

## Tsunami Preparedness and Warnings

What is unique about tsunami hazards in Australia?

Key findings from tsunami preparedness/warnings research

- Interviewees described tsunami as "destructive," "devastating", "unexpected"
- emphasised size/scale based on what seen of past tsunami events (in the media)
  - Impact - land, waterways, coastal zones/recreational areas...
    - hard to conceptualise the levels of destruction that would occur and
    - how helpless it would leave people (based on past tsunami events shown on TV).
- fatalistic attitudes about what they could do in the event of a tsunami.

## As training/experience increased

- “it depends” approach
  - Impacts affected by:
    - source (i.e. seismic, volcanic...)
    - size of tsunami event,
    - geographical characteristics of where they resided.
    - location of home/work
    - characteristics/location of their community/local area
    - where they were at the time of the event
- impact → change depending on where they are at the time of the event.

		Impact factors
Local area/ community	Geographical characteristics	Shape of the coastline and waterways (exp. Bays, Inlets/Rivers, Heads)
		Height of the coastline (exp. Height above/below sea level, cliffs, sand dune, global warming related changes to these)
		Closeness to tsunami/earthquake prone zones (tectonic plates, Pacific Rim, NZ etc.)
Home/place of residence		Weather conditions/time of day?
		Closeness/distance from the coast (greater/ less than 10km)
		Height (exp. 10m above sea level, live on a hill)
Temporal factors		Place @ time of event
		Home/work/commute/@beach
		Weather conditions but not related to weather events
		Time of event: night, day, weekend etc.

### Perceived likelihood/risk

Lack of tsunami events affecting Australia in the last 200 years/or since colonial settlement

- Australia removed from major sources of tsunami hazards
  - no earthquake/volcano events (cf. Japan).
  - distance of home area (and Australia in general) from tsunami/earthquake "prone" areas.
- hazard whose presence within Australia has not been raised by authorities (emergency services, local council etc.).
  - people, government, media do not talk about tsunami as an issue around Australia.
- Lack of specific knowledge of relevant pre-disposing factors/characteristics for tsunami risk.

### Strong opinion

- Likelihood of a tsunami occurring was no chance/very low chance of occurring
- Tsunami is not important...
- Risk rejection



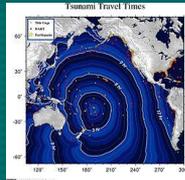
Tsunami Preparedness (Tasmania)

## Tsunami Risk In Australia

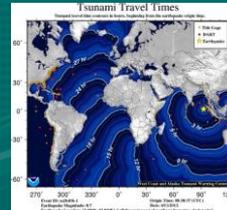
### Subduction zones - Indian and Pacific Oceans

Attorney-General's Department 2008

#### Western Australia earthquakes on southern coast of Indonesia



Burbidge et al. 2008



#### Eastern Australia subduction zones from Papua New Guinea, Solomon Islands, Vanuatu, New Zealand, North and South America

Attorney-General's Department 2008

## Tsunami Risk In Australia

### No national risk assessment undertaken - Location- specific risk assessments completed

#### Sydney

Dall'Osso et al. 2009

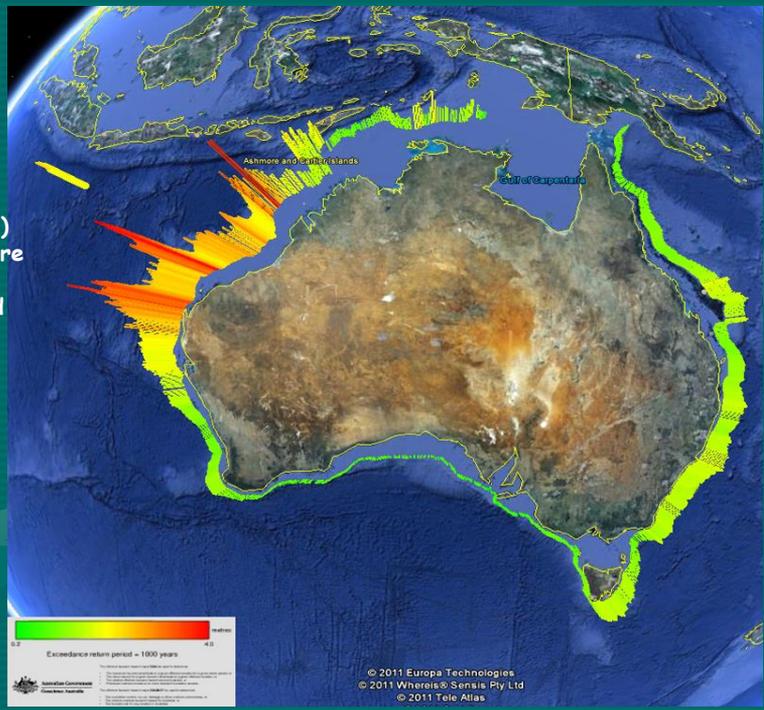
#### Travel times for tsunami from closest sources

- Puysegur Trench, south of New Zealand, and the
- Java Trench, south of Java
  - approximately 2 hours
  - allowing for detection/message formation  
→ warning times as low as 90 minutes.



Further sources have greater travel times  
→ greater warning times (4 - 15 hours).

Geoscience  
Australia (2011)  
National offshore  
Probabilistic  
Tsunami Hazard  
Assessment  
(PTHA)



### Eastern Australian coastline

- faces some 8,000km of active tectonic plate boundary
- capable of generating tsunami that could reach Australia in 2-4 hours

*Australian Bureau of Meteorology, 2008*

### Risk to coastal areas is substantial

- New South Wales
  - some 330,000 people live
    - at/below 10 metres above sea-level,  
and
    - within 1km. of the coast/coastal river.



### Risk Rejection - Important

- will not attend to tsunami information
- resources should not be directed to highly unlikely events
  - *opposition to tsunami risk reduction activities*
  - *reduced trust*

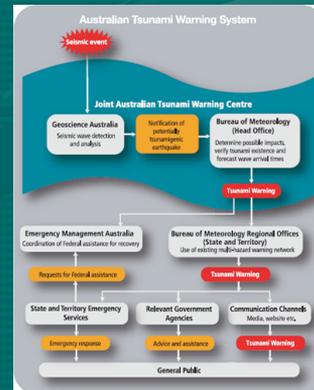
### Emphasised

- *more likely to listen/talk about/act on other more frequent/more important hazards*
- *effort should be on more frequently occurring hazards*

**Warning and Preparedness**  
**Most respondents - No/Very low risk**  
**Justify questioning the need for any work**

**Some (SES/science background, training)**  
**Believe tsunami possible/potentially severe impacts**

→preparing communities for tsunami important  
 →need to consider warnings



### Warning delivery

- TV/radio/social media
  - changes with time of day
- Less certainty re text message warnings
- Sirens (beaches/public places/city/community centres).

### Issues

- people not knowing what to do on receiving a warning
- people ignoring other warnings
- linking warning to what people need to do
- whether warnings would/could be relayed at all, or
- in time.



### Anticipated Warning content

- contain several pieces of information
- areas likely to be affected
- appropriate actions people should take,
- how long until the tsunami arrived where they were based,
- where to evacuate to...but

### Public education and engagement for tsunami

- expensive,
- time consuming
- more likely to be ignored by people and/or not seen as relevant as other hazards...so

### Warning - accommodate education

#### Suggestion

- incorporating response information in warnings processes, and
- advising people about what to do in the warnings.

Thus, preference for "actionable information" within warnings...

- "getting to higher ground"
- driving away
- run up hill or
- head up a multi-storey building.

But, some believed that this is insufficient for an effective public safety response.

#### Acknowledge

- many people trying to evacuate/panicking,
- roads jammed
- people becoming trapped, or hurt/killed
- evacuation routes blocked
- unable to access safe places/evacuation centres etc.
- *justification for staying put in their homes*

Dependent on how much time...

Most people expect shorter warning times

- Minutes to a couple of hours to respond
- *contacting people first via phone and social media and then evacuating.*

If 6-12, 24 hours

check on/contact people (see if they need help evacuating).

Children/pets

- Collected if not in safe area
  - did not see this as additional risk
  - what schools would do.

Family/friends

- contact them to check that they were safe
- determine if they had received warnings.
- apart from contact, helping them not raised.

Helping others

- more vulnerable neighbours
- those less mobile in immediate area.

### First action

- Seek more information, rather than acting immediately
  - *particularly if warnings lacked actionable information*
- seeking verification of the warning/impending event before acting/offering to help others.
- confirm warning with information from a more trusted source
  - monitoring on the radio
  - online/google search
  - monitoring social media.

### Consistent with no/very low risk beliefs...

- Preparedness
  - Not considered, or
  - Something done after receiving a warning

### SES endorsed value of planning/training & distinguished between

- Community/agency preparedness and
- Personal preparedness.

### Prior to event

- community and agency preparedness

### During warning period

- personal preparedness
  - left to people "in the moment."
  - people take responsibility for seeking information to plan their tsunami response after receiving the warning (including property preparedness, evacuation planning, collecting survival goods...)
- to be considered as part of the response to a tsunami warning

### Tsunami different from the other hazards in Australia

- Risk rejection versus risk acceptance (and low response to information etc...)

For tsunami, need to develop strategies to increase recognition of a potential threat from that source.

### Preparedness for low-likelihood events

→ on receipt of a warning?

- increases risk
- low warning time events (a few hours)
- insufficient time for effective actions to be planned, selected, implemented and acted on.

Does not accommodate stress accompanying receiving a warning.

- Stress significantly reduces the capacity for people to think, plan, decide & act.

### Need to first

- shift people's risk beliefs and
- encourage tsunami risk acceptance
- before embarking on strategies to develop DRR capability

Respondents raised some possibilities...

Those who actively discussed tsunami DRR (in professional, volunteer and community settings) - more knowledgeable

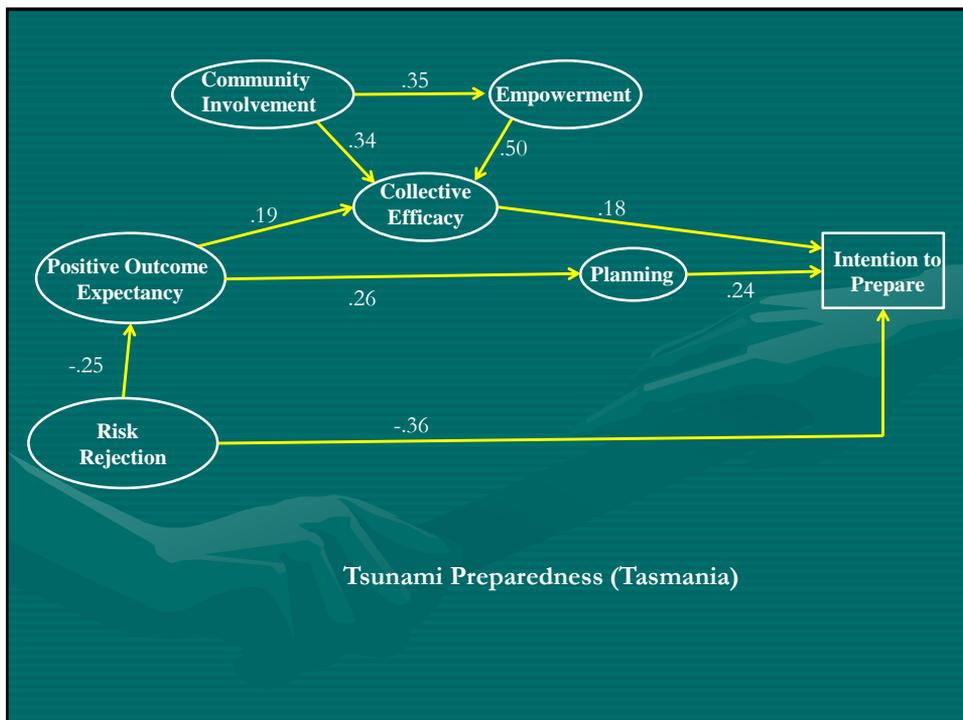
- about tsunami, and,
- warning systems/community response to warnings.

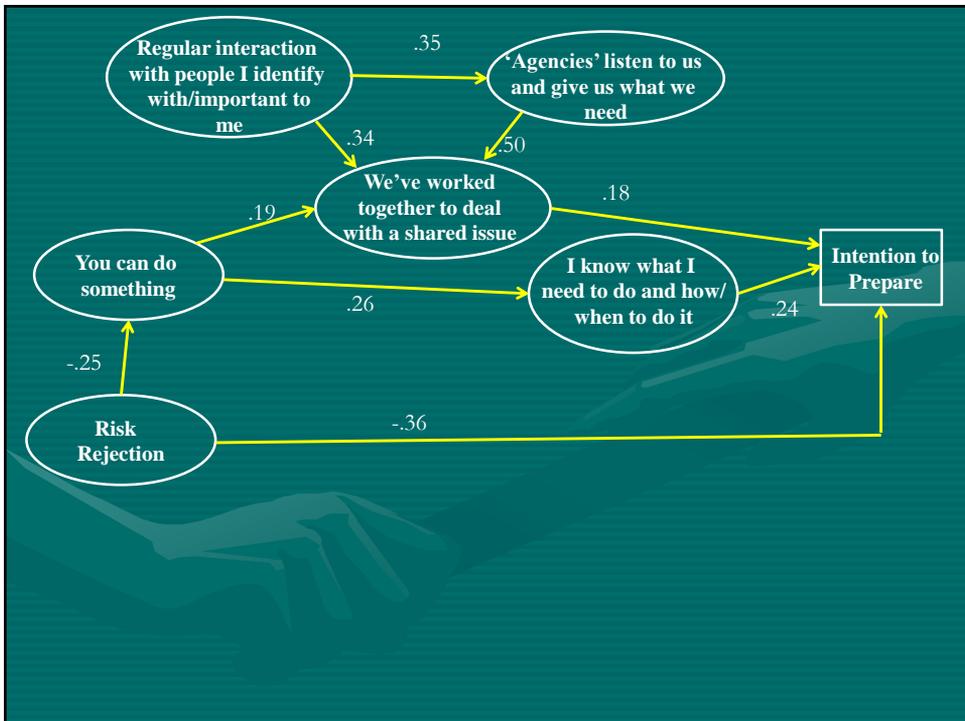
Community discussion (with family, others, experts...)

- discussed risks and potential impact
- in relation to their local geography
- planned responses with their families.
- past events/media coverage
  - only if general interest in geography/ disaster events generally

When there is tsunami risk acceptance

- translate into greater interest in and action towards pre-event preparedness.





### Strategies for Preparing People

#### Information Access/"convenient" sources

"...going to be hard to convince people of the risks/why they should prepare people do not do anything until an event has already happened..."

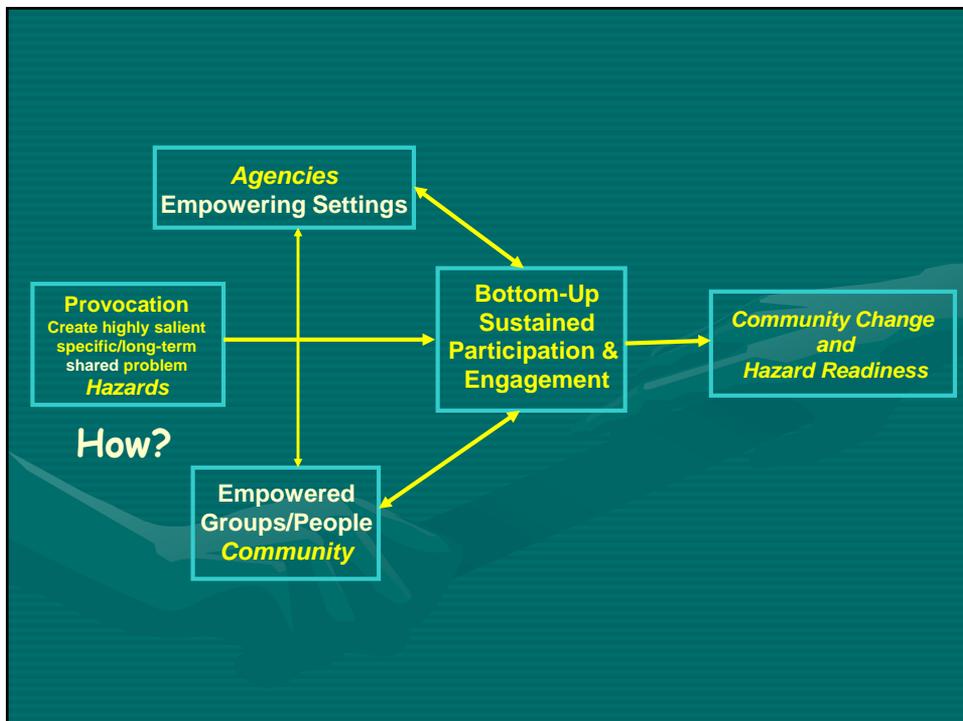
Access/seek information if "they want to."

What then motivates people to want to:

- find out more information about tsunami?
- plan...?

First step is for official sources/representatives to

- Identify tsunami as a real/reasonable risk
- prompt them to do something about it.



### Tsunami Education/Preparedness Using Other Hazards

- Adapt existing approaches (for bushfires), or
- Provide scientific information about tsunamis (as with bushfires)

(Actively engage in) discussion of tsunami alongside other community hazards/issues community interested in

- Tsunami discussed as a coastal hazard issue alongside coastal issues such as erosion, subsidence, sea level rise, storm surge...coastal hazards that communities were concerned with

Tsunami awareness - give people information

- consequences in people's local context.
- demonstrate possible effects using modelling
- emphasise threat/potential destruction rather than the likelihood of the event

### Most important information - locally specific information

- without it people would base what they think will happen on what they have seen on the news and social media
- having local information → help people to have power over their situations and cope
- (Interactive) maps/being able to see visually the local potential areas of impact and evacuation
  - able to highlight/manipulate different factors (sources, sizes, how far inland, heights, and impact on landscape)

People must be able to think beyond, "I'll just get out" and

- factor in information that will affect their response (e.g., access to roads out of the area)
- describe the likelihood & consequences of tsunami affecting someone's local area.
- generalised risk information would not convince people to prepare
  - people need to connect with the information, and
  - think about what it might be like to experience a tsunami, and
  - what they might potentially do in the event of a tsunami.

Alongside the local risks, include local information on

- where warnings information would come from,
- what warnings might look like, and
- what they can do to prepare...

Information/learning - from a trusted source

- emergency services
- local council...
- High quality/"fair dinkum" official information
  - Ensure information
    - well researched
    - consensus
    - in depth, explanatory, attention grabbing, set scene for what people should know/do.

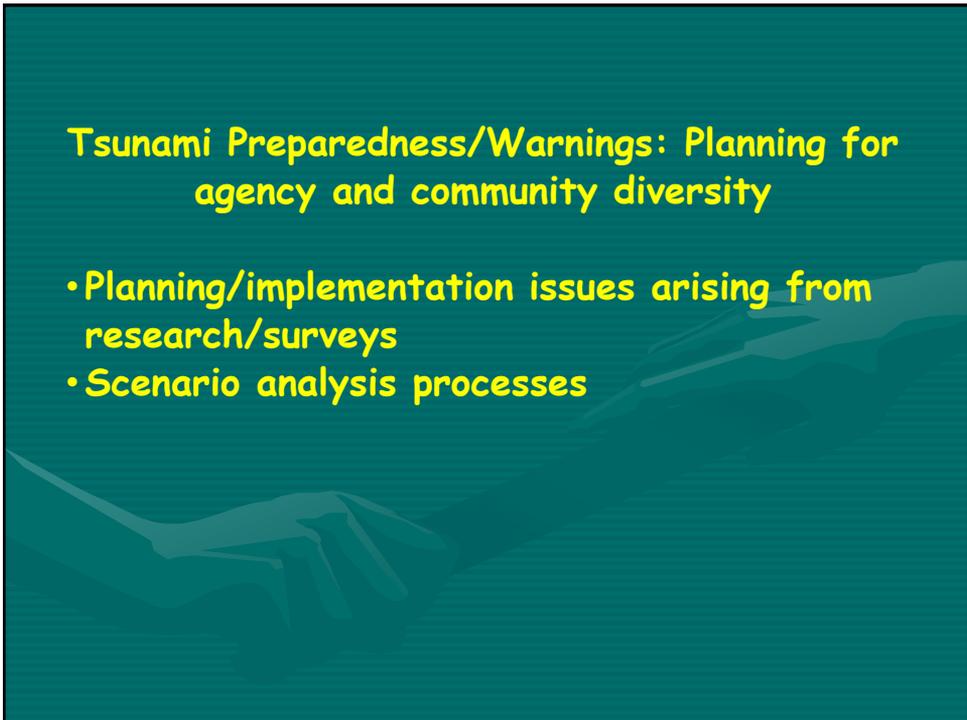
Include: letterbox drops, social media, internet websites, and mobile phone apps as necessary

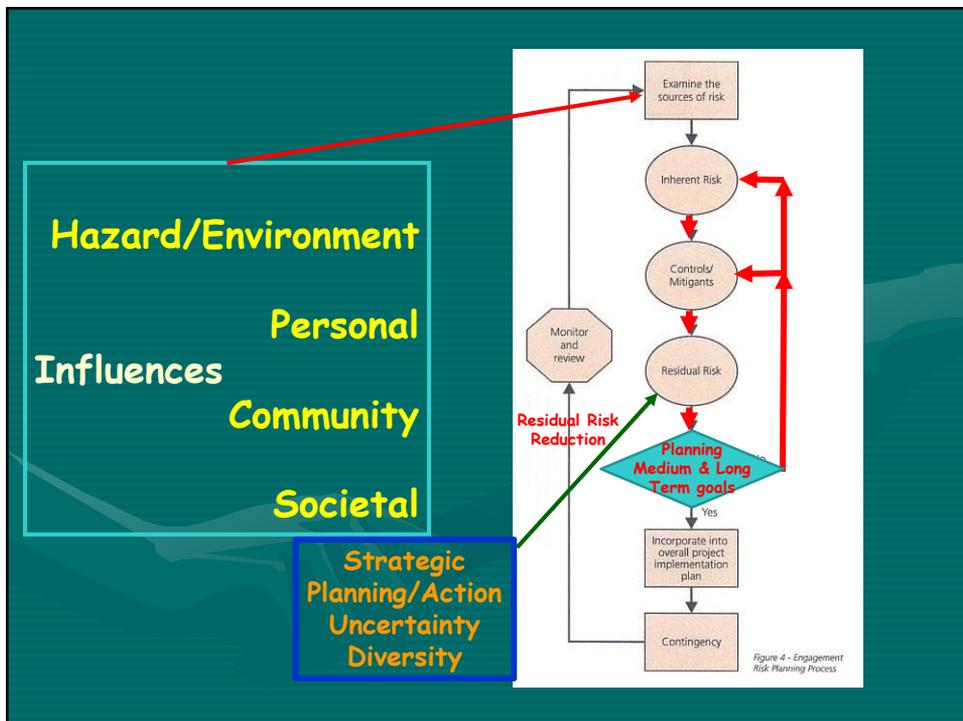
- letterbox drops - ensure comprehensive reach/esp. for those technologically challenged (elderly people).



## **Tsunami Preparedness/Warnings: Planning for agency and community diversity**

- **Planning/implementation issues arising from research/surveys**
- **Scenario analysis processes**





## Scenario Analysis

Tool for collective learning & planning...

→ facilitates (integrative) strategic planning when...

- Uncertainty is high
- There exist differences of opinion about future/uncertain events
- There exist many stakeholders

Facilitates..

- Articulate diverse issues and seek consensus/priorities across stakeholders
- Organise possibilities into narratives that facilitate shared understanding/commitment to action (shared responsibilities)

## Community/Agency Diversity & DRR Planning Scenario Analysis

