SeaChange '05, Heritage Hotel, Auckland – 21-22 November 2005

Coastal margins: rising hazards and risk

Presenter –
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NIWA
Taihoro Nukurangi

Coasts: Mostly picture-postcard

leads to desire for “intimacy” …..

BUT then the wild side emerges …..

©Timaru Herald

and bad things happen …..

Hawke's Bay RC

we hold a meeting ……..

P Arnold, NIWA

and put up the defences,

THEN we feel safe! until ……

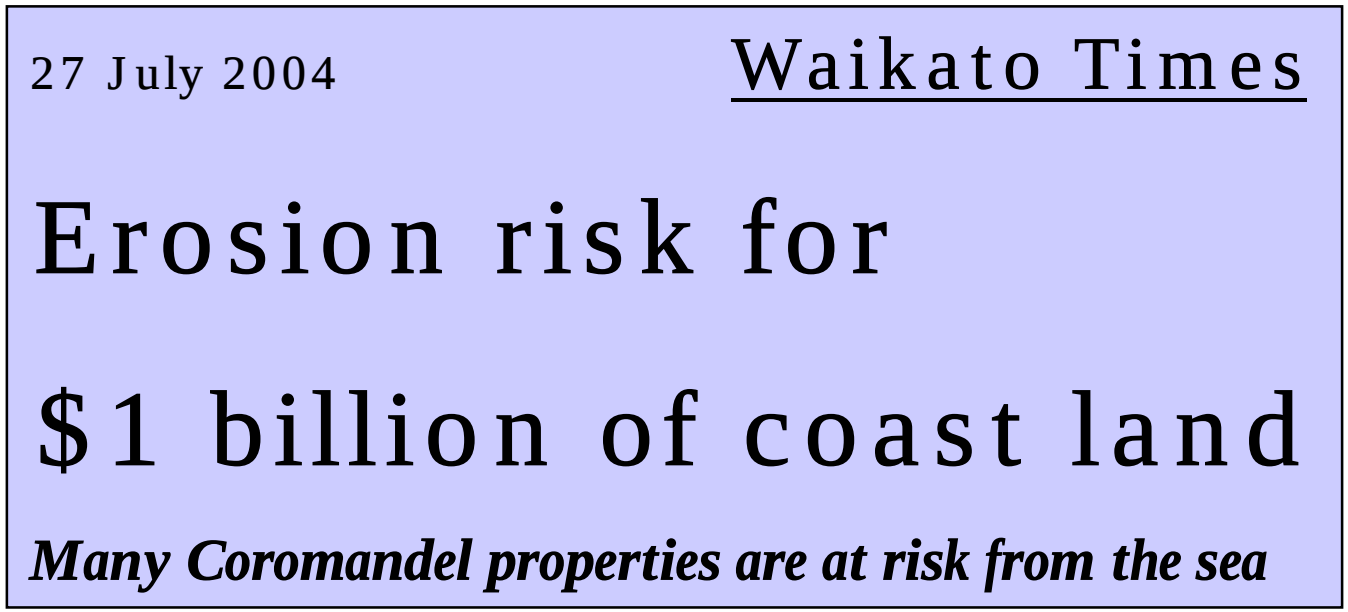
Underlying coastal paradigm

Prevailing paradigm, in the context of property rights, is …

"Hold the Sea Back" or "Hold the shore-line"

Two sides of coin (hazard & risk)

- Kiwis love affair with sea means we sometimes get too close & erosion occurs Þ **hazard exposure rising**
- Soaring property values & large-scale developments Þ **risk is rising** i.e. potential losses & damage
- Global warming Þ **hazard & vulnerability rises**



27 July 2004 Waikato Times

Erosion risk for

$1 billion of coast land

Many Coromandel properties are at risk from the sea

Coasts: hazard exposure

- Hazards have always existed at coast – the issue is **exposure** to the hazard
- **Changes** in coastal margins have **increased** exposure of some existing developments

Principle #1: Coasts are natural “buffers”

<u>Natural coastal function:</u>

coastal margin is a pliable buffer between the fixed landmass and a highly dynamic ocean

- Dynamic ocean (storms, waves, tides, currents, …)
- Coastal shape & form (geology, continental shelf, sediment inputs …)

Principle #1: Coasts are natural “buffers”
NOT coast-lines or shore-lines

Principle #2: Variability across wide range of scales (time & space)

Natural coastal forcing functions:

Pliable margins respond/change in cycles over time & at local to regional scales

- Spatial scales (hotspots, beach-wide, long coasts, regional, global)
- Time scales (mins, hours, days, seasonal, inter-annual, decadal, long-term trends/change)

Climate/weather variability & change

- Storms: episodic
- Seasonal: 1 yr
- El Niño & La Niña (ENSO) cycle at 2–4 yrs
- Interdecadal Pacific Oscillation (IPO) at 20–30 yrs:

  Now in negative phase since 1998, with last -ve phase in 1960-70s. Probably more La Niña events & storms on east coast.

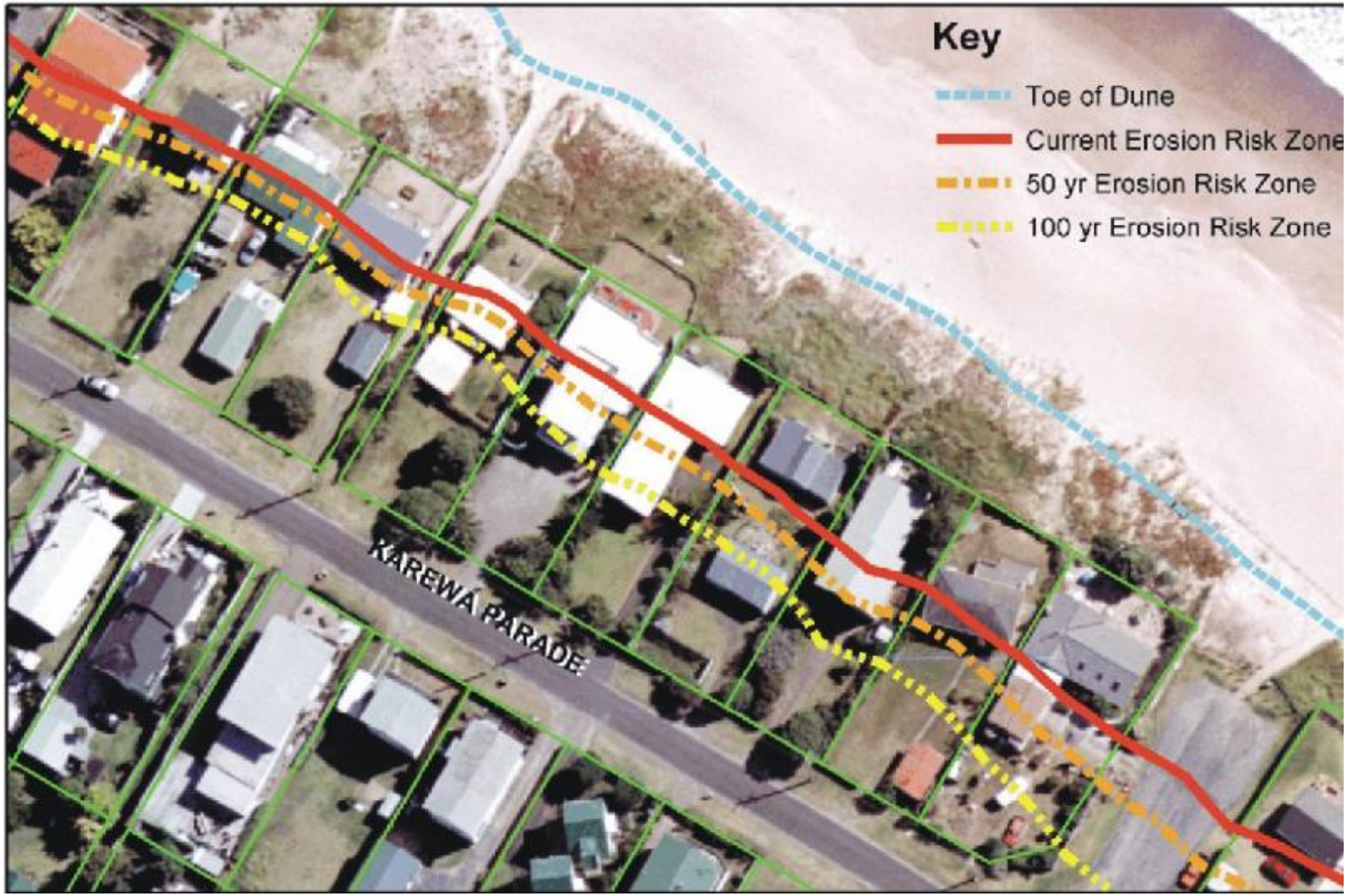
- Climate change (>50 yrs): trends & extremes

Coasts: risk

- **Risk** is the predictable **consequences** of exposure to the hazard in a **given timeframe**
- Risk is given in terms of casualties, injuries, disruption, property damage, indirect losses (tangible & intangible), environmental impacts

Risk is escalating:

new development and rising values



Tauranga City Council

Causes

Seismic

Sea level: Season, ENSO, IPO

Tides

Storms: Winds, pressure

Storms: Rainfall, Run-off

Climate change

Hazard drivers

A tsunami

B sea-level change

C storm tide

D currents

E waves, swell

F sediment supply

Hazard

A, B, C, E

coastal inundation

A, B, C, D, E, F

coastal erosion

A, C, D, E

recreational & maritime

Severe waves: overtopping and overwash

<u>Hazardwatch:</u> **spate of wave breaches along coast since 2000**

<u>Readiness:</u> **improved wave forecasts for NZ coast in pipeline**

<u>Climate Change</u> **sea-level rise ↑ ; intensity of extreme storms ↑**

Storm surge and coastal inundation

<u>Hazardwatch:</u> **July 2001-Sea flooding (Canterbury); Southland**

<u>Readiness:</u> sea-level network (20), red-alert days, planning zones

<u>CC:</u> **sea-level rise ↑ intensity of extreme storms ↑ waves ↑**

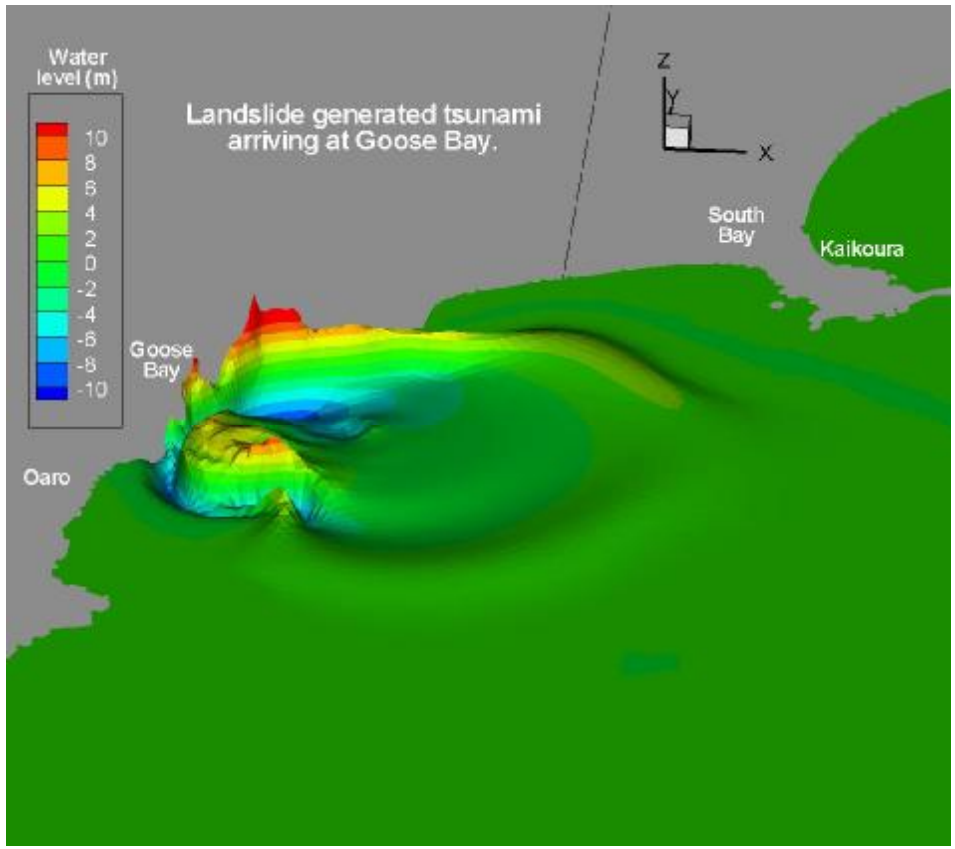
Coastal erosion

<u>Hazardwatch:</u> quiescent since big 1978 storms, since 1999+, several recent hotspots (Mokau, Waihi, Aotea, Raglan, Whitianga …..

<u>Reduction:</u> research, planning, hazard zones, MfE Guidance Manual

<u>CC:</u> sea-level rise ↑ intensity of extreme storms ↑ sediments ?

Tsunami



<u>Hazardwatch:</u> quiescent since 1960, Boxing Day tsunami (up to 1 m in NZ), tsunami inundation modelling, geological/palaeo source investigations, Govt review of risk to NZ & preparedness

<u>Readiness:</u> Sea-level network, sesimic network, NOT real-time yet

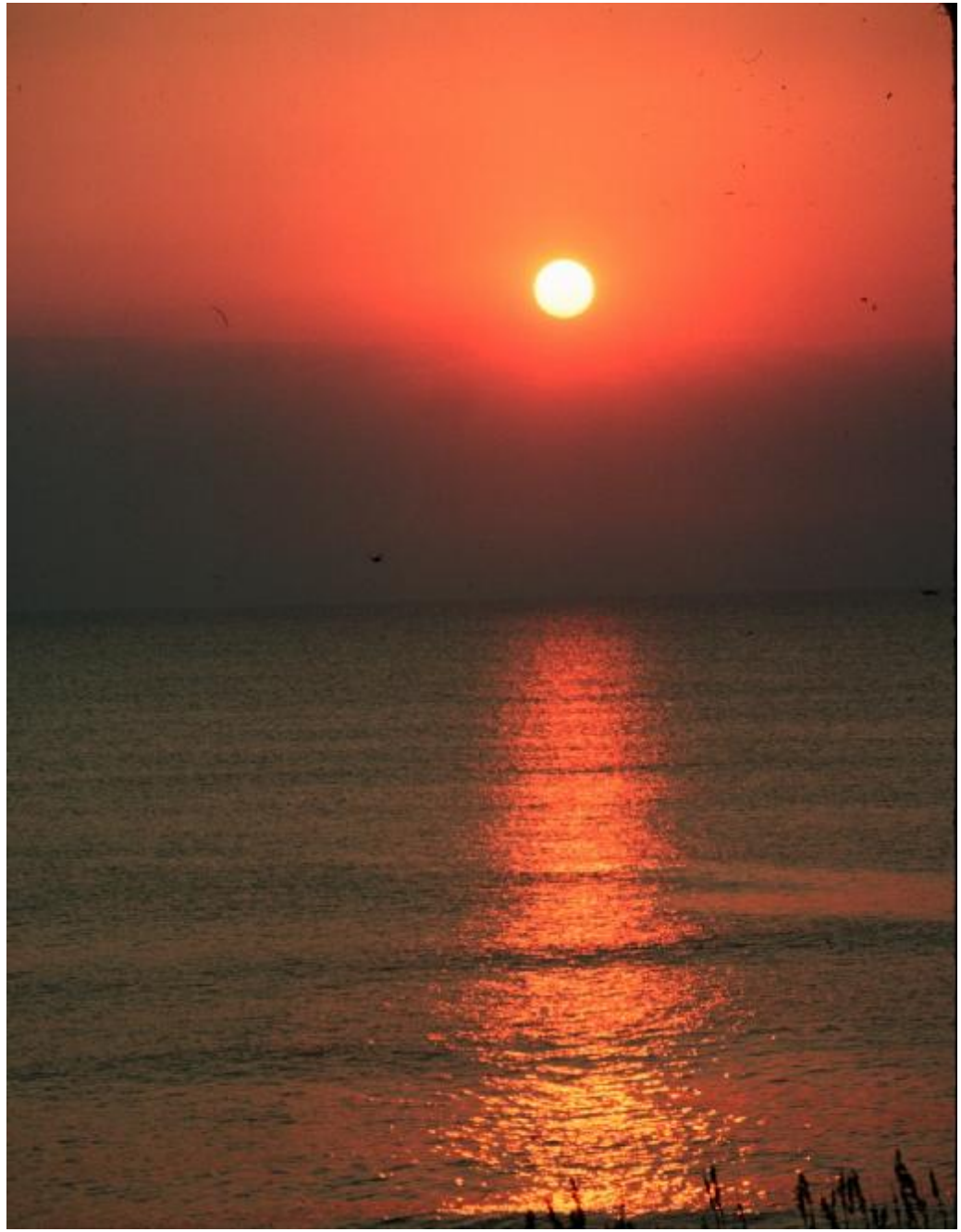
<u>CC:</u> only sea-level rise change ↑

Global Warming

A new hazard?

No new hazards except accelerated sea-level rise, but will modify hazard drivers

Therefore, the historic records will become less useful to predict future extreme events:
e.g. return-period analysis



Issues: reducing hazard exposure

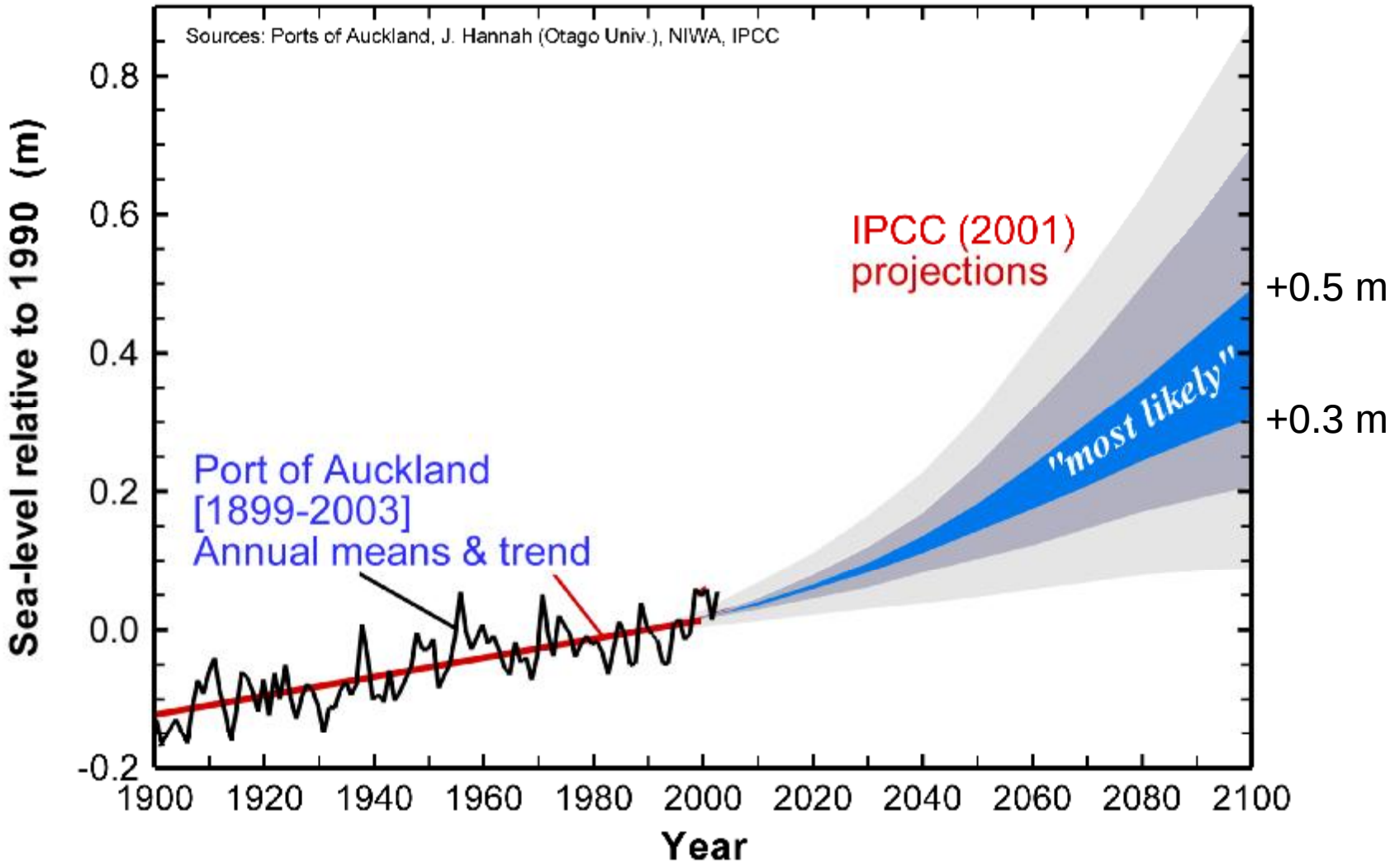
- Pliable coastal buffers are nature's way of absorbing the sea's angry moods – needs backspace to work
- Coasts can change imperceptibly over long cycles – precautionary approach
- Climate change– no "silver lining" for coastal margins - but 1st focus on managing present variability
- Can we really plan beyond 50-100 yr timeframes?
- Increasing pressure on councils to yield to the "hold the line" paradigm
- Land-use planning needs to better connection with CDEM planning and building/asset management
- Exploring implementation of managed retreat: present mitigation and coast-care measures will eventually be exhausted at some locations

Issues: reducing the risk

- Escalating risk of coastal-hazard impacts from rising value and number of assets exposed (even if little coastal change)
- Increasing scrutiny of vulnerability for new coastal developments e.g., subdivisions, roads, utilities
- Public awareness of coastal variability – e.g. reducing risk is a people-issue across lots of disciplines
- Insurance – personal risk vs community risk
- For rapid-onset hazards: saving lives is paramount, so warnings & evacuation procedures must be clear
- Forecasting improves readiness – not just the weather, but the downstream hazards e.g. sea inundation, waves, tsunami

Resilient NZ coastal communities,
who better understand their risk
and participate in reducing it over time

Sea-level rise:
previous 100 years + next 100 years



Recent advances in monitoring rips

snapshot

average 120 shots

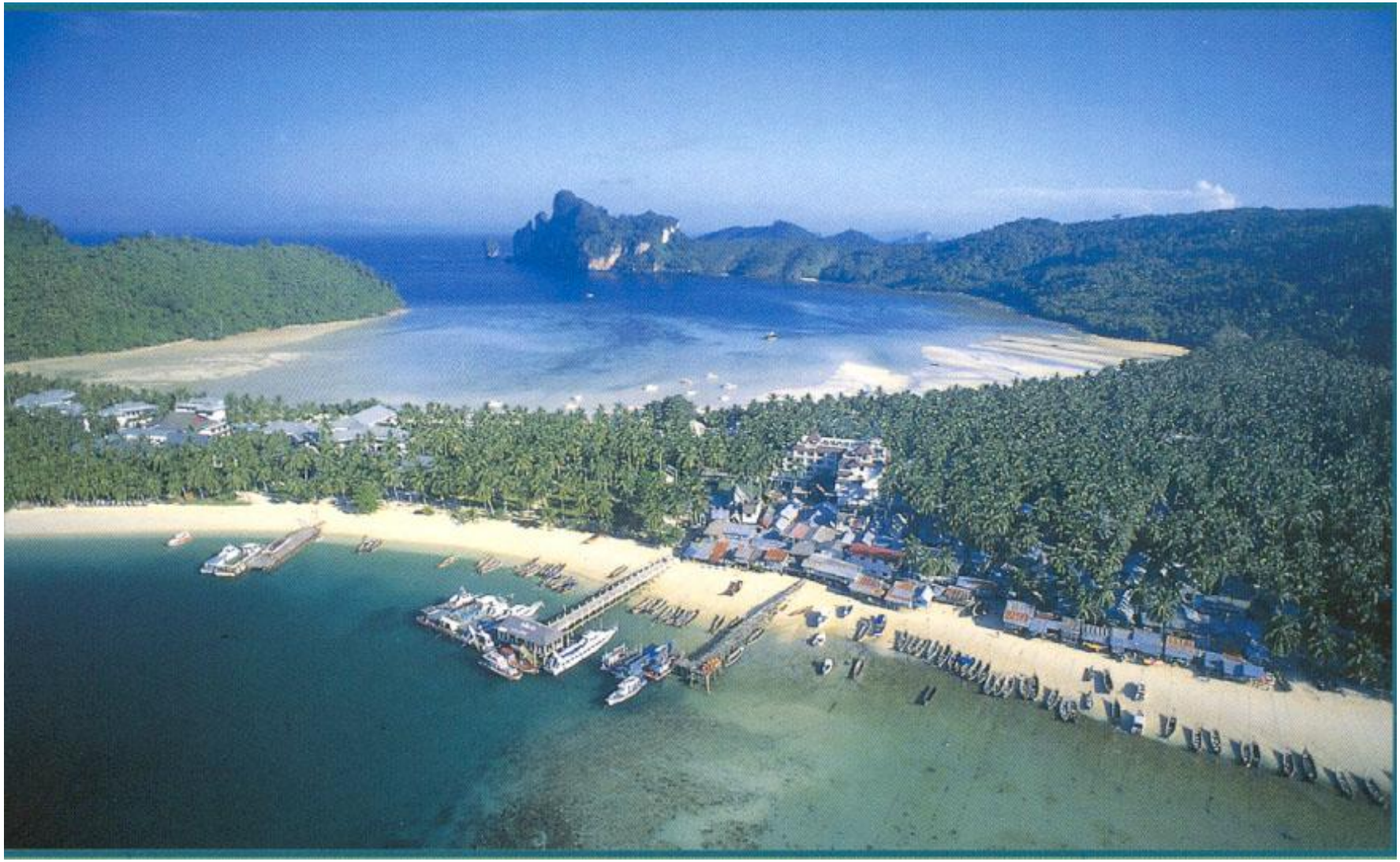
Cam-era

http://www.niwa.co.nz/services/cam-era

Mokau inheritance (Env. Waikato)

At-risk landowners new to area since the previous 1995/6 erosion event

Phi Phi Island (before)

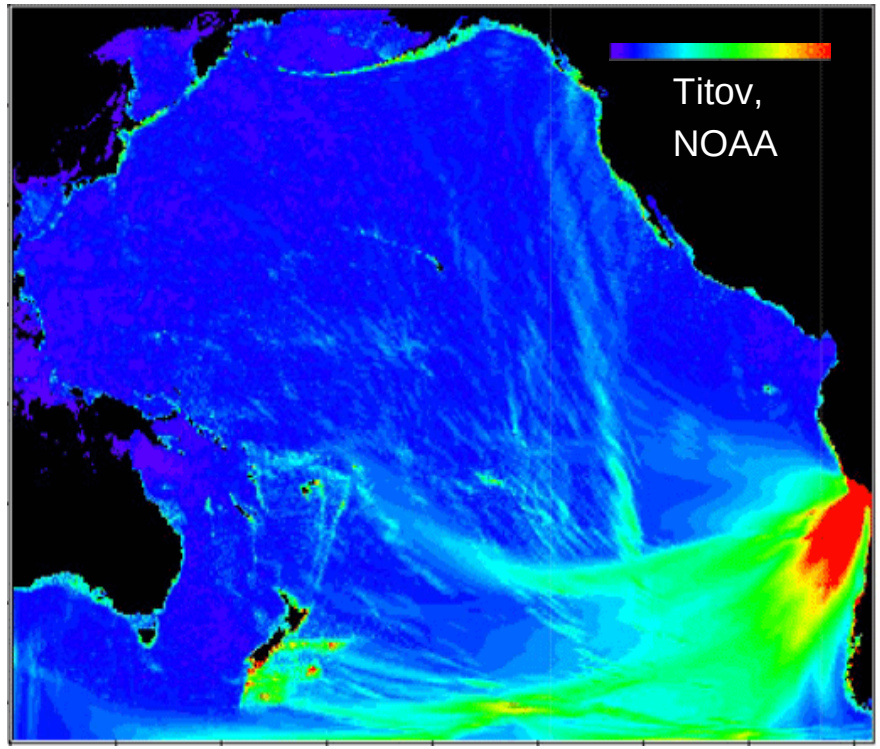


J Everingham

Phi Phi Island (after)

L Yule

Let us not forget our own coast



NZ faces both “local” & “distant” tsunami threats

MfE Guidance Manual for Local Government

Coastal Hazards & Climate Change