Australian Government
National Emergency Management Agency

Australian Institute for Disaster Resilience

AIDR HANDBOOK SHOWCASE | WEBINAR SERIES

Tsunami emergency planning in Australia

WEDNESDAY 5 NOVEMBER 2025 | 1.00PM - 2.00PM AEDT

Acknowledgement of Country

AIDR acknowledges the Traditional Custodians of the various lands on which you all join us from today and the Aboriginal and Torres Strait Islander people participating in this event.

We pay our respects to Elders past and present and celebrate the diversity of Aboriginal peoples and their ongoing cultures and connections to the lands and waters across Australia.

Welcome

Dr Isabel Cornes

Senior Project Officer, Knowledge Development

Australian Institute for Disaster Resilience (AIDR)

Housekeeping

- You will remain muted and your camera will not be activated for the duration of today's event.
- Today's event will be recorded and made available after the event.
- Please enter questions for our speakers in the Q&A function, not the chat box.
- Please use the chat box to share any thoughts or reflections during the presentation
- Please be respectful to each other when posting your comments or questions.

Speaker Introduction

David Parsons ESM

Director, Crisis Management Australia

President, Australian Institute of Emergency Services

Topics

- The handbook
- Australia's tsunami history
- Changes and additions
- Tsunami risk management challenges

The handbook

- Encyclopedia on tsunami vs useful planning guide

A history of tsunamis

Clontarf Beach 1960

SYDNEY HARBOUR IN CHAOS FROM QUAKE WAVE

SYDNEY. — Tidal waves generated by the earthquakes in Chile smashed into the New South Wales coastline yesterday.

AIR PILOT SEES BEACH DISAPPEAR

MELBOURNE. — Salmon spotting pilot Dick Ritchie yesterday 'saw Three-Mile Beach, Wilson's Promontory "disappear" while h

Hobart Mercury 1960

The 1960 Chilean tsunami - caused by a magnitude-9.2 earthquake - damaged boats in harbour on NSW's coast from Evans Head, Newcastle, Sydney and Eden. The Fort Denison tide gauge in Sydney Harbour recorded wave heights up to 84cm. (SMH 2018)

Changes and additions

WARNING LEVEL		ACTION STATEMENT
	Advice	Stay informed Reduced Threat: Return with Caution Monitor conditions
	Emergency Warning	Avoid the area Evacuate Now/Before (time)

- PPRR structure
- Tsunami history
- Indigenous knowledge
- Tsunami risk
- Risk mitigation – natural systems
- Preparation – modelling, Planning Handbook, community engagement
- Response – warnings, AWS, National Situation Room
- Recovery - consequences
- Catastrophic disaster management

Risk management challenges

- A beach culture
- Community interest
- Transient community
- Maritime community
- Risk communication
- Community reaction
- Stakeholder response management

Speaker Introduction

Associate Professor Hannah Power

Associate Professor, Coastal and Marine Science

University of Newcastle

Tsunami science: Key concepts and learnings for management

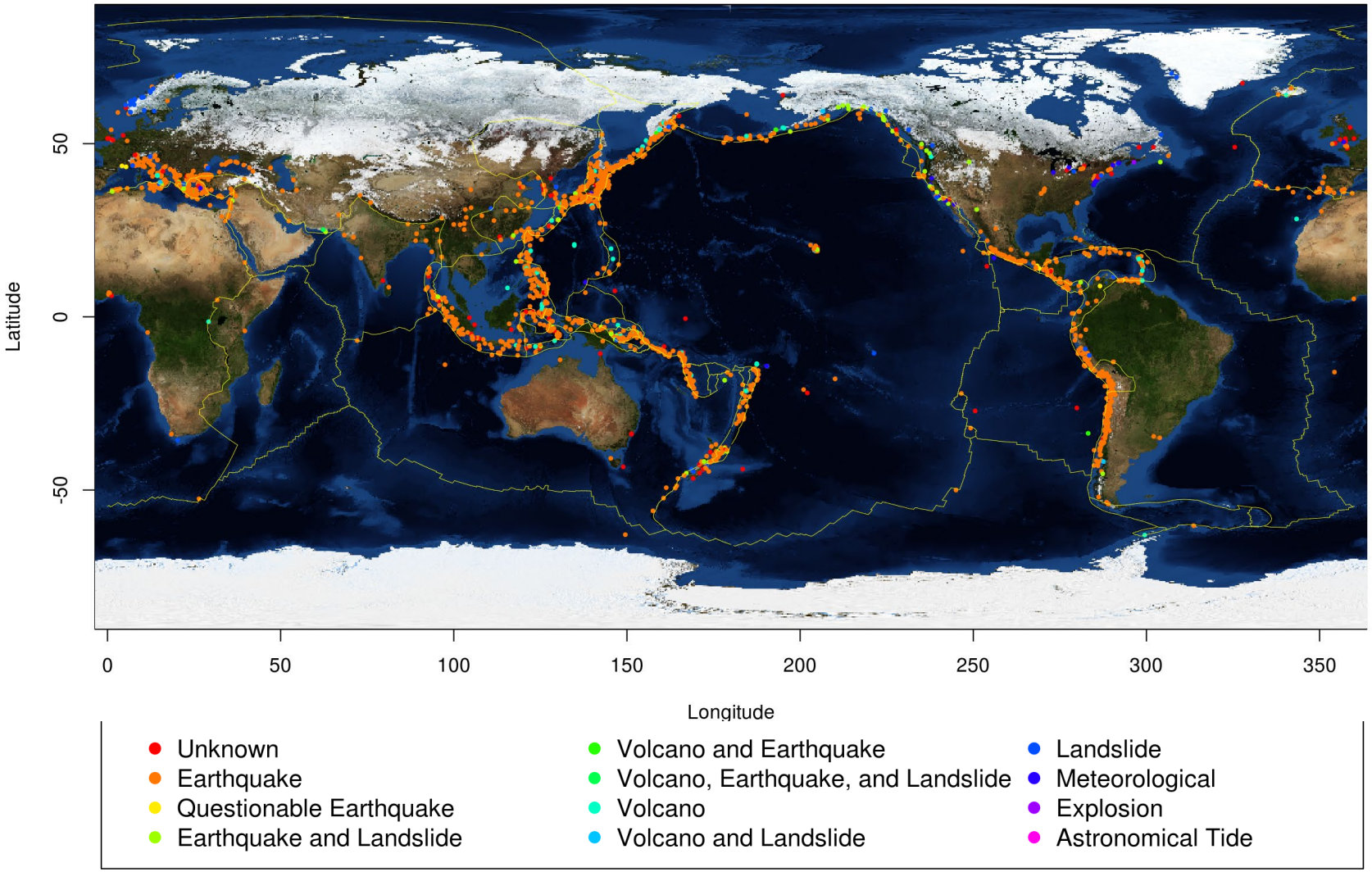
A/Prof Hannah E. Power

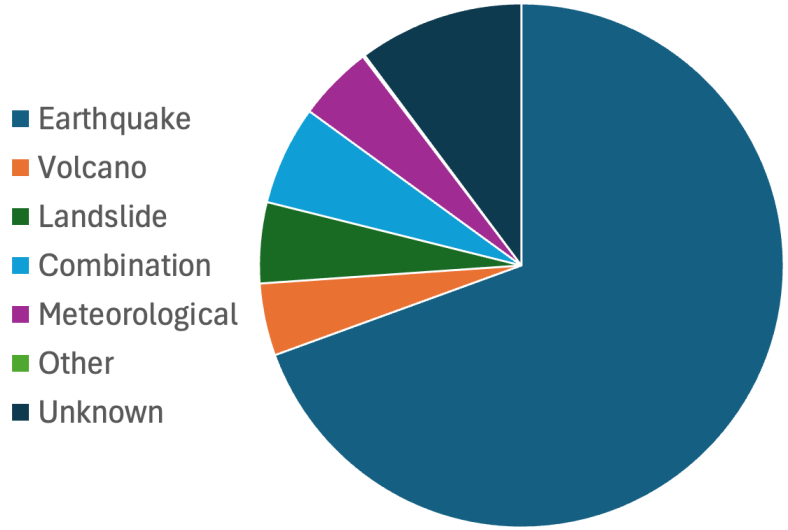
Coasts and Estuaries Research Group
University of Newcastle

5 November 2025

Tsunami sources

Primarily earthquake generated



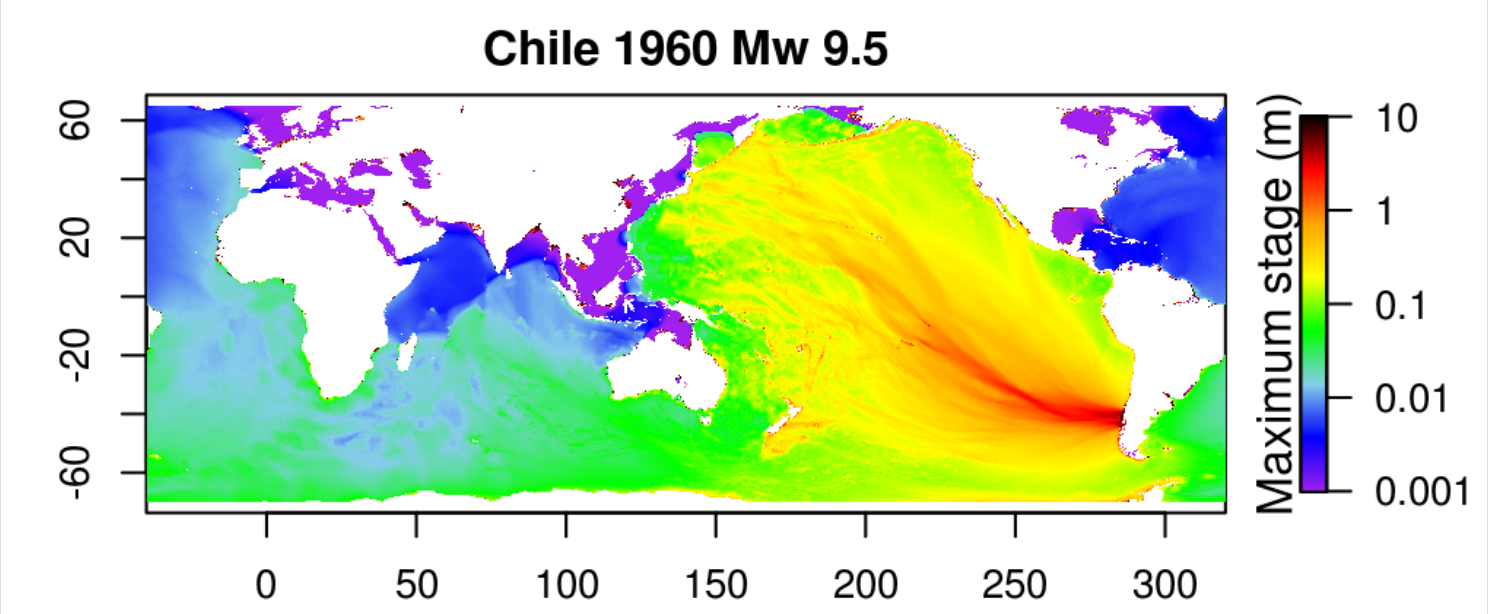


Subduction zone earthquakes account for majority of tsunami sources

Volcano, landslide, and combinations next most common

Significant historic events

Chile 1960



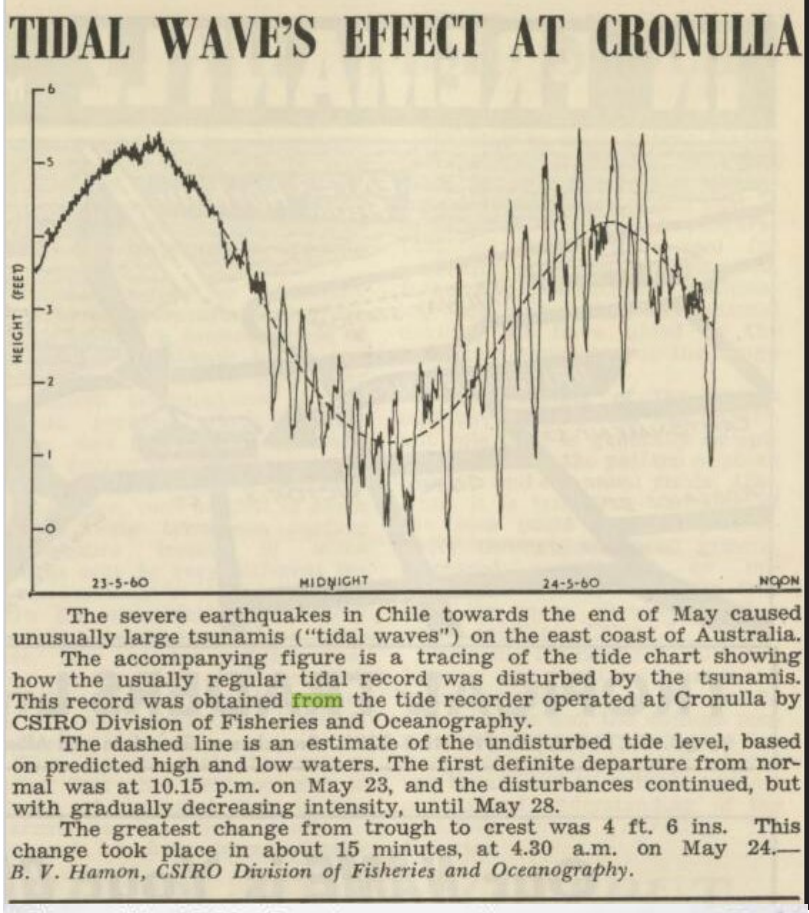
Source: G. Davies

142 deaths in Japan

61 deaths in Hawai'i

4 ft. 6 in. (1.37m) wave recorded at Cronulla

Largest recorded earthquake



TIDAL WAVE'S EFFECT AT CRONULLA

HEIGHT (FEET)

23-5-60 MIDNIGHT 24-5-60 NOON

The severe earthquakes in Chile towards the end of May caused unusually large tsunamis ("tidal waves") on the east coast of Australia.

The accompanying figure is a tracing of the tide chart showing how the usually regular tidal record was disturbed by the tsunamis. This record was obtained from the tide recorder operated at Cronulla by CSIRO Division of Fisheries and Oceanography.

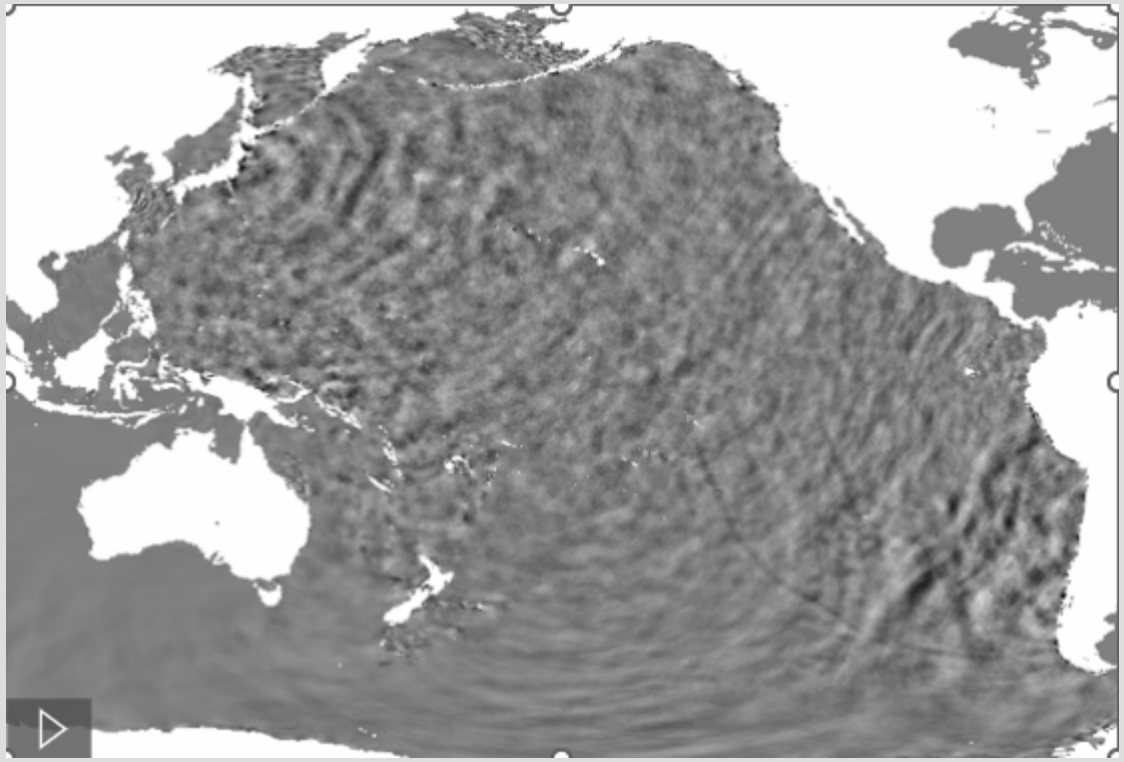
The dashed line is an estimate of the undisturbed tide level, based on predicted high and low waters. The first definite departure from normal was at 10.15 p.m. on May 23, and the disturbances continued, but with gradually decreasing intensity, until May 28.

The greatest change from trough to crest was 4 ft. 6 ins. This change took place in about 15 minutes, at 4.30 a.m. on May 24.—*B. V. Hamon, CSIRO Division of Fisheries and Oceanography.*

~5 km upstream in Sydney Harbour

Significant recent events

Tohoku 2011



Source:
G. Davies

Subduction zone earthquake generated

Mw 9.1

56cm wave at Norfolk Island

35cm wave at Port Kembla NSW

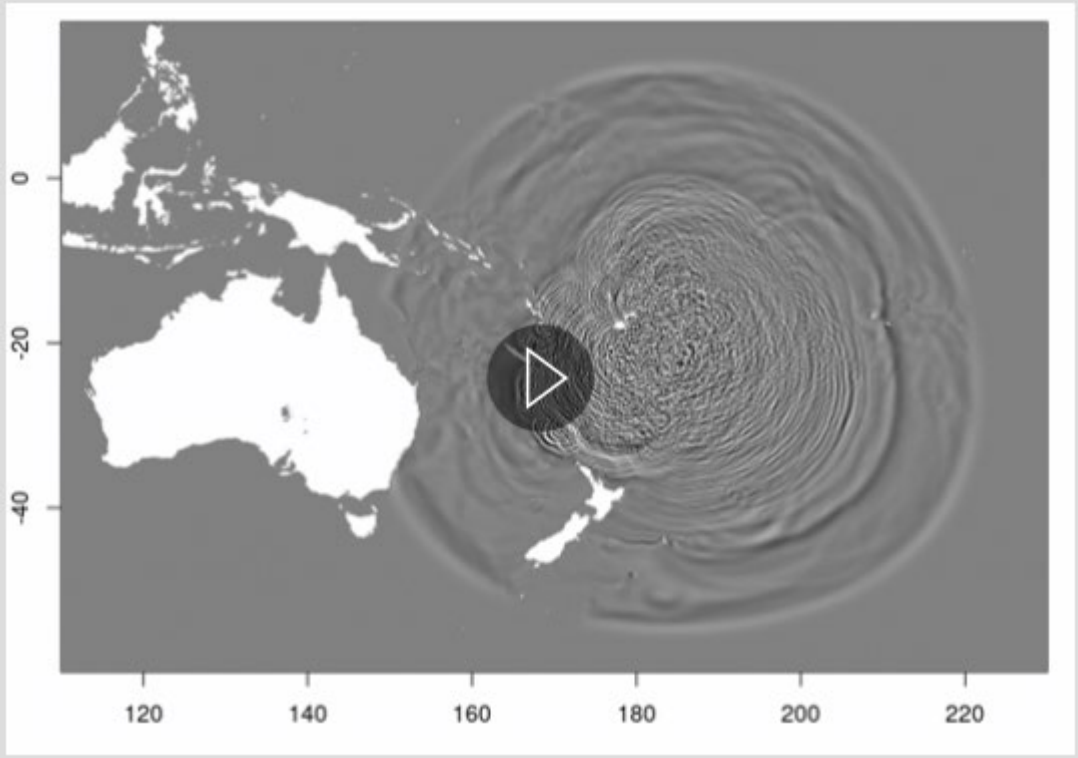
23cm wave at Spring Bay TAS

Unusual currents noted at Port Kembla and Sydney Harbour

Several swimmers washed into a lagoon at Merimbula NSW

Significant recent events

Hunga Tonga Hunga Ha'api 2022



Source:
G. Davies

Submarine volcanic eruption

1.27m wave at Norfolk Island

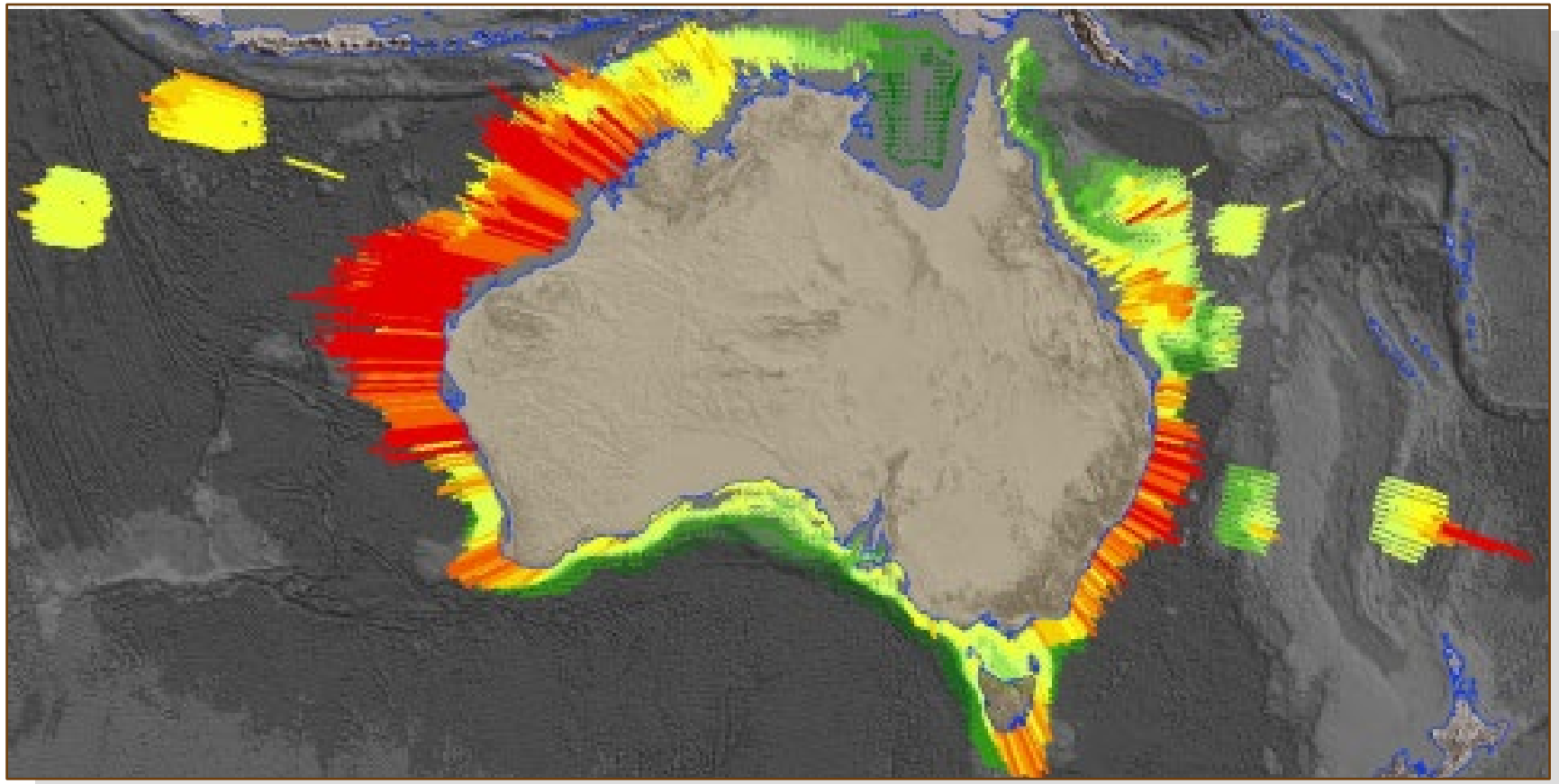
0.82m wave at the Gold Coast

0.77m wave at Eden

0.65m wave at Port Kembla

Tsunami hazards in Australia

Probabilistic tsunami hazard assessment (PTHA)



Source: Davies and Griffin (2018)

Geoscience Australia released 2018 PTHA

Update of 2008 PTHA

**** Probabilistic***

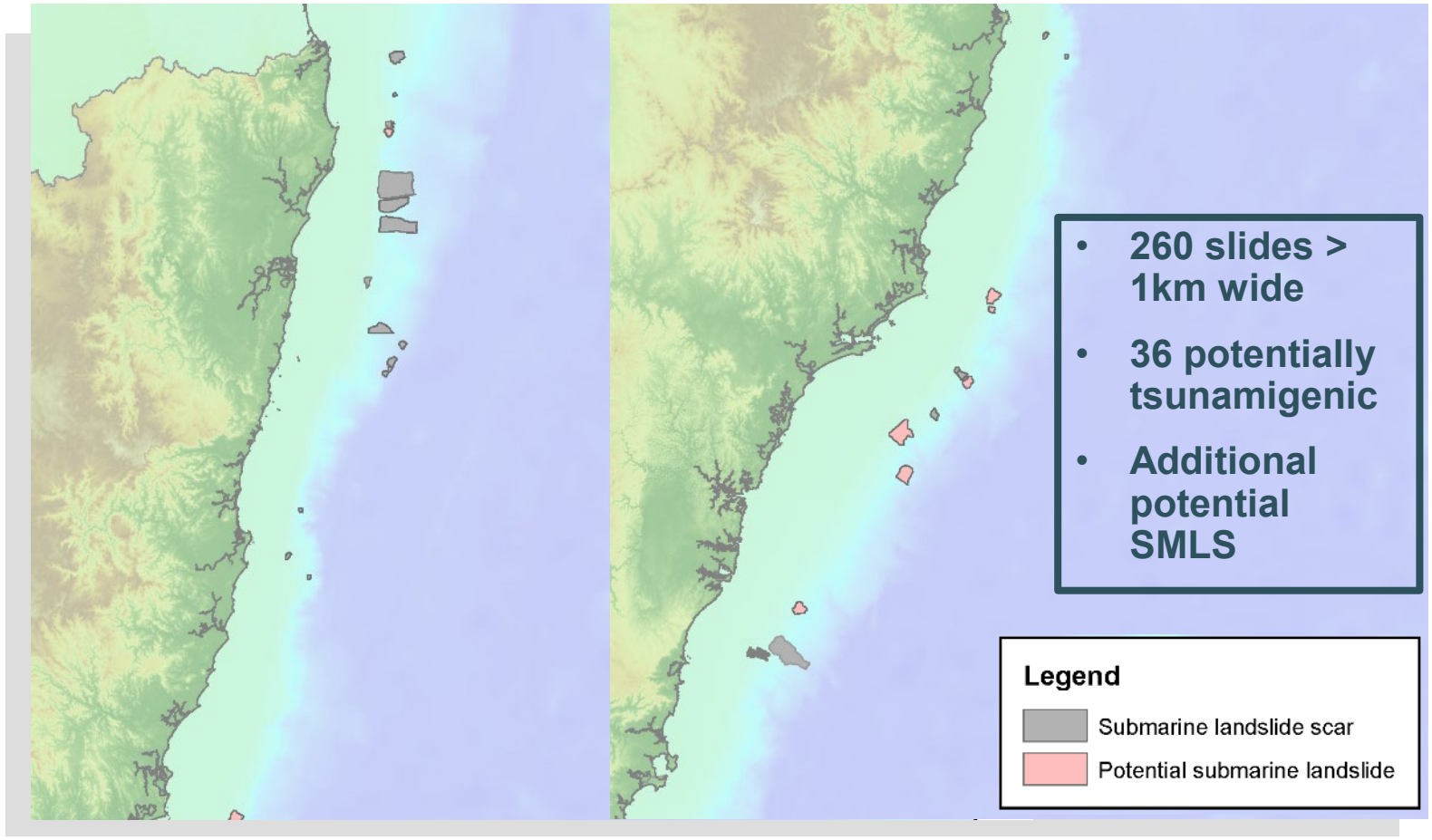
**** Informed by events***

High magnitude, infrequent events have limited historic records

Subduction zone earthquake sources only

Tsunami hazards in Australia

Submarine landslide hazards



Event based modelling

Uses historic landslide scars or potential slides

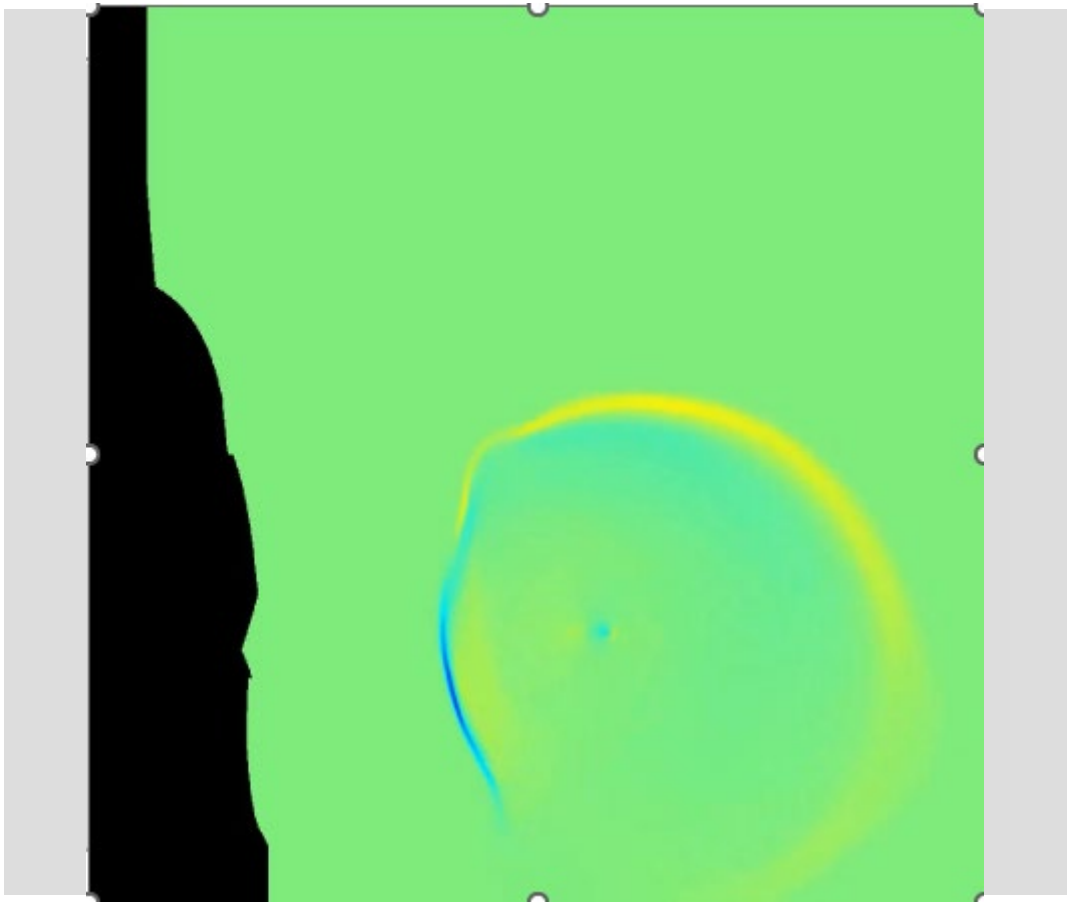
Incomplete bathymetric mapping hinders understanding

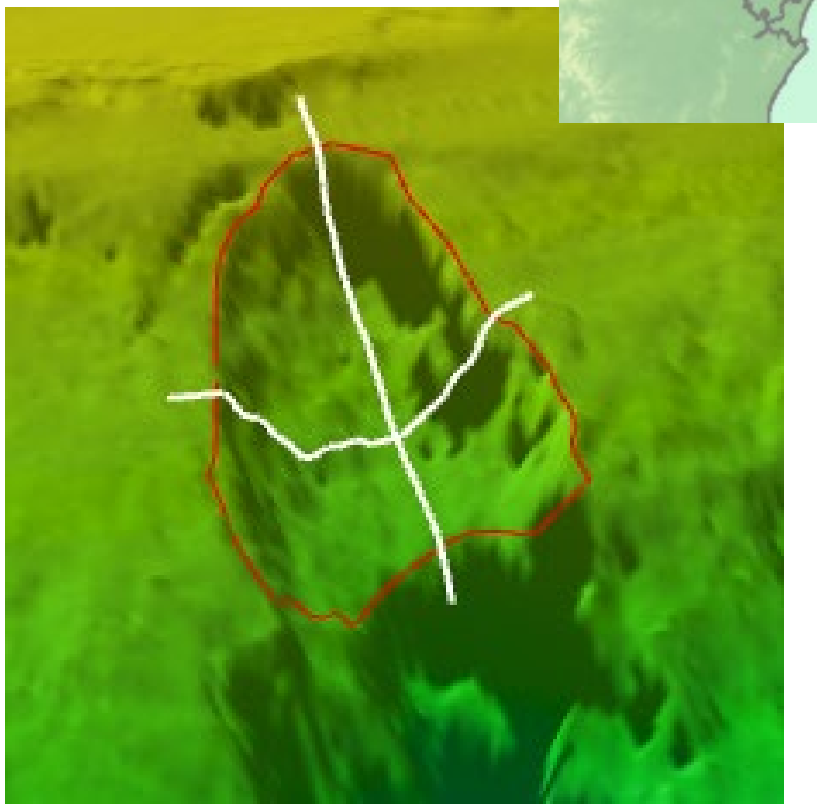
Uncertainties around:

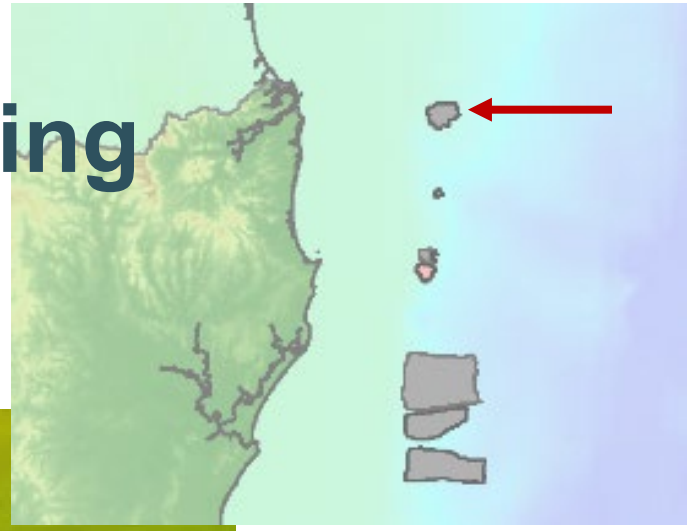
- triggering mechanisms
- rate of failure
- type of failure
- recurrence interval

Submarine landslide tsunami modelling

The Byron Slide







34 km offshore

800 m water depth

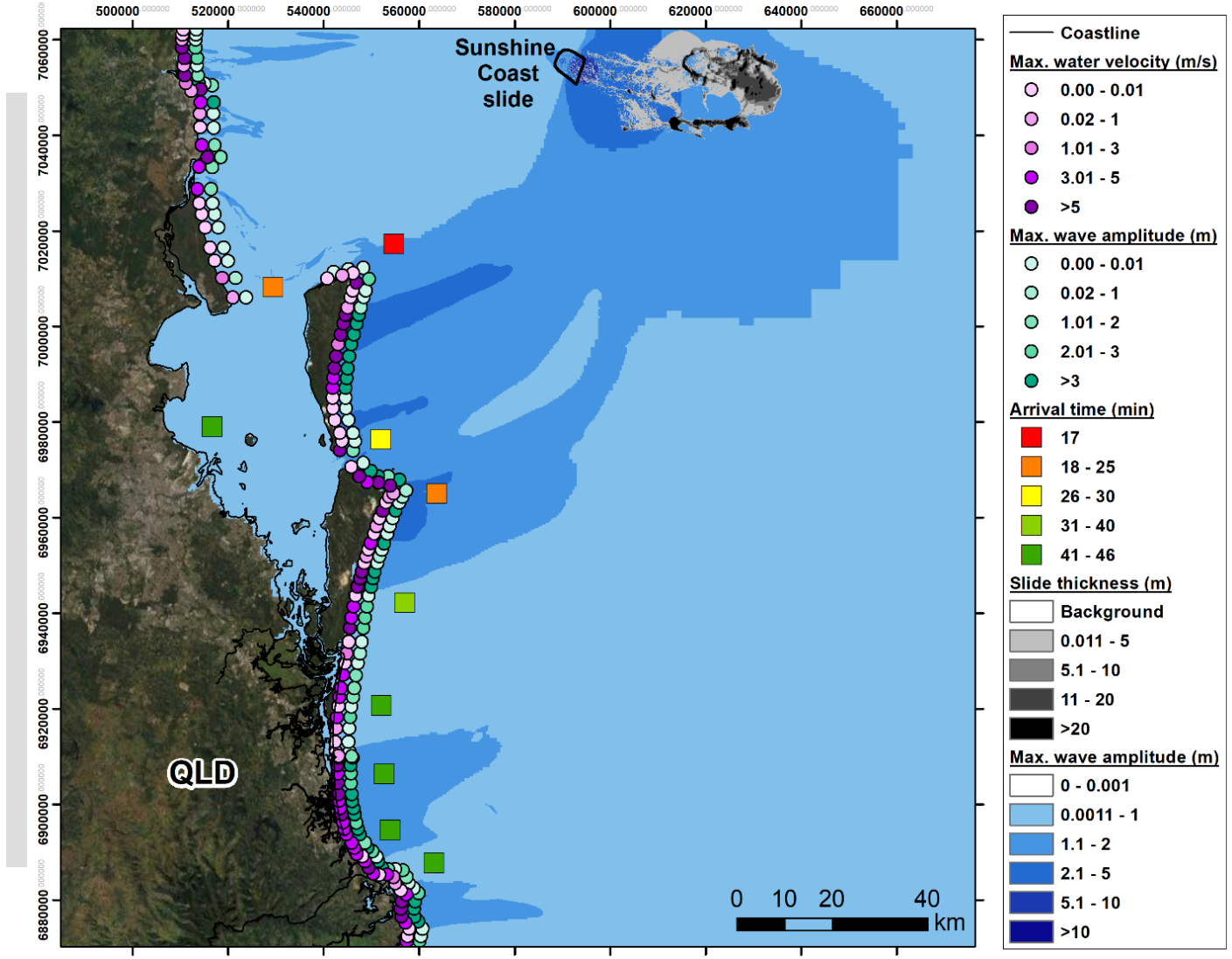
~3.6 km wide

~4 km long

Up to 222 m thick

Bringing the offshore to onshore

Case study: The Sunshine Coast Slide



Arrival times from initiation of tsunami

Maximum wave amplitude

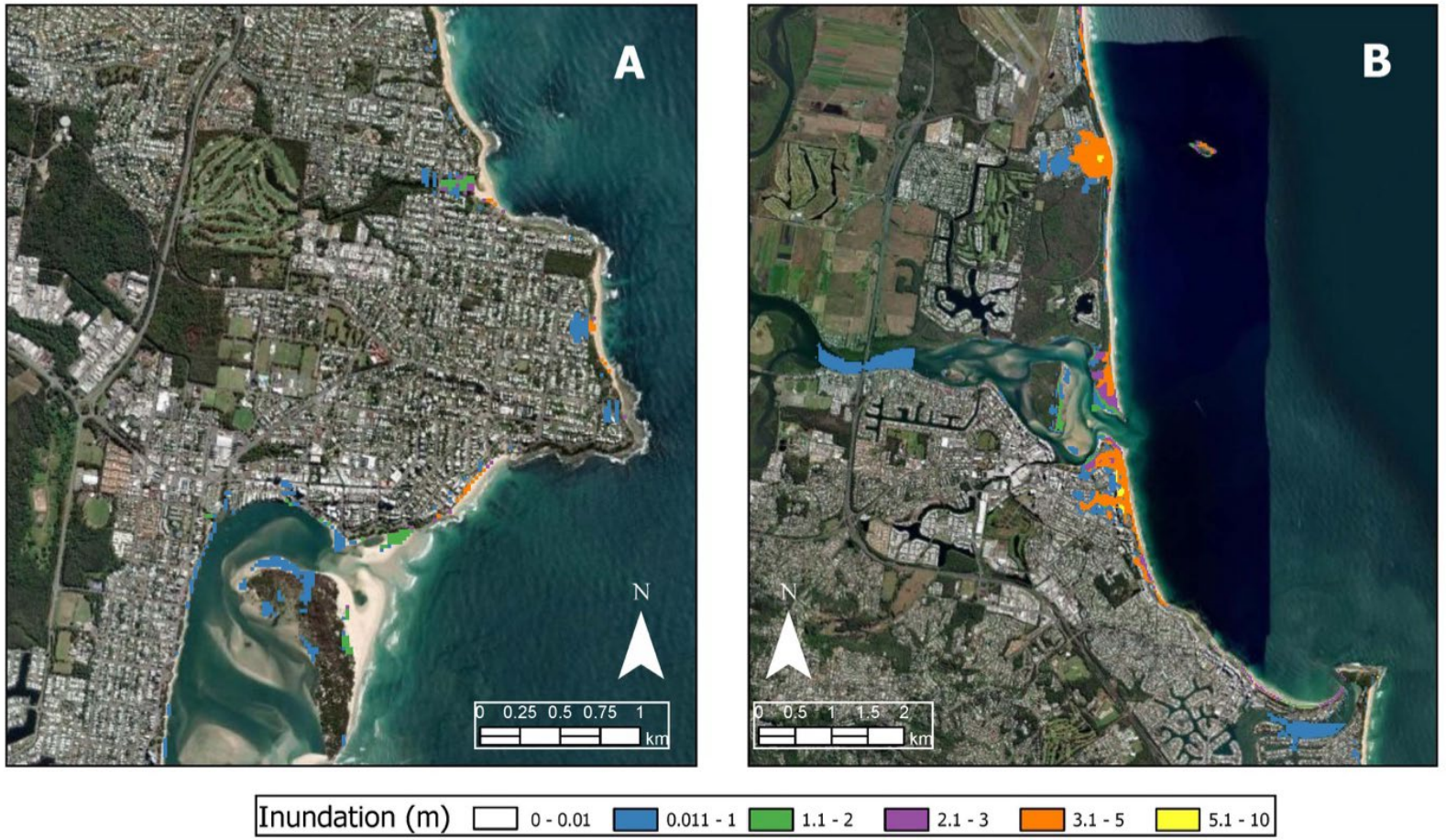
Maximum current speeds

Inundation areas

Same concept applies to modelling other tsunami sources

Bringing the offshore to onshore

Mapping inundation



Map inundation depths

Map inundation extents

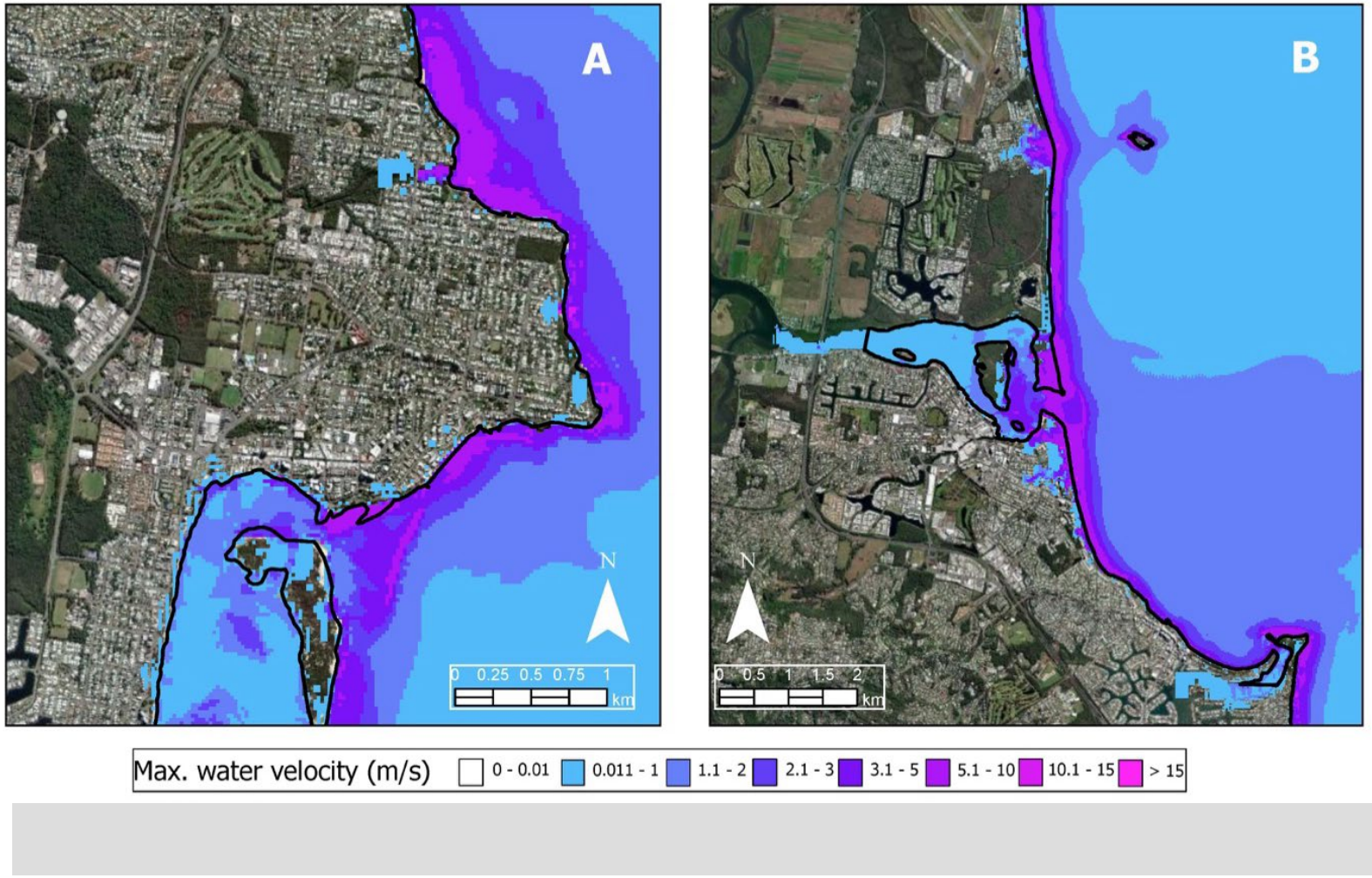
Obtain area inundated

Estuary entrances and upstream areas often vulnerable

Some localized focusing of wave energy on headlands

Bringing the offshore to onshore

Mapping water velocities



Maximum water velocities

Nearshore and onshore

Currents can be significant hazard for "Marine Threat" events

Can drive localized erosion

Tsunami science:
Key concepts and learnings for management

Most tsunami are generated by subduction zone earthquakes but other generation mechanisms are important

Science is constantly evolving as new events occur

Australia has a Probabilistic Tsunami Hazard Assessment for subduction zone earthquake tsunami

Other tsunami sources remain critically understudied

Onshore modelling of hazard provides key parameters to inform emergency management

Case study learnings can be useful for unstudied sites or sources

Thank you

A/Prof Hannah E. Power
Coasts and Estuaries Research Group
University of Newcastle

www.cerg.science
www.hannah-power.com

Speaker Introduction

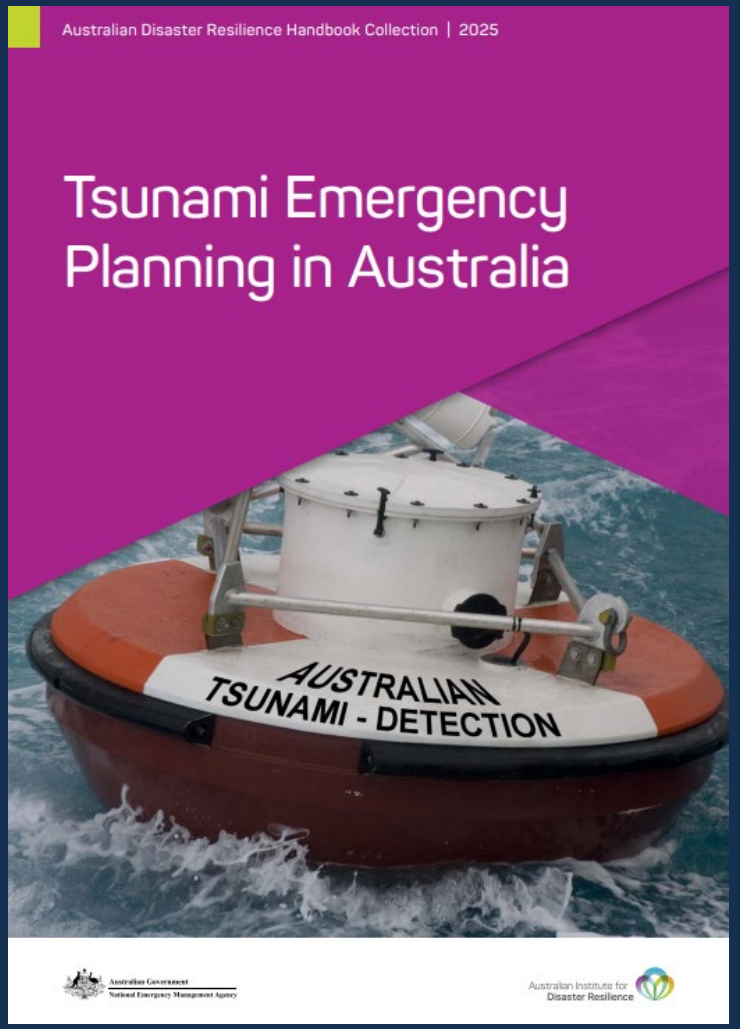
Dr Jane Sexton

Director, State Intelligence, Predictions and Planning

Queensland Fire Department

WORLD TSUNAMI AWARENESS DAY
5 NOVEMBER

How tsunami events have impacted emergency management in Australia from 2004 to now



Respect Integrity Courage Loyalty Trust

QUEENSLAND FIRE DEPARTMENT

Queensland Government

Key messages

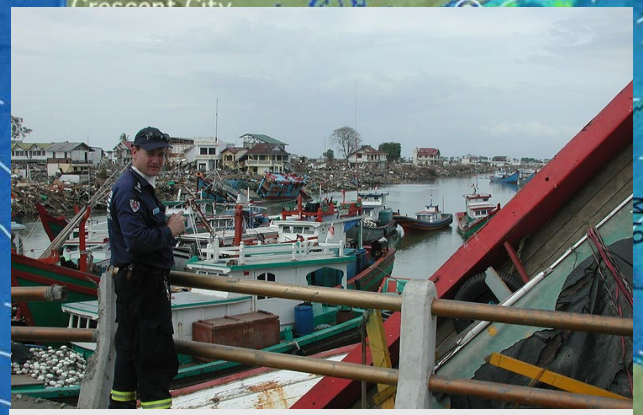
- **learning from events**
- how emergency management has **advanced through the world-class science**
- **science and EM continue to evolve** as we observe more events
- how emergency management is **grounded in the risk-based approach** in line with national and international strategies and frameworks – so that we are **prepared for the next event**
- the continuing **challenges of public awareness** with low frequency – high consequence events
- how our emergency response capabilities have been **deployed to assist** with the response and recovery efforts of **tsunamis around the world**

WORLD TSUNAMI AWARENESS DAY
5 NOVEMBER

Queensland Government

The Indian Ocean Tsunami
December 26, 2004

Max computed tsunami amplitudes



Station Officer Bruce Cameron looking at the destruction at the marina, Banda Aceh, 2004 [Museum of Fire Collection]

Destruction in Gadhdhoo, Maldives, 2004
[Museum of Fire Collection]

Titov et al., 2005, Science, v.309, 2045-2048

NOAA Center for Tsunami Research

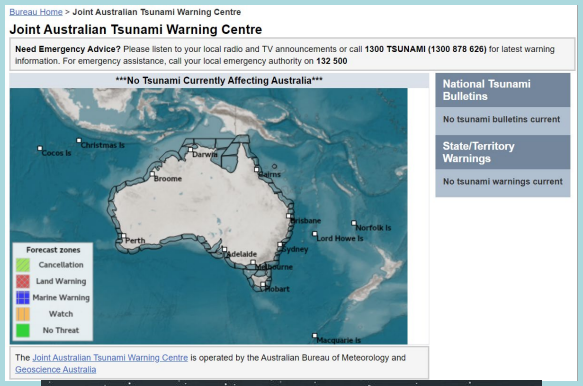
NOAA Research product
Not an official forecast

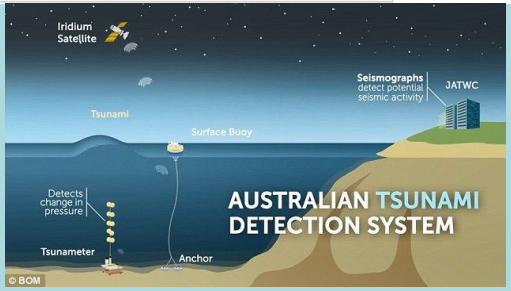
Queensland Government

From 2004

Australian Tsunami Warning System

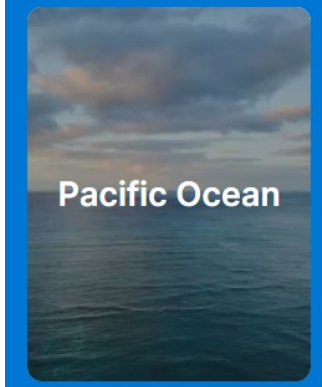
Australian Tsunami Advisory Group

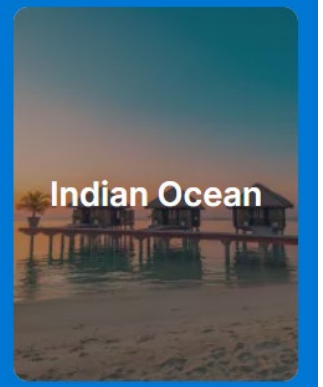




unesco

Tsunami Programme





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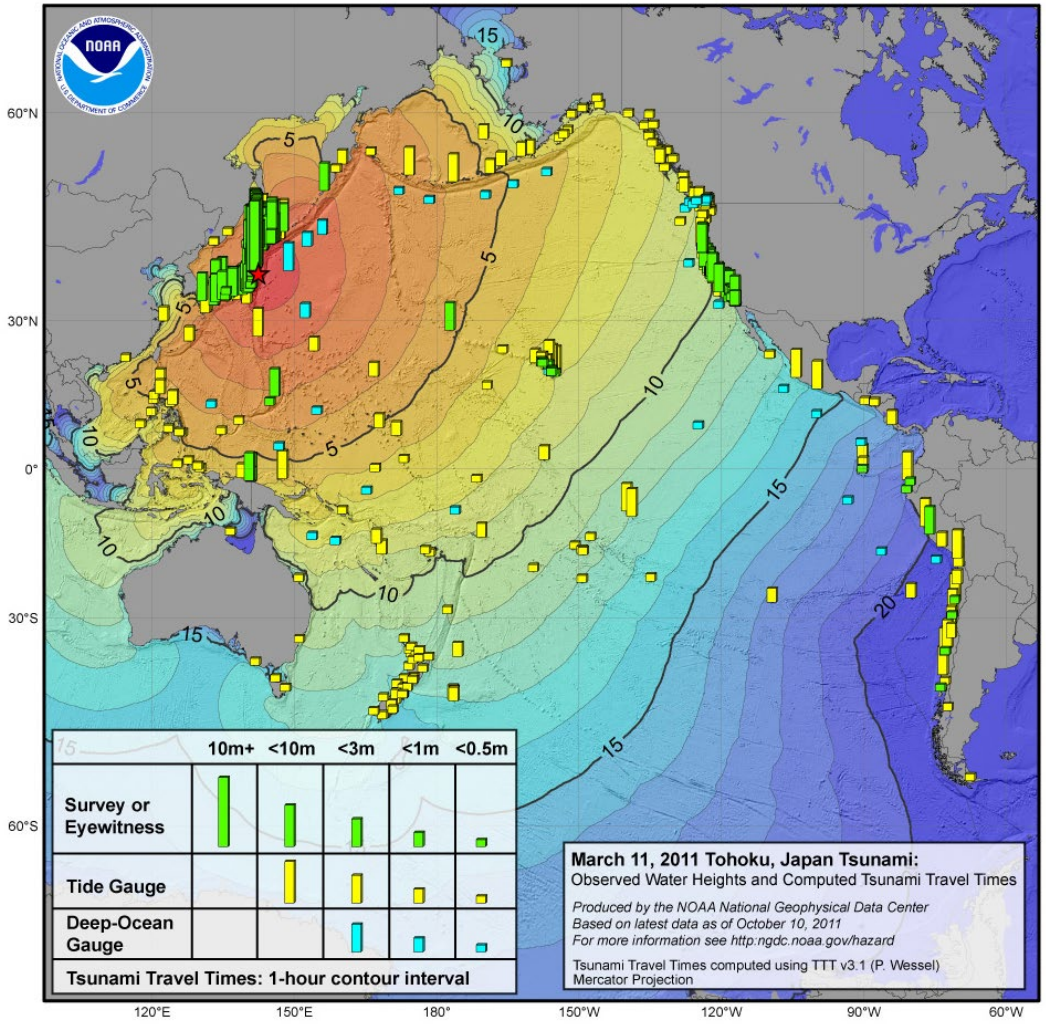
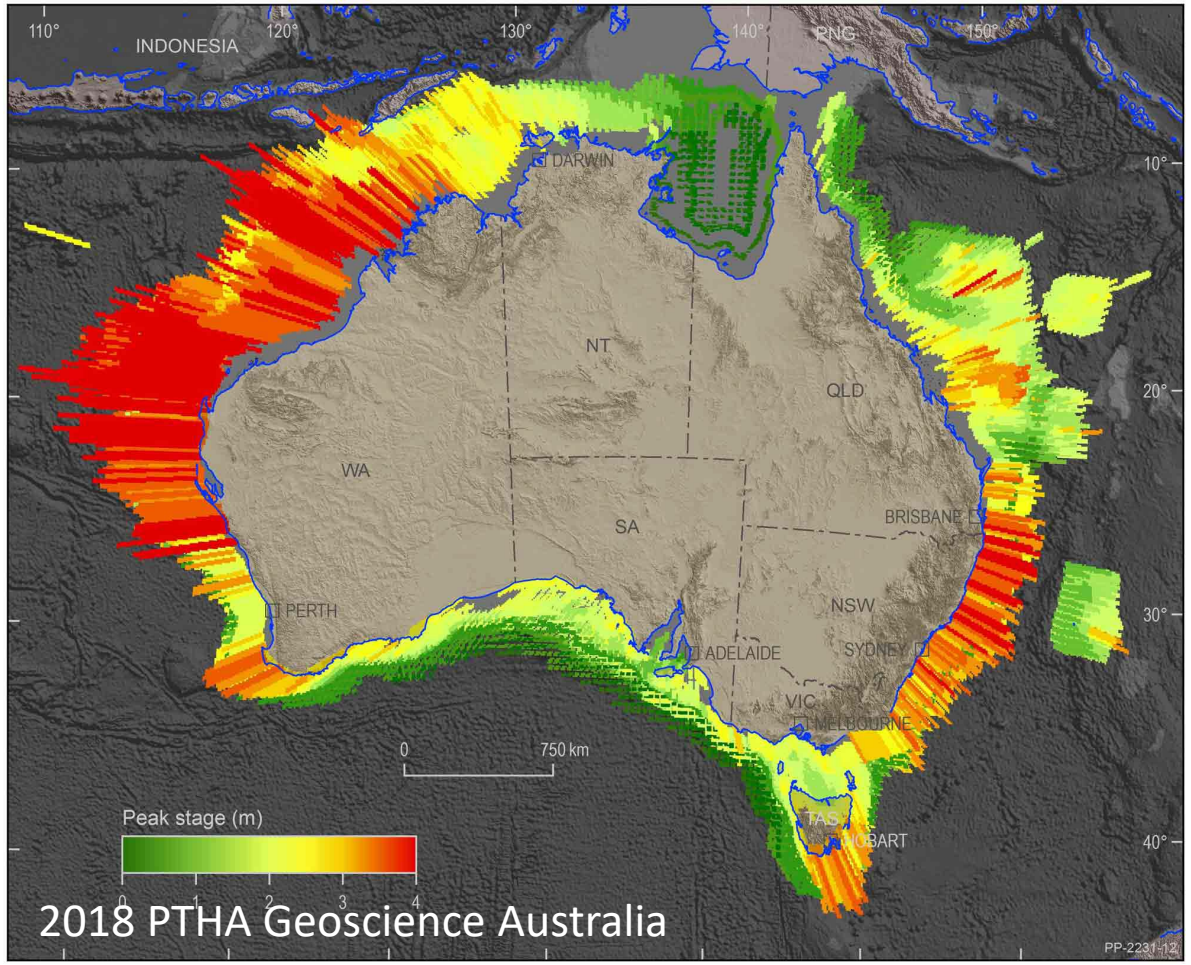
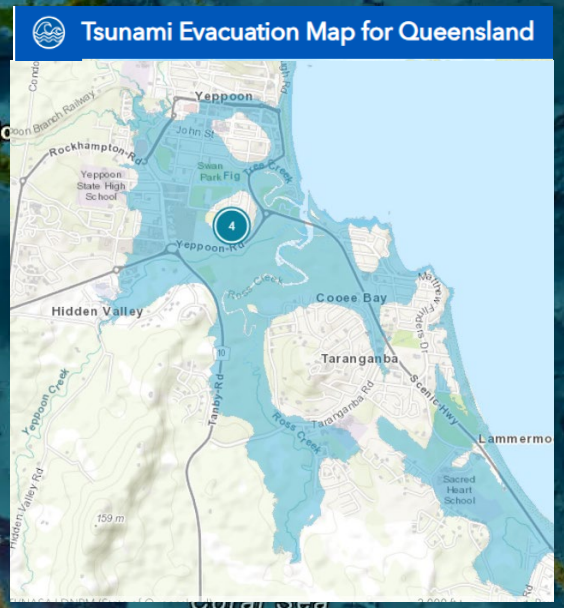
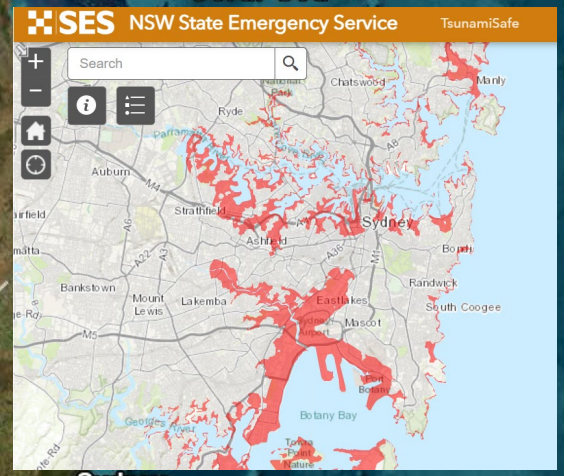
2011 event





Queensland Government





Singapore

Jakarta

Bandung

17 July 2006
M7.7

Port Mo

Northern Territory

Queensland

10m run-up
Steep Point

Western Australia

AUSTRALIA

South Australia

Perth

New South Wales

Sydney

Pure appl. geophys. 165 (2008) 2003–2018
0033–4553/08/112003–16
DOI 10.1007/s00024-008-0418-5

Pure and Applied Geophysics

The Effect of the Great Barrier Reef on the Propagation of the 2007 Solomon Islands Tsunami Recorded in Northeastern Australia

Toshitaka Baba,[1,2] Richard Mleczko,[2] David Burbidge,[2] Phil R. Cummins,[2] and Hong Kie Thio[3]

by a flat plane at a depth equal to the mean water depth of the GBR (the "Average GBR" grid). From the comparison between the synthetic waveforms both with and without the Great Barrier Reef, we found that the Great Barrier Reef significantly weakened the tsunami impact. According to our model, the coral reefs delayed the tsunami arrival time by 5–10 minutes, decreased the amplitude of the first tsunami pulse to half or less, and lengthened the period of the tsunami.

Key words: Tsunami, the Great Barrier Reef, the 2007 Solomon Islands earthquake.

Beijing
Tianjin
Pyongyang
Seoul
SOUTH KOREA
JAPAN
Tokyo
Shanghai
Wuhan
Taipei
Hong Kong
Manila
PHILIPPINES

11 March 2011
M9.1

Fishing nets wrapped around buildings in Shizugawa by tsunami

Australian USAR rescuer searching buildings in Shizugawa

JAPAN EARTHQUAKE AND TSUNAMI

USAR Task Force Leader - Chief Superintendent Rob McNeil

More recently, Rob has worked in the role of Assistant Director Specialised Operations and is now the Assistant Director Community and Corporate Risk.

Rob's extensive experience in USAR has included the role of Commander

Japan deployment

The Task Force was deployed to Japan for a period of seven days, arriving on Monday 14 March and returning home on Monday 21 March.

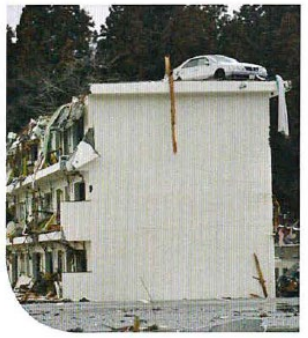
Speaking about how team members were chosen for the Japanese earthquake and tsunami Task Force, Rob said, "Firefighters with USAR qualifications were the main core of the team along with hazmat technicians, paramedics from NSW Ambulance, doctors, engineers, a Police Liaison Officer, communications and GIS experts and Japanese cultural and linguistics specialists."

"As Task Force Leader in Japan, it was my role to ensure that the command team was functioning well and meeting the set objectives. I liaised with other international officials and USAR teams, especially the Japanese forces in establishing where our staff could be

Australian USAR Taskforce members at Base of Operations (BoO) outside Tome City

Australian Task Force members being briefed before a line and hail search at Shizugawa

Car dumped on top of 3-storey building by tsunami



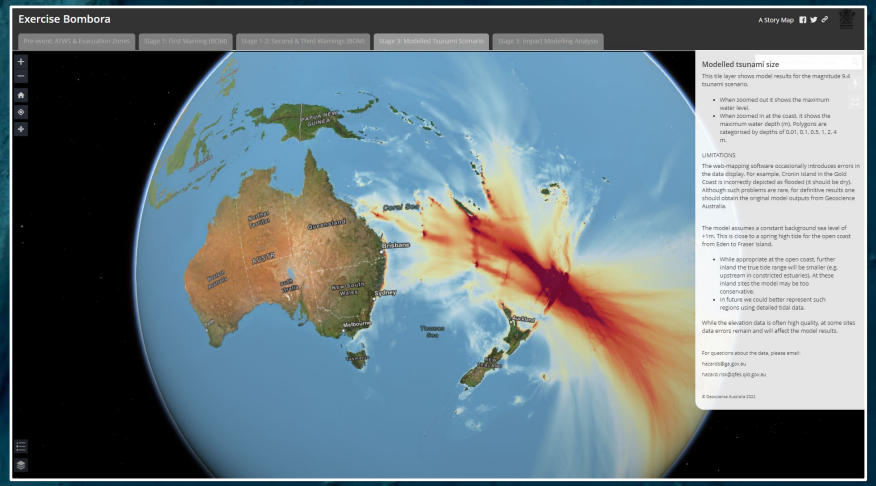
Australian rescuers searching cars for victims

PAPUA NEW GUINEA
Port Moresby
Coral Sea
Queensland
Brisbane
South Australia
New South Wales
Sydney
Adelaide
Victoria
Melbourne
Tasman Sea
Auckland
Tasmania

Natural Hazards Research Australia

Understanding tsunami risk to Australia from volcanic sources

15 Jan 2022
Hunga Tonga-Hunga Ha'apai




Singapore
Jakarta
Bandung
INDONESIA
PAPUA
NEW
GUINEA
Port Moresby
Northern
Territory
Queensland
Coral Sea
Western
Australia
AUSTRALIA
Brisbane
South
Australia
Perth
New South
Wales
Sydney

What next?

Thank you for your listening

#TsunamiDay
#GetToHighGround

Respect Integrity Courage Loyalty Trust

Queensland Government

Speaker Introduction

Adrian Brannigan

Intelligence Analyst

Department of Fire and Emergency Services, WA

WA Tsunami Project

– Tsunami Emergency Planning in Australia Handbook

Adrian Brannigan	**Project Lead - Intelligence Analyst**	**DFES**
Ant Sadler	Supt. Emergency Management Intelligence	DFES
Matt Zanini	Manager Hazards Research Intelligence	DFES
Rayen Gho	Spatial Analyst	DFES
Robyn Parker	Spatial Analyst	DFES
Sophie Edgar	Spatial Analyst	DFES
Jamie Hunter	Spatial Analyst	DFES
Simon Abbott	Spatial Analyst	DFES
G Ryan	Science Communication	DFES
Lou Gishubl	Intelligence Intern	DFES

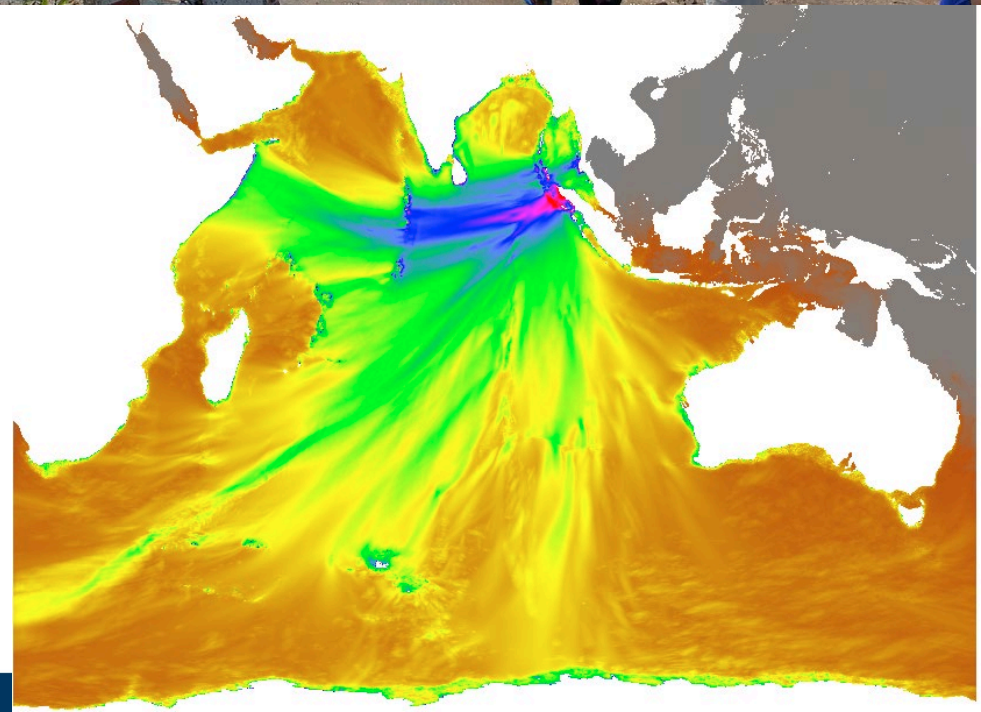
Gareth Davies	Tsunami Team Lead	Geoscience Australia
Matthew Macaulay	Tsunami Hazard Scientist	Geoscience Australia
Dylan Kendall	Director, Natural Hazards and Impacts	Geoscience Australia

The catastrophic tsunami that hit Japan on March 11th, 2011

GOVERNMENT OF WESTERN AUSTRALIA | DFES Department of Fire & Emergency Services | FOR A SAFER STATE

World's deadliest hazard

Tsunamis can be extremely deadly. In the past 100 years, 58 of them have claimed more than 260,000 lives globally, averaging 4,600 per disaster, **surpassing any other natural hazard**.



https://www.un.org/en/observances/tsunami-awareness-day#:~:text=Tsunamis%20are%20rare%20events%20but,surpassing%20any%20other%20natural%20hazard
https://www.theatlantic.com/photo/2014/12/ten-years-since-the-2004-indian-ocean-tsunami/100878/

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WA tsunami every decade

WA experiences a tsunami on average once every 10 years, according to historical records dating back to 1838.

More than 100 people needed rescuing near Perth in 2004.

Goff, J., & Chagué-Goff, C. (2014). The Australian tsunami database: A review. Progress in Physical Geography: Earth and Environment, 38(2), 218–240. https://doi.org/10.1177/0309133314522282
Tsunami Effects along the Western Australian coastline https://aees.org.au/wp-content/uploads/2013/11/Gaull_WA_Tsunami.pdf

Prendergast, A. L., and N. Brown. "Far-Field Impact and Coastal Sedimentation Associated with the 2006 Java Tsunami in West Australia." Natural Hazards 60, no. 1 (January 2012): 69–79. https://doi.org/10.1007/s11069-011-9953-y.

DFES roles and responsibilities

As the Hazard Management Agency for tsunamis, the Fire and Emergency Services Commissioner is responsible for the management of the adverse effects of a tsunami emergency across the full **prevention, preparedness, response and recovery** (PPRR) spectrum

Emergency Management Regulations 2006 regulation 17(2).

Tsunami **inundation modelling and mapping**
Participate in local and regional tsunami **planning**

State Hazard Plan Tsunami, Appendix C, Roles and Responsibilities

GOVERNMENT OF WESTERN AUSTRALIA | DFES Department of Fire & Emergency Services | FOR A SAFER STATE

WA Tsunami Inundation Modelling Project

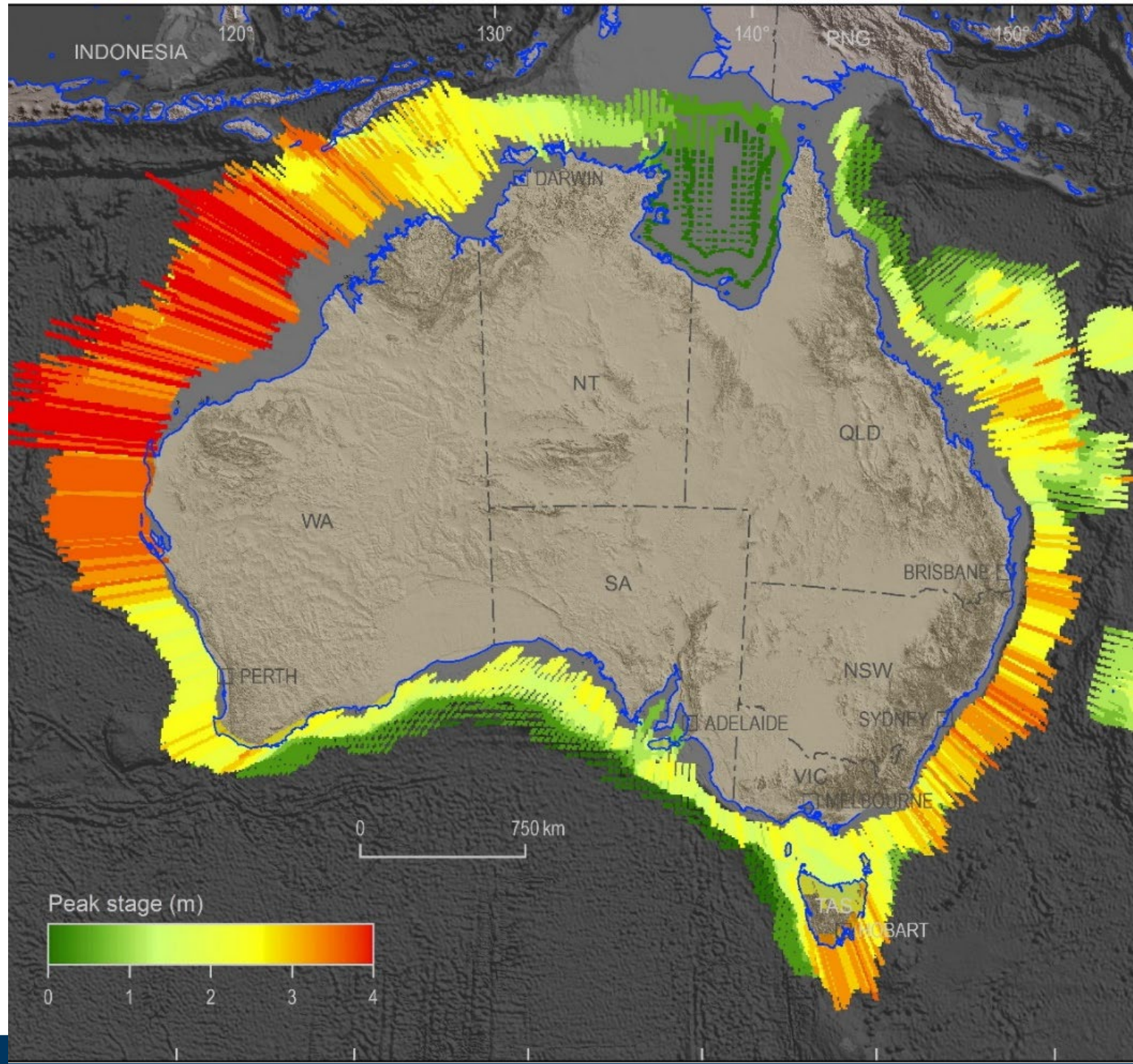
Developing science-informed tsunami evacuation maps to ensure WA communities are better prepared.

GOVERNMENT OF WESTERN AUSTRALIA | DFES Department of Fire & Emergency Services | FOR A SAFER STATE

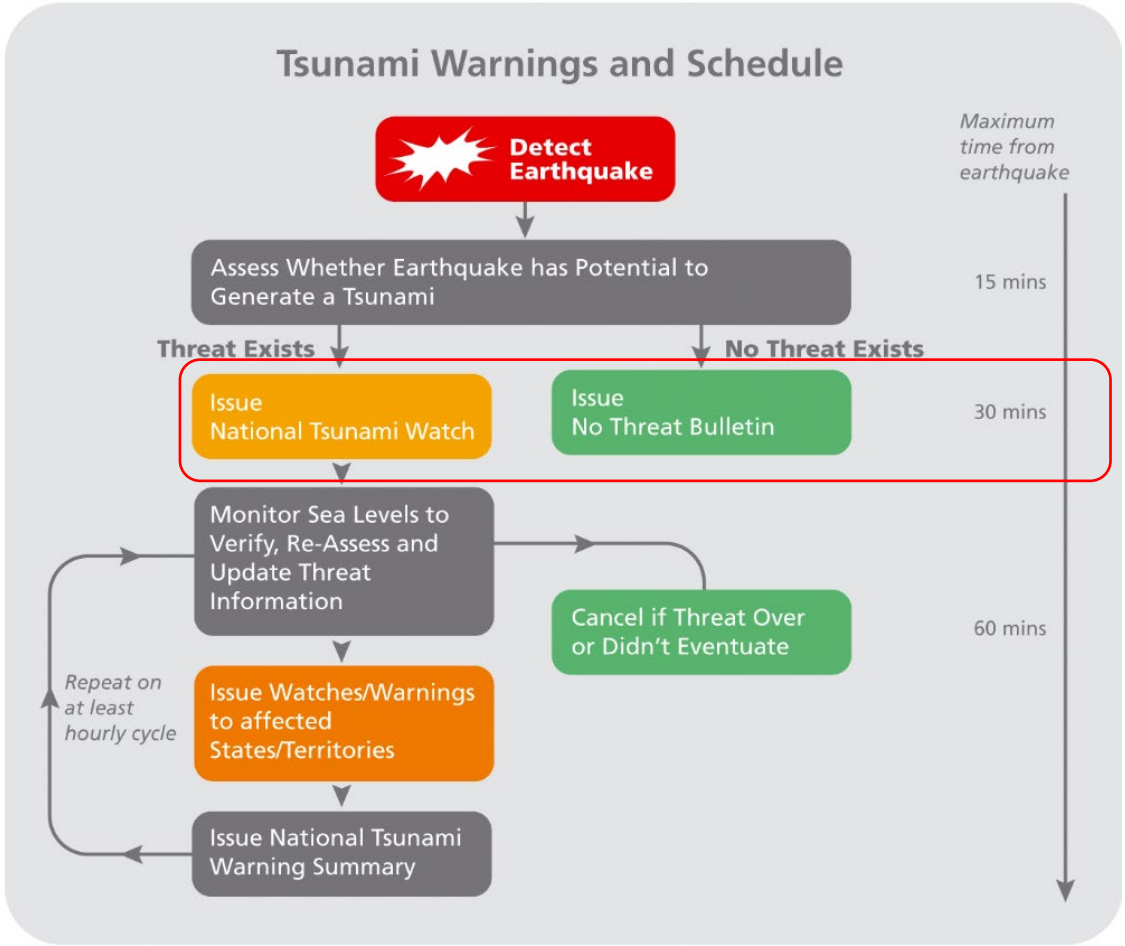
Knowledge of earthquake-generated tsunami hazard before the Project.

WA has Australia's highest offshore earthquake-generated tsunami hazard.

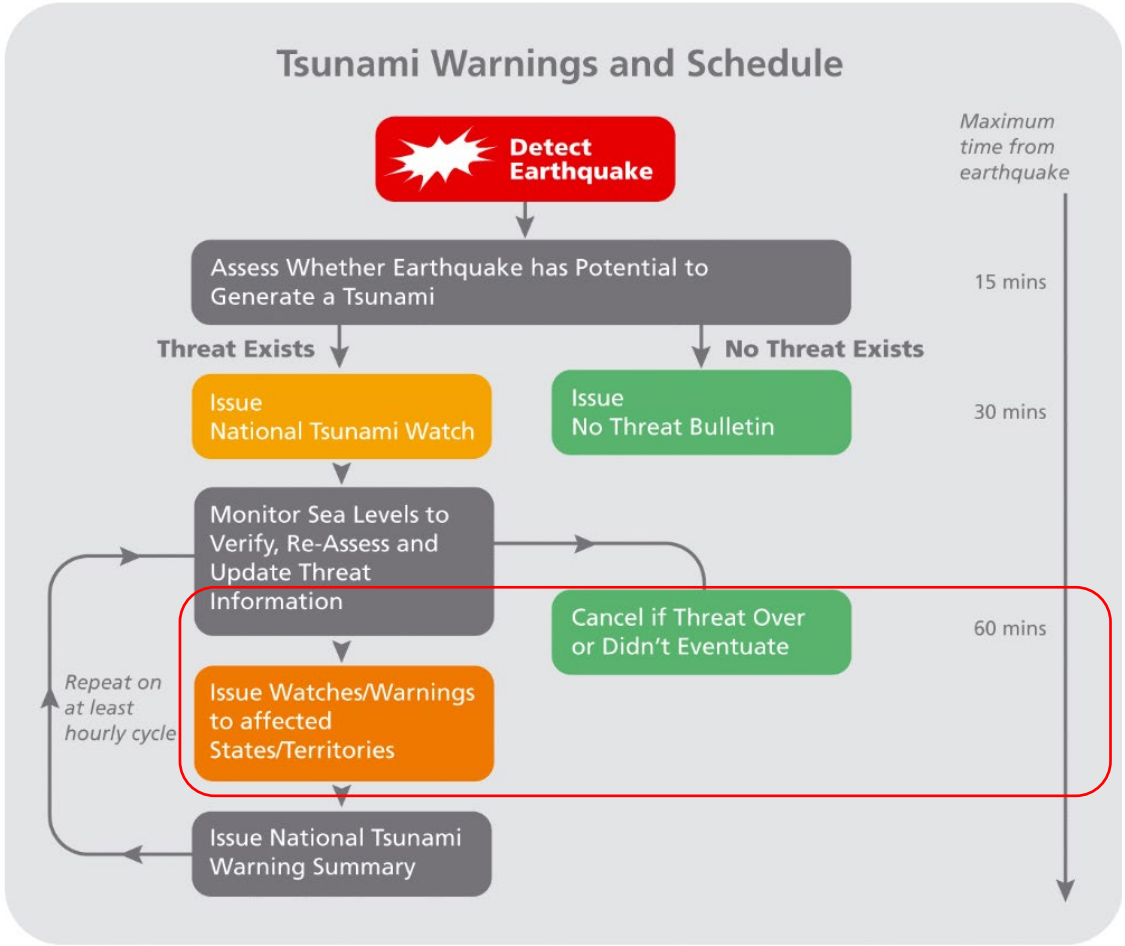
No detailed tsunami evacuation maps.



Joint Australian Tsunami Warning Centre (JATWC) Warnings and Schedule



Joint Australian Tsunami Warning Centre (JATWC) Warnings and Schedule



GOVERNMENT OF WESTERN AUSTRALIA | DFES Department of Fire & Emergency Services | FOR A SAFER STATE

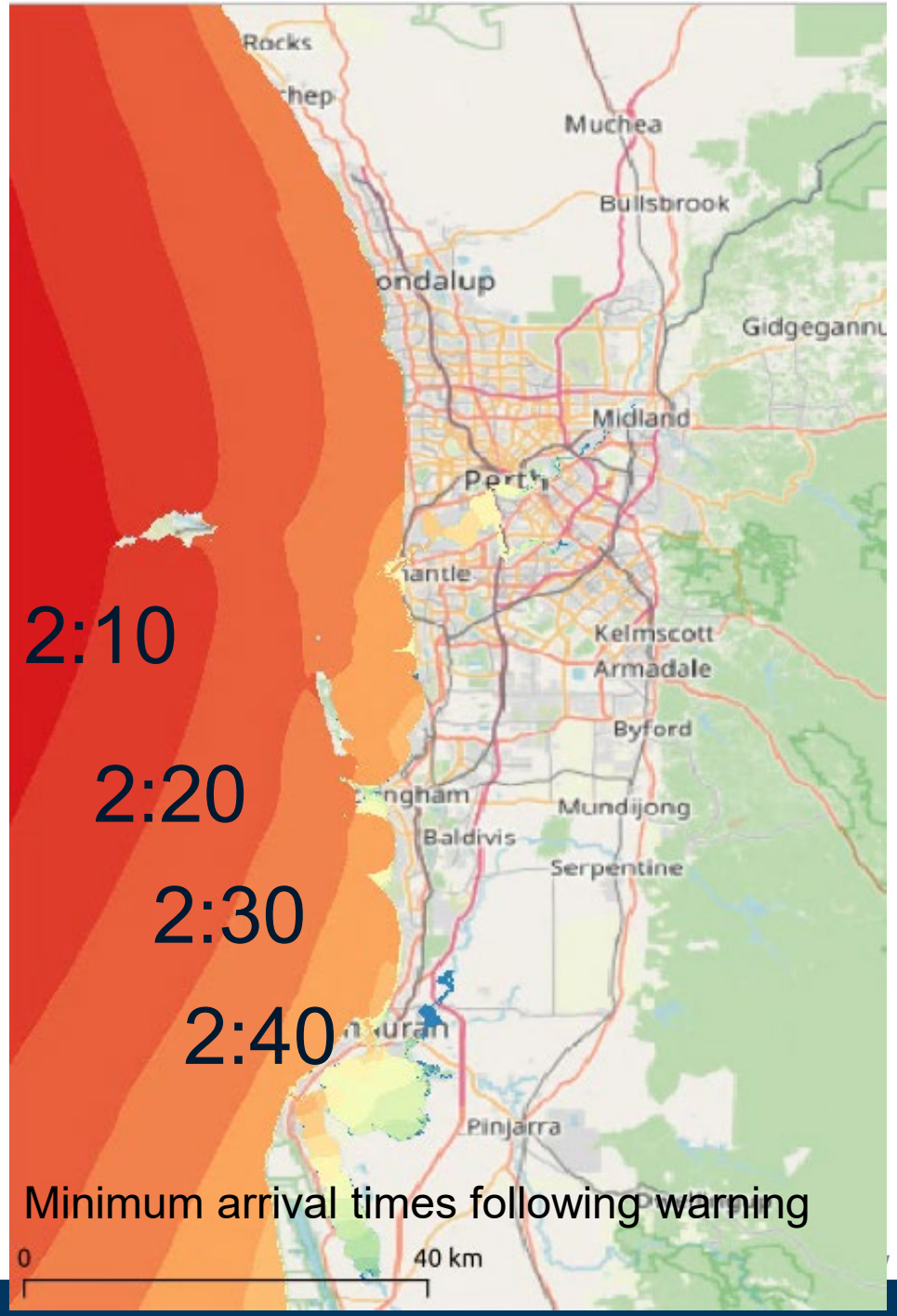
What will you do?

JATWC issues a tsunami land warning for the Metro regions due to an earthquake near the south coast of Indonesia.

Following this warning, in the mainland Metropolitan regions, DFES has as little as:

- **2 hours and 30 minutes before marine impacts**
- **3 hours before land inundation**

Dangerous waves may last more than a day.



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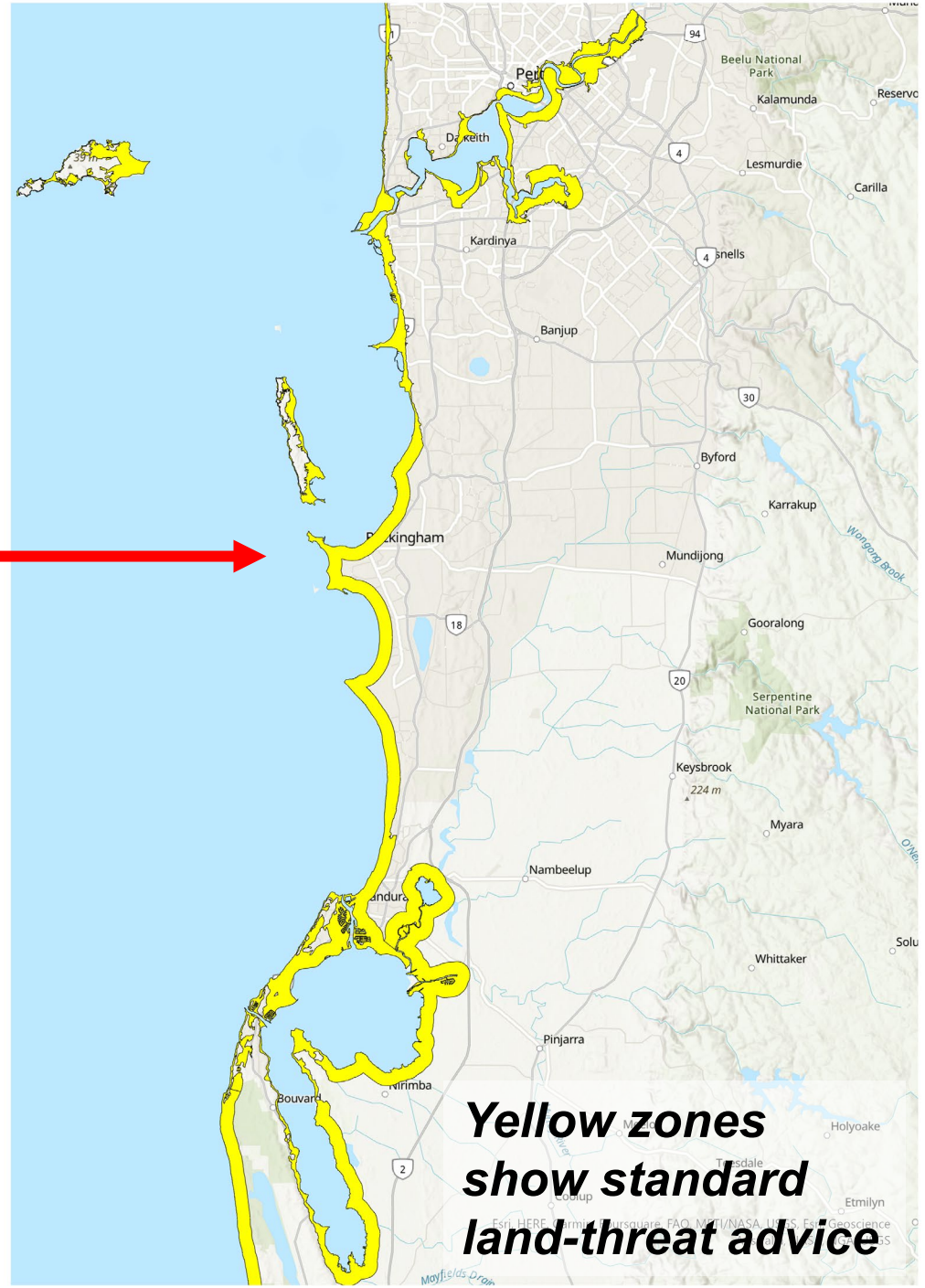
What will you do?

Current land-threat advice

- 10+ m up or 1 km inland
- Handbook describes this as “rule of thumb”

In the Perth Metro area, evacuation of at least:

- 100,000 estimated residents, plus additional people, including workers, tourists at the beach and coastal entertainment areas
- 22 schools
- 15 Nursing and Retirement Homes
- 1 Public Hospital



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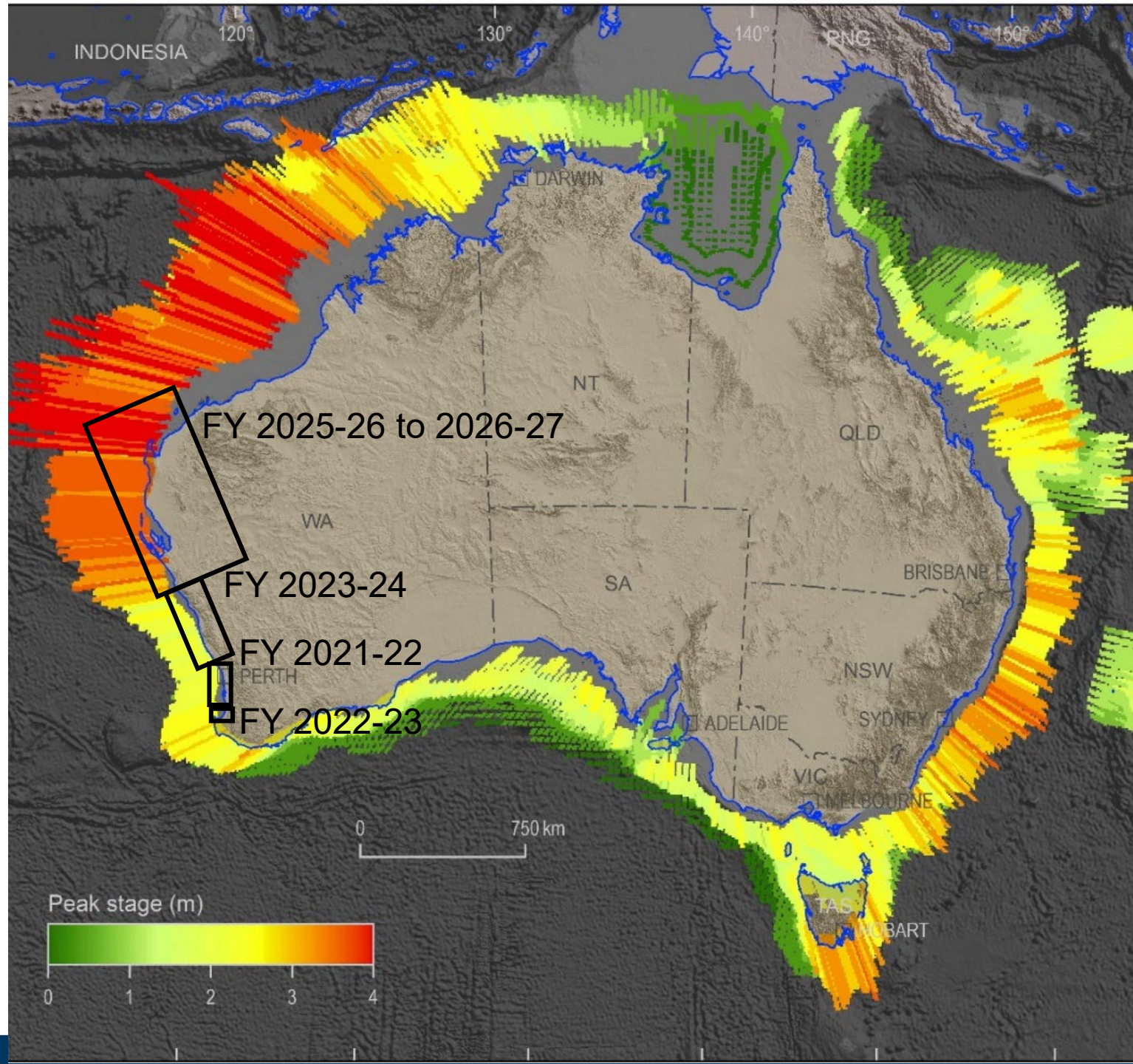
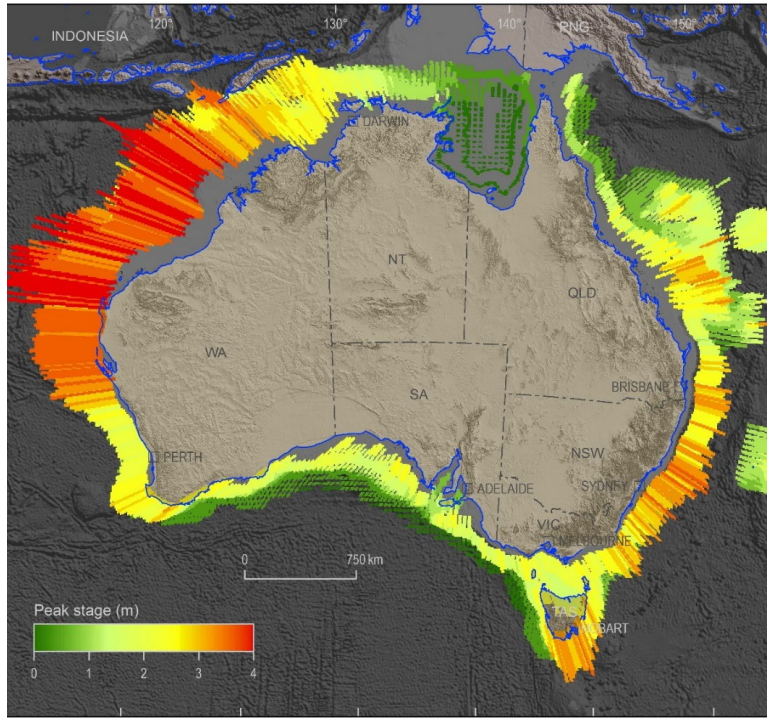
Australia's most extensive tsunami evacuation maps informed by high-resolution modelling.

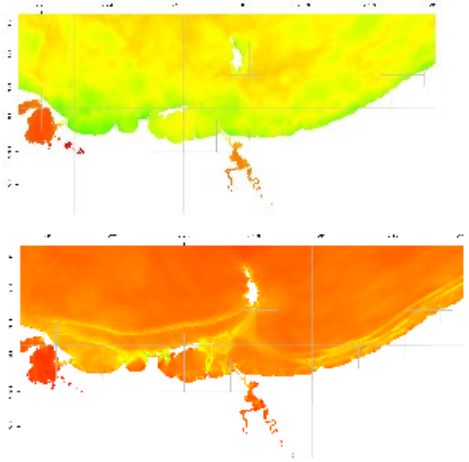


GA modelled onshore tsunami hazards

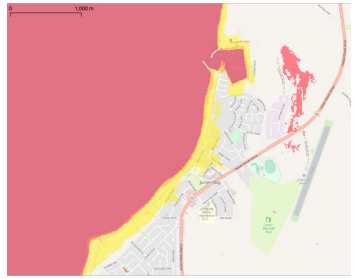
PTHA18
Only considers earthquake-tsunami scenarios near the south coast of Indonesia **~130,000**



High-res model
(Sampled 390 scenarios)
- Depth
- Flow speed
- Arrival time
- Wave time-series

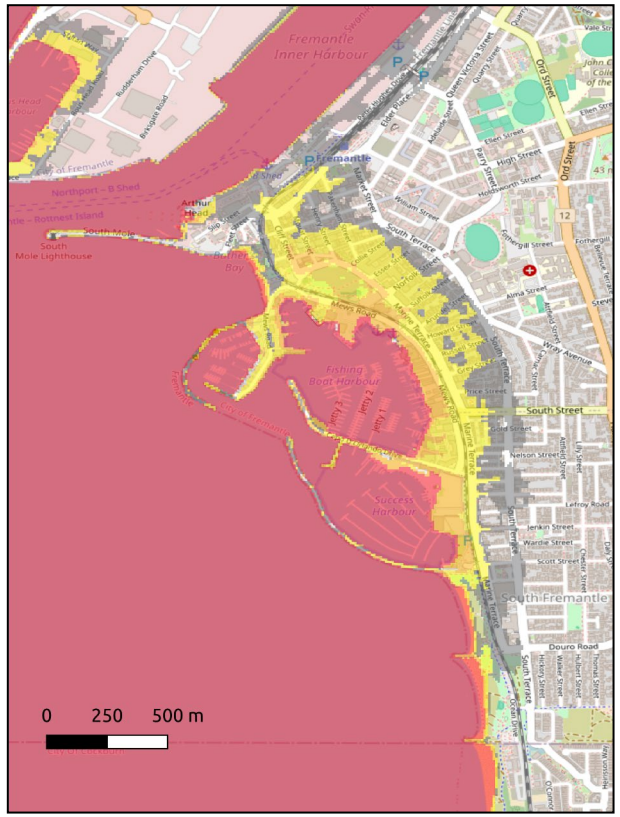


High-res frequency
- Frequency of inundation
- E.g average return interval
- With uncertainties

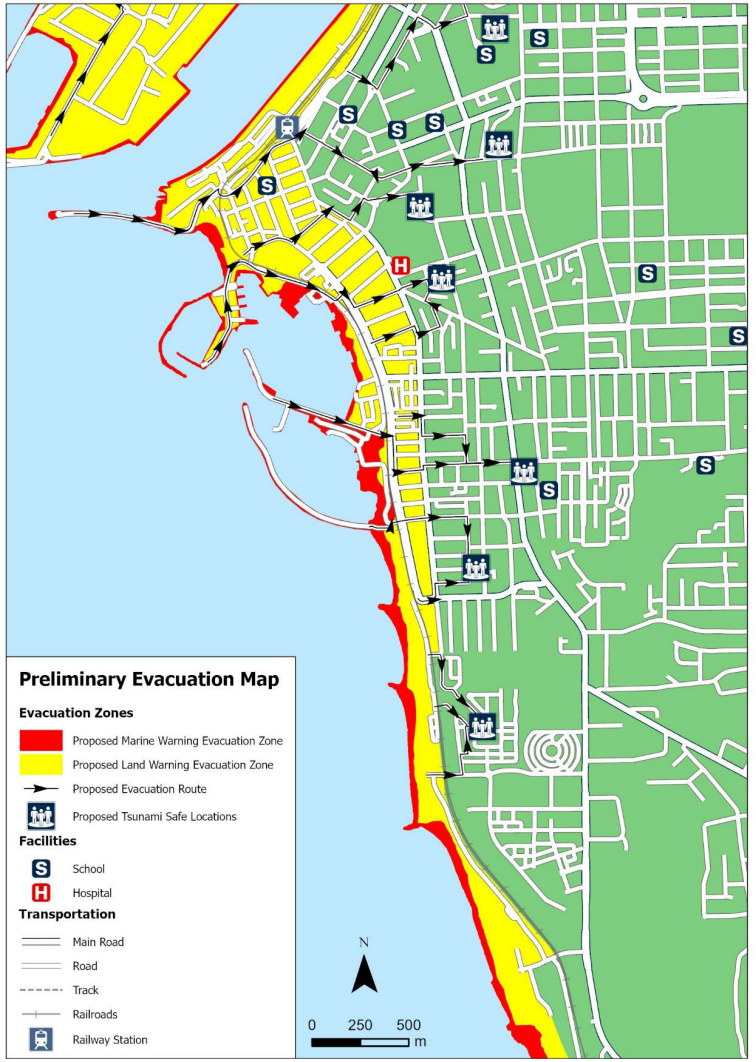


From models to evacuation zones

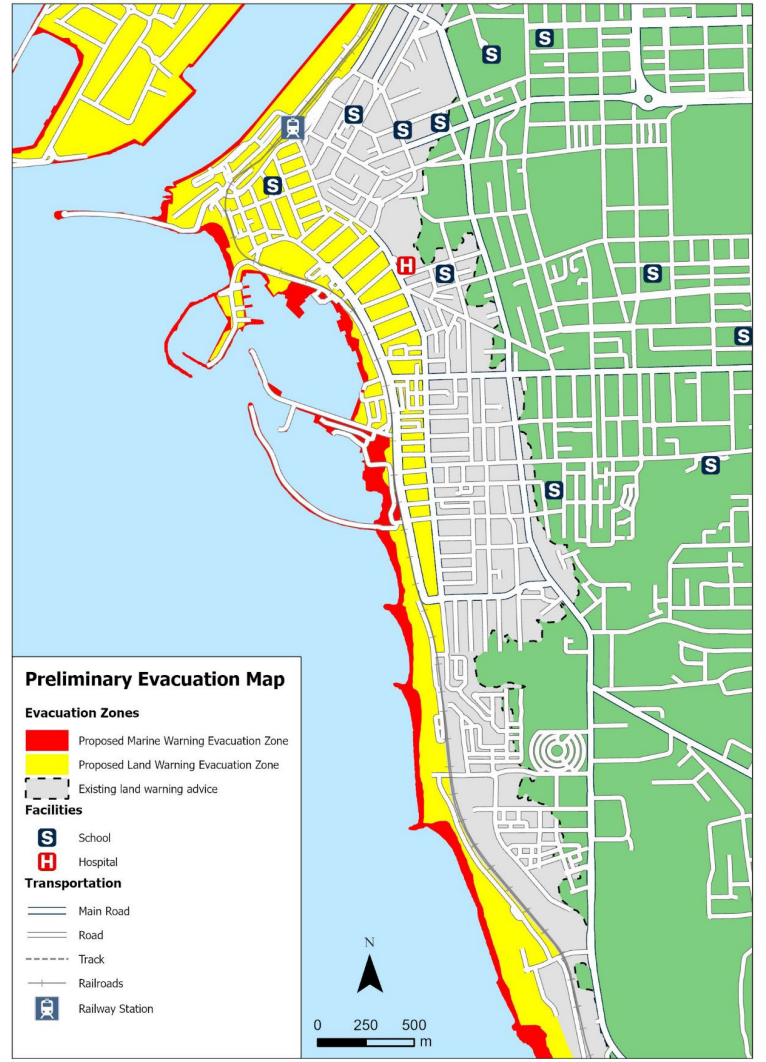
Modelled zones



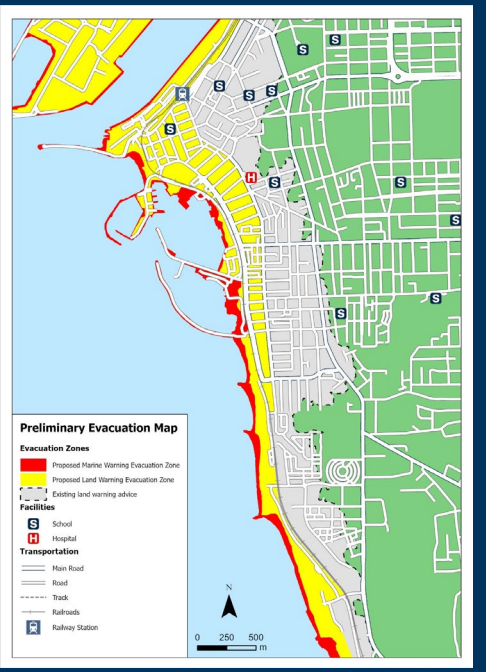
Science-informed evacuation zone



Comparison with existing 10 m up / 1 km inland



Compare proposed and existing evacuation zones



At least an 80% reduction in people and vulnerable facilities in Metro area

	Proposed	Existing
	Science informed	Rule of thumb
Estimated residents	Less than 20,000	Over 100,000
Schools	2	22
Nursing and Retirement Homes	3	15
Public Hospital	0	1

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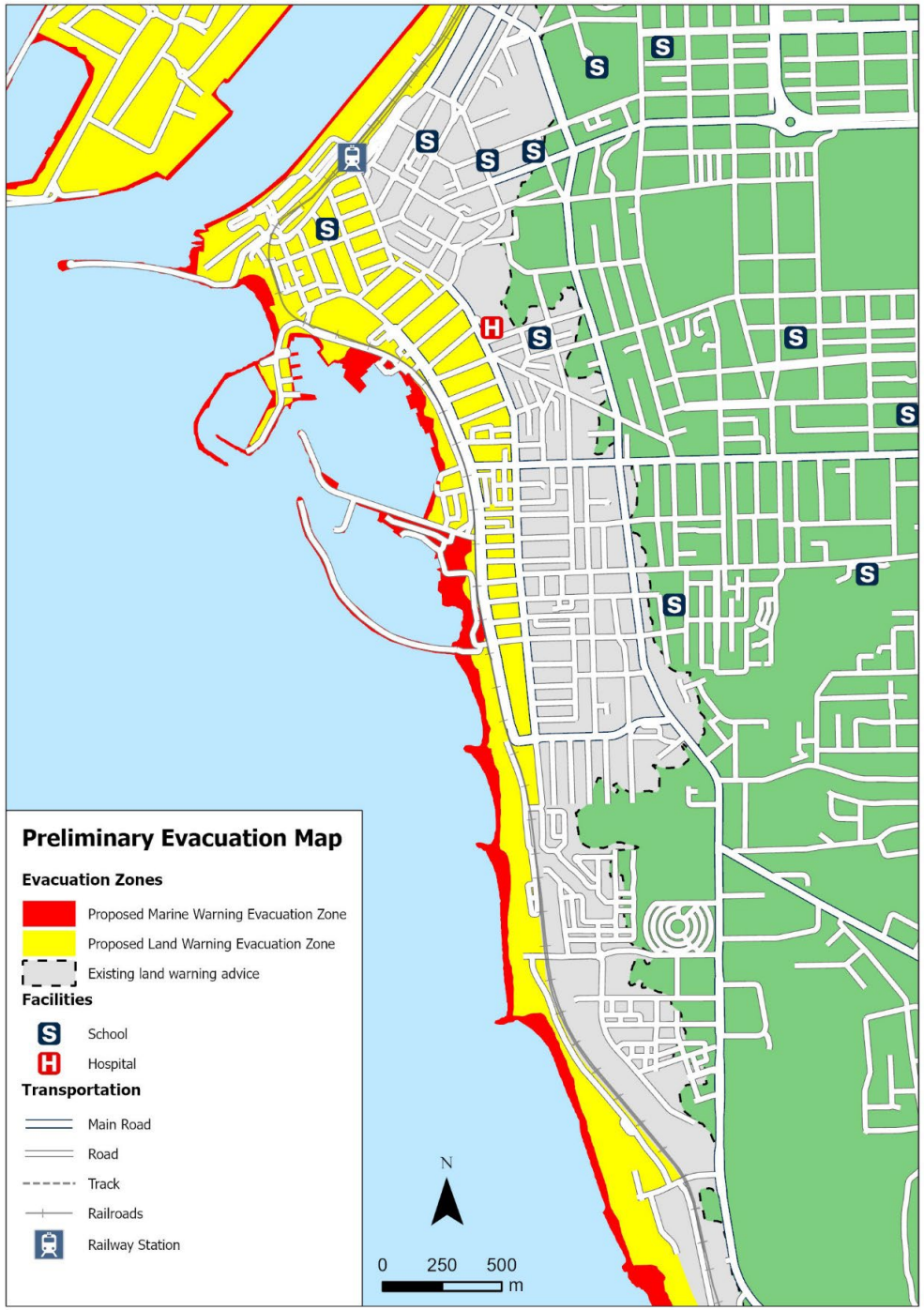
Reduce over-evacuation risks

- Enable DFES to prioritise and warn a longer stretch of the coastline with current systems
- Reduce extra people to manage during an evacuation
- More targeted communications and planning for those in the evacuation zone



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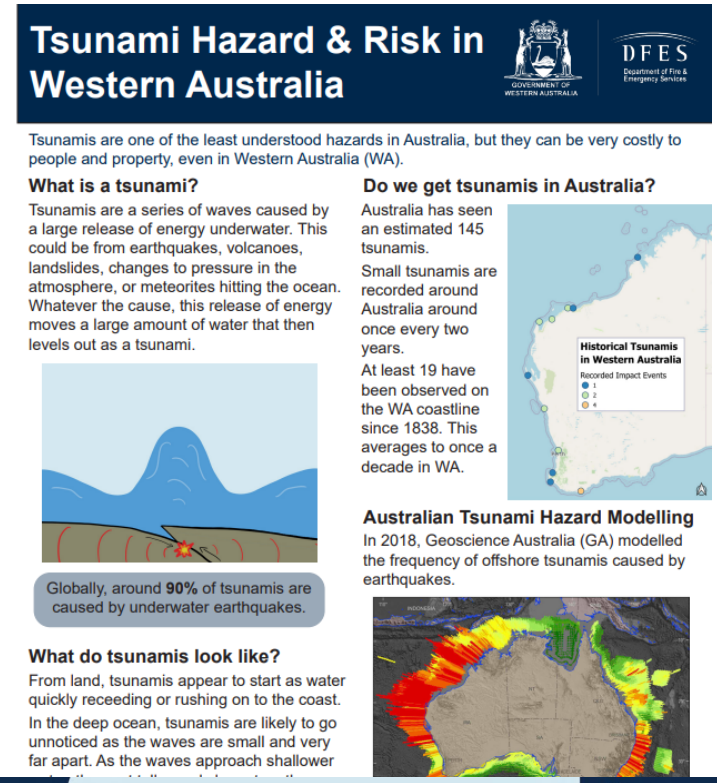
Next steps

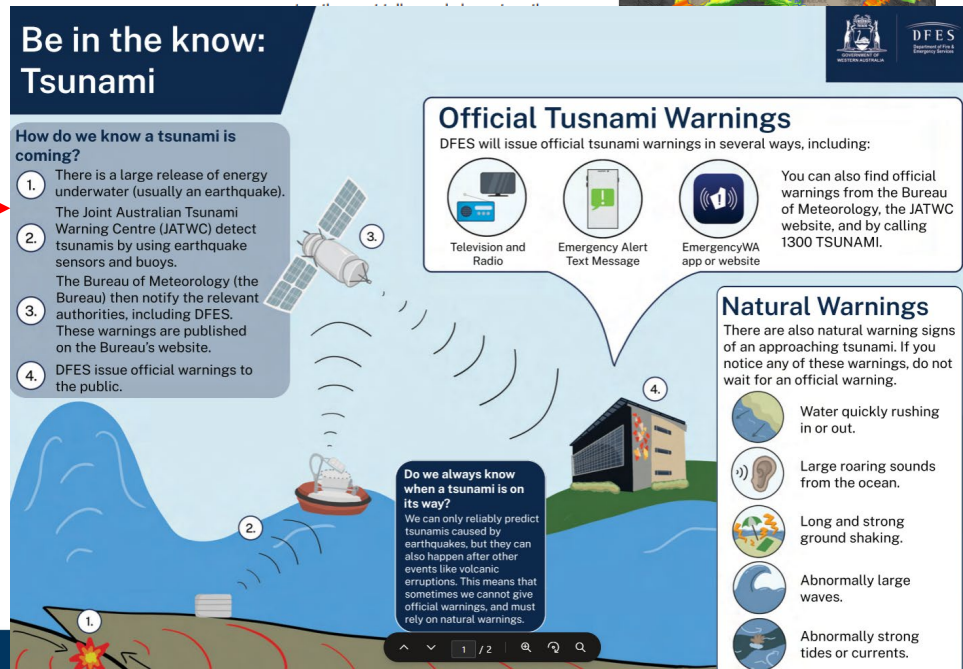
1. **DFES awareness of evacuation maps**
   - Available in DFES operational viewer

2. **Broadcasting of evacuation maps - Public**
   - Integration into *Emergency WA*

3. **Tsunami awareness products**

4. **Communications strategy for tsunami**





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Next steps

5. Integrating mitigation activities into land use planning.

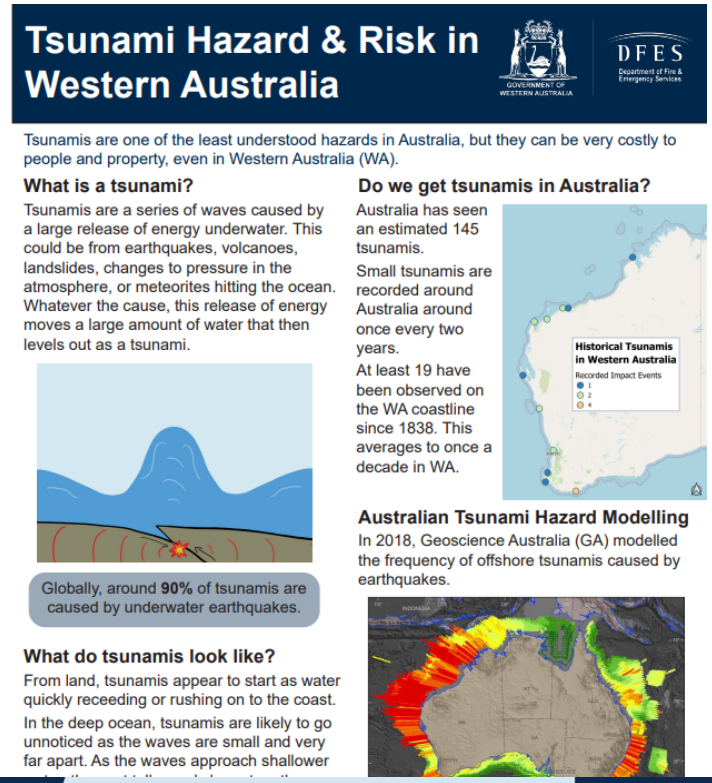
- Provide inundation modelling products to inform land use planning

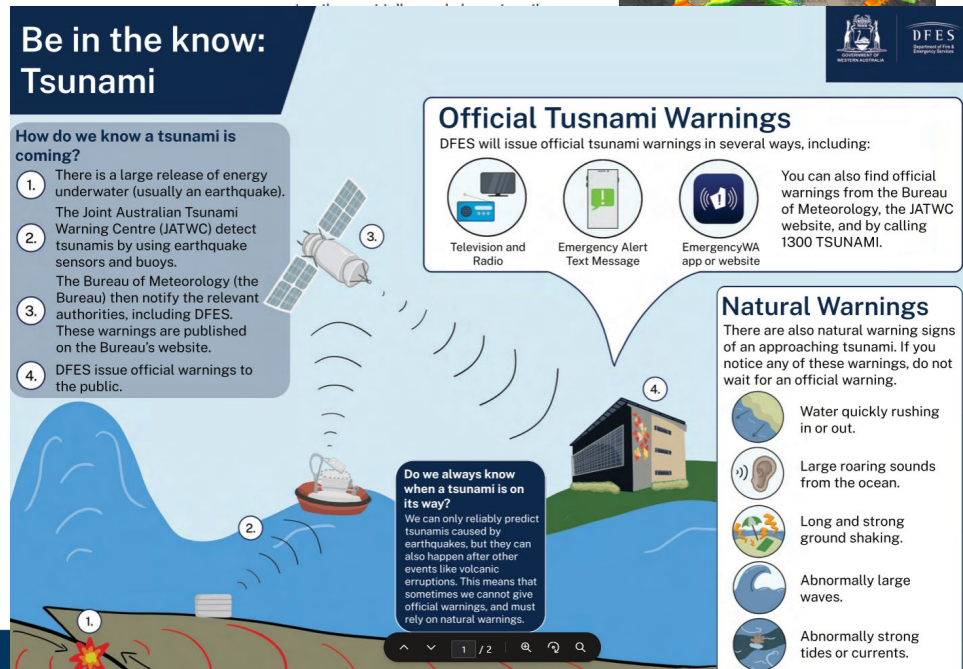
6. Exercises

- Exercises at local, district and State/Multiagency levels

7. Develop recommendations for plans and procedures

- Updating existing plans, policies and procedures
- Embedding mapping updates into business processes
- Capability gaps are informed by response actions in the Handbook.





More information

Science-informed risk reduction for earthquake-generated tsunamis in Western Australia

https://knowledge.aidr.org.au/media/11339/ajem-2024-04_18.pdf

Geoscience Australia's report, *WA Tsunami Inundation Modelling, Geraldton to Dunsborough*

https://doi.org/10.26186/150015

The catastrophic tsunami that hit Japan on March 11th, 2011

Q&A

Don’t forget to put your questions in the Q&A function.

Australian Government
National Emergency Management Agency
Australian Institute for Disaster Resilience

Event concludes

Thank you for attending today's webinar.

Next webinar:

Resilience Matters webinar series: The ethical premise of disaster management leadership

Wednesday 12 November 2025, 1.00pm-2.00pm AEDT

Register now.

Australian Government
National Emergency Management Agency

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AIDR HANDBOOK SHOWCASE | WEBINAR SERIES

Tsunami emergency planning in Australia

WEDNESDAY 5 NOVEMBER 2025 | 1.00PM - 2.00PM AEDT