Looking Ahead Infrastructure Symposium

Session 4
Strengthening Resilience
To
Shocks and Stresses

How do we Plan for Future Disruption?

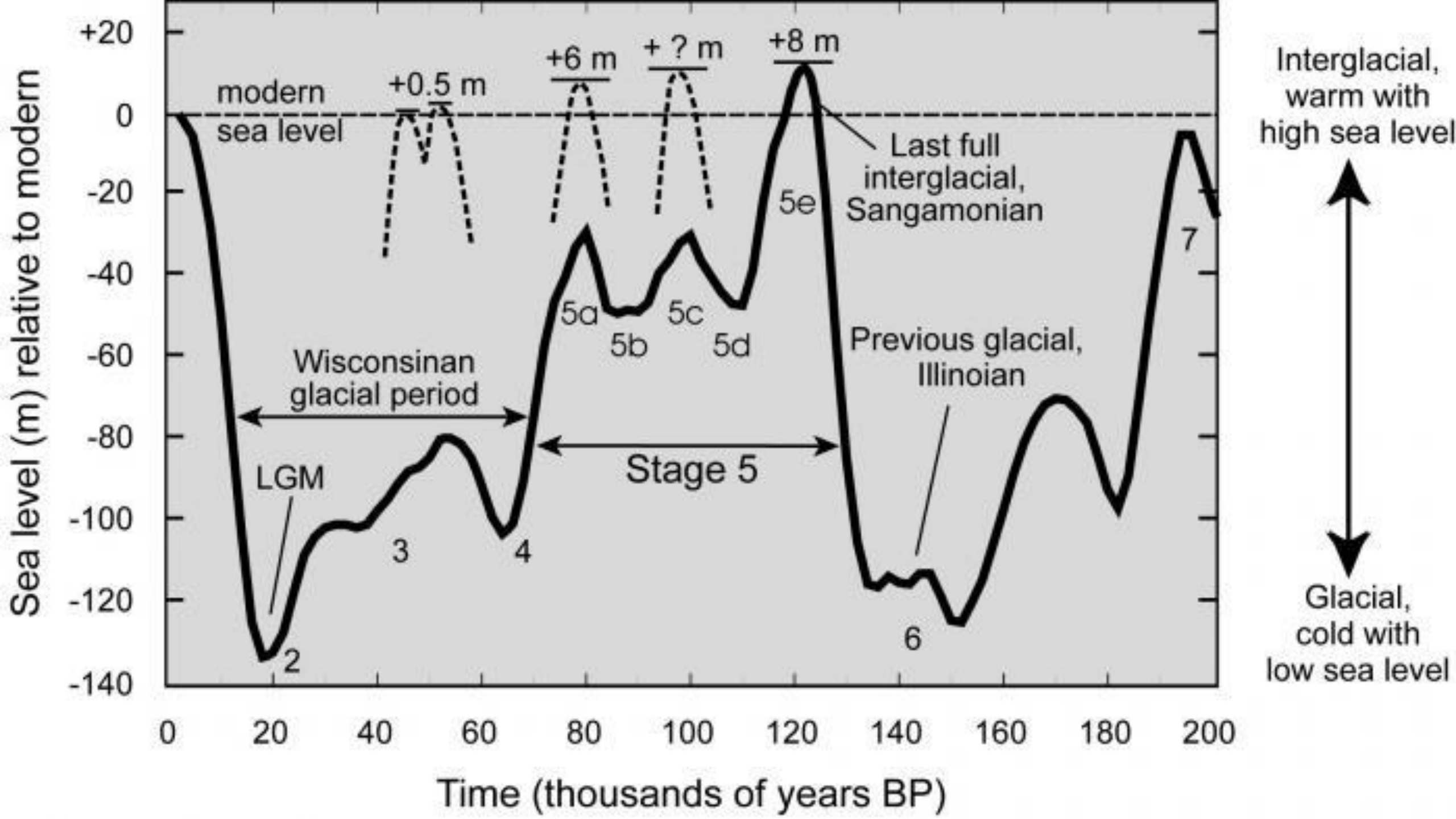
Planning for the Unprecedented

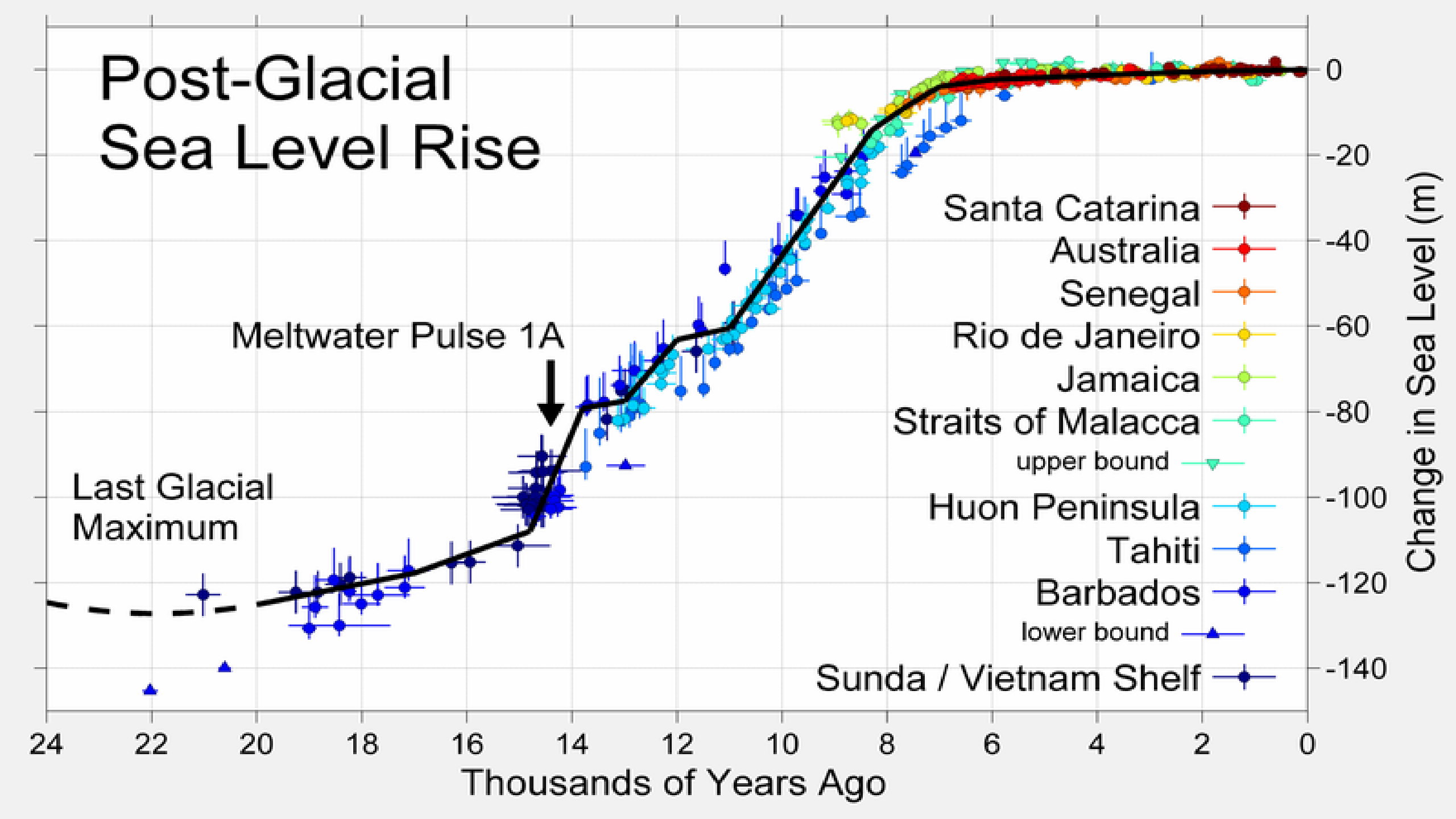
Nick Rogers

The way we were

Coming out of the last cold period, a glaciation with its maximum about 18,000 years ago, we have been in what is known as an interglacial period, with relatively cool global temperatures and sea levels about what they are now for the past 6,000 years

A period of relative global climate stability


+20
0
-20
-40
-60
-80
-100
-120
-140
Sea level (m) relative to modern
modern
sea level
+0.5 m
+6 m
+ ? m
+8 m
Last full
interglacial,
Sangamonian
5e
7
5a
5b
5c
5d
Wisconsinan
glacial period
Stage 5
Previous glacial,
Illinoian
LGM
2
3
4
6
0
20
40
60
80
100
120
140
160
180
200
Time (thousands of years BP)
Interglacial,
warm with
high sea level
Glacial,
cold with
low sea level


Post-Glacial
Sea Level Rise
Meltwater Pulse 1A
Last Glacial
Maximum
Santa Catarina
Australia
Senegal
Rio de Janeiro
Jamaica
Straits of Malacca
upper bound
Huon Peninsula
Tahiti
Barbados
lower bound
Sunda / Vietnam Shelf
0
-20
-40
-60
-80
-100
-120
-140
Change in Sea Level (m)
24
22
20
18
16
14
12
10
8
6
4
2
0
Thousands of Years Ago

The next cold period

Having been in an interglacial period for over 6000 years, the expectation was that snow and ice would increase and the tide would go out.

Another period of glaciation was around the corner.

Good News

The planet has probably seen its last glaciation for some considerable time

In fact, we can probably stop worrying about it

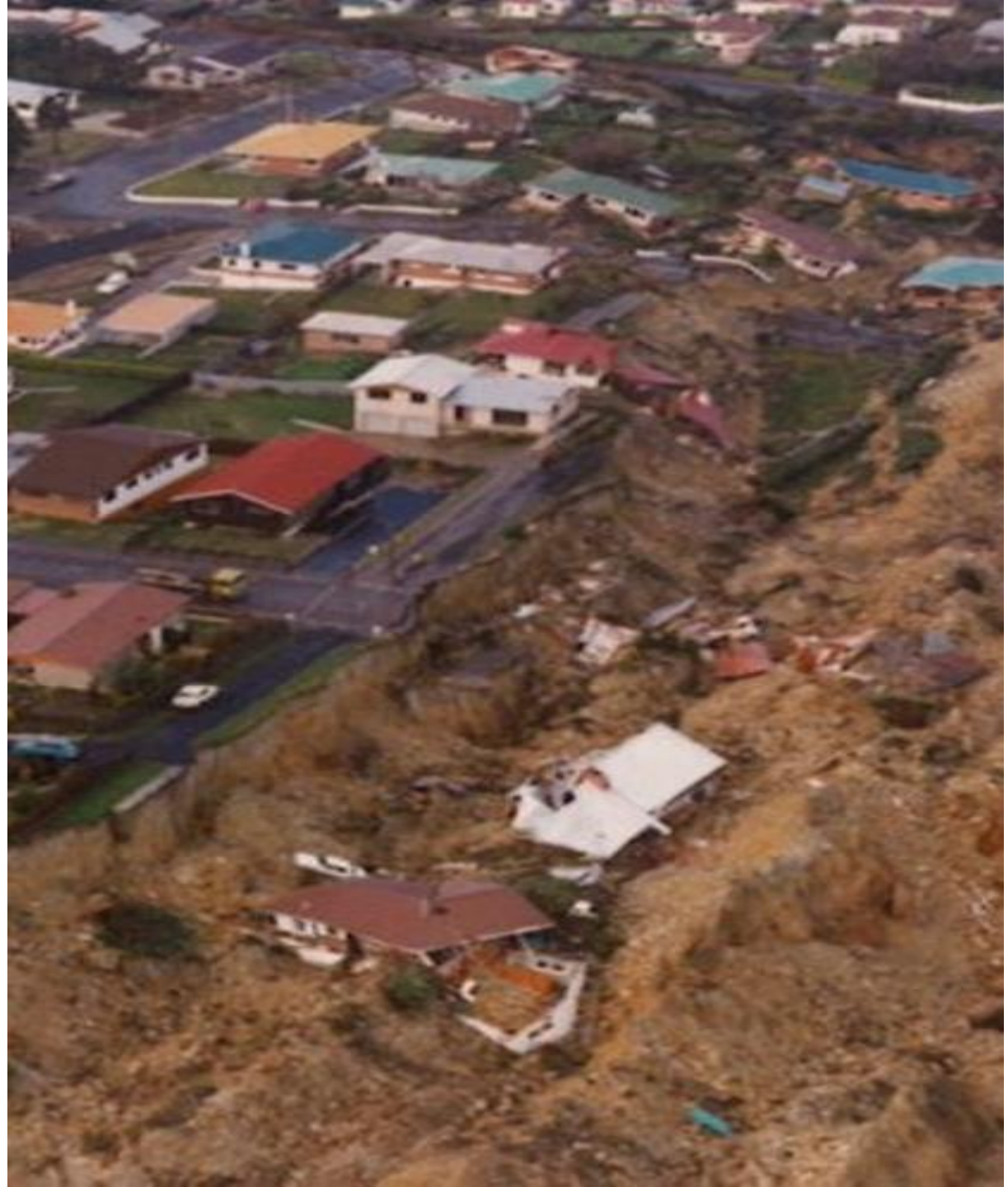
The tide is not going to go out any day soon. If it does then it means a tsunami is coming

Take out from Antarctica 1976-1977

Use the most resilient transport media that nature provides – in this case water and air

Antarctica is melting and has enough water locked up to raise sea levels by 60m

The West Antarctic Ice Sheet (WAIS) alone could raise sea levels by more than 3m



Take out from Abbotsford 1979

Many hillslopes in New Zealand are only marginally stable

The Commission of Inquiry into the Abbotsford Landslip Disaster recommended no changes to the responsibility of Councils in issuing land use and building consents

Local Government Act stated Councils **shall**

Refuse to issue building consents on land that is or is likely to be subject to most natural hazards…including inundation and slippage

But Councils had already allowed subdivision of such land and people had bought land that they could no longer get consent to build on

So, only 2 years later, in 1981

Government amended the Local Government Act yet again to allow Councils to issue building consents on hazard prone land and be under no civil liability

This provision persists today with Section 72 of the Building Act 2004.

Canterbury Earthquake Sequence 2010 -2011

- Fault Rupture
- Shaking damage
- Landslides and rock fall
- Liquefaction
- Subsidence
- Lateral Spreading


WE CAN
RE BUILD

Rebuilding – but only under s72

Council advised that rebuilding would be under s72

Property owners would have no natural disaster insurance

Property owners would have difficulty selling their properties as banks would not provide mortgage finance to buyers

The Government said that was not OK

Building back better

Government allocated funding ($140M) to allow building back better to get over the s72 issue

DBH/MBIE provided guidance on building back better with increased resilience

February 2011 Earthquake

Changed everything

No longer practicable to rebuild everywhere in a timely manner

Many people no longer wanted to rebuild

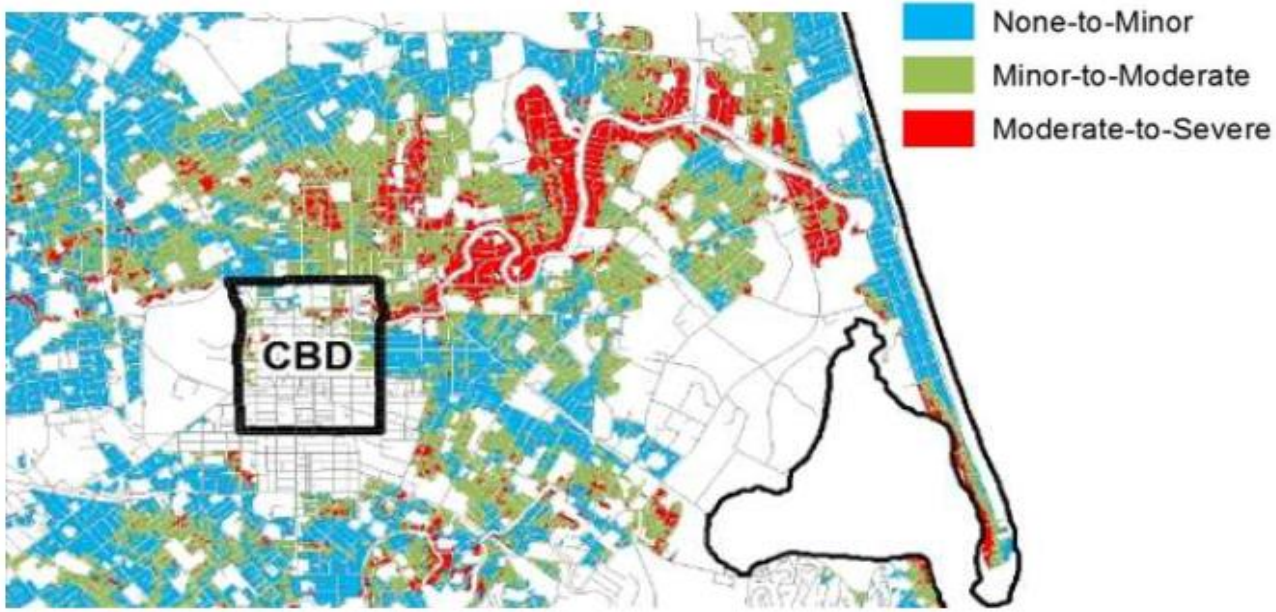
Government Retreat Criteria

The best available information

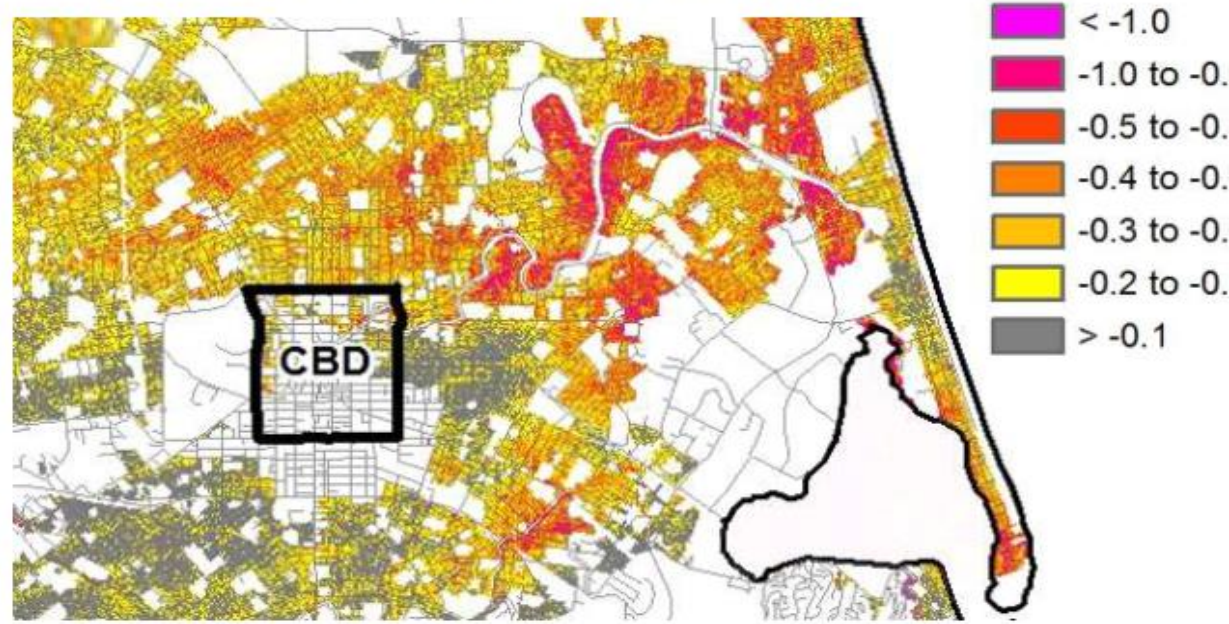
A simple process in order to provide clarity

Certainty of outcome for homeowners as soon as possible

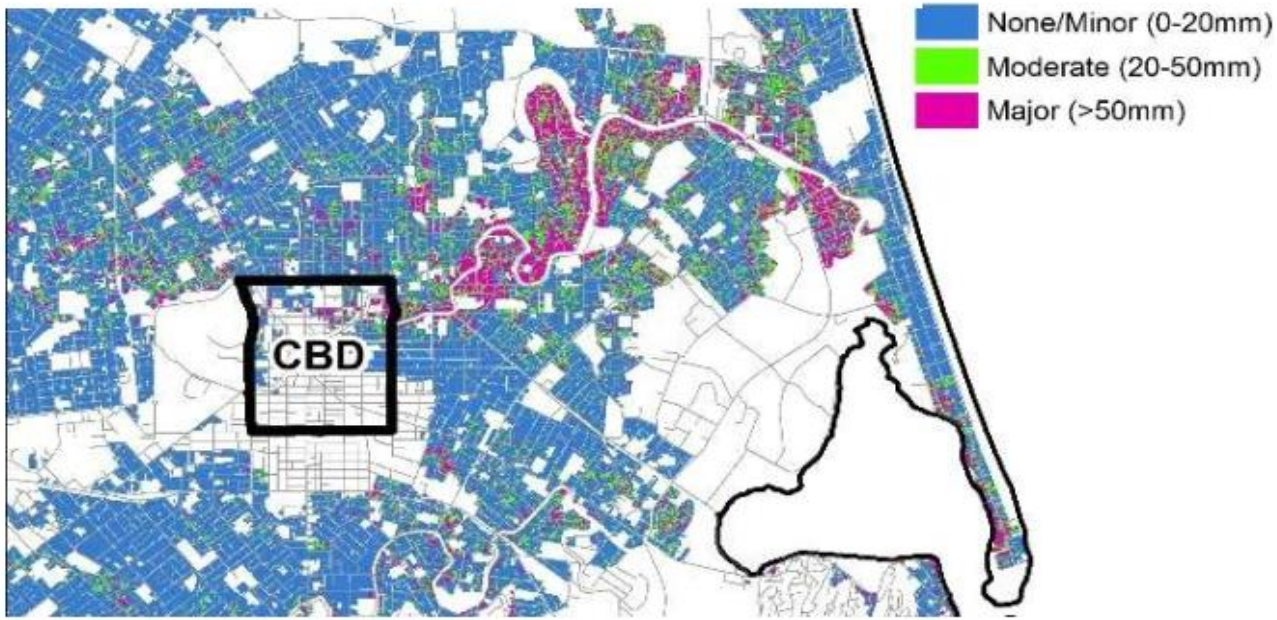
Observed Liquefaction Land Damage



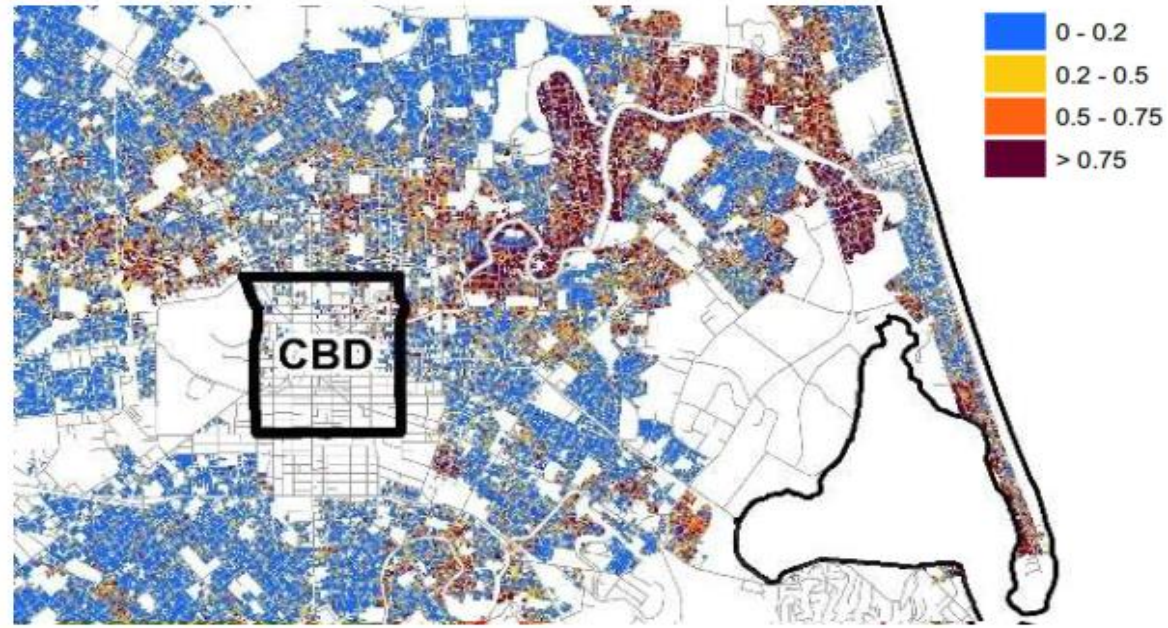
Liquefaction Related Subsidence (m)



Differential Foundation Settlement



Building Damage Ratio



Then….

…Now

Kaikoura Earthquake 2016

Massive Landslides

Fault rupture and ground movement

Bad News

Average global temperatures will soon be higher than humans have ever experienced

The tide is coming in. Tomorrows low tide might be yesterdays high tide. Plan for 3m.

The End

Thank you

The Government natural disaster insurance scheme (NDIS) would need to be

- Affordable
- Available
- Sound and economically viable
- Adequate to meet as many as possible of the reasonable expectations of the public
- Free of any undesirable social consequences, and
- As free as possible of anomaly and individual injustice