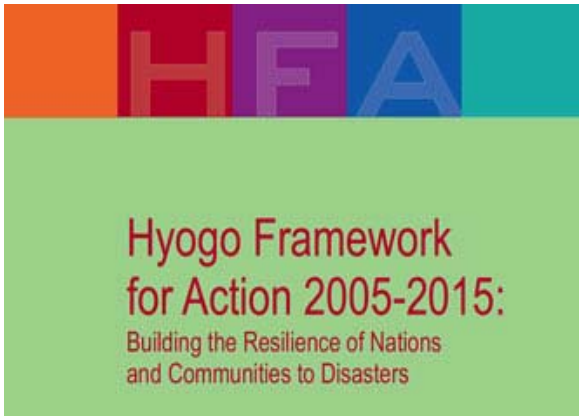
Australian Government
Geoscience Australia

Natural Hazard Risk Assessment in the Australasian Region: Informing Disaster Risk Reduction and Building Community Resilience

Jane Sexton

Australia and Disaster Risk Reduction



Australian Context

Understanding Risk
Communicating Risk

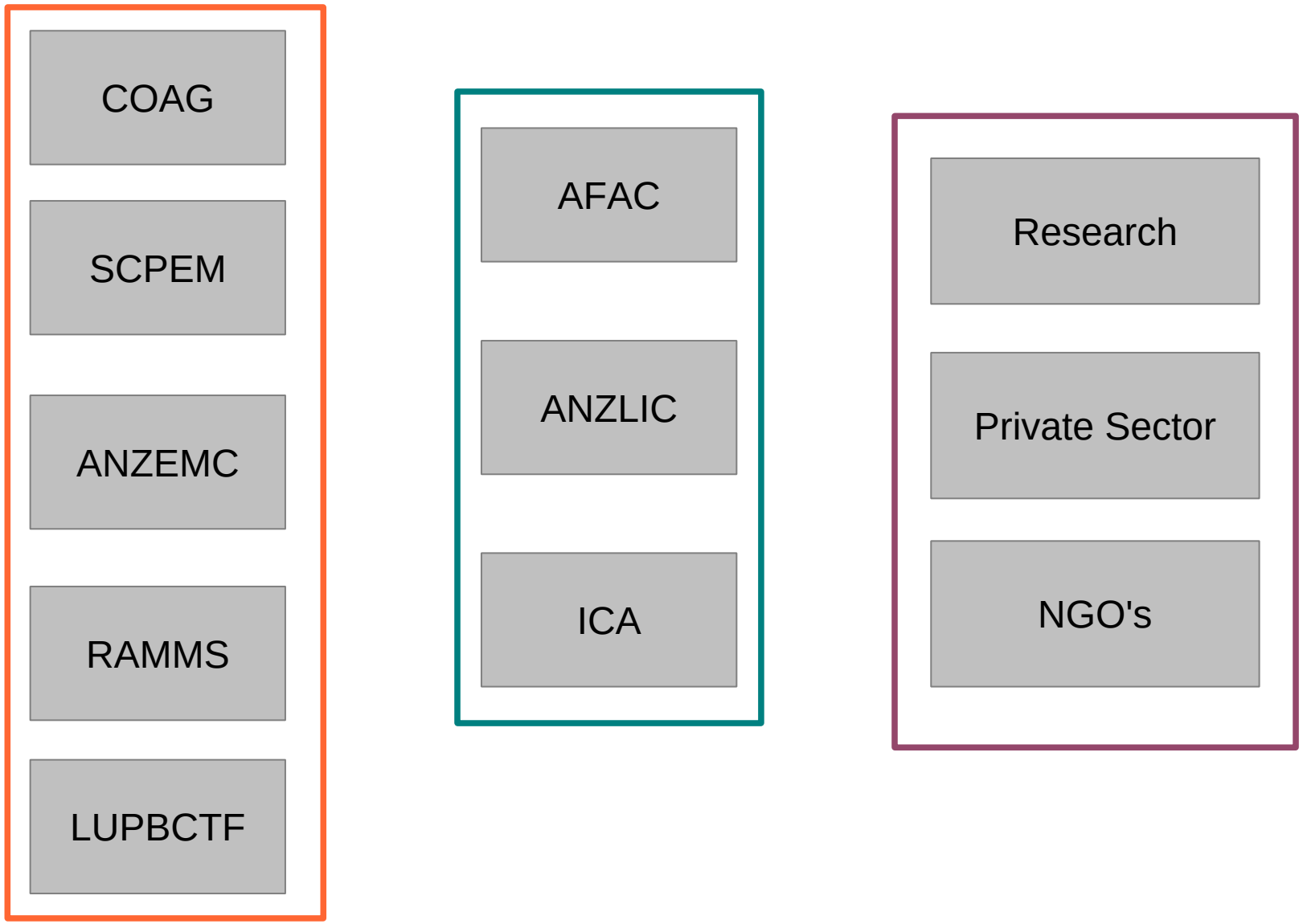
Decisions

Shared Responsibility

Mitigation
Community Resilience

Australian Context – Risk Governance Framework

Australian Context - Environment

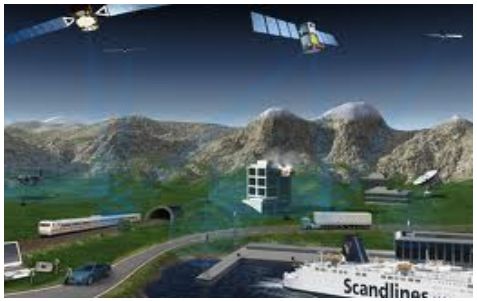


What role does Science, Technology and IM play?

Understanding Risk
Communicating Risk

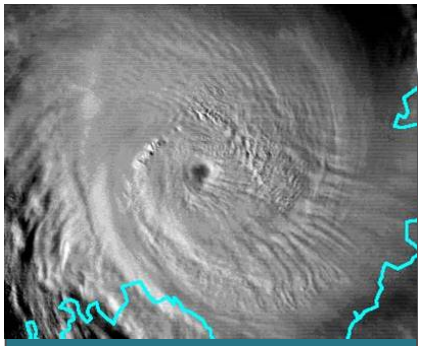
information management

Data Portals
Virtual Laboratories
Monitoring & Warning Systems
Advice



Land-use Planning
Emergency Management
Insurance

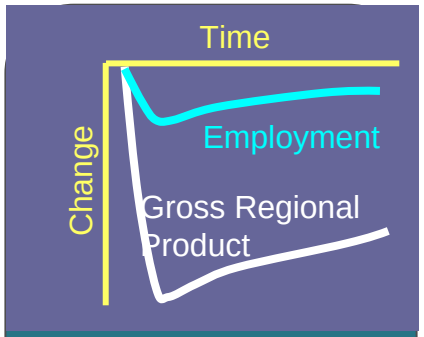
Understanding Risk



Hazard

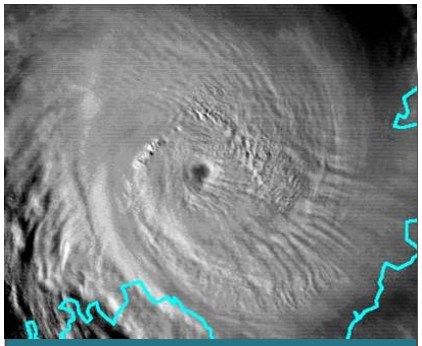
Exposure

Vulnerability



Impact

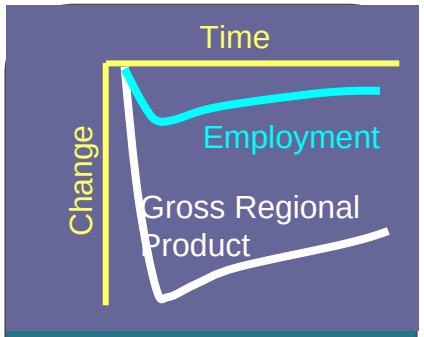
Understanding Risk



Hazard

Exposure

Vulnerability

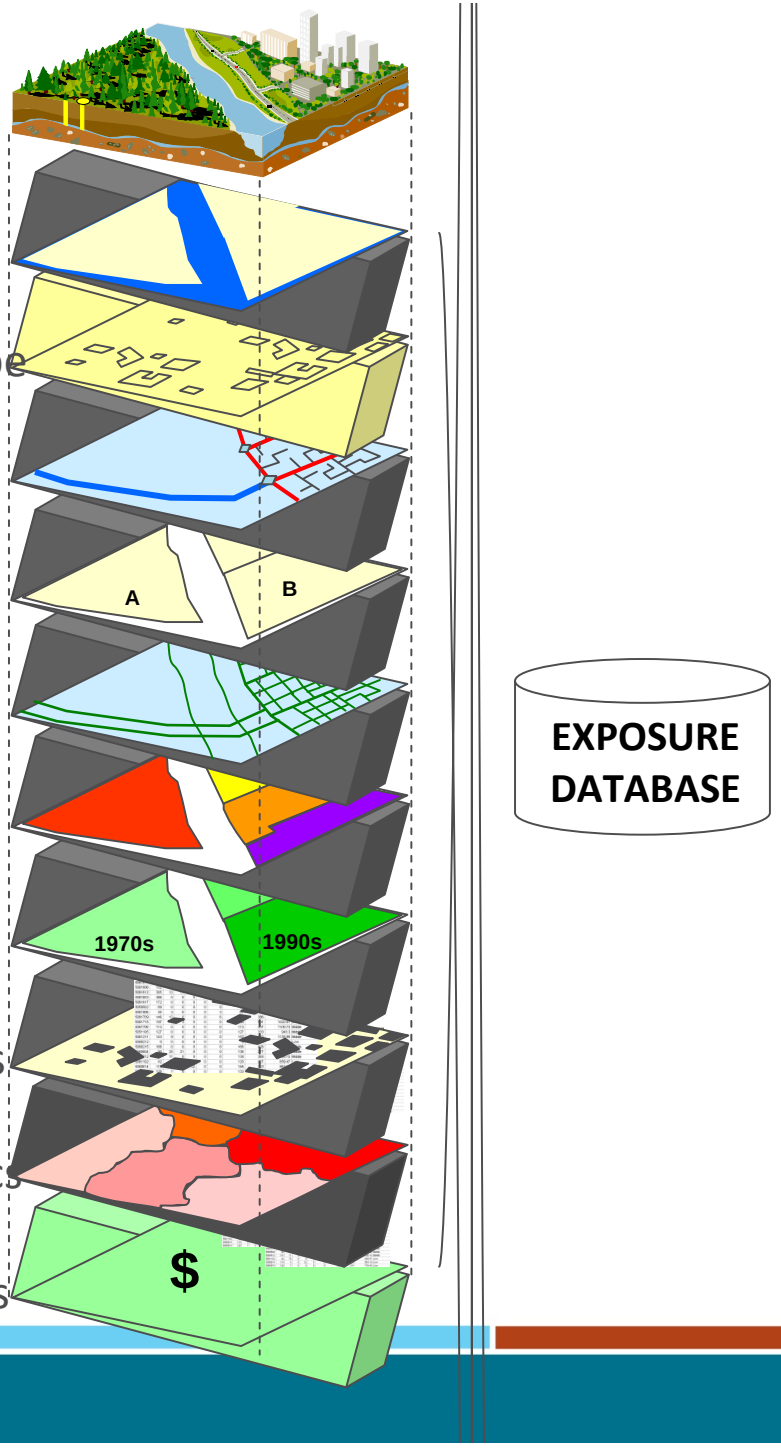


Impact

Multidisciplinary & Collaborative
Holistic: structural, social, economic
Across spatial scales

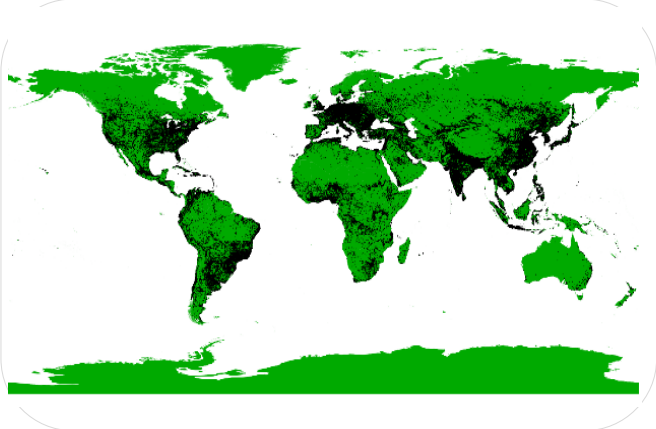
Exposure Information

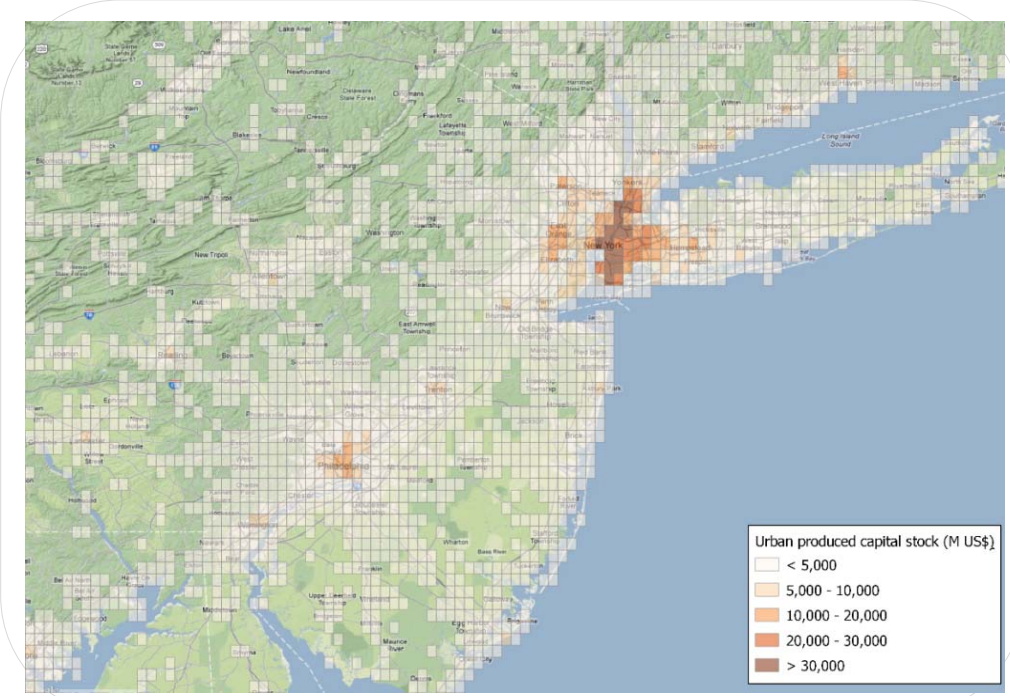
Building and maintaining an integrated, centralised and ***spatially-enabled*** database is the most effective way to manage exposure information



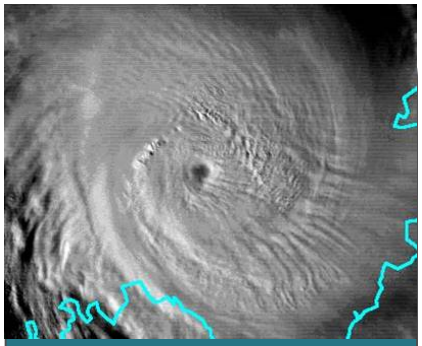
Global Exposure Database

The Global Exposure Database provides the distribution of the value of the urban built environment around the world in a 5 km x 5 km grid





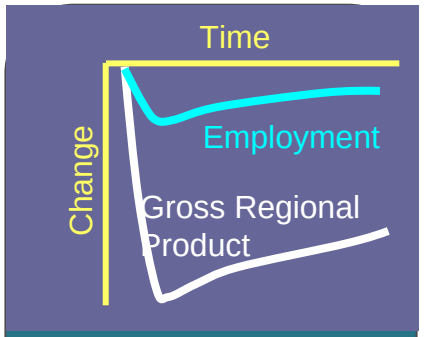
Understanding Risk



Hazard

Exposure

Vulnerability

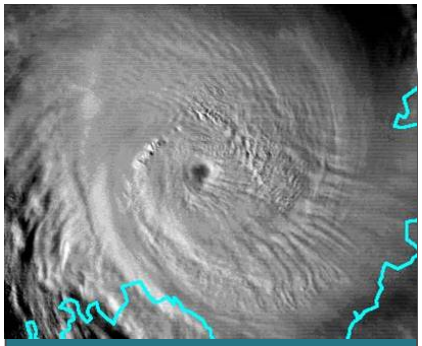


Impact

End-user need:

- Deterministic or scenario hazard or impact analysis
- Probabilistic hazard or risk analysis

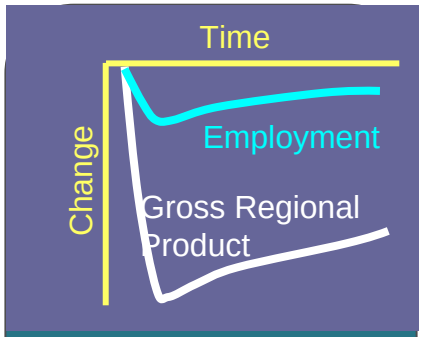
Understanding & Communicating Risk



Hazard

Exposure

Vulnerability



Impact

Virtual Laboratories
Data Portals
Partnerships

Open & Linked Data
Standards & Interoperability
Networks

FUNDAMENTAL DATA

Regolith Elevation; on & offshore Geomorphology
Built Environment Demographics Landcover Landuse

HAZARD

Fault Database Observations from Space
Event Catalogues
Seismic Waveforms
Site Records (displacement, water level, wind speed etc)

EXPOSURE

Synthetic Exposure

VULNERABILITY

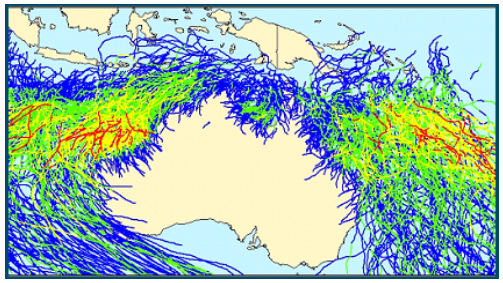
Post-Disaster and Survey Information
Insurance Claims

HAZARD IMPACT & RISK

Vulnerability Repository Site Class
Wind multipliers Roughness Fuel Load
Intensity-Frequency-Duration Wind Forecasts

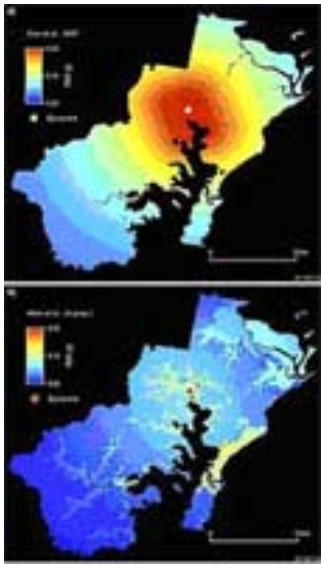
Modelling and Analysis Tools

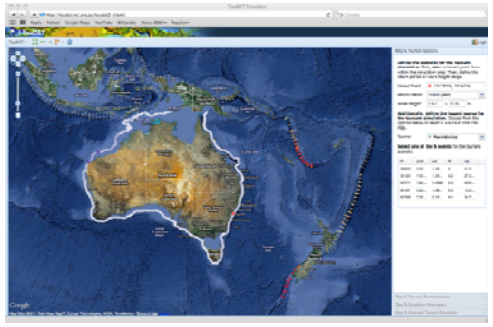
Tropical Cyclone Risk Model (TCRM)



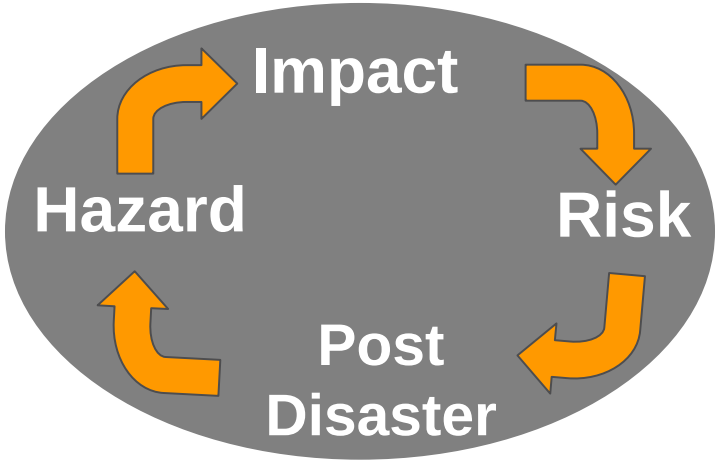
ANUGA

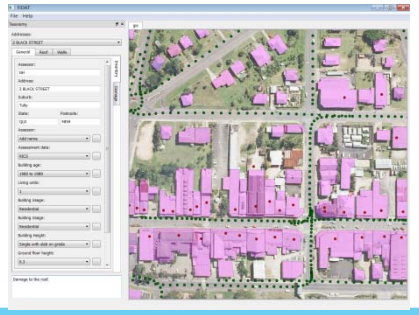
Earthquake Risk Model (EQRM)





Tsunami Data Access Tool (TsuDAT)





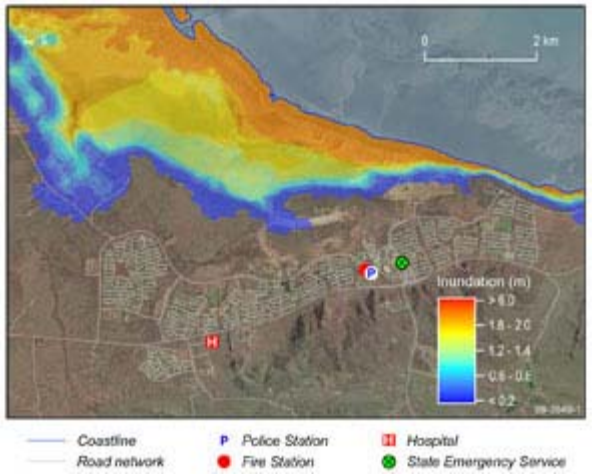
Field Data Analysis Tool (FiDAT)

Rapid Image Capture System (RICS)

Case Study: **Tsunami Hazard Modelling in Australia**

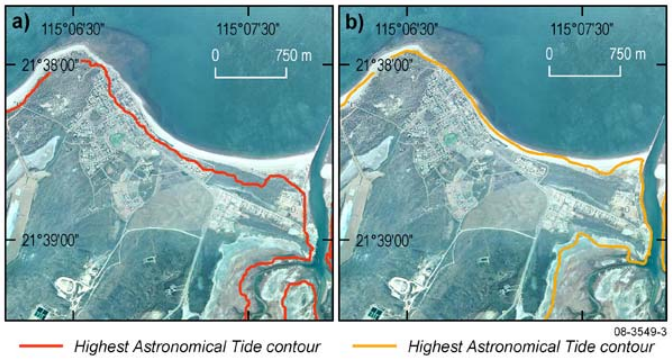
Integration:

- onshore and offshore elevation data from range of government custodians with supporting high-resolution imagery
- Geophysical and geological data (earthquake source and recurrence properties)
- Buildings and infrastructure data
- Local knowledge



Modelling and Analysis

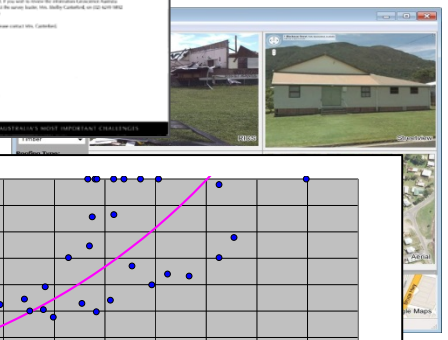
- Coupling of deep water and shallow water models
  - Virtual laboratory (future)
- Loss estimation



Dissemination:

- State Government GIS platforms
- Local engagement

Case Study: **Australia – Vulnerability and Resilience Database and Model Development**



Capture:

- Field survey of damage and causative hazard.
- Postal / on-line socio-economic survey instruments.
- Follow-up surveys of recovery/mitigation behaviour.

Analysis

- Data processing, integration and derivation using FiDAT. Research database development.
- Vulnerability and resilience model development.

Dissemination:

- Federal, State and local government.
- Insurance industry and academia.

Case Study: Greater Metro Manila Area Risk Analysis Project

Focus: strengthening capacity of government technical agencies

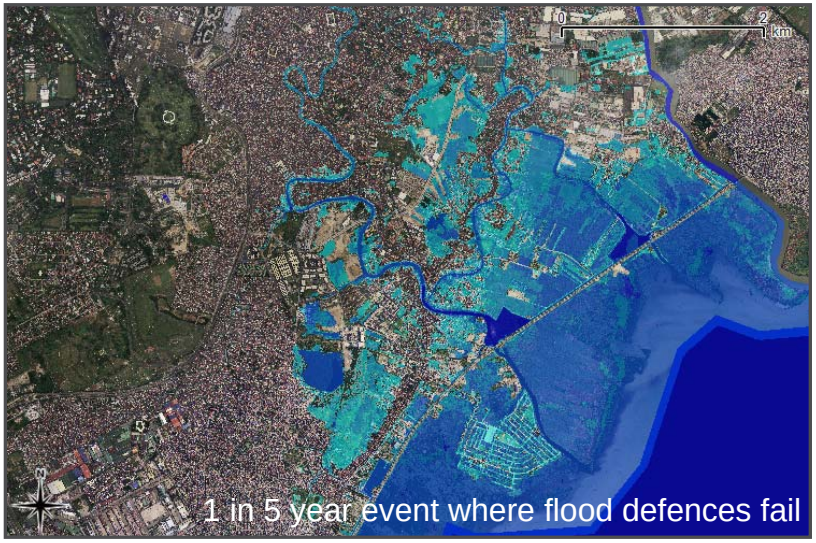
Integration:

- LiDAR dataset acquired for Metro Manila (custodian is the national mapping agency, NAMRIA)
- Geophysical and geological data (relating to source and recurrence properties of the hazards)
- Building, landcover etc data derived from LiDAR and integrated with other datasets
  - Surveys to collect additional building information for pilot area
- Local knowledge


Multispectral imagery draped over LiDAR DEM

Modelling and Analysis

- Draft hazard maps for flood, cyclone and earthquake
- Vulnerability models developed



1 in 5 year event where flood defences fail

Dissemination:

- Training technical agencies in open source geospatial data and software
  - QGIS, ANUGA (flood), TCRM (cyclone), RICS (exposure information capture)

Case Study: **National Flood Risk Information Project (NFRIP)**

NFRIP: 4 year project, 1 July 2012 – 30 June 2016

Aim: to improve the quality, availability and accessibility of flood information

Integration:

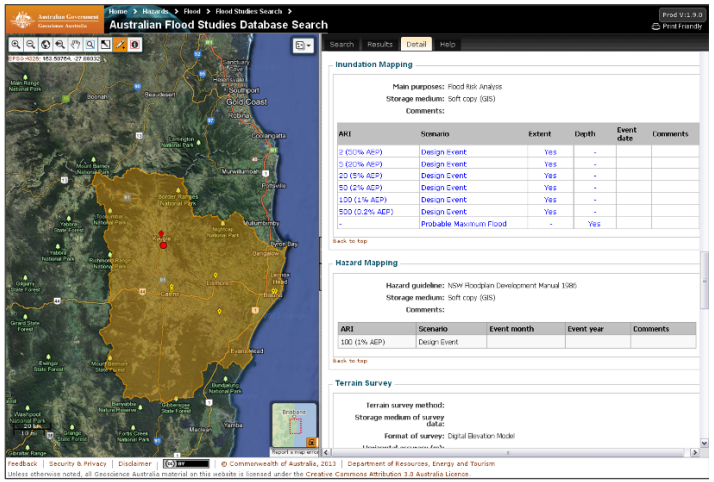
- Local and State Government data

Modelling:

- Australian Rainfall and Runoff
  Revision for future flood risk modelling

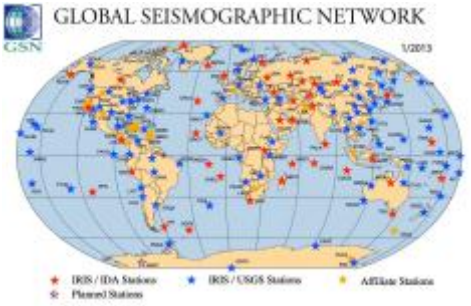
Dissemination:

- Webservices

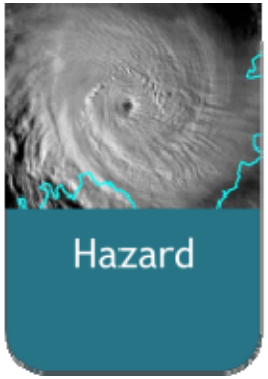


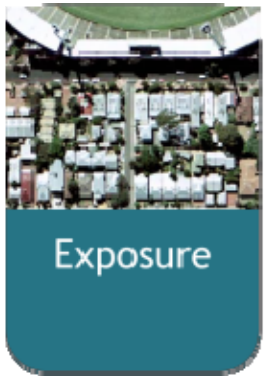
Spatial Information Spectrum

Collect data



Derive information



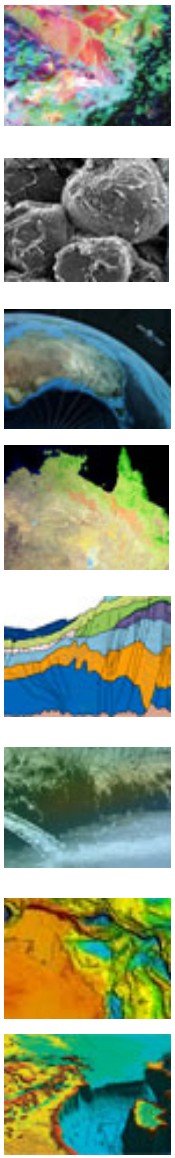


Deliver data and information

Collaborations

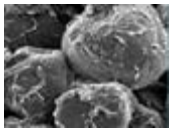
Key Messages

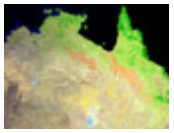
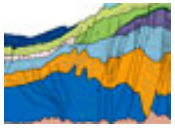
- Science, technology and information management working with policy for DRR and community resilience
  - Integrating, modelling, analysing and disseminating geospatial information
- Collaboration
  - Multi-disciplinary approach
  - Public and private sector
  - Multi-lateral
- Approach
  - Modelling: develop and apply FOSS using HPC
  - Integration and Dissemination: open and linked

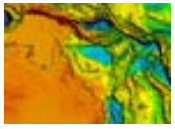
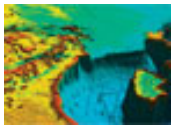


Key Messages

- **Challenges**
  - Exposure information critical to risk information
  - Maintenance, appropriateness, accuracy
    - trusted source
    - coverage (area, resolution, accuracy)
    - completeness
    - currency
    - custodians responsibility
  - Liability, data security
- **Opportunities**
  - Benefits across sectors
  - Leverage existing networks

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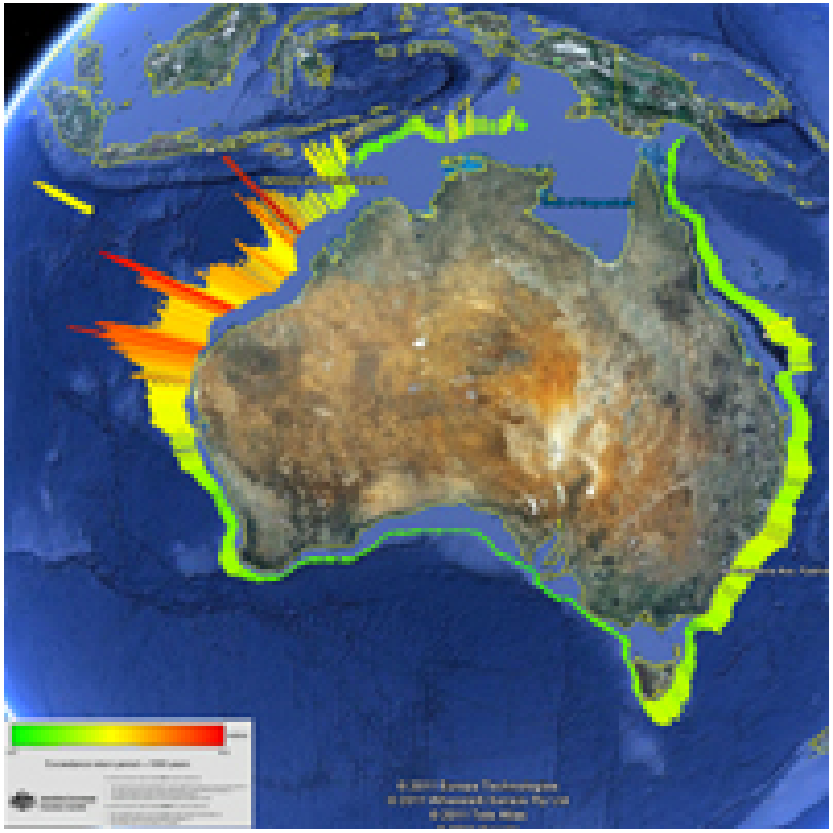
Thank you



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Case Study: GA – AIFDR partnership

Focus: strengthening capacity for national scale earthquake hazard and risk (tsunami for future)

2009 West Sumatra earthquake, post-disaster survey

Integration:

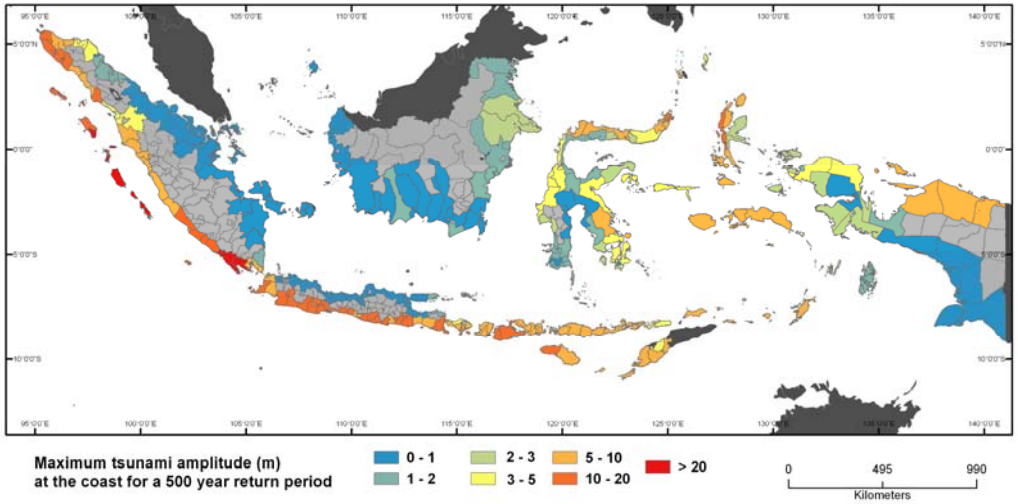
- onshore and offshore elevation data from range of government custodians with supporting imagery
- Geophysical and geological data (earthquake source and recurrence properties)
- Buildings and essential infrastructure data
- Local knowledge

Modelling and Analysis

- Draft hazard maps (using FOSS)
- Impact analysis (using FOSS)

Dissemination:

- Training regional disaster managers in open source geospatial data and software for contingency planning
  - OpenStreetMap, QuantumGIS and InaSAFE



Case Study: Papua New Guinea Risk

Focus: strengthening capacity for provincial scale multi-hazard risk (tsunami volcanic ash and earthquake)

Integration:

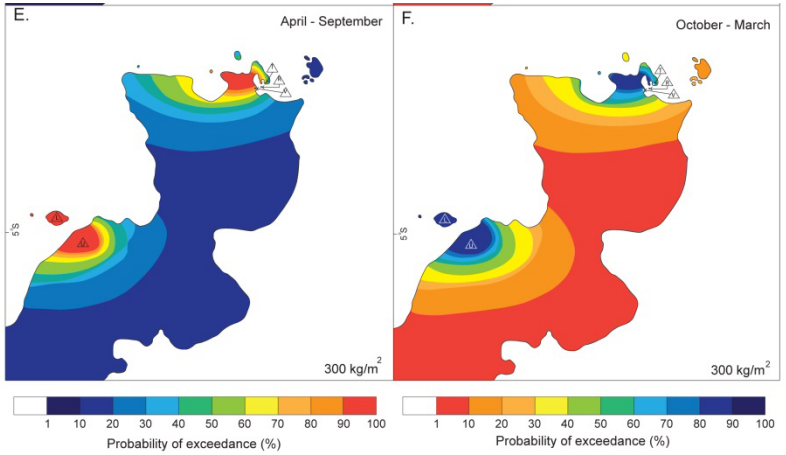
- onshore and offshore elevation data (inc. 5m InSAR DEM) from range of government custodians with supporting imagery
- Geophysical and geological data (source and recurrence properties)
- Buildings and essential infrastructure data
- Local knowledge

Modelling and Analysis

- Draft hazard maps (using FOSS)

Dissemination:

- Community awareness and education materials (posters, flyers, books etc) in collaboration with community groups (i.e. local illustrators)
- Training technical agencies in open source geospatial data and software
  - ANUGA, EQRM, pythonFall3D, QGIS



Volcanic Ash Fall hazard for East New Britain Province, PNG

Tavurvur Volcano, East New Britain Province, PNG

Community awareness materials