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Spatial Information for assessing Land Issues in Disaster Risk Management

Prof.dr. Jaap Zevenbergen, Dr. Norman Kerle,
Dr. Arbind Tuladhar

FAO/FIG Cooperation on land and disaster – based on a report funded by FAO
Some slides from Masaru Kaidzu (FIG/Japan), David Mitchell (FIG/Australia)

ITC FACULTY OF GEO-INFORMATION SCIENCE AND EARTH OBSERVATION

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WHY SPATIAL INFORMATION AND DISASTER ?

- Imagine … you're a relief worker with a truck full of emergency supplies, trying to find those most in need. But which roads are open? Which hospitals are still standing? How do you reach the people needing help?

MapAction

GI FOR DRM – MORE FORMAL

- "Each year, **disasters** arising from storms, floods, volcanoes and earthquakes cause thousands of deaths and tremendous damage to property around the world, displacing tens of thousands of people from their homes and **destroying their livelihoods**. Developing countries and poor communities are especially vulnerable. Many of the deaths and property losses could be prevented if **better information** were available on the exposed populations and assets, the environmental factors in disaster risk, and the patterns and behaviour of particular hazards. Increasingly, this information is becoming available with the help of technologies such as meteorological and **earth observation satellites**, communication satellites and satellite-based **positioning technologies**, coupled with hazard **modelling** and analysis, and geographical information systems (GIS). When integrated into a disaster risk reduction approach, and connected to national and community risk management systems, these technologies offer considerable potential to **reduce losses to life and property**. To do his requires a solid base of political support, laws and regulations",
- Preface by **Margareta Wahlström** in "***Geoinformation for Disaster and Risk Management: Examples and Best Practices***". (Joint Board of Geospatial Information Societies (JB GIS); United Nations Office for Outer Space Affairs (UNOOSA))

SPATIAL INFORMATION AND DRM

- Spatial information and spatial data analysis should (and can) be **effectively used** in each of the stages of Disaster Risk Management (**DRM**).
  - Emergency response
  - Recovery & Reconstruction.
  - Disaster Risk Reduction.
- Spatial information should (and can) **support effective land administration**.
- But on top of 'normal' issues (data, SDI, SEGS), esp. in emergency response and (early) recovery **speed** is crucial; have to go with what we have.

EMERGENCY RESPONSE

- Issues of spatial data sources and availability
- International Charter for Space and Major Disasters..
- Spatial data acquisition and coordination of agencies
- Damage and loss mapping
- Spatial data to support evacuation, and provision of emergency shelter
- Spatial information and rapid assessments
- Find and secure land records

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To modify cho

INTERNATIONAL CHARTER FOR SPACE AND MAJOR DISASTERS

- "Rapid mapping activities can benefit from the possible activation of the "International Charter for Space and Major Disaster" that…aims at providing a unified system of space data acquisition and delivery to those affected by natural or man-made disasters through Authorized Users
- Provides remote sensing-based situation assessment and damage information to authorised users and nations affected by disasters.
- Easily printed 'maps', not data
- No (re)usuable in later stages

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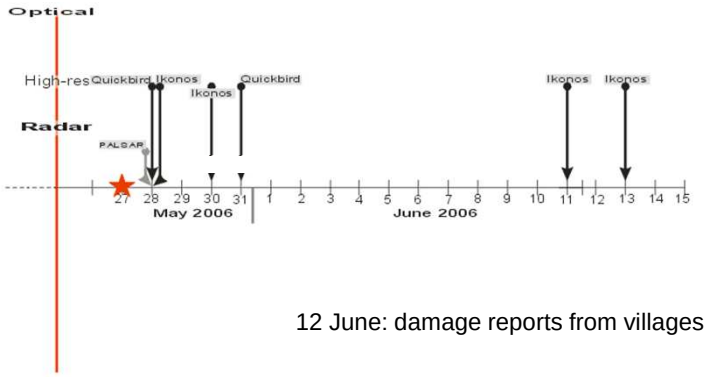
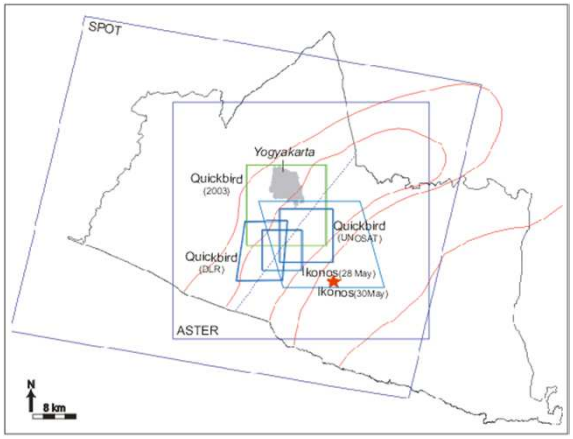
To modify choose 'Insert' then

The 27 May 2006 Indonesia earthquake – near real time



12 June: damage reports from villages

The 27 May 2006 Indonesia earthquake – near real time



RECOVERY

- Spatial data to support detailed assessments (damage partly visible) – example of student work on actual data sets (models not verified)
- Assessing land tenure issues
- Land availability mapping
- Creating cadastral maps
- Adjudication of land claims
- Site selection and management of transitional settlement

Level of Damage	Area (km2)	Area (%)	Number of Affected Building	Percentage Of Affected Building (%)	Number of Affected People *)	Percentage of Affected People (%)
None	0.201	76	686	39	1,005	76
Moderate	0.047	18	645	37	235	18
Heavy	0.015	6	409	24	75	6
Total	**0.263**	**100**	**1,740**	**100**	**1,315**	**100**

Source: Syahid, Waziri and Charoenkalunyuta (2011)

**) = Number of people counted by using assumption density population 5000/km2*

Source: Density Population Map from DLR

Participatory mapping in Haiti

- The participatory approach allowed mapping large parts of Haiti within a few days
- 'any information is better than no information'

- *OpenStreetMap coverage over Port-au-Prince before the earthquake (top), as of February 15th (centre) and February, 26th (bottom)*

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The importance of survey control points

- In preparation for recovery and reconstruction any damage to surveying control points must be resolved.
- New marks will need to be placed and re-surveyed using GPS or conventional surveying techniques.
- This will allow surveys to demarcate boundaries and for positioning of all rebuilding activities.

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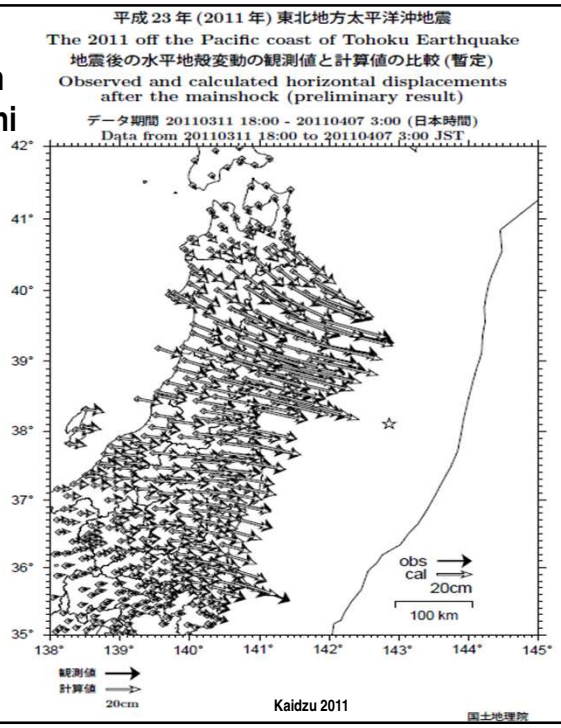
Post-seismic deformation mapping of Japan tsunami and earthquake

- Up to 5.6 m moved
- Origin in Tokyo 20 cm
- 44,000 official points affected
- 600 re-established
- (incl. VLBI station and GPS)
- Min.Just: boundary moves with land, unless landslide..



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Japanese Recovery of Boundaries

- Restoration of boundary with coordinates transformation - In most cases, boundaries are restored using software provided by GSI.
- Resurvey of locally distorted area (land slide, liquefaction etc.).
- Establishment of rehabilitation control points to aid resurveying boundaries.
- About 90% of damaged area was covered with modern cadastral survey.
- Min.Land survey boundary of public properties first so that they will be referred to as reliable known boundaries when private properties come.
- Information of registration including maps was already backed up in central database by Min.Justice

Kaidzu 2011

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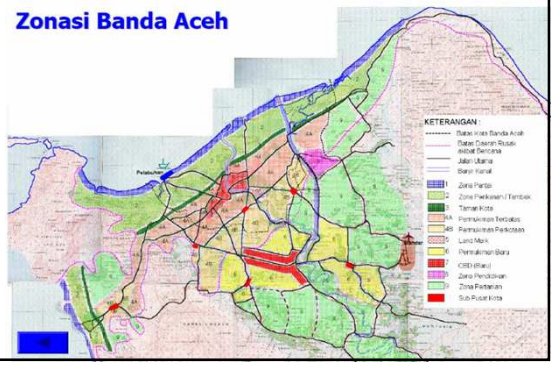
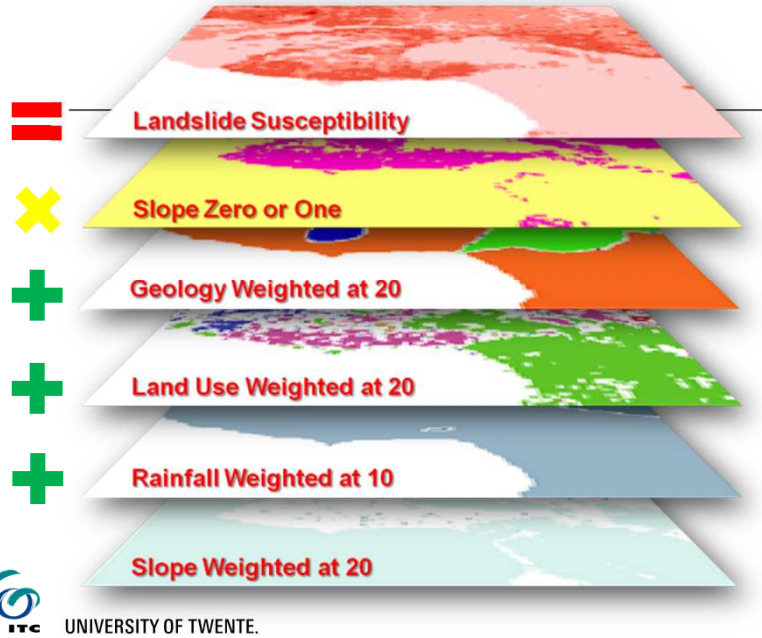
RECONSTRUCTION

- Planning for reconstruction.
- Monitoring of the quality of housing construction.
  - E.g. in Aceh if distance to coast line has been obeyed during reconstruction of houses



DISASTER RISK REDUCTION

- Hazard and risk mapping.
- Vulnerability assessment.
- Early warning systems.
- Developing baseline land tenure information.
- Protecting existing spatial information.
- Supporting the development of land policies and land use master plans.



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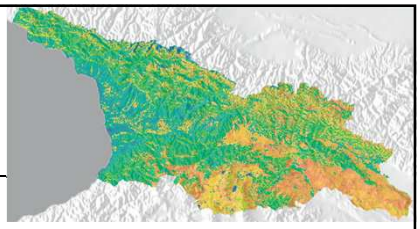
17

Risk Atlas for Georgia



- ITC undertook project “Institutional Building for Natural Disaster Risk Reduction (DRR) in Georgia” with Caucasian Environmental NGO Network (CENN).
- It addressed 9 different natural hazards (e.g. wild fire) and their overlap with eight elements at risk, such as population, buildings, and GDP.
- Georgia part of area with many different natural hazards.
- A large number of people was trained in hazard and risk assessment, environmental impact assessment, web GIS, and participatory GIS.
- Flagship result was the national scale hazard and risk atlas of Georgia that was made together with national expert organizations.

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Trends

- Topic gets attention and it is still increasing.
- More and more data is available, esp. after disaster.
- New platforms, sensors and combinations promising.
- Not everything can be easily combined immediately (limits in metadata (to know how to convert, know quality levels).
- Need for local involvement (crowd sourcing, VGI, MapAction, ..)
- Input for DRR vital, increasingly available, modelling ?, effects of hazard maps (eg on value), link to resilience (more social-economic).
- Documenting legitimate tenures before disaster eases recovery and reconstruction (and implementation of DRR)

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Role land professionals (LPs)

- Many items (esp. DRR) are 'normal' SDI issues, LPs are already heavily involved in.
- Links to broader land issues and planning (land administration), strong position of LPs
- Data acquisition and **integration** typical LPs field.
- Fit for purpose thinking increasingly key for LPs, esp. also in DRM; after disaster use what is there approach needed (hard for some LPs)

- Are 'disaster people' and LPs knowing each other and each others' needs and qualities enough ?

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Thank you for your attention

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