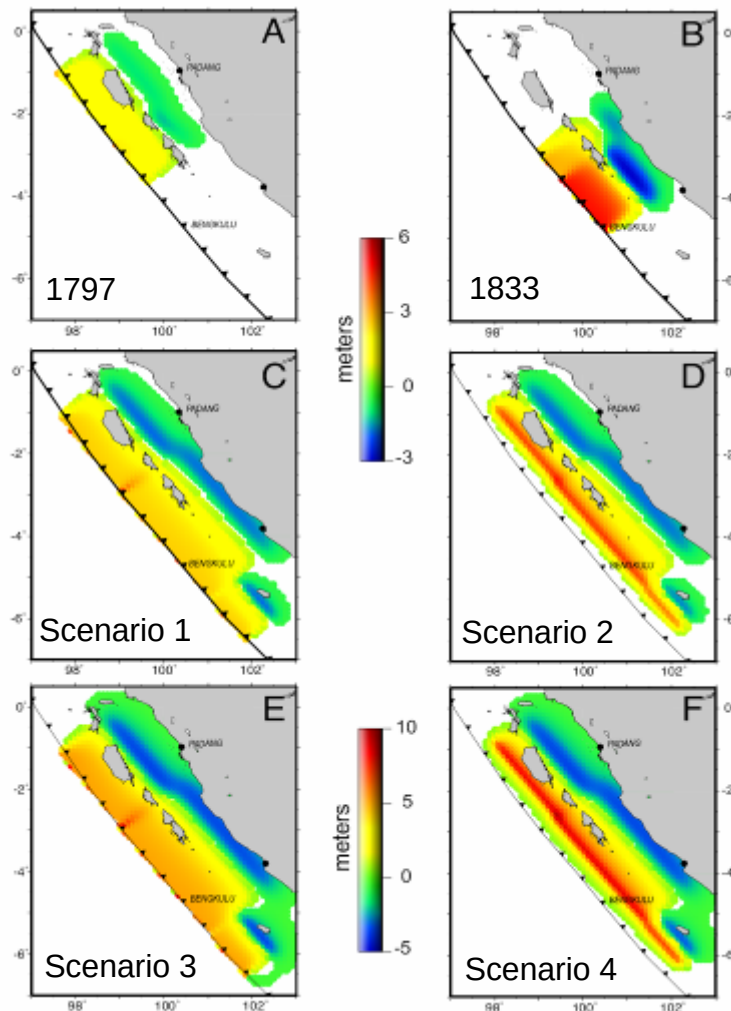
3rd largest city of Sumatra
approx. 1 mio. inhabitants, area 650 km²
built environment 350 km²
flat coastal areas, net of urban waterways

Major Tsunamis: 1797: 9m and 1833: 6m

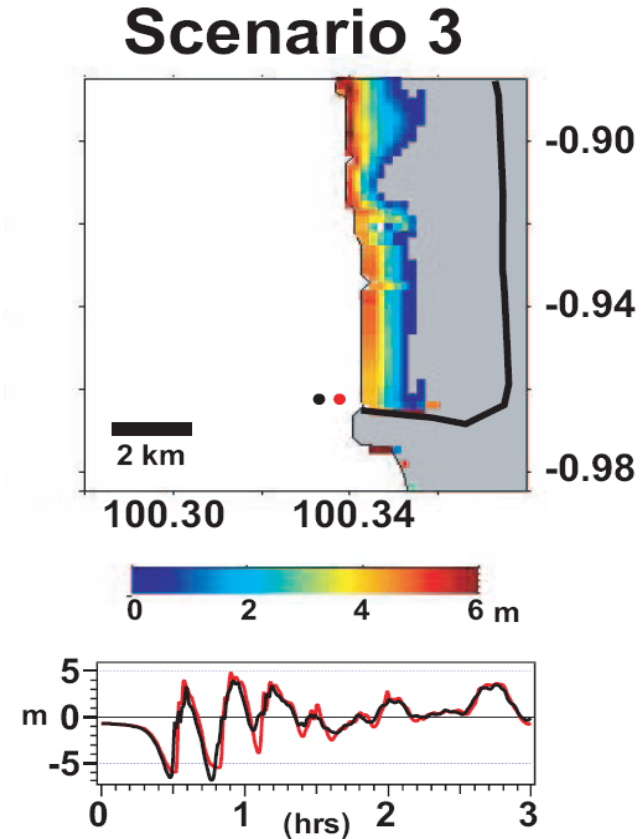








Close-up of tsunami inundation
at Padang (Scenario 3, Mw = 9.3)

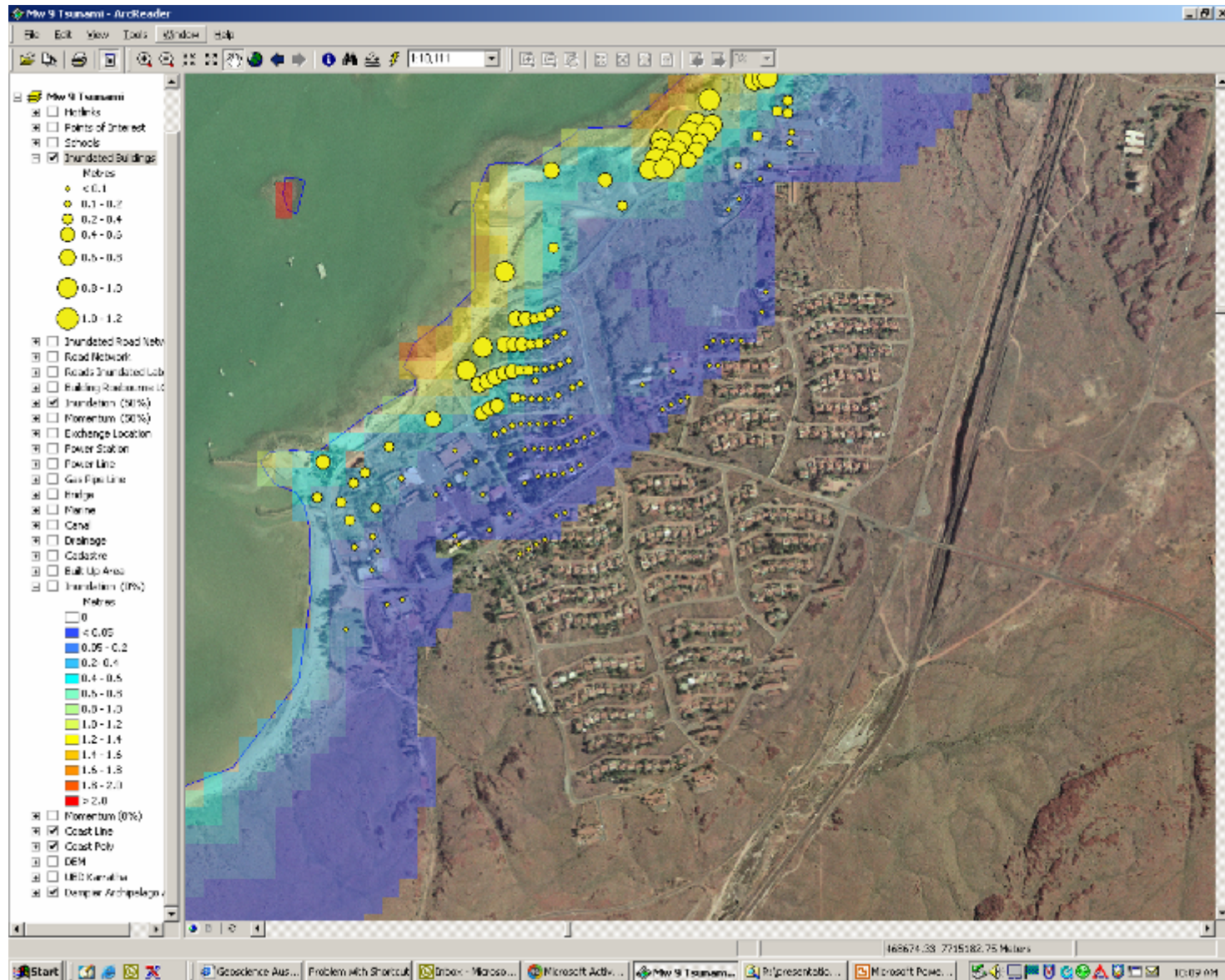


Rough and detailed tsunami inundation modelling

Numerical last-mile Tsunami Early Warning and Evacuation Information System (last-mile)

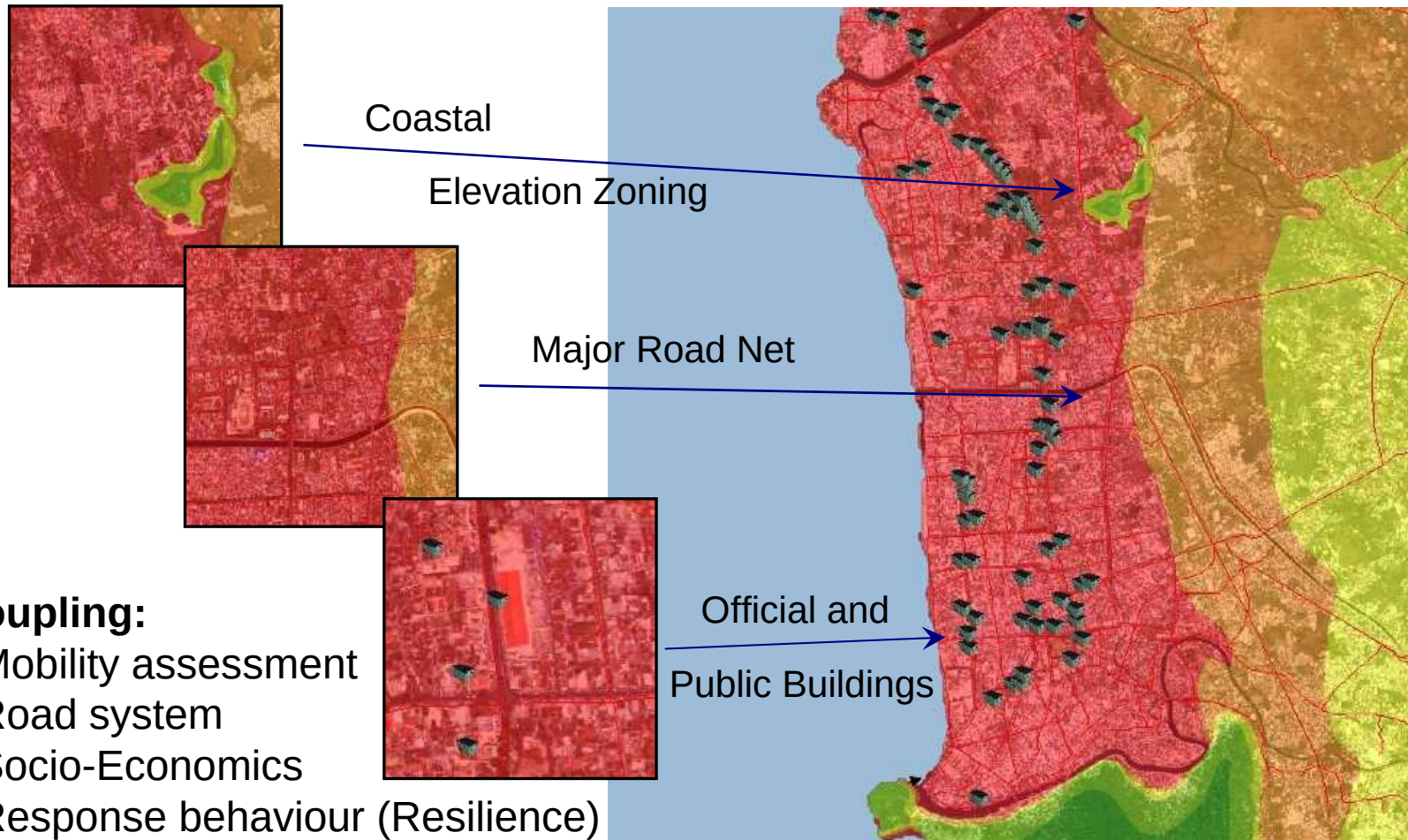
Tsunami inundation modelling (rough/coarse)
off Wollongong (NSW), Australia,
© Dr. John Schneider, GEOSCIENCE AUSTRALIA

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



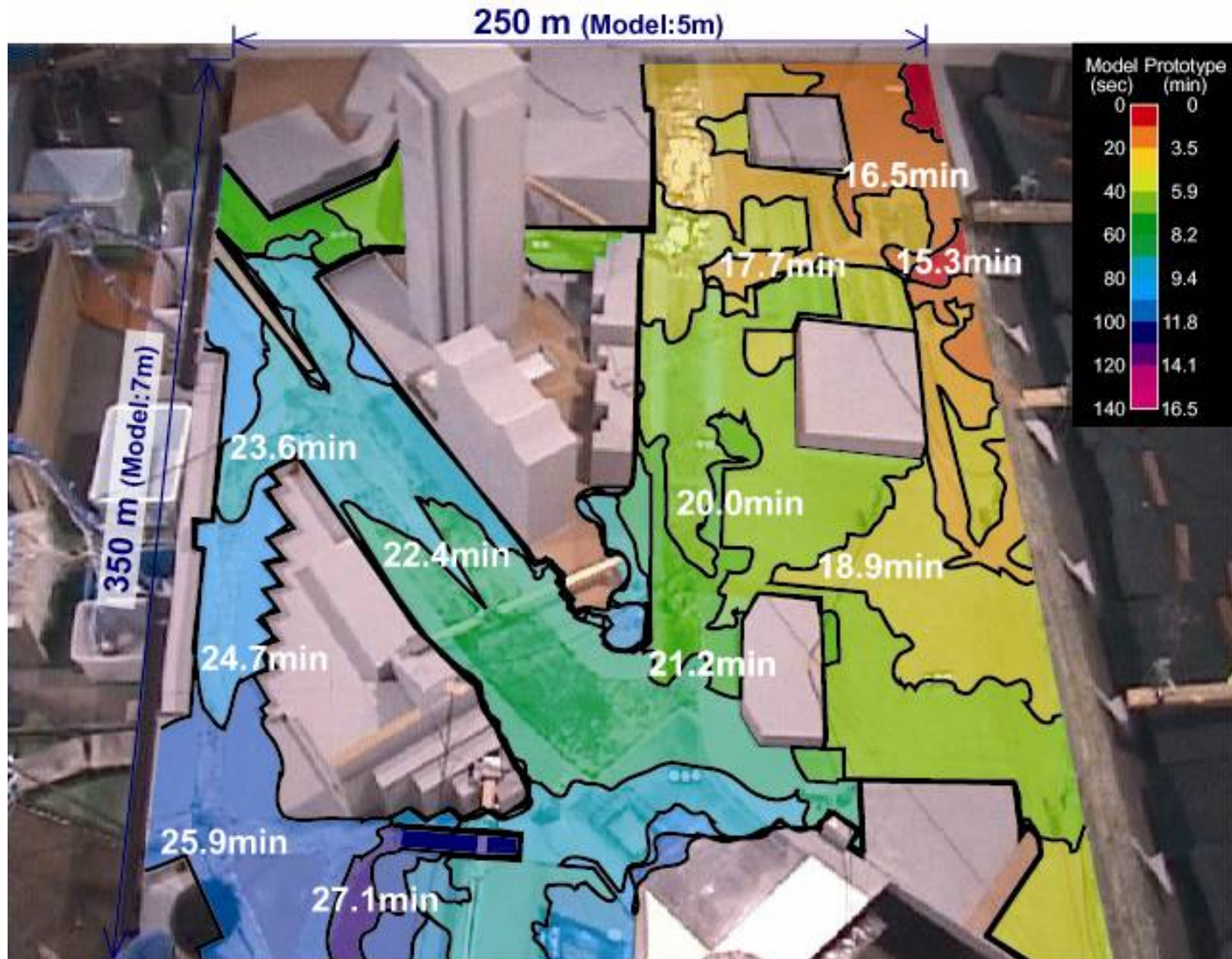
Risk and Vulnerability assessment in Padang

Identification of infrastructure & degree of exposure to tsunami inundation



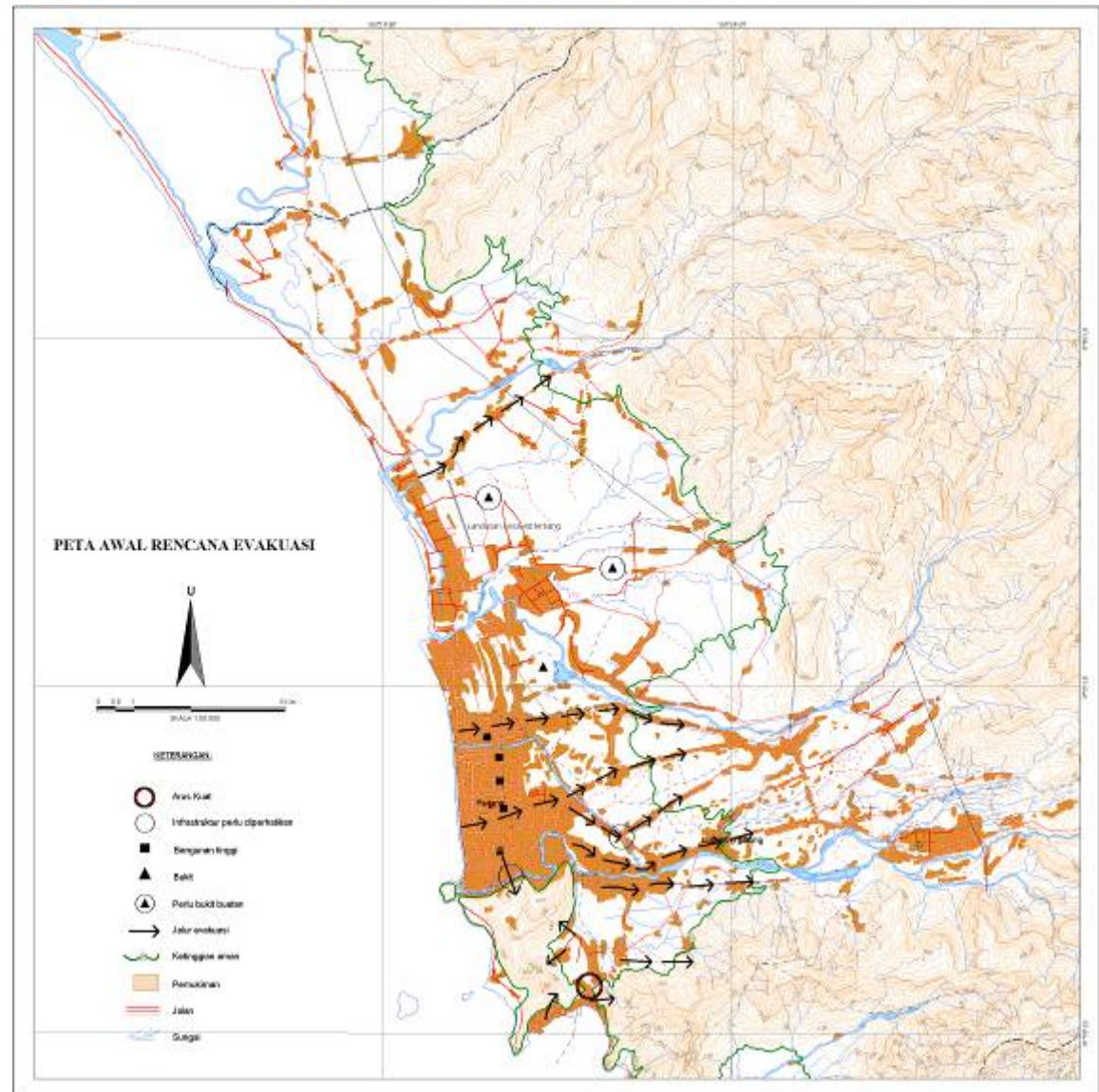
Coupling:

- 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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