Priorities for Geoscience in Australia

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CEO
Two suggestions.

One for the region with global opportunities.

One for Australia Also with global opportunities

- Mega thrust earthquakes and tsunami’s
- Intraplate continental deformation processes.
MEGATHRUST EARTHQUAKES

Tsunami risk

John Schneider and Phil Cummins
The 2004 Indian Ocean Tsunami: One of the most Lethal Natural Disasters in Human History

Total Deaths: 227,898

The 2011 Tohoku Earthquake and Tsunami: The Most Costly Natural Disaster in Recorded History
Why Was the Death Toll so High?

Inadequate Preparedness.

2004 IOT: No one had foreseen the potential for a large tsunami, especially one of such massive scale. Hence, Sumatra and the Indian Ocean at large had not even considered tsunami mitigation measures.

2011 Tohoku: Although Japan was thought to be well prepared for tsunamis, the size of the 2011 event turned out to be far larger than anyone had expected. Hence, even the seemingly impressive tsunami mitigation measures were, in the end, inadequate.
Is Preparedness a Serious Component of Response/Recovery?

For the IOT, the tsunami Evaluation Coalition Synthesis Report (2006) documents the effectiveness - and lack thereof - of the international humanitarian response. It noted:

- “It is notable that disaster risk reduction (DRR) and preparedness, though demonstrably cost-efficient and effective if correctly undertaken, receive only a small portion of international aid.”

- “Despite advances in early warning systems, the tsunami response has rarely enhanced local preparedness or significantly reduced longer term vulnerability.”

Preparedness was only a very small fraction of the response/recovery effort, and was largely directed at warning systems and public awareness in areas already impacted by the tsunami.
Tsunami Preparedness is Underpinned by Geology – i.e., Paleotsunami Studies

- Only paleotsunami studies can extend knowledge beyond the historical record to cover the long return periods of the largest events
- For both IOT and Tohoku, paleotsunami studies revealed evidence for recurrence of large events similar to those that caused the modern disasters

2004 IOT along with prehistoric tsunami deposits in pit off Thai coast (Jankaew et al., 2008)

Tsunami deposit attributed to 869 Jogan tsunami, in core collected near Sendai (Sawai et al., 2008)
The Real Killer: Local Tsunamis

Satellite images of the city of Banda Aceh, pop. 400,000, before (left) and after (right) it was devastated by the 2004 Indian Ocean Tsunami (images courtesy NASA).

A large, local tsunami can arrive within minutes, devastating coastal areas even several km from the coast. Such tsunamis are responsible for the massive death tolls in recent events. Large coastal cities in the Indian and Pacific Oceans that could experience such tsunamis include:

<table>
<thead>
<tr>
<th>Chittagong, Bangladesh</th>
<th>Karachi, Pakistan</th>
<th>Nuku'alofa, Tonga</th>
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<tbody>
<tr>
<td>Padang, Indonesia</td>
<td>Kaosiung, Taiwan</td>
<td>Cilacap, Indonesia</td>
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<tr>
<td>Cebu City, Philippines</td>
<td>Seattle, USA</td>
<td>Concepcion, Chile</td>
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An International Paleotsunami Program for Tsunami Disaster Reduction

Should be focused on subduction zones with large coastal populations that have yet to experience a major tsunami disaster (e.g. Makran, Arakan, SW Pacific).

Unlike the ‘quick technological fix’ promised by warning systems, the commitment should be for a long term, basic science program spanning at least a decade.

Capacity building should be a major part of the program, along with outreach to the disaster management community to ensure uptake of results.
Intraplate continental deformation

Timor Orogen

New Guinea Orogen

Flinders - Fleurieu

New Zealand
Digital Elevation Model
The Cadell Scarp
The Cadell Scarp
Developing the New National Earthquake Hazard Map for Australia for input into building codes
Two ideas for consideration:

1. An international Paleotsunami program
2. An intraplate processes program
   – building 4d understanding of how continents deform
Thank you

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