



Australian Government
Department of Climate Change

Climate Change: Where And When to Engineer Responses

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Department of Climate Change

4 August 2008



The Conundrum!



Trophy beach house / development site – Gold Coast QLD

3551 Main Beach Parade, Main Beach, Gold Coast

A prime Northern corner, double block hugging the sands of Main Beach and the adjoining cul-de-sac, this beach house is an uncut diamond in a perfect setting. A priceless 75m²* beachfront land-outcrop extends the land Eastward, giving this address development edge over similar blocks along the coastline of Main Beach Parade.

- Renovated 1930s beach house on prime 963m², North corner site
- Potential development options to increase density and height
- Unobstructed 180 degree views from beachfront outcrop protrusion

The Greenhouse Effect



Changes in temperature, sea level and Northern Hemisphere snow cover

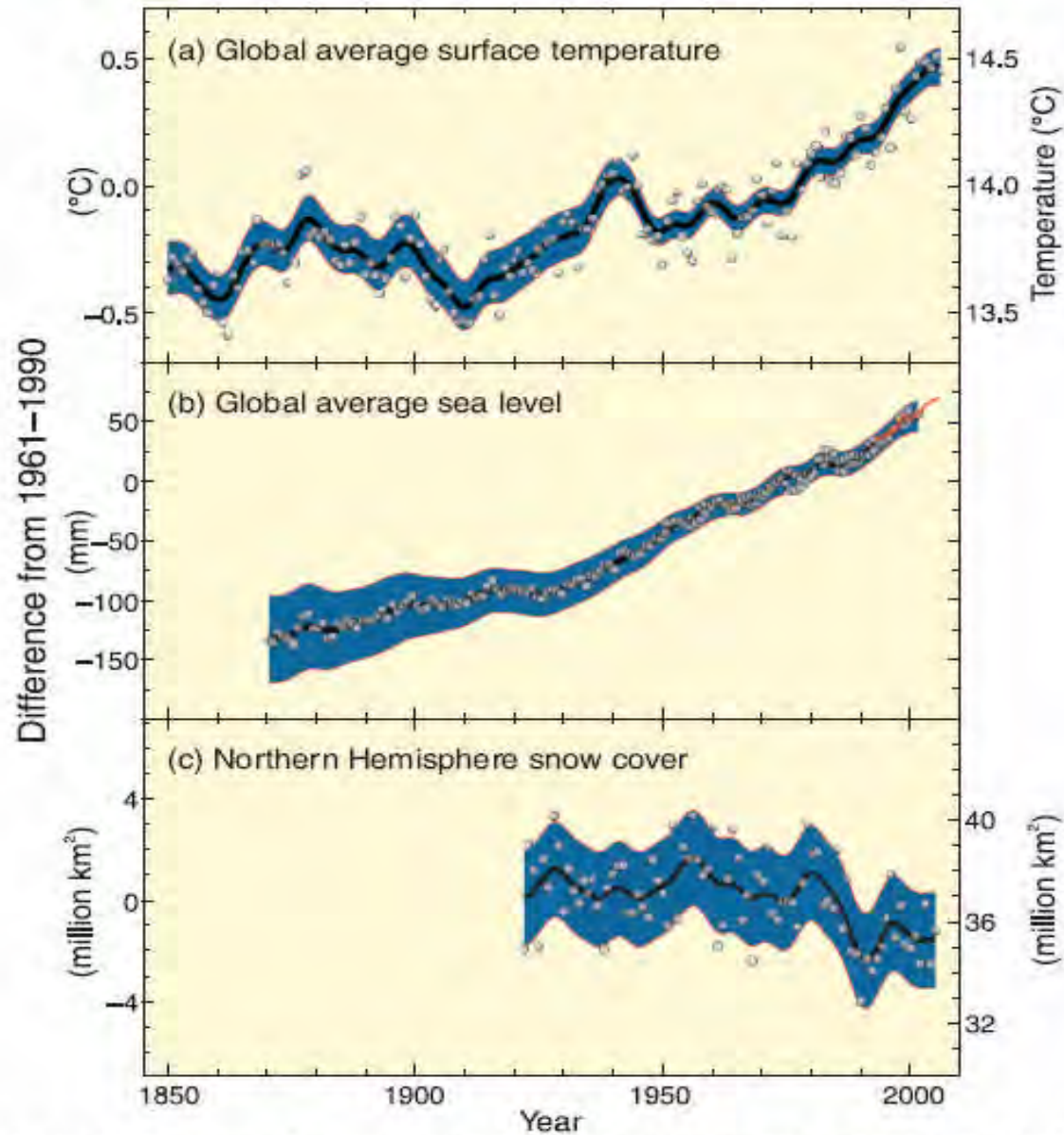


Figure 1.1. Observed changes in (a) global average surface temperature; (b) global average sea level from tide gauge (blue) and satellite (red) data; and (c) Northern Hemisphere snow cover for March-April. All differences are relative to corresponding averages for the period 1961-1990. Smoothed curves represent decadal averaged values while circles show yearly values. The shaded areas are the uncertainty intervals estimated from a comprehensive analysis of known uncertainties (a and b) and from the time series (c). [WGI FAQ 3.1 Figure 1, Figure 4.2, Figure 5.13, Figure SPM.3]

Global and continental temperature change

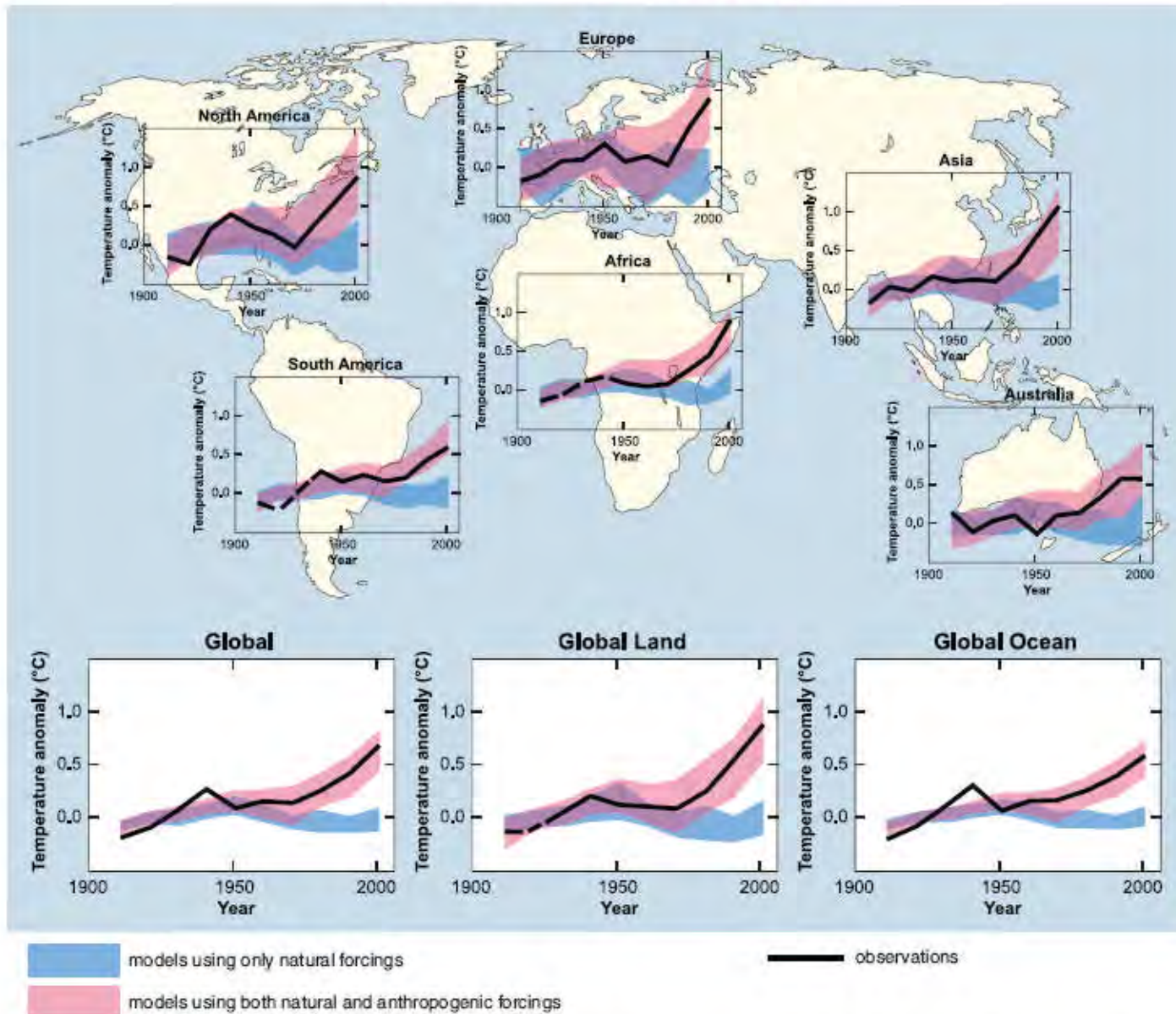


Figure 2.5. Comparison of observed continental- and global-scale changes in surface temperature with results simulated by climate models using either natural or both natural and anthropogenic forcings. Decadal averages of observations are shown for the period 1906-2005 (black line) plotted against the centre of the decade and relative to the corresponding average for the 1901-1950. Lines are dashed where spatial coverage is less than 50%. Blue shaded bands show the 5 to 95% range for 19 simulations from five climate models using only the natural forcings due to solar activity and volcanoes. Red shaded bands show the 5 to 95% range for 58 simulations from 14 climate models using both natural and anthropogenic forcings. [WGI Figure SPM.4]

Temperature

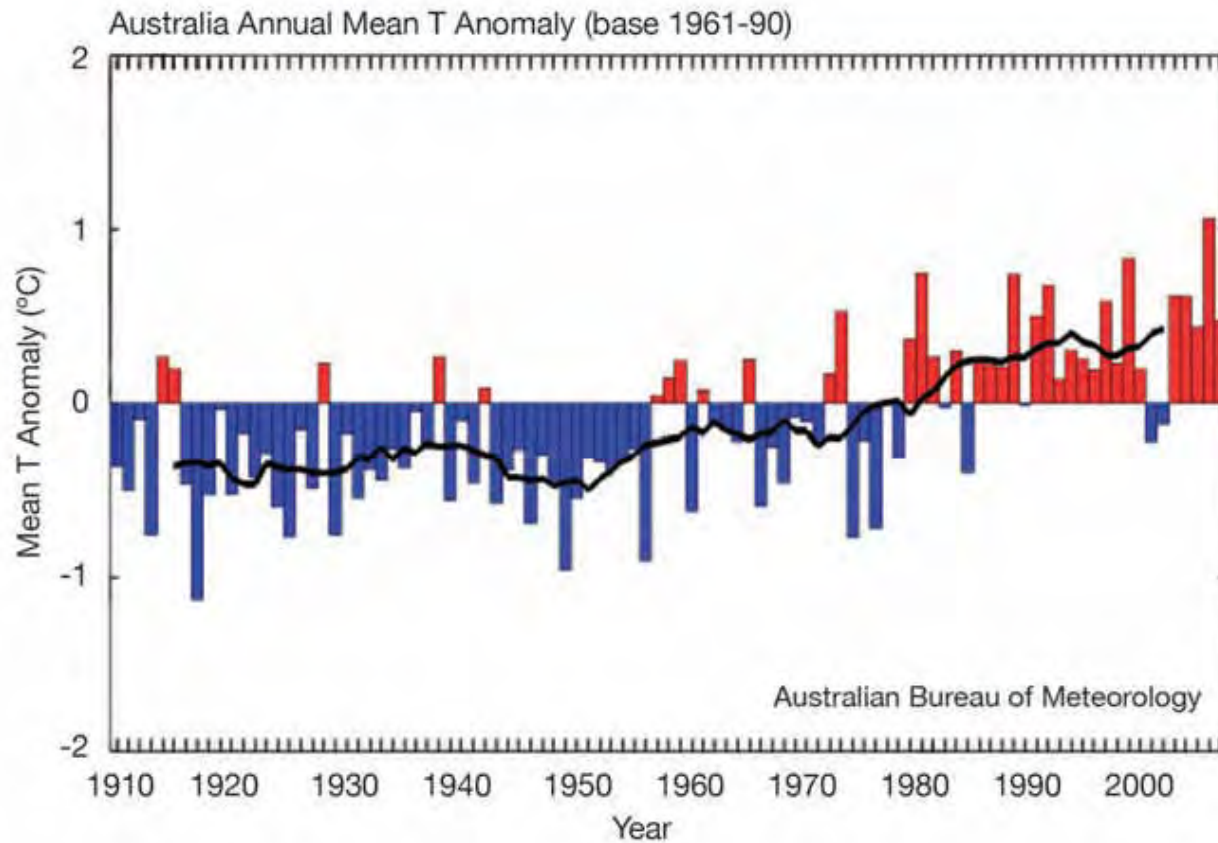
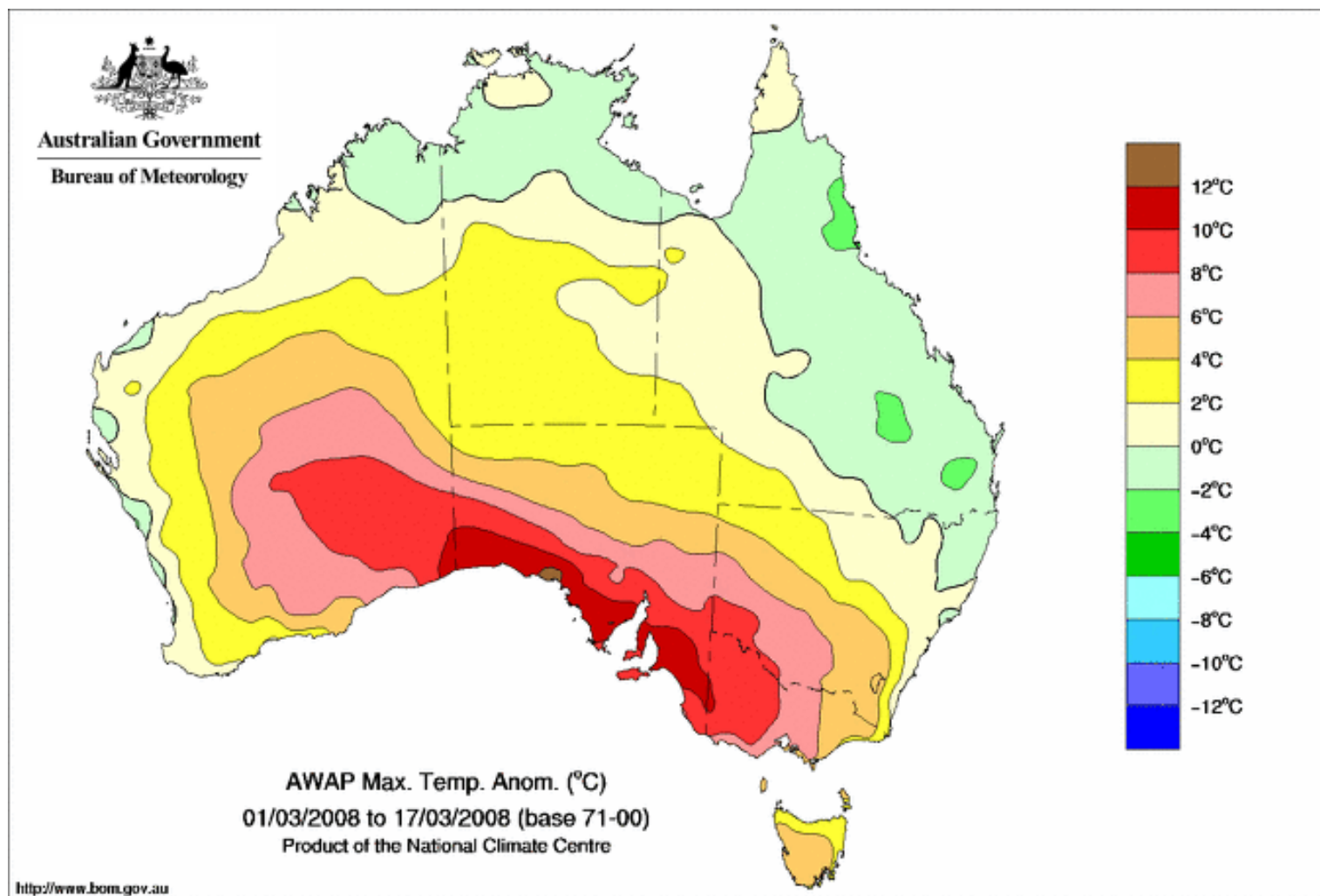
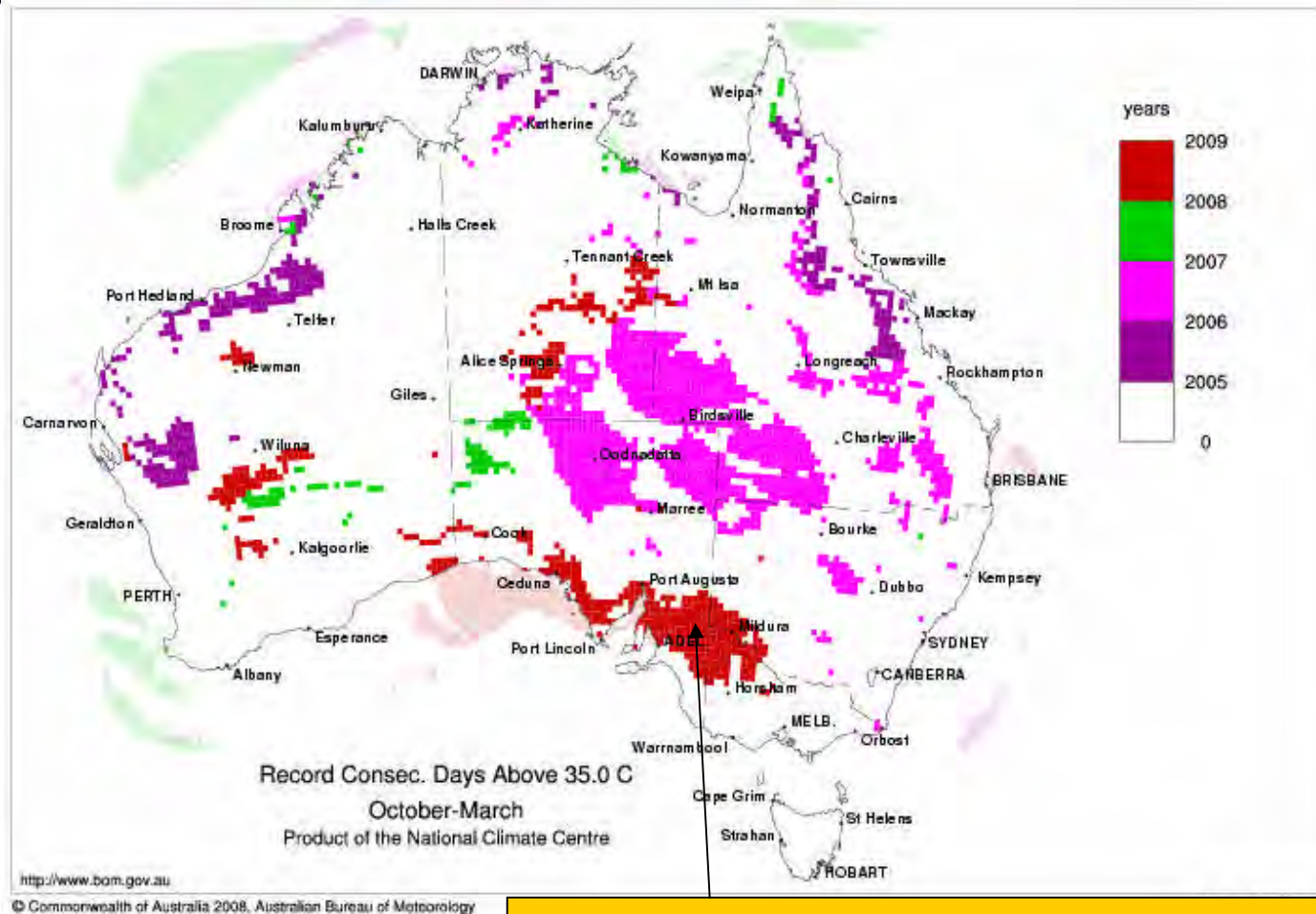


Figure 2.1: Annual mean Australian temperatures taken as anomalies from the 30-year 1961 to 1990 average. The black line is an 11-year running mean.

'Adelaide' heatwave - Temperatures for 1-17 March up to 12°C above normal



Record runs of consecutive hot days



Source: Dr Blair Trewin

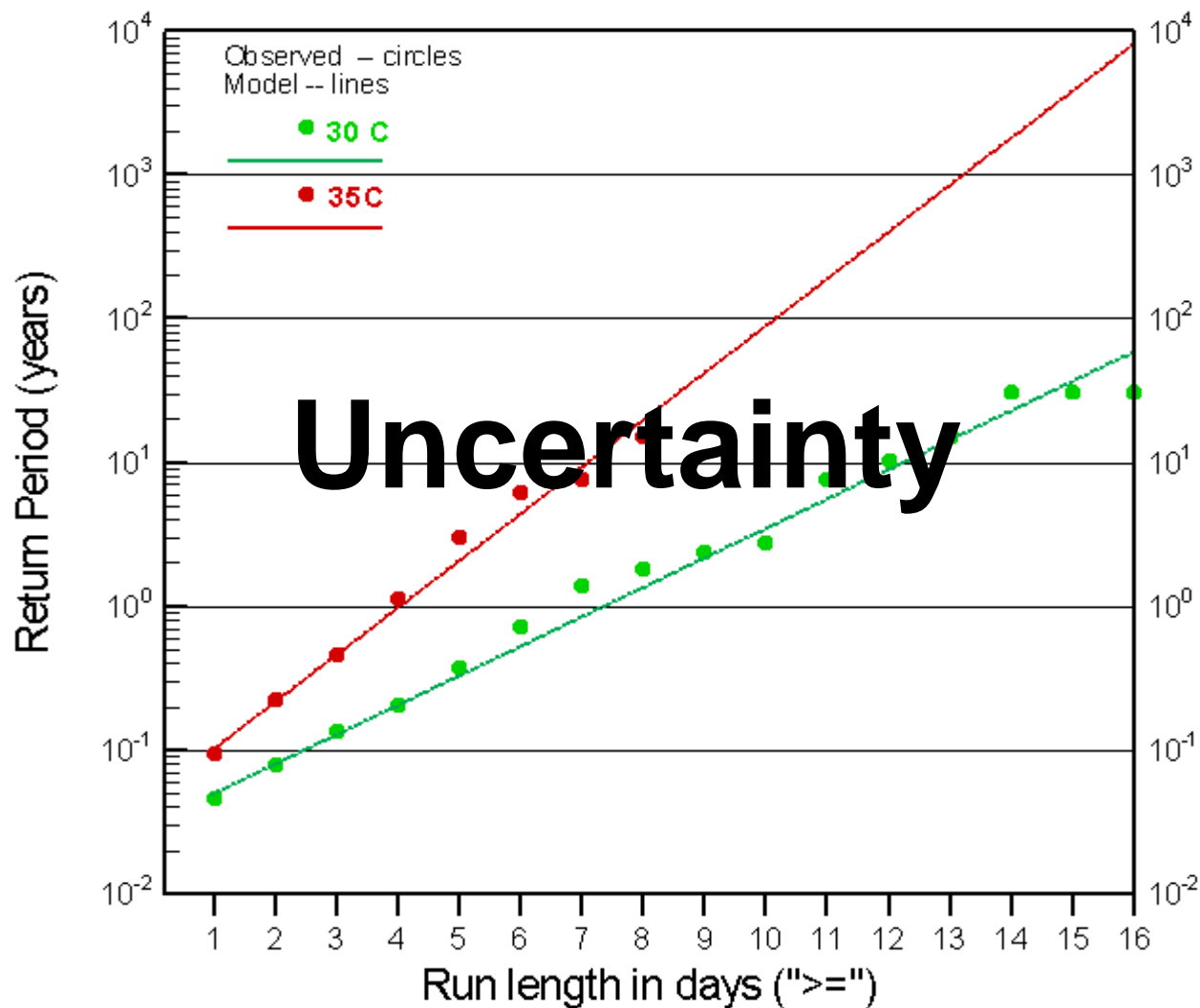
Area in red set all-time records in March 2008 for most consecutive days above 35°C

15 consecutive days at Adelaide – previous record 8

How unusual was this event?

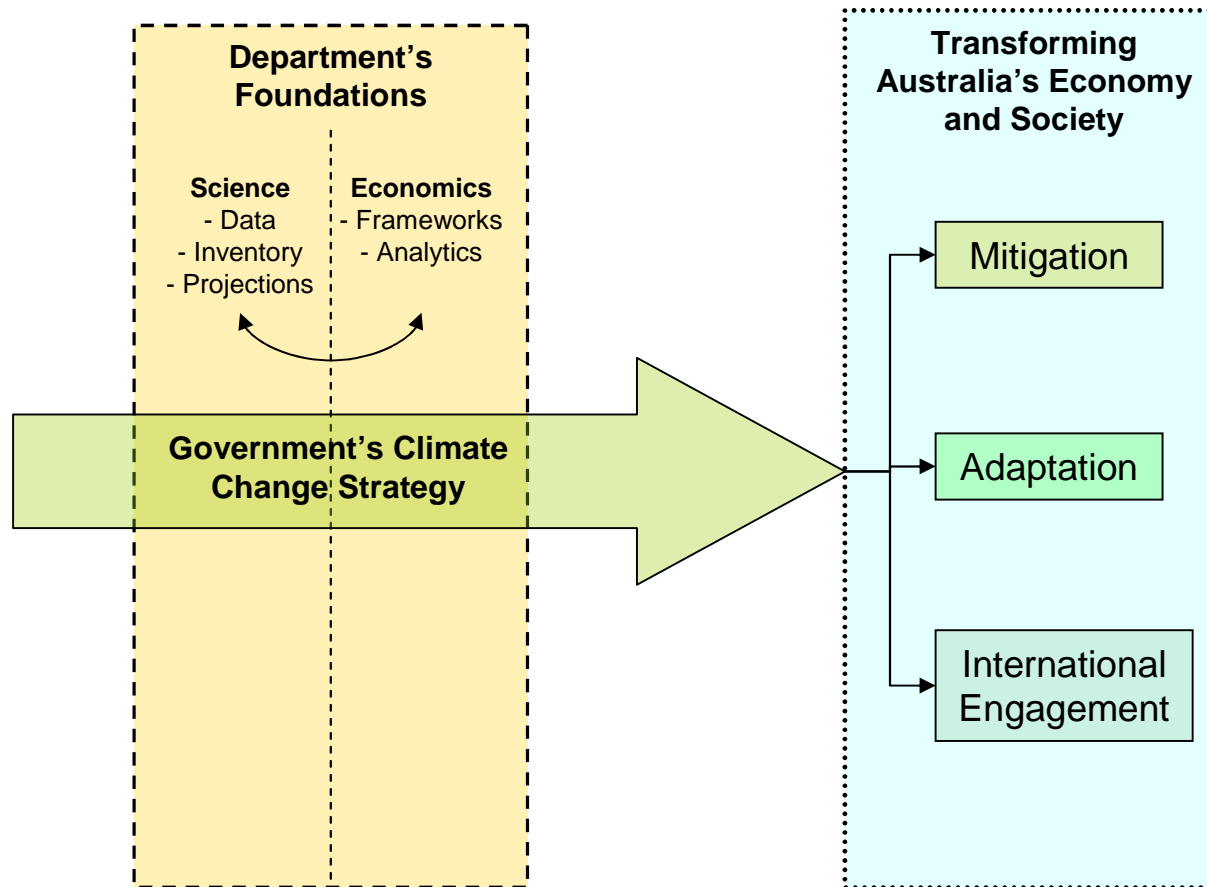
Estimated Return Period for
consecutive days over threshold

Adelaide (Kent Town)
30 years of record



Source:
Dr
Warwick
Grace

Climate Change Action



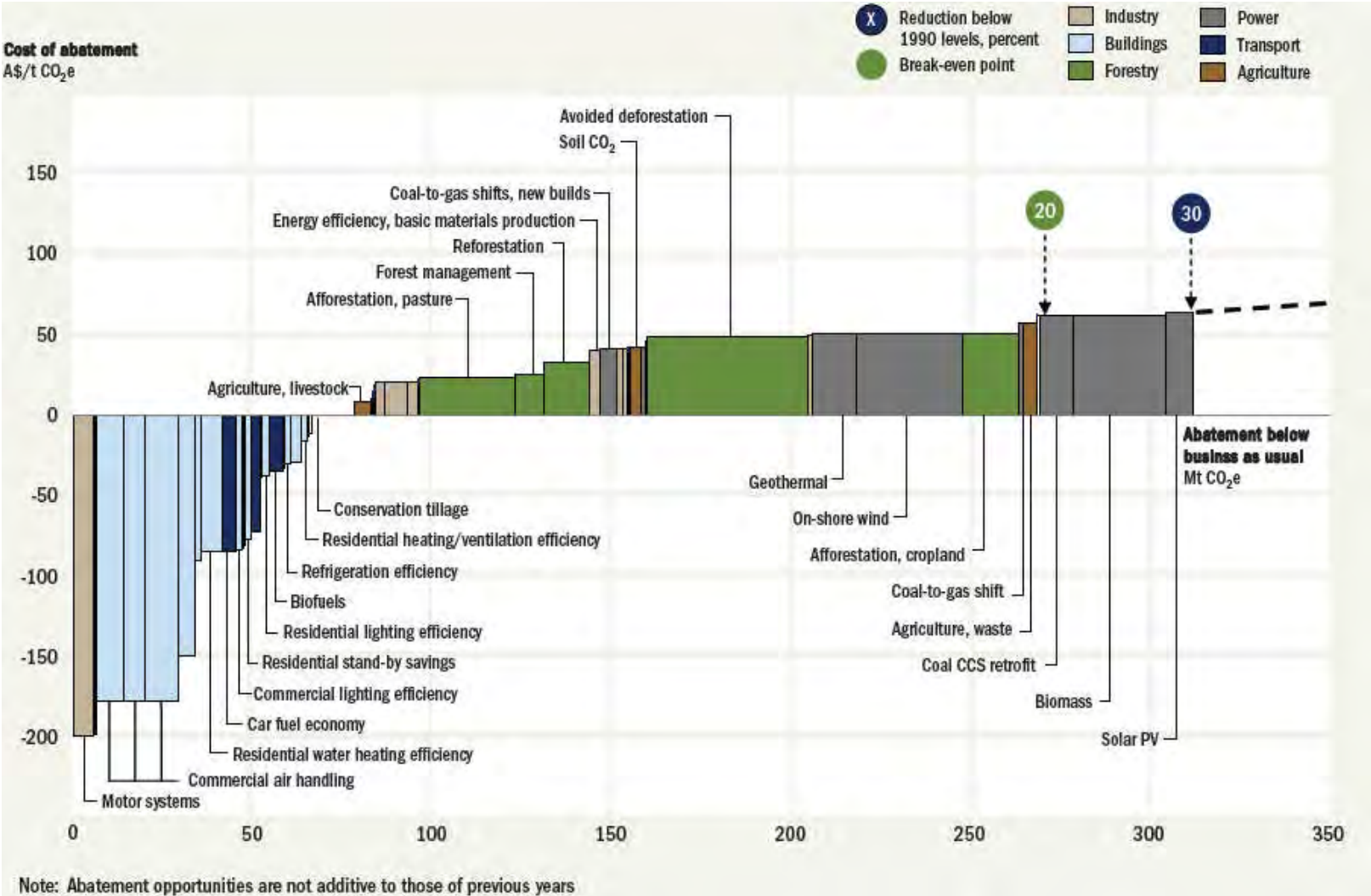
Mitigation of greenhouse gases



Foreword

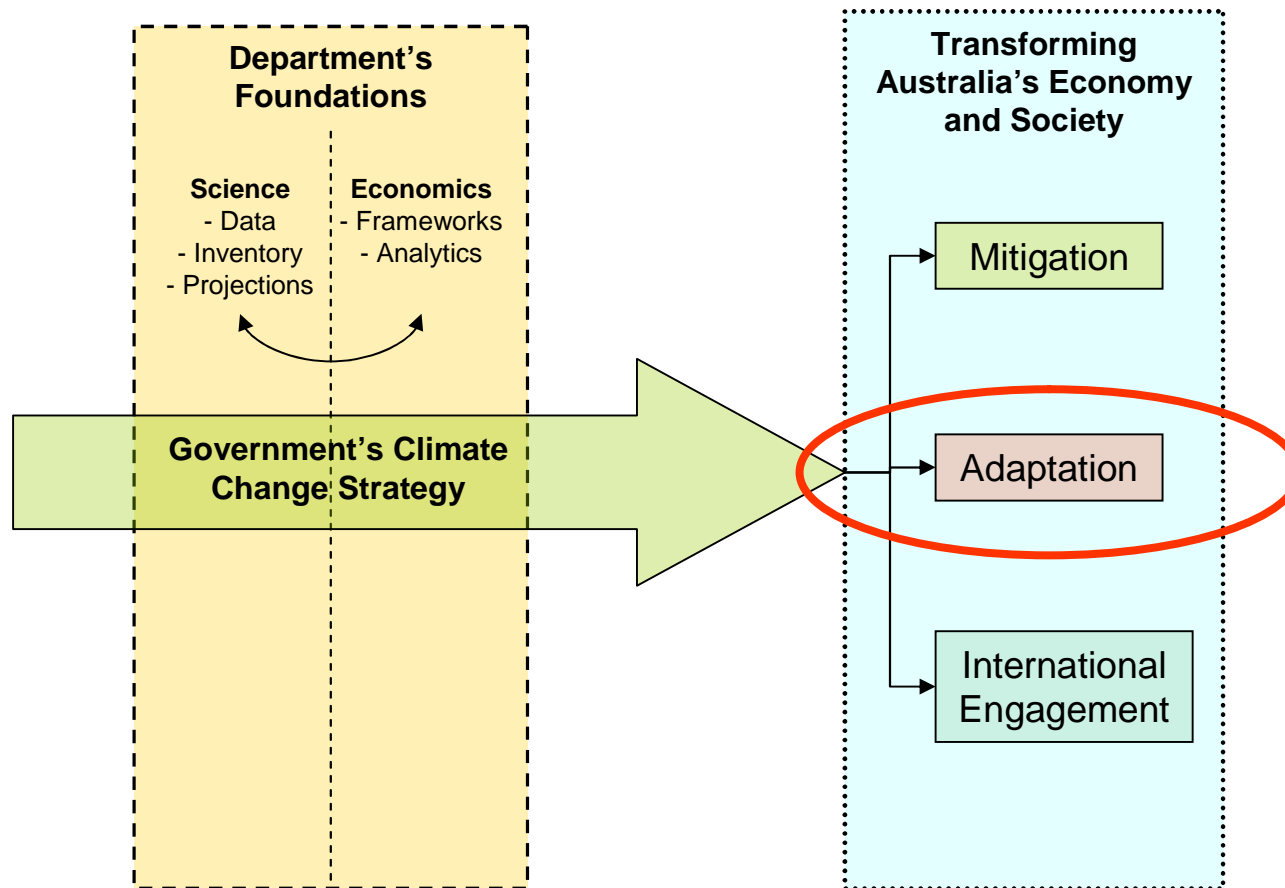
CARBON POLLUTION REDUCTION SCHEME **GREEN PAPER** JULY 2008
www.climatechange.gov.au

Carbon abatement cost curve - 2020



Source: McKinsey & Company Australia, 2008.

Climate Change Action



Adaptation explained

- Vulnerability of New Orleans to hurricane impacts has been known and officially recognised for more than 50 years
- The cost of raising the protective levees around New Orleans and strengthening identified weak spots was estimated prior to Hurricane Katrina at US\$300-400 million
- As of April 2006, the US Government has appropriated US\$105 billion for repairs and reconstruction. This does not account for the great personal losses, as well as the damage to the region's economy through the interruption of oil supply and the destruction of the Gulf Coast Highway disrupting the region's export trade. It does not account for the longer-term impacts on the local economy eg the fishery in the Gulf of Mexico
- It is estimated that the total economic impact of Hurricane Katrina on the States of Louisiana and Mississippi may exceed UD\$150 billion

Adaptation: being prepared



What would have happened if Noah had waited until the flood – before starting to build the Ark?

Adapting to Climate Change



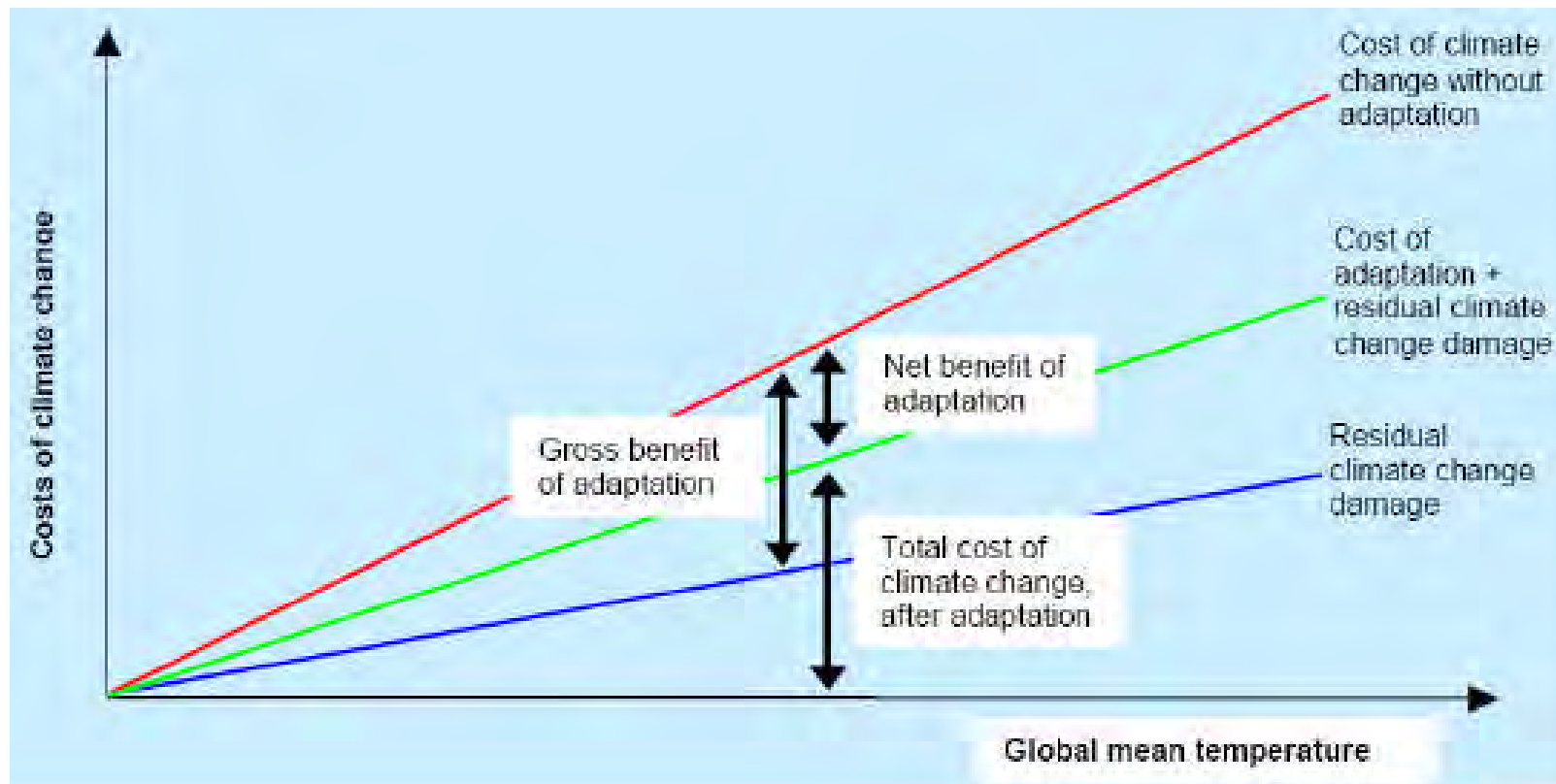
Adapting to Climate Change



Adapting to Climate Change



Net Costs of Adaptation



Stern (2007)



As the waves break, so does the heart of one man's dream

By **BEN DOHERTY**

YOU can hear the surf from Kevin Reardon's block at The Honeysuckles. It is one of the reasons he bought the place.

But the sound of waves breaking on Ninety Mile Beach is no longer a comfort. It is a portent of trouble.

"I wanted close to the beach-

standing dream to build a holiday and, ultimately retirement, home behind the dunes at Gippsland's Ninety Mile Beach is in serious jeopardy.

In a Victorian first, Wellington Shire Council appears set to pass a moratorium on any new building at The Honeysuckles, because of rising sea levels caused by climate change.

a last-minute inter-
y two councillors last
oped the shire asking

the Victorian Government to put an immediate 12-month ban on any development in the tiny hamlet of just over 100 houses, and less than 30 permanent residents.

But the motion is set to go back before council on Tuesday, and could mean all future building is suspended, and possibly banned forever.

► Continued **PAGE 2**

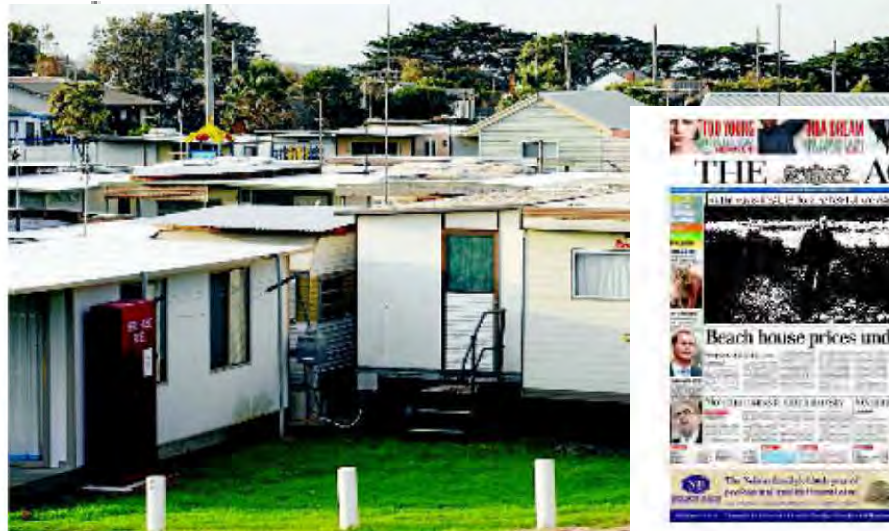
He has almost \$400,000 tied

up in land there but fears his investment might be worth closer to \$400 if his right to build on the land is suddenly revoked.

"A moratorium is unacceptable. Buy me out or just leave me alone," he says.



Kevin Reardon's dreams of a retirement home are in jeopardy.



The Seaspray caravan park is being moved to higher ground to escape rising sea levels.



Age
28/06/2008
Page: 1
General News
Region: Melbourne
Circulation: 207000
Type: Capital City Daily
Size: 1004.16 sq.cms
MTWTFS-

Honeysuckles owners may sue council

Properties devalued by climate scare

By **BEN DOHERTY**

A GIPPSLAND council is facing a multimillion-dollar class action for damage already done to coastal property values as it weighs banning development in areas vulnerable to rising sea levels caused by climate change.

Following a report in *The Age* that the Wellington Shire Council was considering banning any new development at The Honeysuckles behind Ninety Mile Beach, up to 70 landowners in the area are joining to fight the move, potentially seeking hundreds of thousands of dollars each.

But other nearby settlements, such as Golden Beach, Paradise Beach, Sea Spray, and even major centres such as Lakes Entrance are just as vulnerable to rising sea levels.

Even Melbourne's bayside suburbs such as Elwood, Brighton and South Melbourne are at risk, according to CSIRO and State Government studies.

Graham Smit, a landowner who intended to build his retirement home at The Honeysuckles, said by singling out one settlement Wellington Shire Council had depressed property prices forever, ever before it makes a final decision on whether to outlaw development.

30 permanent residents at The Honeysuckles, said joining a class action against the council was being seriously considered by other affected residents and landowners.

Wellington Shire Council meets this morning to decide on whether to write to Victorian Planning Minister Justin Madden asking for a 12-month moratorium on all development in The Honeysuckles.

Shire chief executive Lyndon Webb said the council was "caught between a rock

the State Government's Victorian Coastal Strategy Draft in January, the shire itself said banning development was not the only strategy to balance development with climate change concerns.

"There is a need to investigate alternative approaches including physical barriers such as sea walls, better-vegetated sand dune systems or even levy banks, to protect coastal residential areas in lower areas, rather than prohibiting development altogether," the sub-



Age
01/07/2008
Page: 2
General News
Region: Melbourne
Circulation: 207000
Type: Capital City Daily
Size: 247.29 sq.cms
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KEY POINTS

- Residents say existing property values have been gutted by talk of a development ban.
- Up to 70 are considering a class action for millions of dollars in damages.

Reprieve on Ninety Mile Beach homes

Council baulks at building moratorium

By **BEN DOHERTY**

RESIDENTS and landowners in a small community on Ninety Mile Beach in Gippsland have won a planning reprieve, with Wellington Shire Council backing down on a proposal to ban development in the hamlet.

But home owners in low-lying coastal settlements could still be slugged with extra building conditions, or forced to indemnify the council of any responsibility in the event of flood, with the council meeting behind closed doors yesterday afternoon to discuss legal advice on new regulations.

And the council might face a class action from angry landowners, who argue that speculation about the moratorium

But outraged residents overwhelmed a council meeting yesterday, with more than 50 protesters attending, and more than 20 residents and landowners condemning the move.

The council voted six to one to drop the proposed ban.

Kylie Stolk bought a block at The Honeysuckles last year just after she turned 21.

She broke down as she told councillors of the sacrifices she had made, and that her dream had been shattered by the coun-

effects of climate change on coastal settlements and, in particular, how to minimise any exposure to legal liability.

Yesterday, the council considered legal advice behind closed doors about the possibility of mandating certain building conditions — for instance, that all dwellings be demountable, or setting minimum floor levels — for new coastal dwellings. It also considered section 173 agreements, which could relieve council of any legal liab-

KEY POINTS

- Proposed building ban at The Honeysuckles overturned.
- Council considers legal advice behind closed doors.
- Mayor fears big problems with projected rise in seas.

Age

02/07/2008

Page: 2

General News

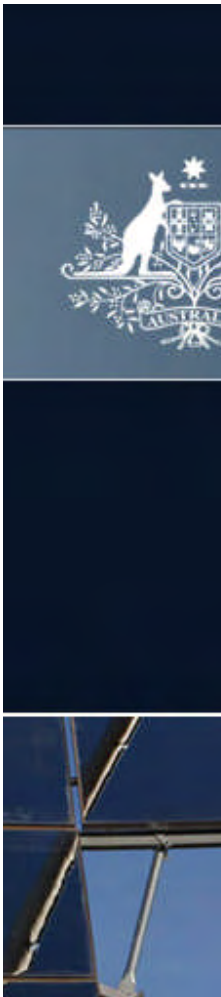
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Circulation: 207000

Type: Capital City Daily

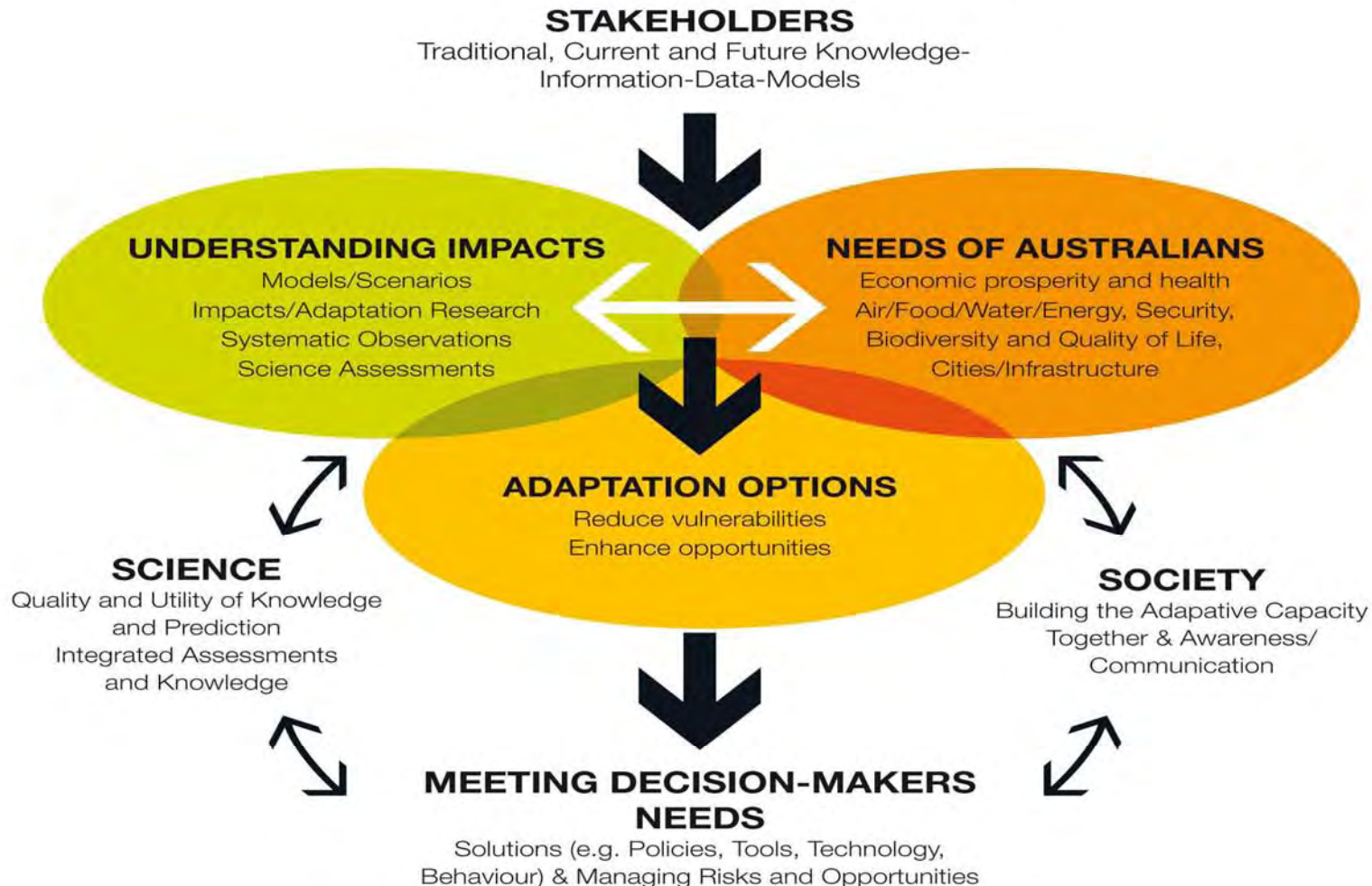
Size: 211.76 sq.cms

MTWTFSS-



Australian Government Support for Adaptation

MAINSTREAMING ADAPTATION

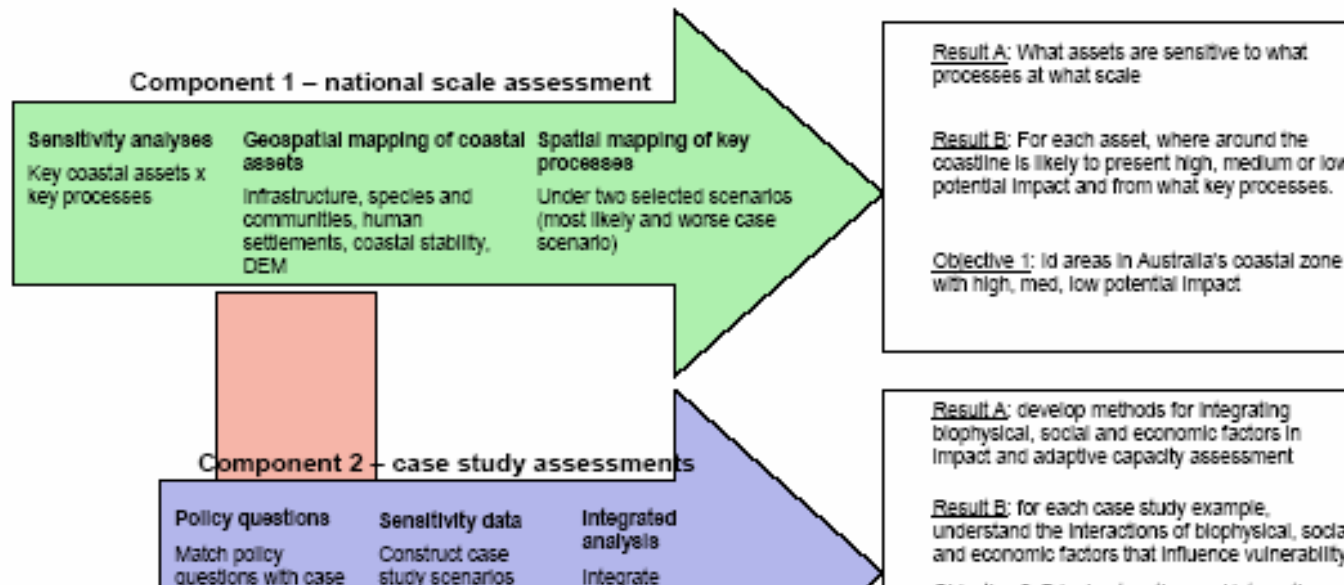


Source: Adapted from Environment Canada, 2004 and Wheaton and MacIver, 1999

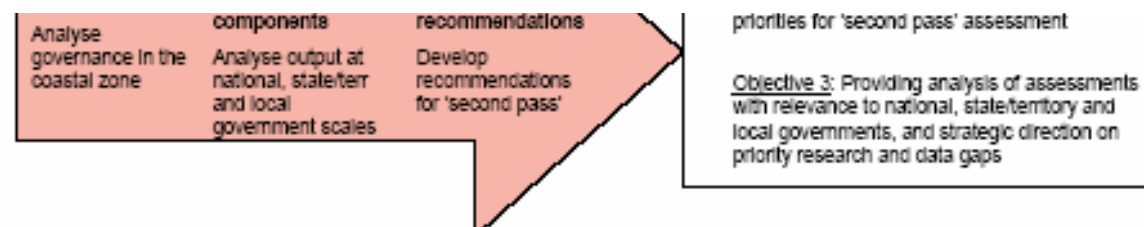
National Coastal Vulnerability Assessment

The purpose of the 'first pass' national coastal vulnerability assessment is to support decision-makers through:

- identifying areas in Australia's coastal zone with high, medium and low potential impact from climate change;
- linking biophysical and socio-economic analyses so that decision-makers can better understand the vulnerability and potential costs of climate change in the coastal zone; and
- providing analysis of policy and governance of relevance to governments, and outlining priority research areas and national data gaps.



Completion date: late December 2008





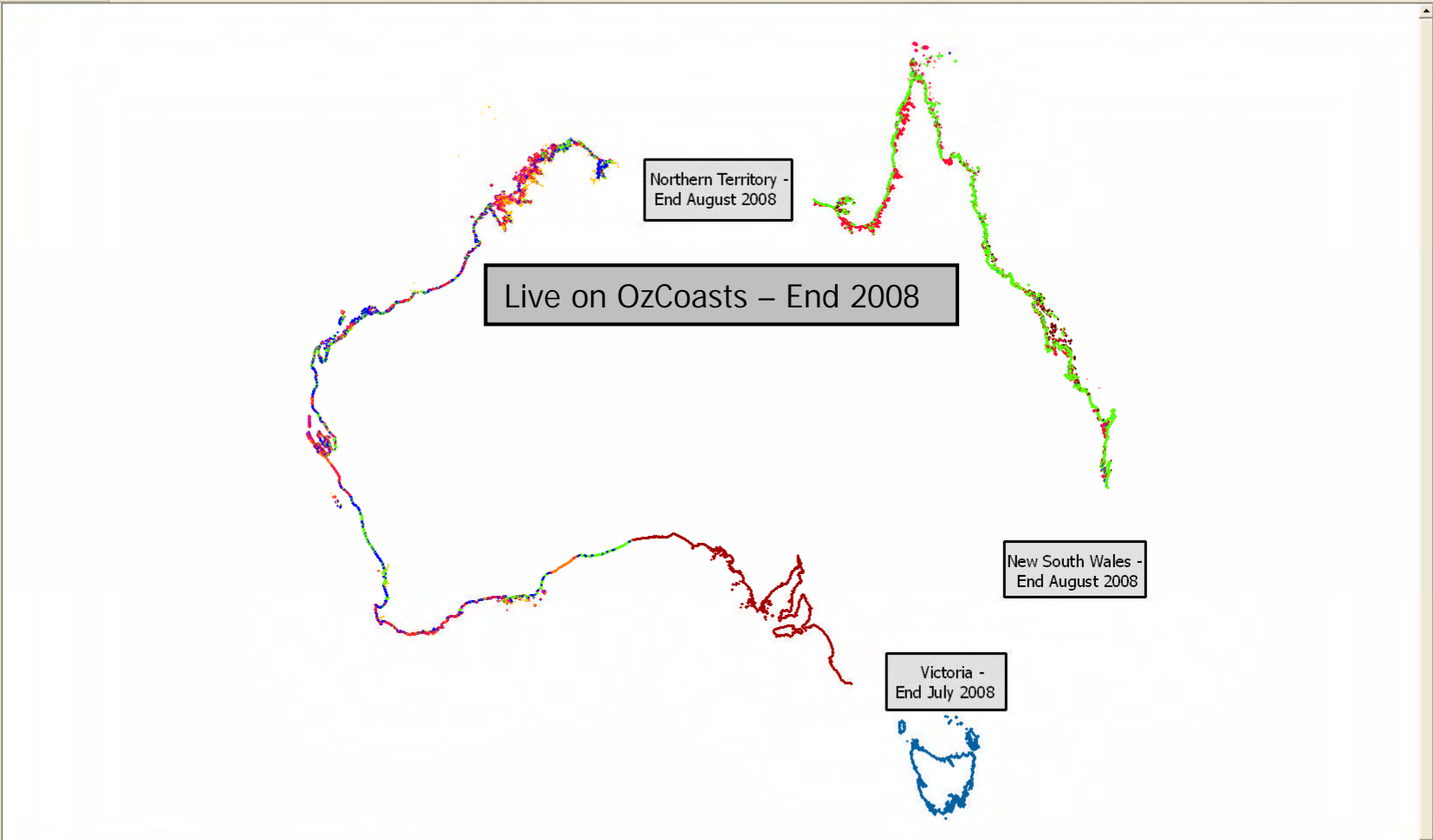
Smartline_July2008.mxd - ArcMap - ArcView

File Edit View Insert Selection Tools Window Help

1:16,261,210

Task: Create New Feature

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- auscstgeo_wa_v1_beta7
 - Backprof_v
 - Gentle-moderate slopes
 - Gently sloping plains
 - High cliffed coast
 - Steep slopes
 - Unclassified
 - Very flat plains
 - auscstgeo_tas_v1_beta6
 - auscstgeo_sa_v1_beta5
 - auscstgeo_qld_v1_beta8
 - Interd1_v
 - Artificial shoreline undiff
 - Cliff (>5m) (undiff)
 - Cobble (rock) beach
 - Coffee rock platform
 - Flat boulder deposit (rock) undiff
 - Flat pebble/cobble deposit (rock) ur
 - Hard rock cliff (>5m)
 - Hard rocky shore platform
 - Mixed sand beach
 - Mixed sand tidal flat undiff
 - Mixed sandy shore undiff
 - Muddy tidal flats
 - Pebble/cobble (rock shingle) beach
 - Piles (Jetty)
 - Rock Wall
 - Rocky shore platform (undiff)
 - Sandy beach undiff
 - Sandy shore undiff
 - Sandy tidal flat
 - Sloping boulder deposit (rock) undiff
 - Sloping coffee rock deposit
 - Sloping hard rock shore
 - Sloping rocky shore (undiff)
 - Sloping soft 'bedrock' shore
 - Soft 'bedrock' shore platform
 - Steep boulder talus
 - Tidal flats (sediment undiff.)
 - Unclassified

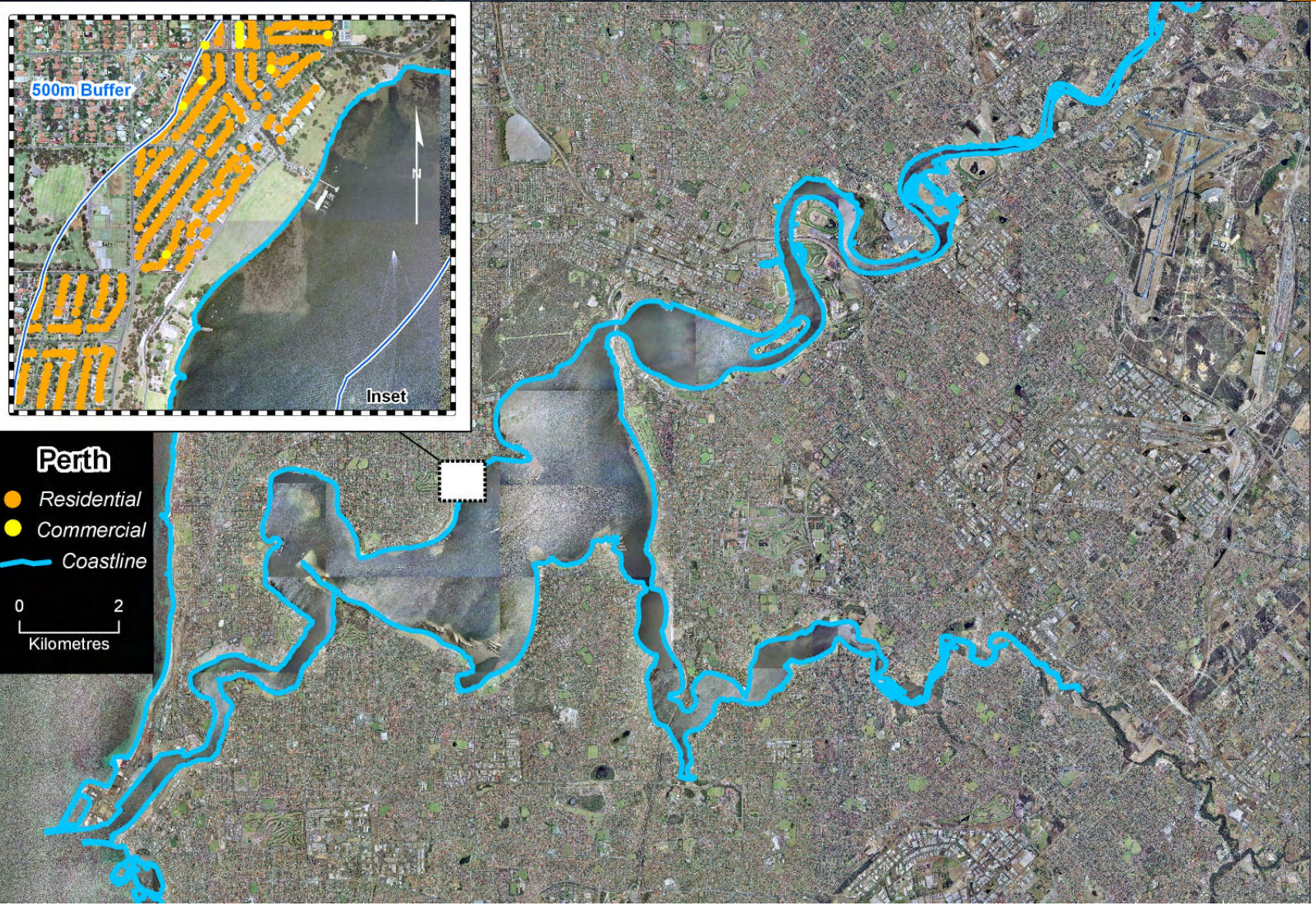
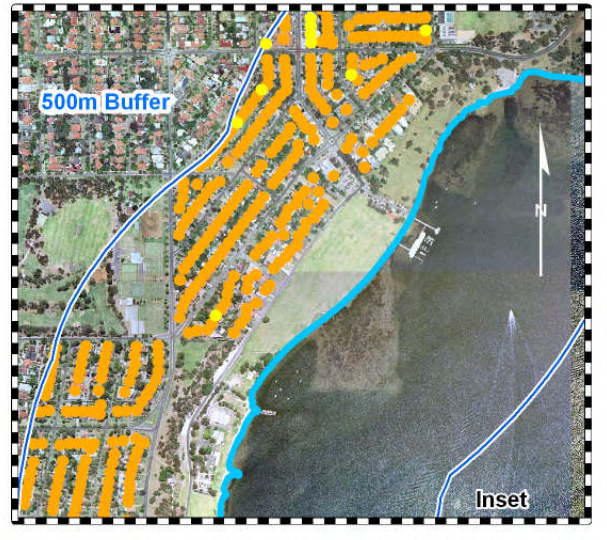


Display Source Selection Catalog

Drawing

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Hardy Inlet - ArcMap - ArcInfo

File Edit View Insert Selection Tools Window Help

1:59,550 136%

Editor Task: Create New Feature Target: Spatial Analyst Layer:

XTools Pro

Layers

- auscstgeo_wa_v1_beta7
 - Intertd1_v
 - Colluvium (talus) undiff
 - Hard bedrock shore
 - Sandy beach undiff
 - Sandy tidal flat
 - Soft sediment shore (undiff)
 - Tidal flats (sediment undiff)
 - Unclassified

Identify

Identify from: <Top-most layer>

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Baseline	234
Basyscale	25K-100K
Basefeat	Mean High Water Mark (MHWM)
Auscstfid	0
Updated	<null>
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Backprox_n	509042
Backprox_v	Dune undiff
Backprox_r	144
Backprox_s	50K
Backdst_n	509044
Backdst_v	Dune field undiff
Backdst_r	144
Backdst_s	50K
Backprof_n	900
Backprof_v	Unclassified
Backprof_r	
Backprof_s	
Intertd1_n	509010
Intertd1_v	Sandy beach undiff
Intertd1_r	144
Intertd1_s	50K
Intertd2_n	909090
Intertd2_v	Unclassified
Intertd2_r	
Intertd2_s	
Intslope_n	900
Intslope_v	Unclassified
Intslope_r	
Intslope_s	
Subtid1_n	609010
Subtid1_v	Muddy bottom undiff
Subtid1_r	231
Subtid1_s	10K-24K
Subtid2_n	909090
Subtid2_v	Unclassified
Subtid2_r	
Subtid2_s	
Exposure_n	100
Exposure_v	Very Low
Exposure_r	231
Exposure_s	10K-24K
Geology1_n	429043
Geology1_v	Amphibolites
Geology1_r	102
Geology1_s	500K
Geology2_n	909090
Geology2_v	Unclassified
Geology2_r	
Geology2_s	

Identified 1 feature

Display Source Selection Catalog

Drawing Arial 10 B I U

-1716239.287 -3865534.02 Meters 12.44 19.73 Centimeters

Vulnerable Infrastructure (within 200m of the coast)

Within 200 m of coast

Australia

559,000 residential addresses
with replacement value \$104 billion
replacement value plus contents 128 billion

24,000 commercial and small – medium industrial buildings
with replacement value \$33,581 billion

Total for residential, commercial and small – medium industrial
buildings
583,000 buildings
with replacement cost (without contents) of \$33,685 billion

Includes:

35 ambulance stations
117 fire stations
106 police stations
11 SES establishments
44 shopping centres
244 post offices
538 caravan/ camping grounds
32 hospitals and health services
102 nursing homes

Vulnerable Infrastructure (within 200m of the coast)

Plus (uncosted)

120 ports and harbours

360 universities, technical colleges, schools and related institutions

1 grain silo

10 tank farms for petroleum products

3 power stations, 2 substations

4 factories

1 shipyard

170 unidentified industrial zones

3 water treatment plants

15,900 km freeways, highways, roads valued at \$25 billion

1841 bridges spanning 199,813 metres

5,210 m freeway tunnels



Potential_Inundation2070.mxd - ArcMap - ArcView

File Edit View Insert Selection Tools Window Help

1:23,119

Editor Task: Create New Feature Target:

- Layers
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 - C_VALUE
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 - \$400,001 - \$500,000
 - \$500,001 - \$750,000
 - \$750,001 - \$1,000,000
 - >\$1,000,000
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 - <all other values>
 - NewShoreline_2070
 - CurrentBuildingStock
 - Smartline_Currentshoreline
 - Intertidal_v
 - Artificial shoreline undiff
 - Rock Wall
 - Piles (Jetty)
 - Cobble (rock) beach
 - Flat boulder deposit (rock) undiff
 - Hard rocky shore platform
 - Mixed sand tidal flat undiff
 - Mixed sandy shore undiff
 - Muddy tidal flats
 - Sandy beach undiff
 - Sandy shore undiff
 - Sandy tidal flat
 - Sloping boulder deposit (rock) undiff
 - Unclassified
 - AreaPotentiallyInundated_2070



Display Source Selection Catalog

Drawing Arial 10 B I U



Potential_Inundation2070.mxd - ArcMap - ArcView

File Edit View Insert Selection Tools Window Help

1:23,119

Task: Create New Feature

Target:

Layers

- BuildingValue_Construction Costs
 - C_VALUE
 - \$300,000 - \$400,000
 - \$400,001 - \$500,000
 - \$500,001 - \$750,000
 - \$750,001 - \$1,000,000
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- BuildingsPotentiallyInundated_2070
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- NewShoreline_2070
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Bedrock Headland

Pacific Ocean

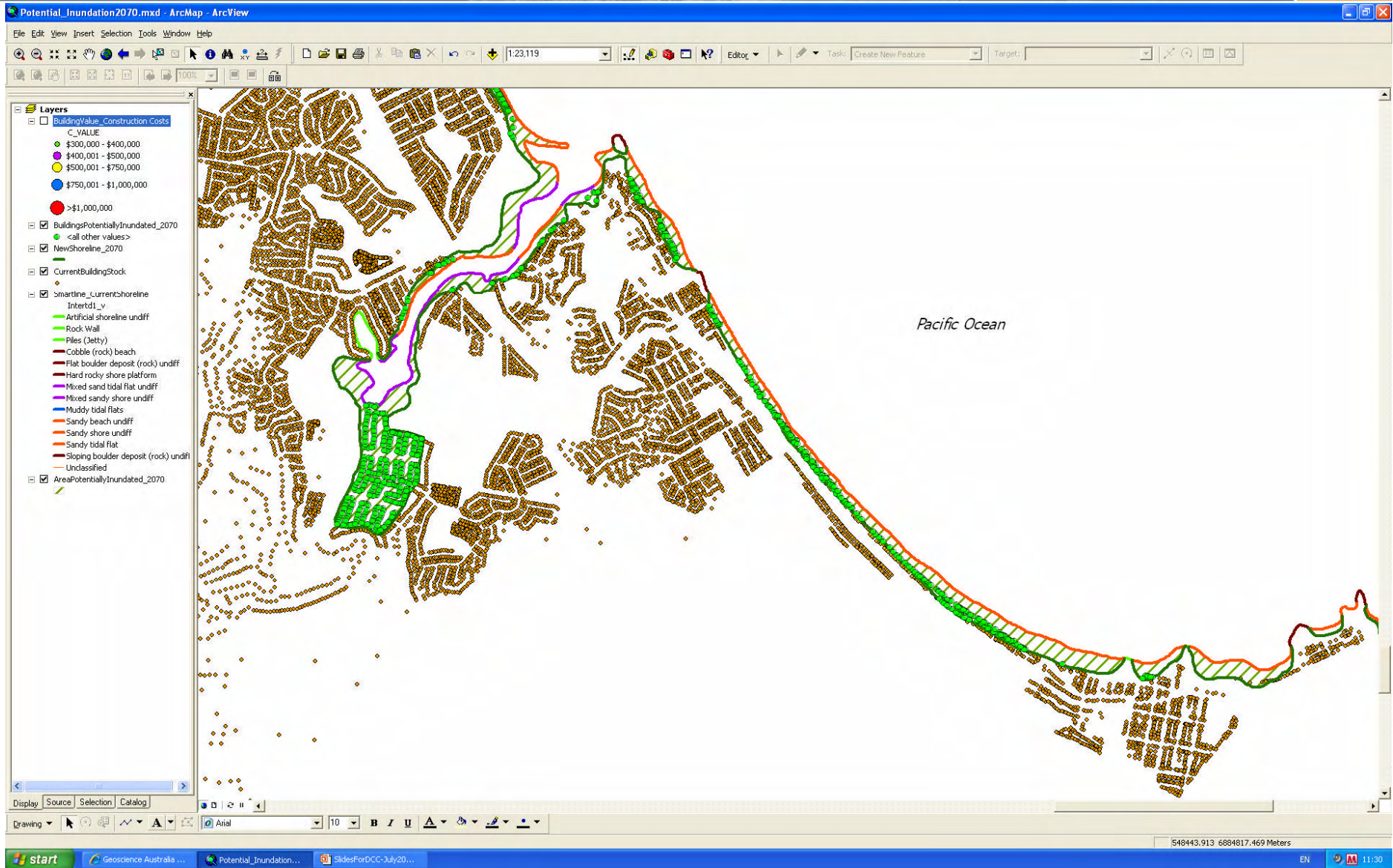
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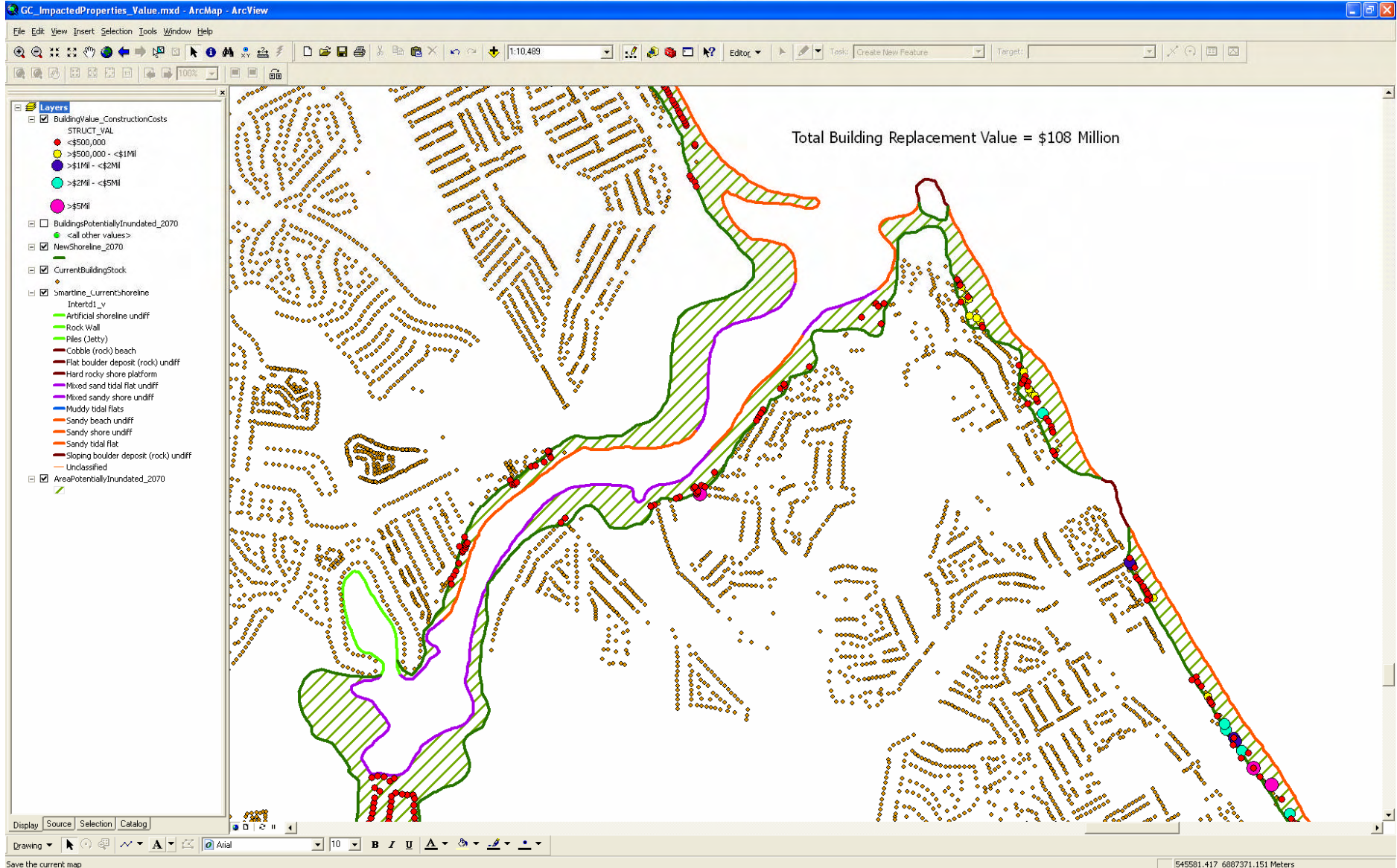
Drawing

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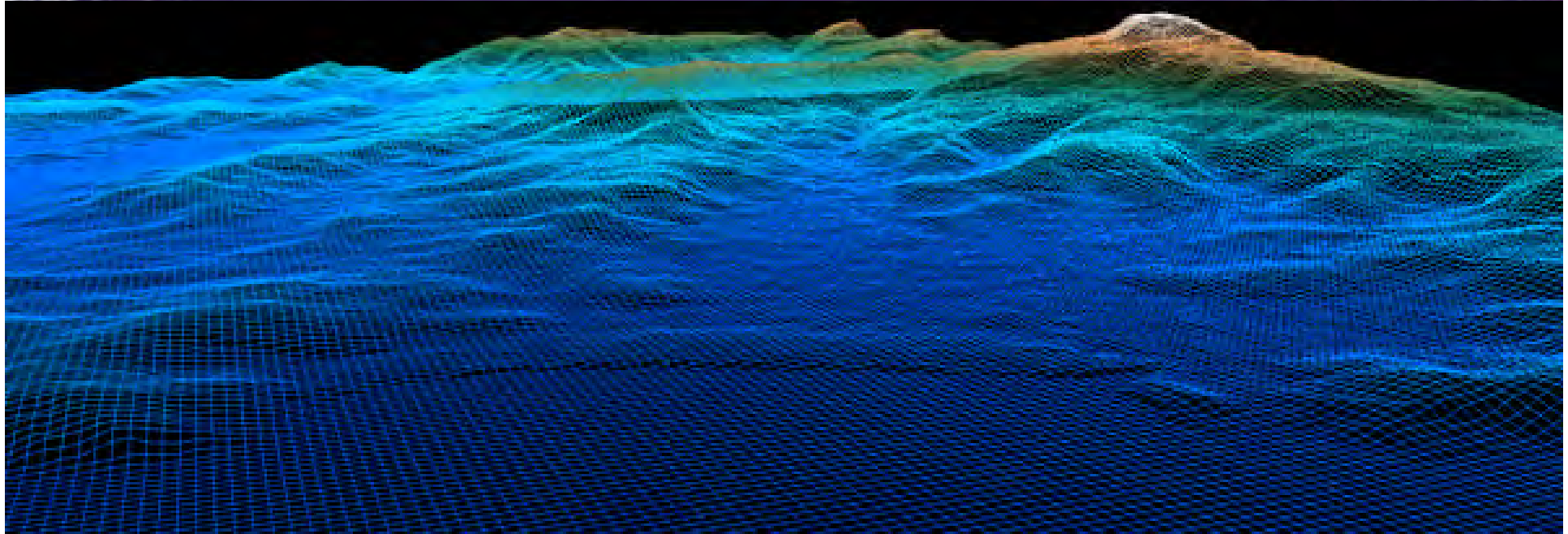
start Geoscience Australia Potential_Inundation SlidesForDCC-July20...

EN 11:28





Digital Elevation Model (DEM)



Flooding



1 m rise

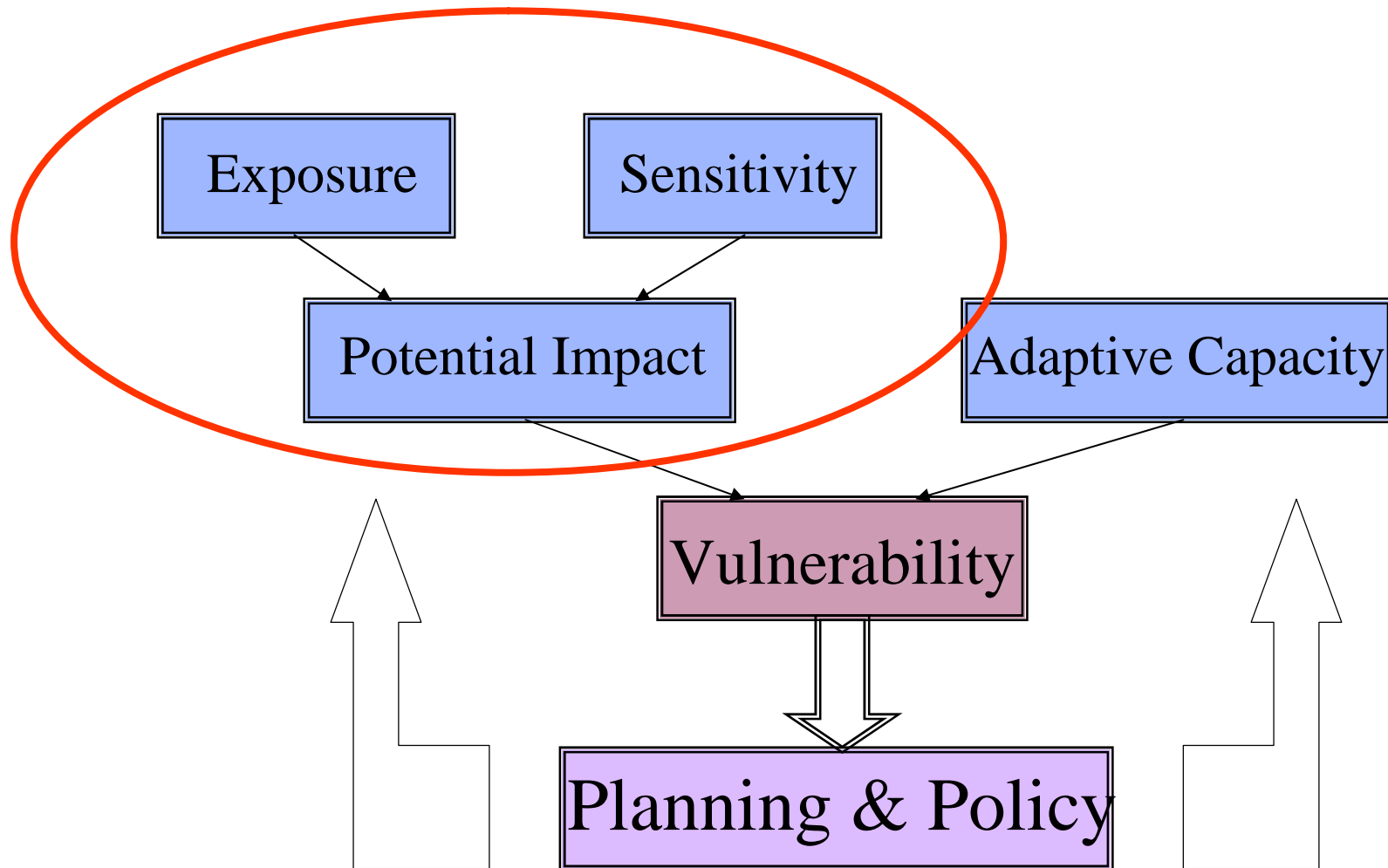


3 m rise



5 m rise

Vulnerability Framework





Vulnerability

Smartline coastline with all attributes

Nationally consistent data and information products

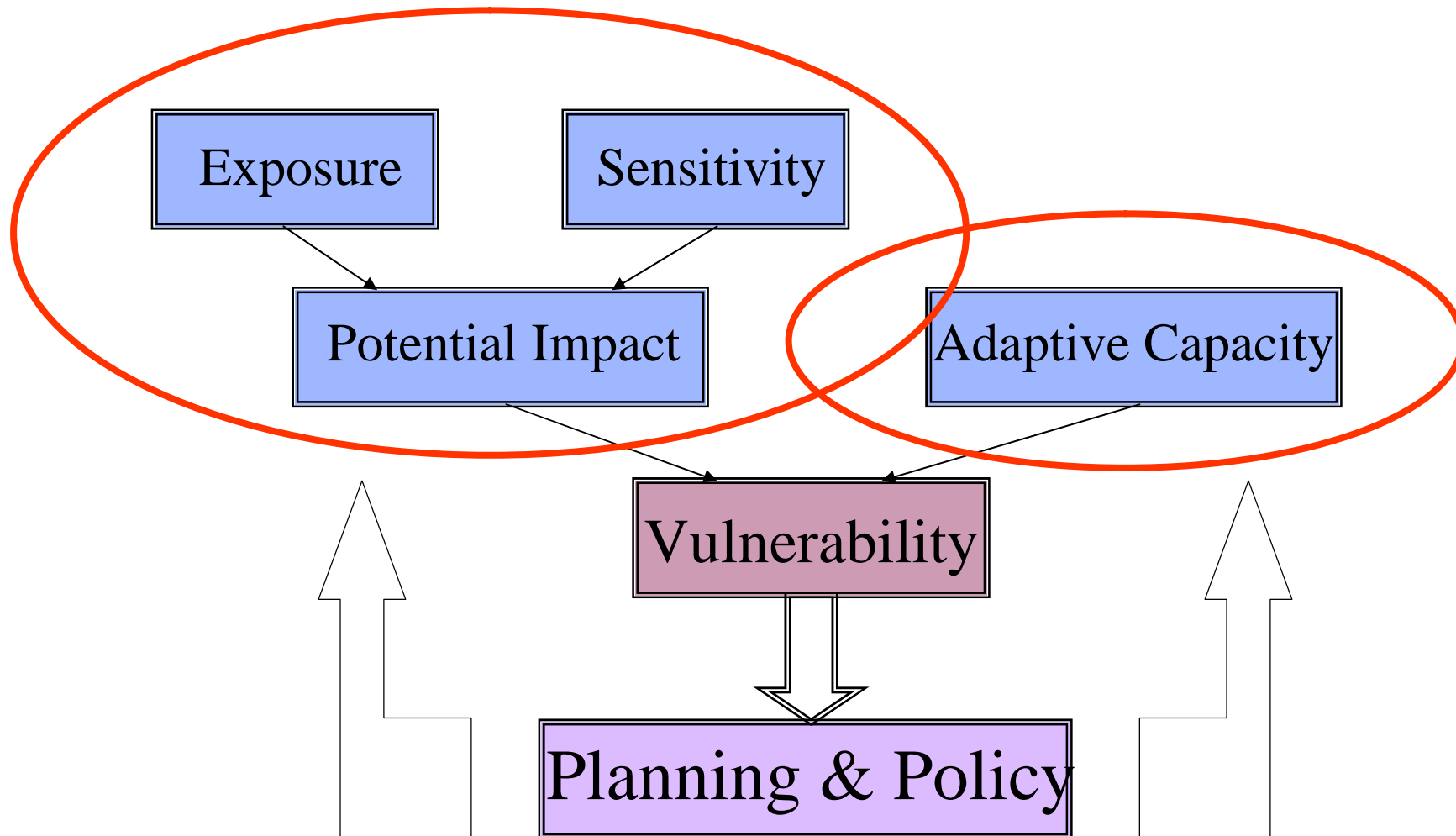
with

sufficient resolution to be useful at the local government level

with

easy access to information products

Vulnerability Framework



The Conundrum!



Trophy beach house / development site – Gold Coast QLD

3551 Main Beach Parade, Main Beach, Gold Coast

A prime Northern corner, double block hugging the sands of Main Beach and the adjoining cul-de-sac, this beach house is an uncut diamond in a perfect setting. A priceless 75m²* beachfront land-outcrop extends the land Eastward, giving this address development edge over similar blocks along the coastline of Main Beach Parade.

- Renovated 1930s beach house on prime 963m², North corner site
- Potential development options to increase density and height
- Unobstructed 180 degree views from beachfront outcrop protrusion