

# Science Advice for Decision-making in Responses to Natural Hazards Event – Some Lessons Learnt



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Co-opted onto PM Chief Science Advisor's Forum for natural hazards and risks

QuakeCoRE, 9 December 2020



# A personal journey

The stories I will tell:

- Different challenges presented by natural hazards events
  - What have I learnt?
  - Where to next?

What I can't talk about: Whakaari

# **Step 1 – Montserrat, West Indies. 1996-2005. A steep learning curve.**



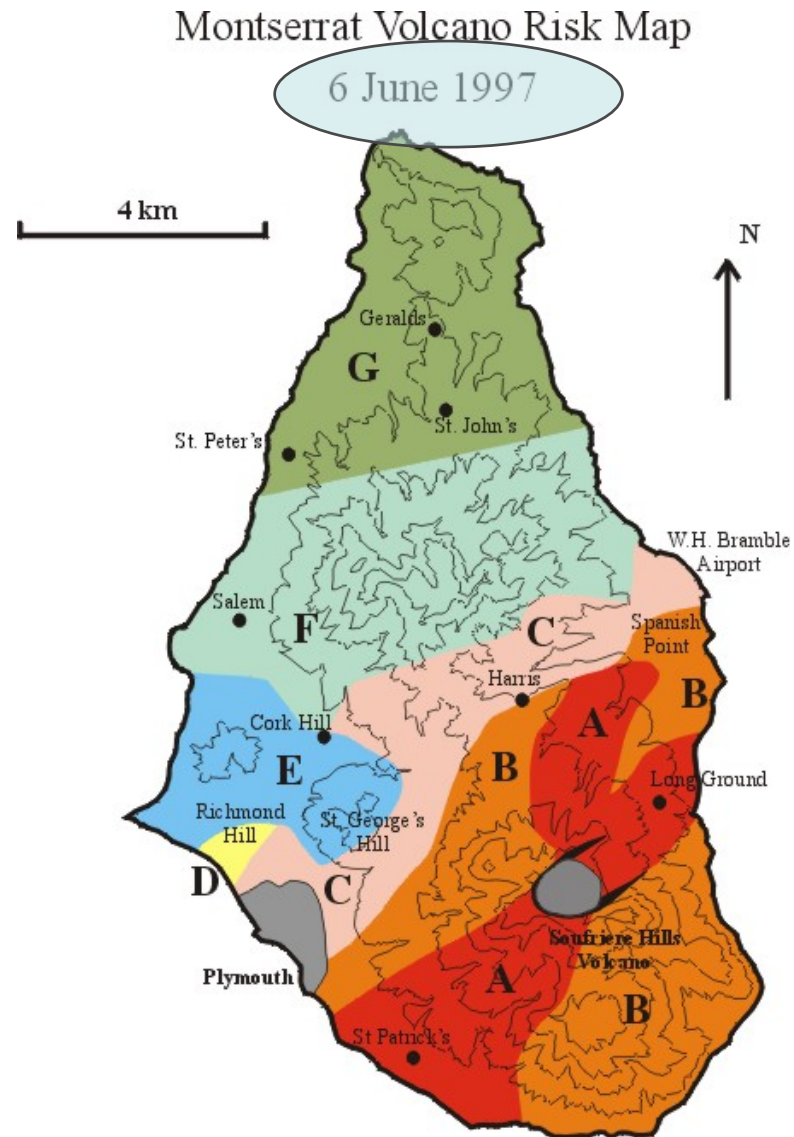
# What I learnt along the way



**The importance of teamwork and diversity –  
and recognising and understanding different perspectives**

# What I learnt along the way

A first lesson in uncertainty – how safe  
is “safe”?

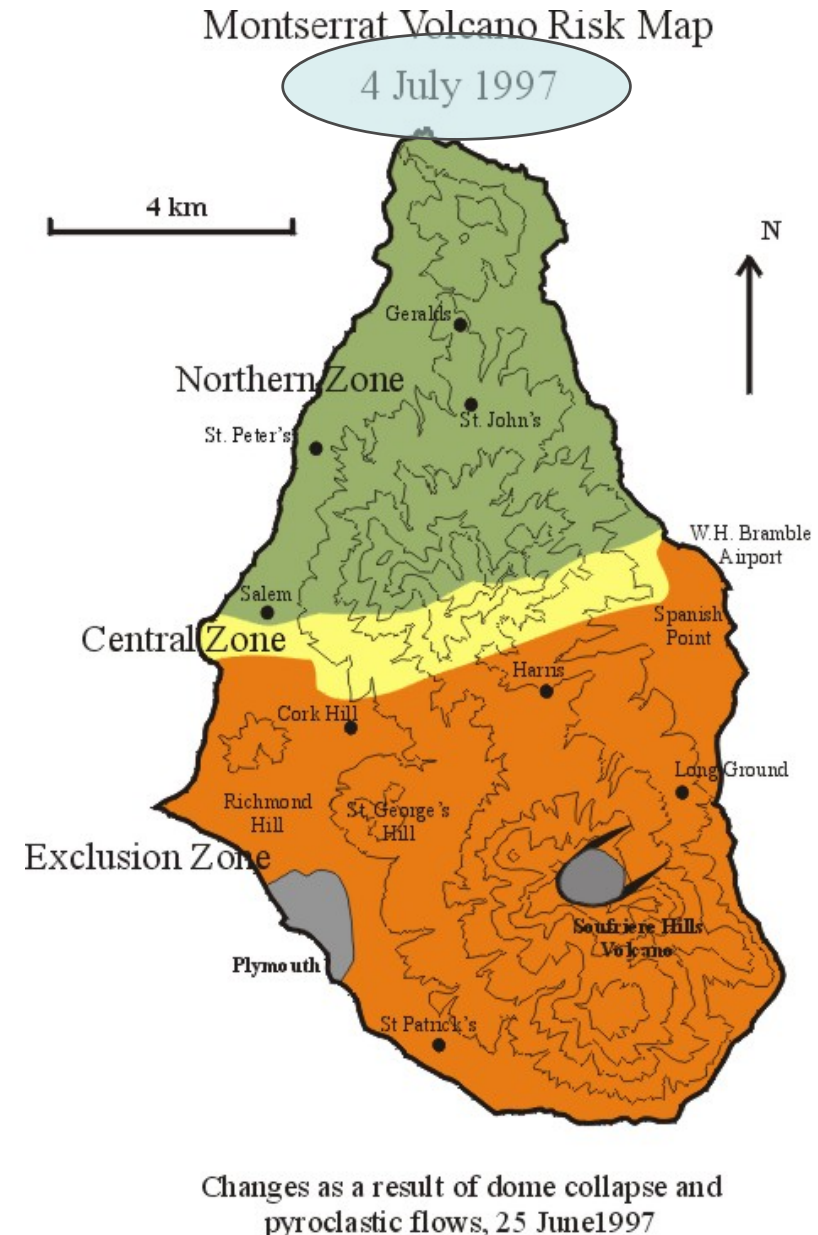


Changes as a result of pyroclastic flows  
down the north flank, early June 1997

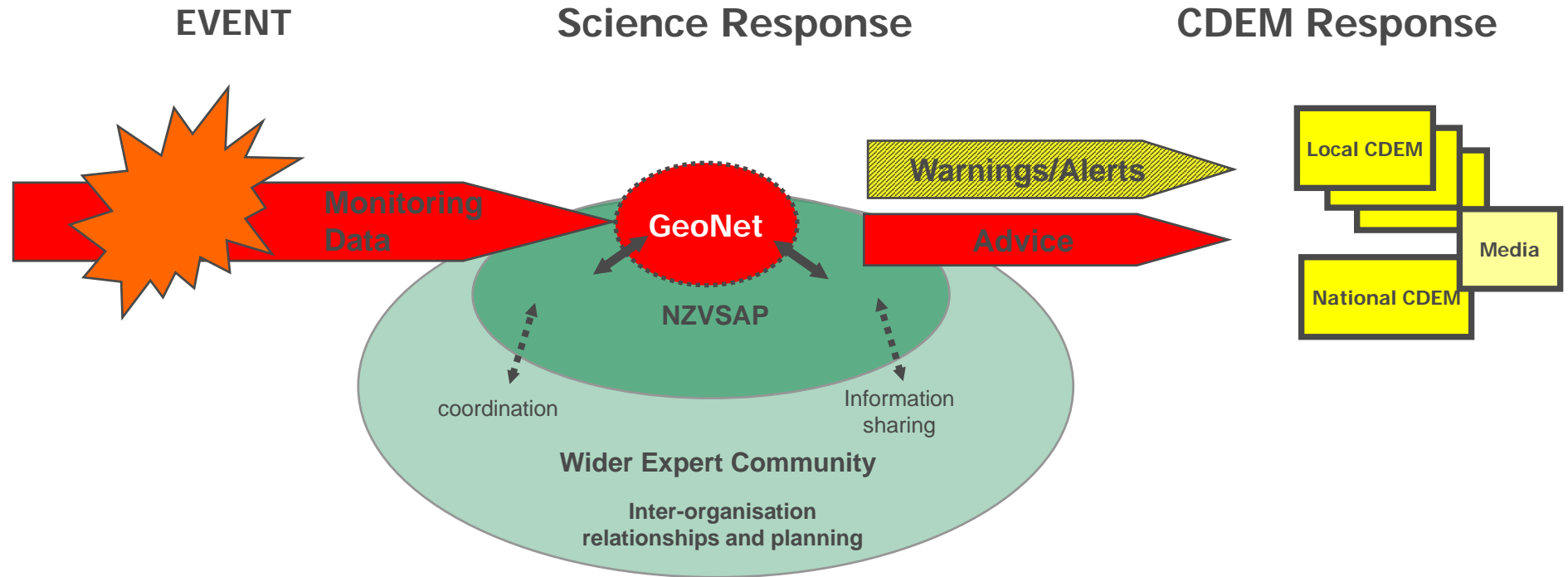
# What I learnt along the way

**A first lesson in uncertainty – how safe  
is “safe”?**

**The development of a Science Advisory  
Group to bring different expertise  
together – both for rapid response and  
for more considered long term advice**

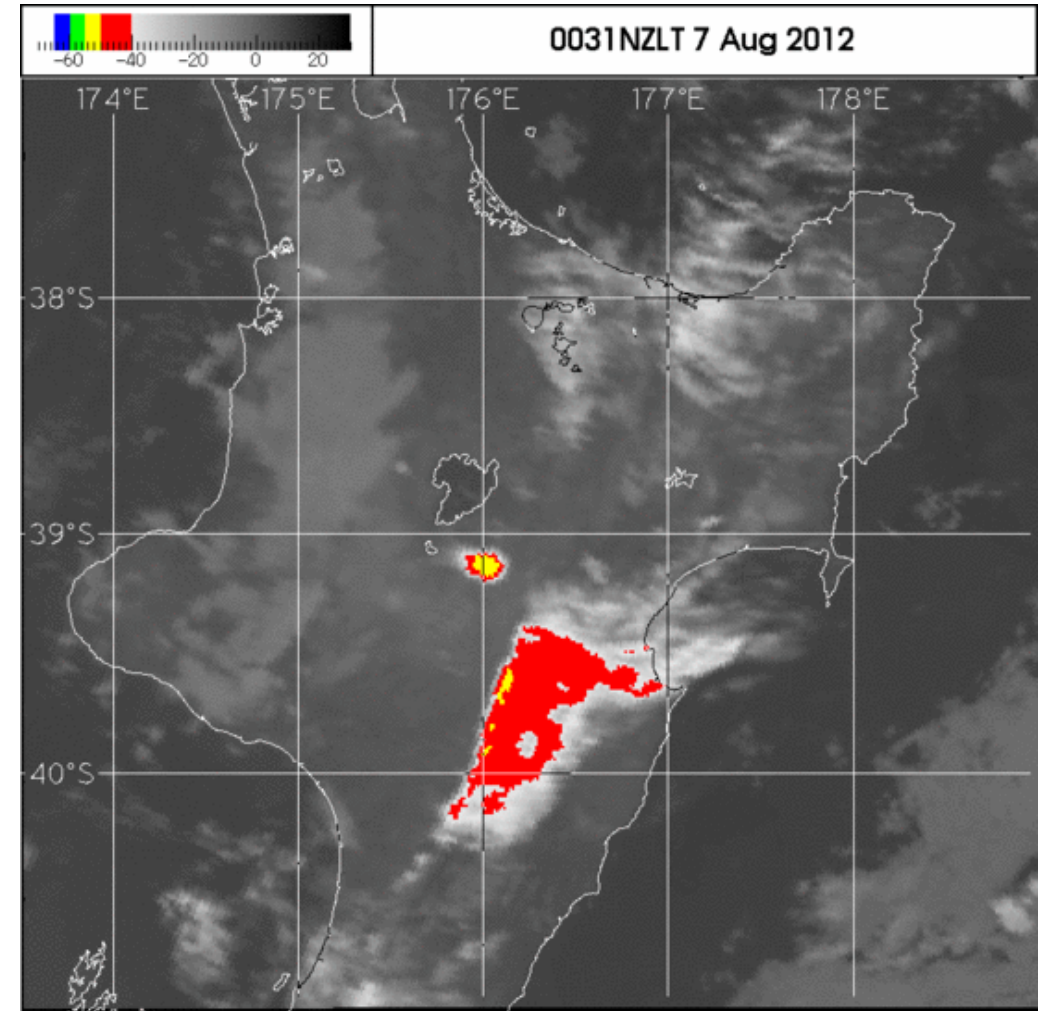
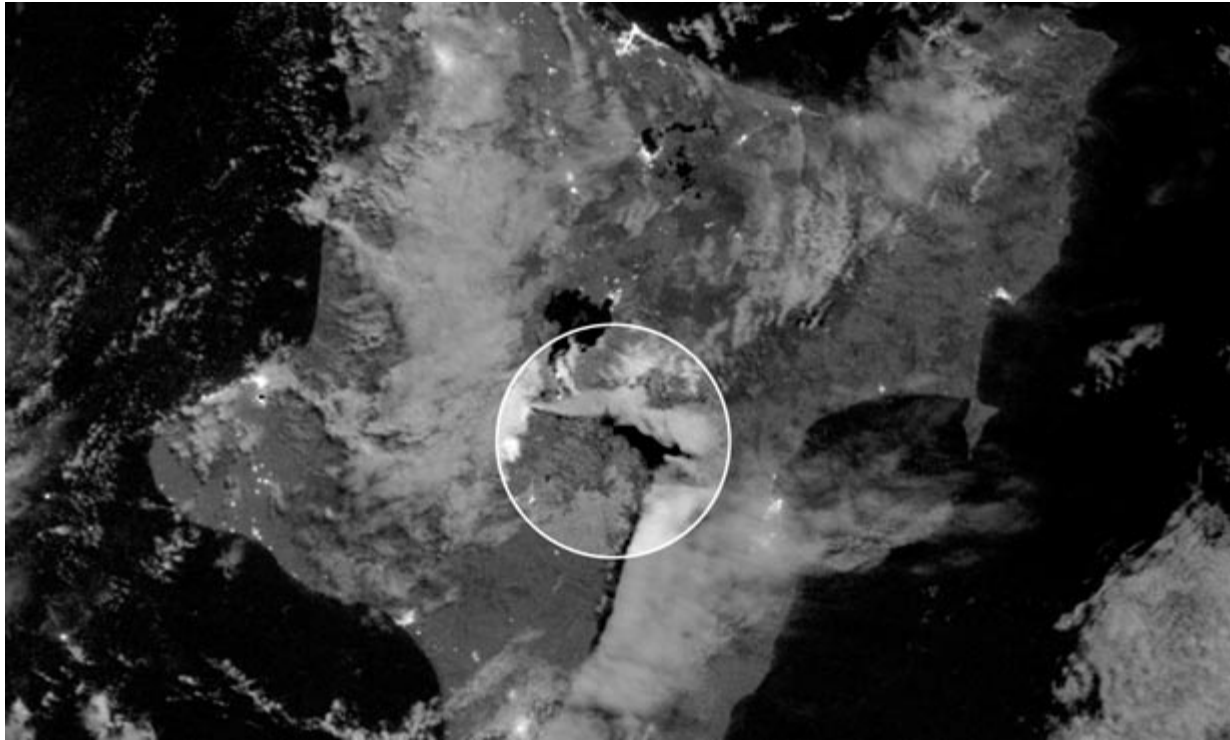


# Step 2. Move to New Zealand: 2006



- Working with MCDEM (Richard Smith) to develop the NZVSAP concept (2008-12). Initial ToRs discussed by early 2012

# Te Maari (2012) eruption



# Eruption impacts

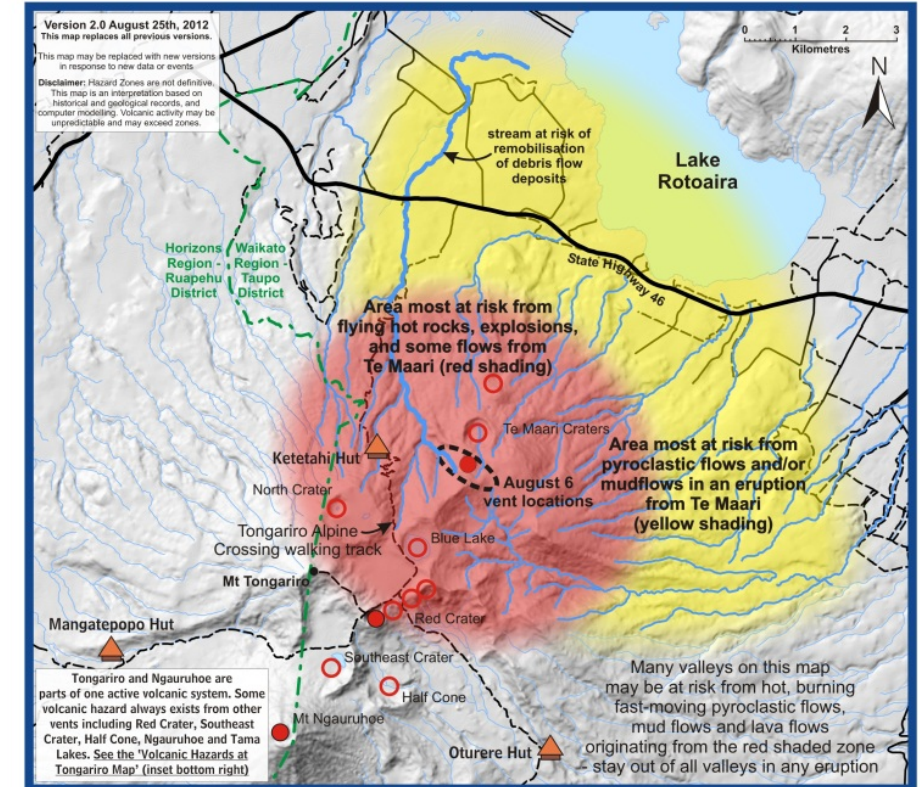


# What I learnt along the way

## Importance of co-ordination, communication and risk management NZVSAP in action

- Ash collection and analysis
- Map production
- Hui with Ngati Hikairo

### TE MAARI ERUPTION PHENOMENA



#### WHAT TO DO!

If there are any signs of an eruption (earthquakes, rumbling, ash-steam cloud or flying rocks):

- Seek immediate shelter from flying rocks if an explosion occurs.
- Move as quickly as possible off the mountain away from the Summit and Flow Hazard Zones.
- Stay on ridges, out of valleys and out of the yellow flow hazard zone - move away from the eruption vent.
- Know where the safer areas are (ridge lines outside of the coloured Summit and Flow Hazard Zones).

#### VOLCANIC HAZARDS

##### SUMMIT HAZARDS

- During an eruption there may be gas, flying rocks and flows from recent or new eruption vents, especially within the red shaded Summit Hazard Zone. This zone includes Ketetahi Hut.

##### PYROCLASTIC FLOWS & MUDFLOWS

- Eruptions may generate very hot pyroclastic flows of ash, rock and gas (burning ground-hugging clouds). They also generate mud flows. Both move down slopes very fast - High risk in the yellow shaded 'Flow Hazard Zone' and part of the red shaded 'Summit Hazard Zone'

##### LAVA FLOWS

- Lava flows of molten rock are very hot but do not move as fast as pyroclastic flows.

##### ASH FALL & LIGHTNING

- Any place on this map is at risk from ash fall in an eruption - this will obscure vision and make it hard to breathe, but is non-lethal. Lightning may occur in eruptions and can be lethal.



Central Plateau  
Volcanic Advisory Group  
Main agencies involved in this map:



# What I learnt along the way



**Working with stakeholders to build trust**

# Step 3 – Earthquakes and tsunami. Kaikōura. Advice to government.



# What I learnt along the way

Evolving data and different  
needs for information

How the research community  
collaborated, co-ordinated and  
communicated

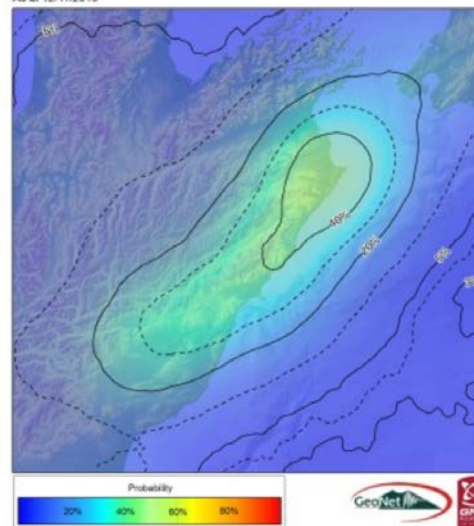
Enormous goodwill

## Aftershock shaking forecasts

We have also calculated the probability of strong and severe earthquake shaking from aftershocks over the [Modified Mercalli Intensity \(MMI\) scale](#). Strong shaking is classed as MM6, and severe as MM7. The MMI scale describes the intensity and impacts of the shaking, which depend on the magnitude of the earthquake, how ground you are on. At MM6 intensity shaking levels, walking steadily is difficult, furniture and appliances move; glassware and crockery break; slight non-structural damage to buildings may occur. At MM7 intensity shaking levels, furniture and appliances move; contents are damaged; there is minor building damage and liquefaction can occur.

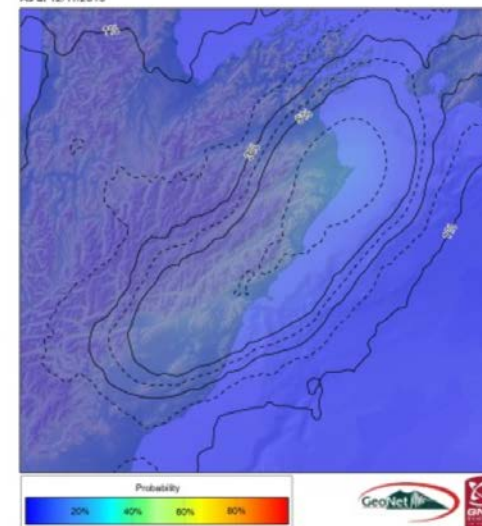
The maps show the probability of MM6 and MM7 shaking within the aftershock region, which includes Wellington. Shaking is largest around Cape Campbell with around 15%. In comparison, the probability of MM7 shaking is around 5% in the next year. While this probability is considerably lower in Wellington than in the areas around Kaikoura (15% occurred during the mainshock to happen again in Wellington).

Probability of damaging shaking (MM6) in the next year  
As at 12/11/2019



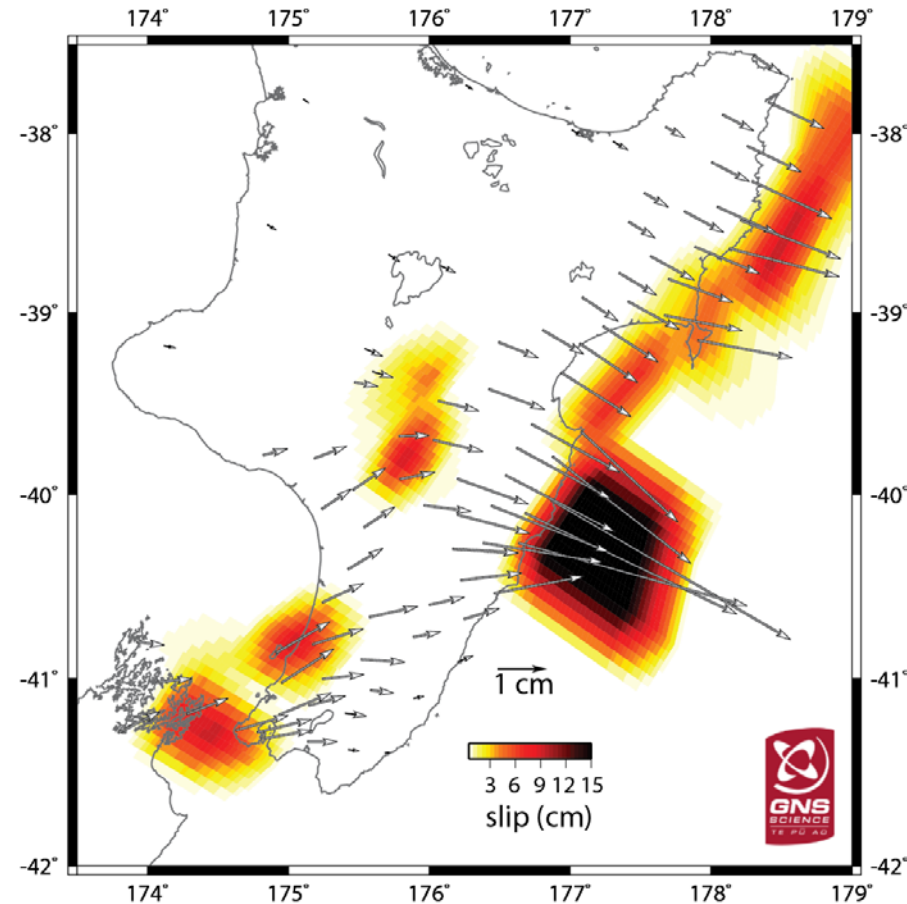
MM6 shaking corresponds with internal building damage, structural damage to a few weak buildings, and will be alarming to affected people

Probability of damaging shaking (MM7) in the next year  
As at 12/11/2019



MM7 shaking corresponds with internal building damage, structural damage to a few weak buildings, and will be alarming to affected people

# What I learnt along the way



Patches of slip on the Hikurangi subduction plate boundary beneath the North Island. This is recorded by the GeoNet and PositionZ GPS stations. GPS station movements are denoted by the arrows.

Decision makers need science as one input:  
Understand what they need, why and what they need to decide.

➤ “Free and frank advice”

# Step 4. 2018 - present

- Co-opted to join PM Chief Science Advisor's Forum

## **VISION for the role (Juliet's words!)**

a trusted, accessible bridge between scientists, society and government

## **PRINCIPLES\***

Inclusive, Rigorous, Transparent, Accessible

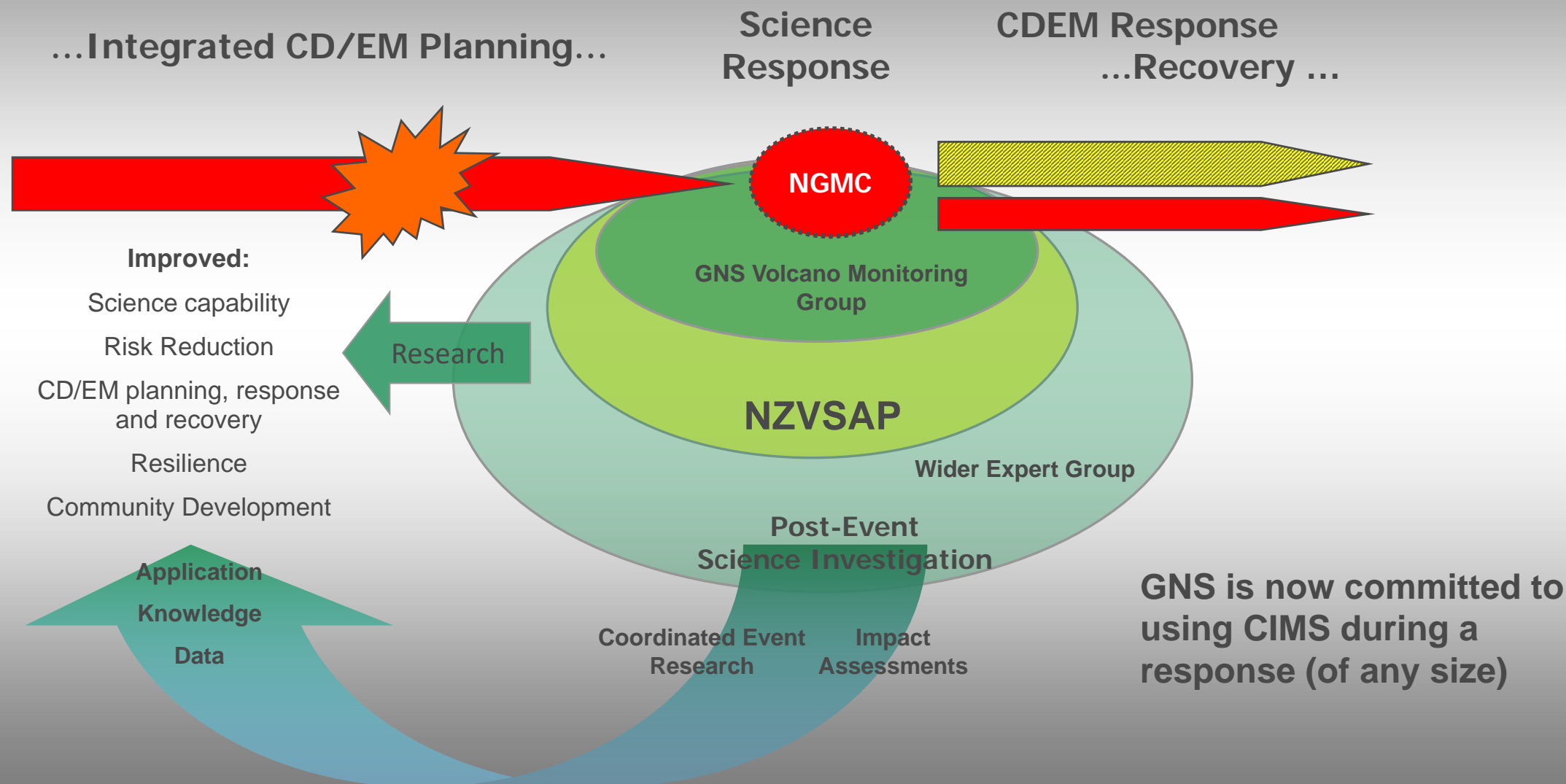
## **CHALLENGE**

Providing advice on a useful timescale

\* Nature, June 2018 : Four principles to make evidence synthesis more useful for policy

# A Vision of Coordinated, Comprehensive Science (2019)

Major Credit to Richard Smith



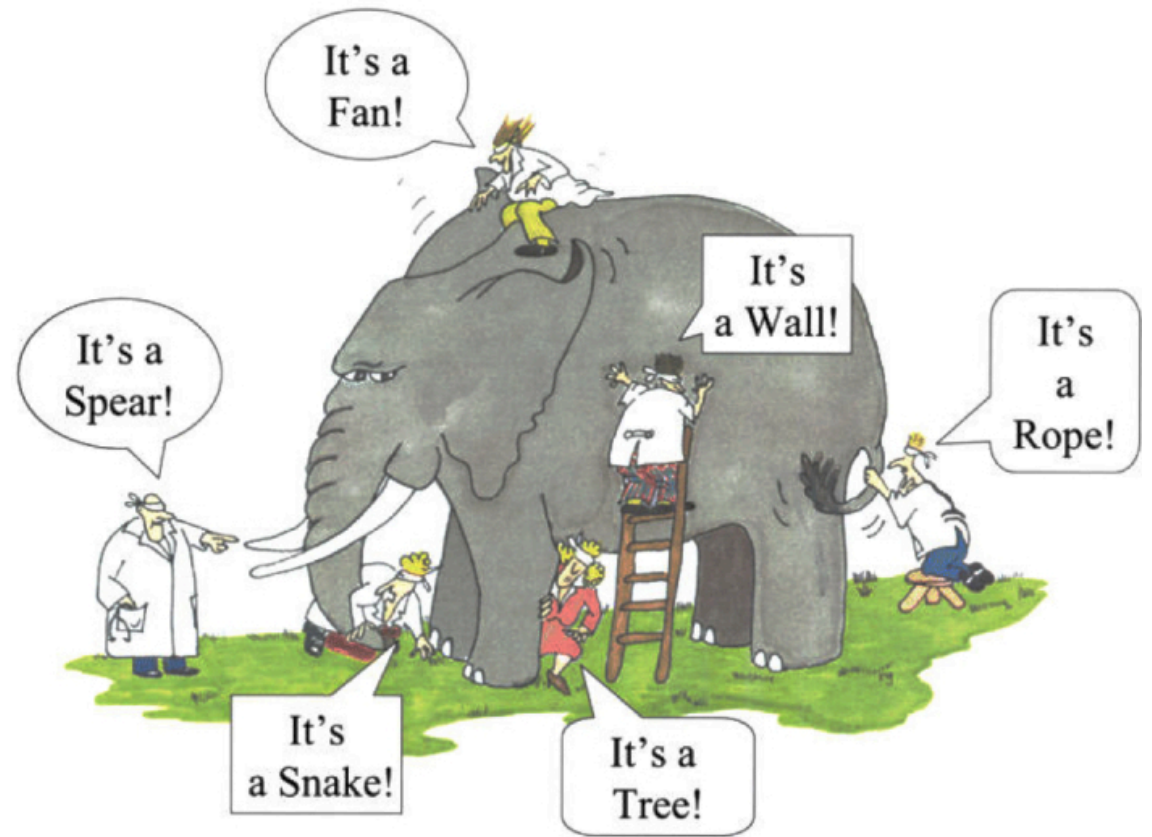
# How do we all co-ordinate, collaborate, communicate before, during and after an earthquake?

- Working with NEMA to develop Science Advisory Panels for other perils
  - Earthquake?
  - Tsunami?
  - Landslide?
- Come and have a chat after the session or email:

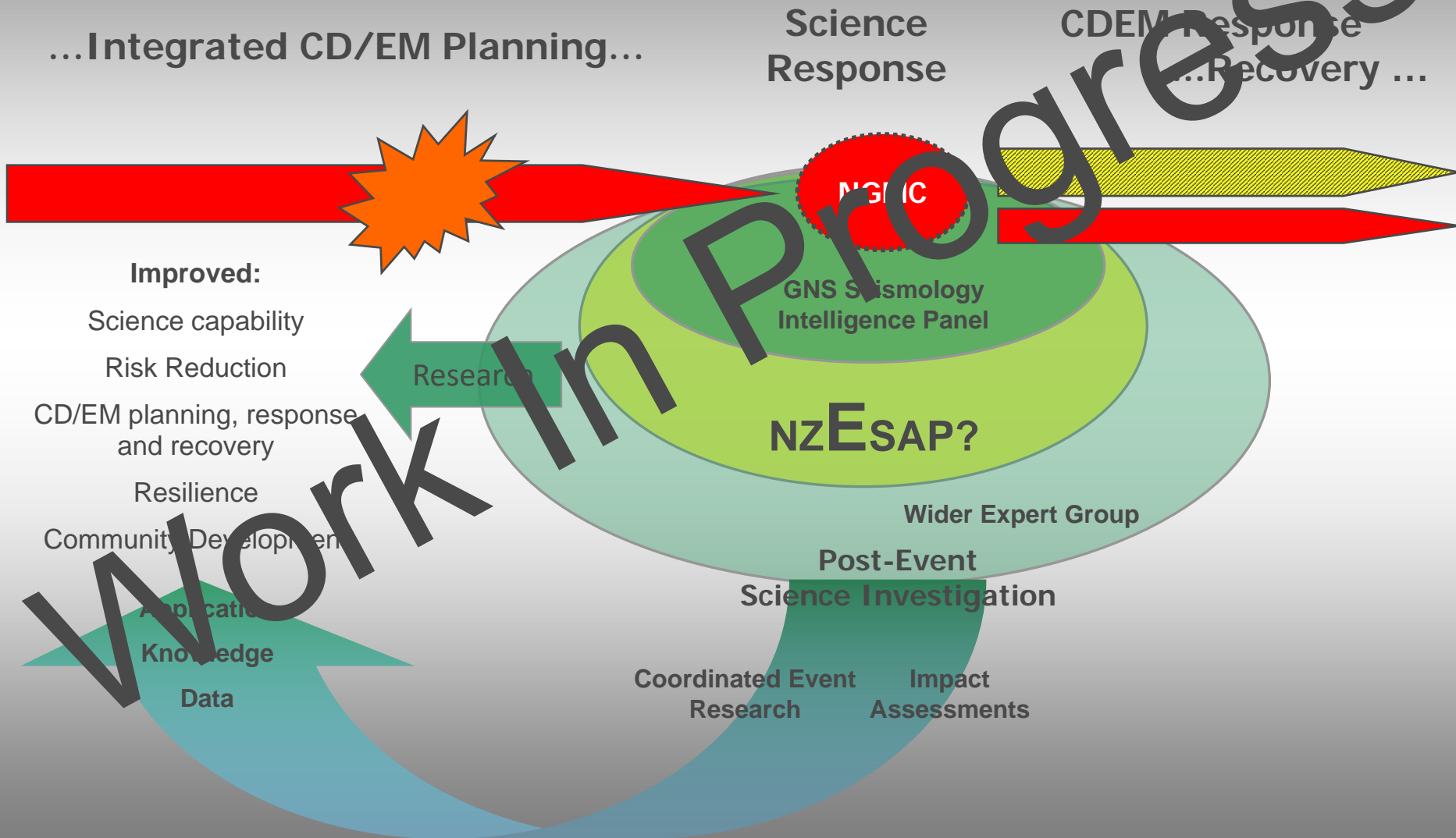
[g.jolly@gns.cri.nz](mailto:g.jolly@gns.cri.nz)

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[daniel.hill@nema.govt.nz](mailto:daniel.hill@nema.govt.nz)



# New Zealand **Earthquake** Science Advisory Panel??



# What I've learned about science advice in a crisis

- **No single person or group has all the knowledge**
  - Use the evidence base and be open to change as new information is available
  - Listen to different perspectives
  - Be clear about differences of opinion when providing advice
  - Take a “team approach” wherever possible
- **Understand what information is required, in what time frames and for what reason**
  - Be clear on roles and responsibilities
- **Understand and communicate uncertainty and ambiguity**
  - Be clear about what you know and what you don't
- **Build trust**
  - Be open and honest; “free and frank advice”

*I'm still on the journey and still learning*

One year on from this tragic day, our thoughts are with the friends and whānau of those who lost their lives, the survivors of the eruption, the first responders, emergency services, Ngāti Awa and the people of Whakatāne. Our thoughts are with them on this difficult day.

Kāti rā!

Kia hora te marino

Kia papa pounamu te moana

Kia teretere te kārohirohi

Tēnā koutou, tēnā tātou!

Kia kaha!

May there be pervasive calm

Let the oceans glisten as the pounamu

There now the shimmering, dancing haze of our summers before us

Greetings, we acknowledge you, one and all.

Be strong!



Ngā mihi nui