

# Coastal Policy and Resource Management

Professor Nick Harvey

*The University of Adelaide, South Australia*



## Talk outline

1. The value of the coast, globally and nationally
2. The 'combination lock effect' on coastal policy and management
3. Putting the 'value' into decision making in coastal management

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1. **The value of the coast, globally and nationally**
2. The 'combination lock effect' on coastal policy and management
3. Putting the 'value' into decision making in coastal management

## International recognition of value of the coast

*Each coastal State should consider establishing, or where necessary strengthening, appropriate coordinating mechanisms ... for integrated management and **sustainable development of coastal and marine areas** and their resources, at both the local and national levels.*

*(United Nations, Agenda 21, Chapter 17.6, 1992)*

## Global value of the coast

- The coast provides both market (commercial) and non-market (social & environmental) services which can be valued using different methods to determine the \$ attached to coastal ecosystem service products (ESP)
- Costanza et al (1997) estimate global total ESP (including natural and human altered ecosystems) at \$US  $33,268 \times 10^9$  per year
- Martinez et al (2007) estimate that global coastal total ESP is \$US  $25,782 \times 10^9$  per year or over three quarters of the total global ESP

## National values of coastal ecosystem services (ESP)

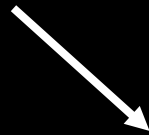
<b><i>Top countries</i></b>	<b><i>million \$US</i></b>
Australia	316,184
Indonesia	285,499
Russian Federation	279,218
Canada	124,432
United States	100,203
Brazil	67,611
Papua New Guinea	60,276
Mexico	58,341

*(source Martinez et al 2007)*

## Other national values of Australian coast

- Value of coastal assets at risk due to climate change
- Ecological value of coasts and importance of sustainable use
- Explicit and implicit value of coast in numerous national public inquiries
- Value of coast for living (>80% near the coast) and infrastructure
- Value of coast for tourism, fishing, shipping, ports, strategic purposes

threat to value of  
world coasts



Global  
Environmental  
Change

**Four key global  
Influences on Australian  
coastal management**

Sustainable  
Development

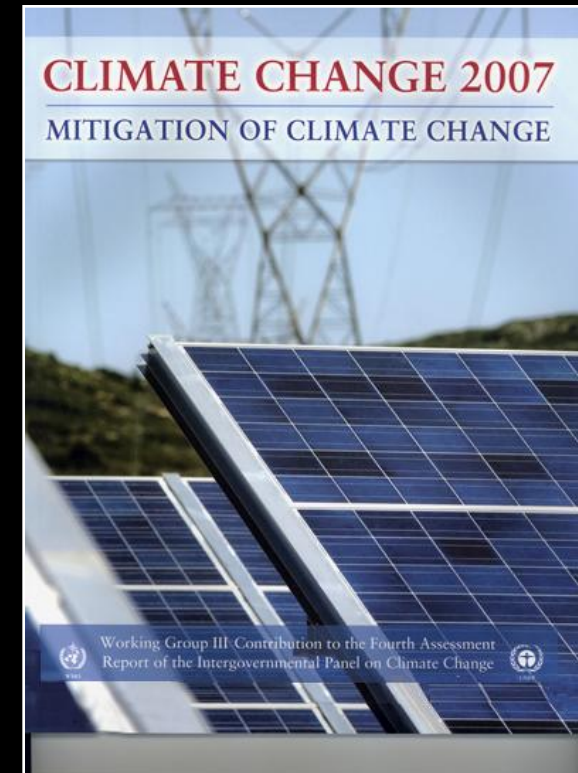
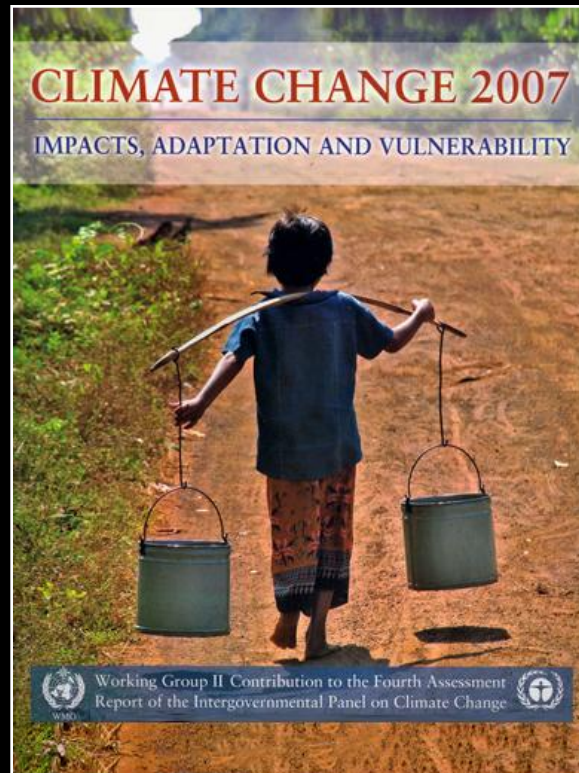
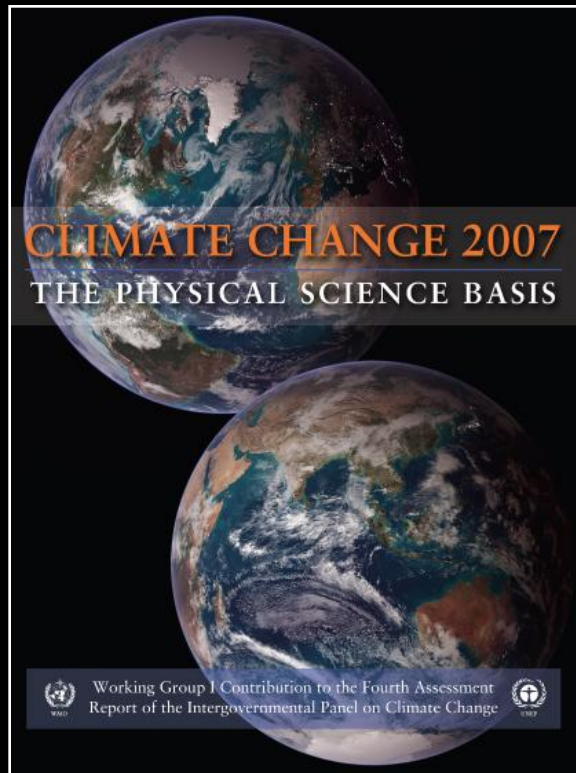
Integrated  
Resource  
Management

Community  
Participation



# Intergovernmental Panel on Climate Change (IPCC) Assessments

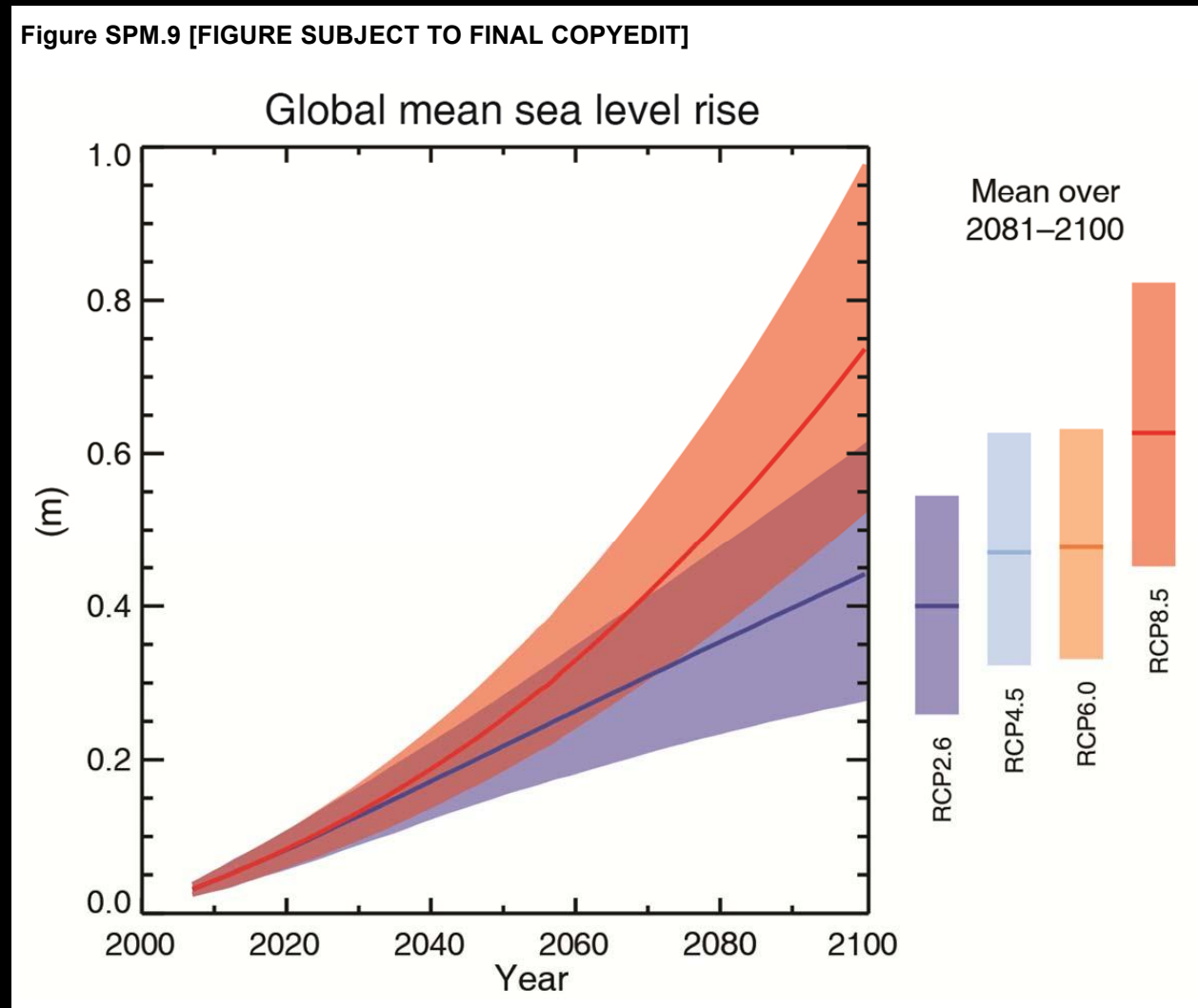
First Assessment Report (FAR)	1990
Second Assessment Report (SAR)	1995
Regional Assessment Report	1998
Third Assessment Report (TAR)	2001
Fourth Assessment Report (AR4) - Nobel Prize -	2007



*Fifth Assessment Report (AR5 - SPM)*

*2013*

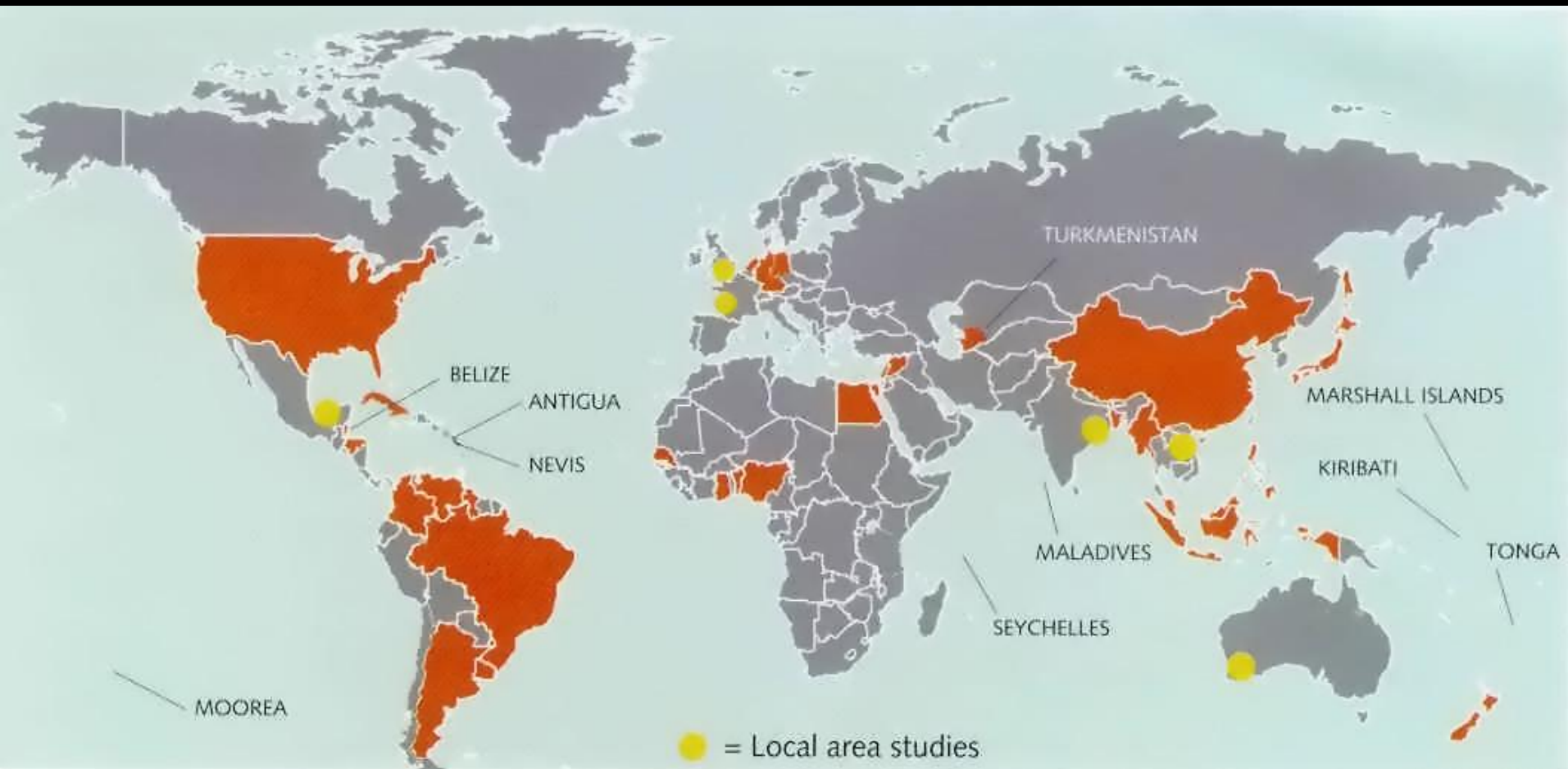
# IPCC AR5 Summary Report for Policy Makers provides sea-level rise projections (confirming projections from AR4)



Source: IPCC WG1 AR5, Sep 2013

# Earlier IPCC Global Coastal Vulnerability Studies

Low GDP countries may not have economic capacity to adapt to sea-level rise

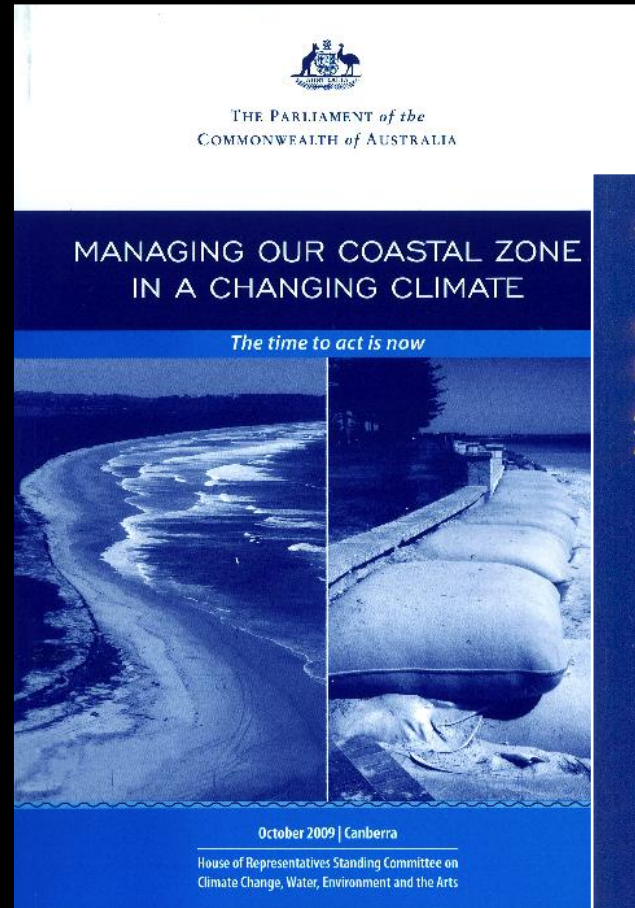


Source: World Coast Conference, IPCC, 1994

## National response to threat of climate change on coast

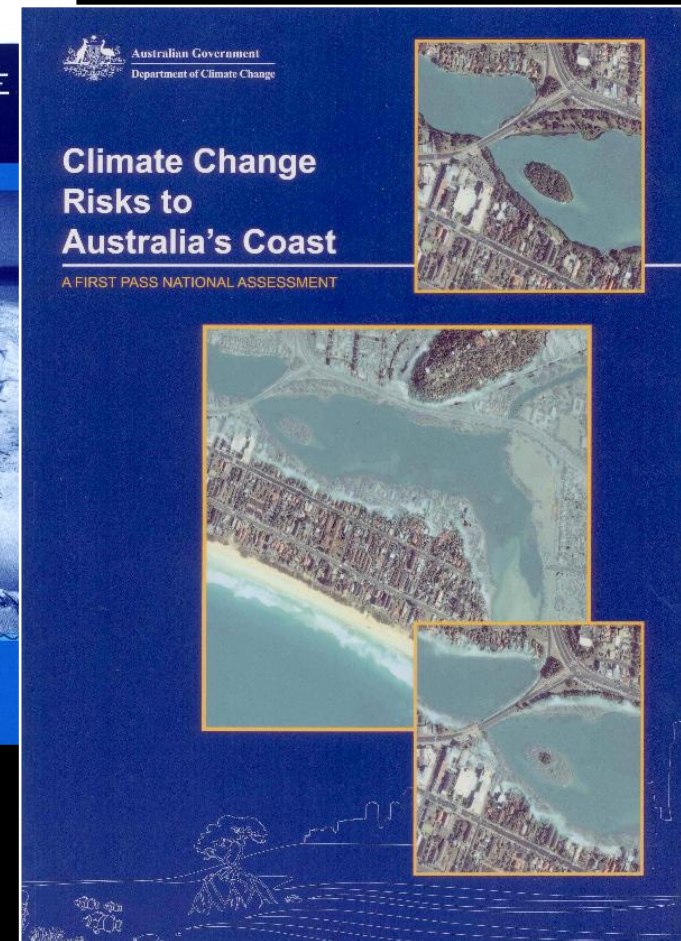
- Gaps analysis of Australian coastal vulnerability 2006
- Department of Climate Change (created 2007) influential on coastal issues
- National Climate Change Adaptation Research Framework (NCCARF) 2008
- House of Reps Inquiry into coastal management and climate change 2009
- Dep Climate change report on coastal risks of climate change 2009
- Change of government downplays climate change as issue 2013

# Two major government reports related to climate change and coasts released in 2009



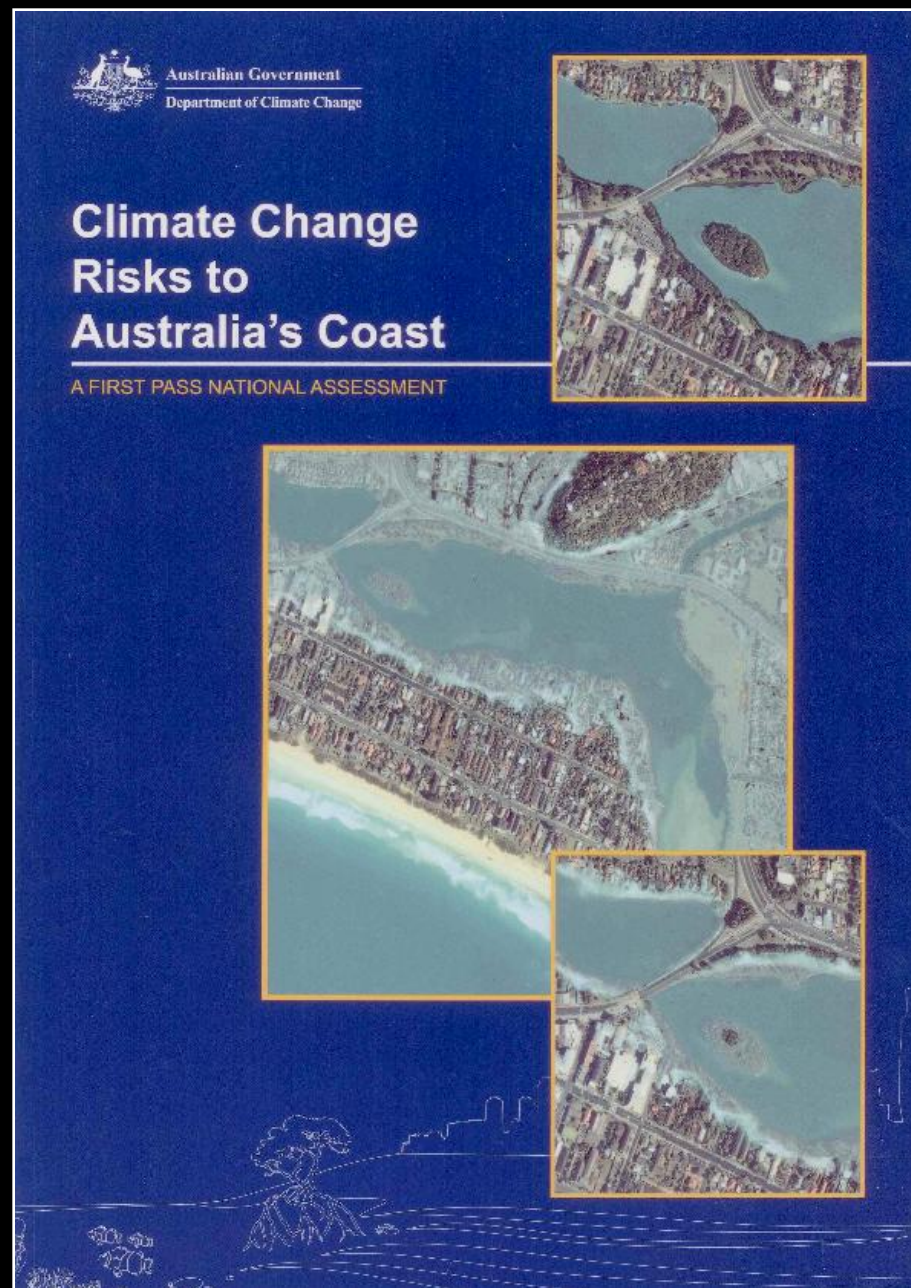
House of Representatives  
Standing Committee on  
Climate Change, Water,  
Environment and the Arts

Australian Government  
Department of Climate Change



# Coastal Risk, November 2009

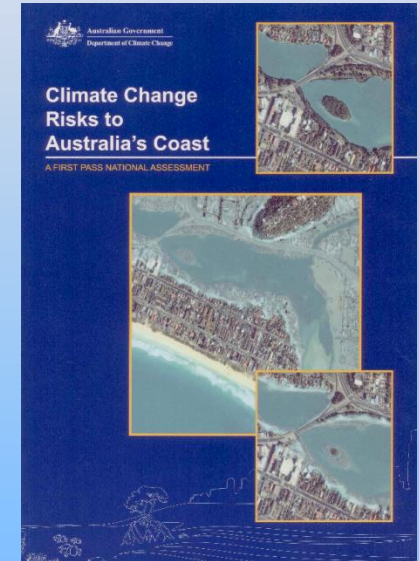
Release of Report (166 pages) by the  
Climate Change Minister (prepared by the  
Department of Climate Change)



## 2009 Coastal Risk Report

### KEY FINDINGS

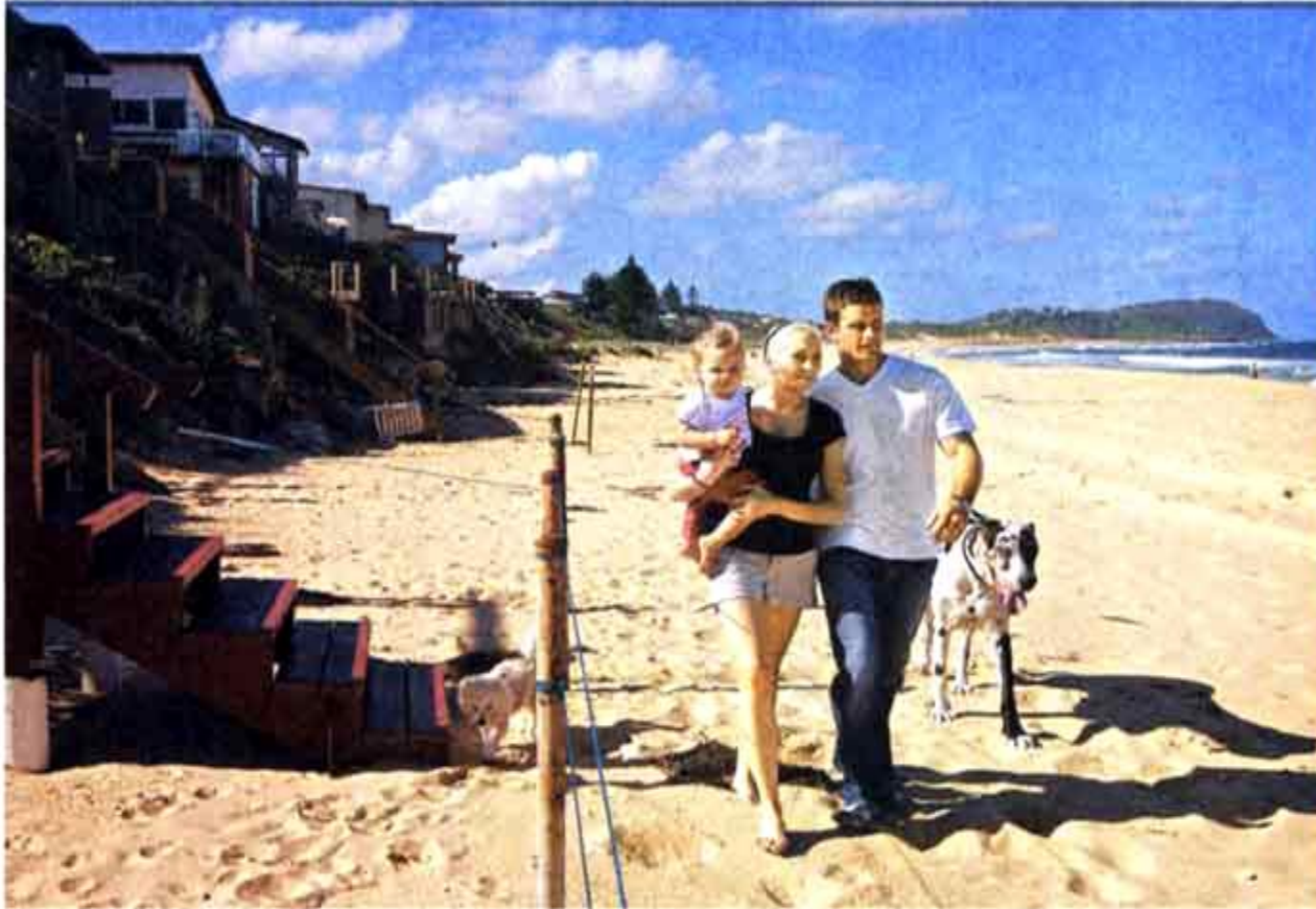
1. Used a higher sea-level projection of 1.1 m by end of century
2. mid-range rise of 50 cm makes 10 yr event 10 days by 2100
3. 1:100 event (eg NSW 2007 - \$1.3 billion) several times a year
4. Accreting beaches will flip to become receding beaches
5. Bucket-fill model used to illustrate problems (has limitations)
6. Up to \$63 billion residential properties at risk from 1.1 metre sea-level rise
7. Between 157,000 to 247,600 buildings at risk (most in QLD, NSW)
8. Communities ability to adapt will vary where there is less capacity



# Industry recognizes changing coastal values and levels of risk

## Insurers race to map areas at risk of flooding

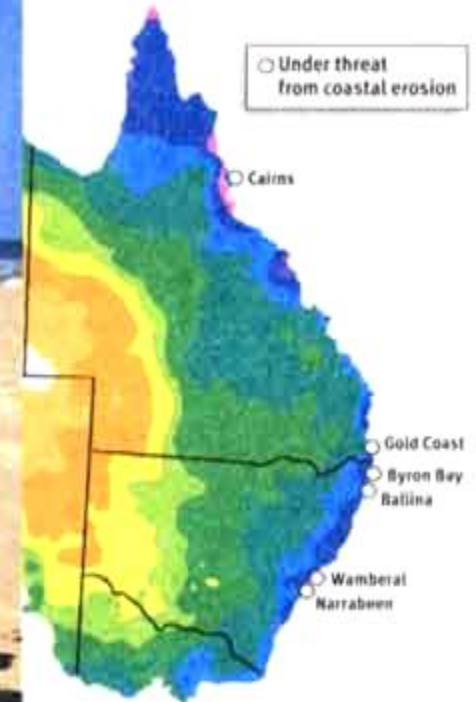
THE AUSTRALIAN FRIDAY FEBRUARY 15 2008



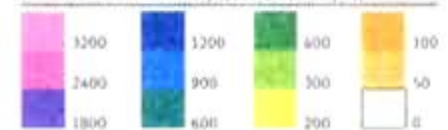
**Under threat:** Paul Klumper and wife Carolyn, with 18-month-old daughter Mia, stand on the beach outside their home in the NSW central coast town of Wamberal, which is highly vulnerable to coastal erosion

Picture: Amos Aikman

**SINKING FEELING**  
East coast is at risk from the combined impact of rising sea levels and flooding



Annual rainfall from February 1, 2007, to January 31, 2008 (mm)



Source: Bureau of Meteorology



Bubble wrap boy:  
yes, it's art NEWS, PAGE 5

Thai food pioneer  
takes to the street  
GOOD LIVING

Australian twist in  
Lucan riddle NEWS, PAGE 3



Tuesday October 27, 2009

NEWSPAPER OF THE YEAR

First published 1831 No. 53,689 \$1.40 (inc GST)

## Make evacuation plans

● Climate change warnings ● Report calls for immediate action

Marian Wilkinson  
ENVIRONMENT EDITOR

URGENT action to cope with the impact of rising sea levels needs to start now, including improving evacuation routes for coastal communities during extreme storms and flooding.

As well, a sweeping federal parliamentary report calls for an overhaul of the building code to make homes more resilient and for the legal liability for future property losses to be sorted out.

Warning that "the time to act is now", the bipartisan report brought down last night states that thousands of kilometres of coastline have been identified as at risk from the threat of rising sea levels and extreme weather events caused by climate change.

The committee, led by Labor's Jennie George and with the Liberal Mal Washer as co-chairman, wants the Government to take a far greater role in preparing coastal towns and cities to adapt to the impact of sea level rise.

Their report recommends a new Inter-governmental Agreement on the Coastal Zone to be worked out between Canberra, the states and councils to set out actions and guidelines on the enormous coastal challenges from climate change.

"The first clarion call from everybody was the need for national leadership," Ms George told the Herald. "We have taken that call".

Eighty per cent of Australians live in the coastal zone facing major pressures, says the report. The concentration of people and infrastructure makes Australia "particularly vulnerable to the coastal erosion and inundation that will accompany increases in sea level".

There are about 711,000 addresses within three kilometres of the coast and less than six metres above sea level, says the government in the coastal zone is described as "complex and fragmented".

The committee accepts the United Nations scientific findings that sea levels will rise about 80 centimetres globally by 2100, but it says this could be an underestimation if greenhouse gas emissions are not slowed and the polar ice caps melt. It notes each centimetre of sea level rise could push the shoreline back a metre or more.

Sea level rise will also cause a disproportionately large increase in the frequency of flooding, inundation and erosion that will come with high tides and storm surges.

**INSURE**  
Insurance  
nightmare, plus  
fears Kakadu may  
be swamped

NEWS - Pages 6 and 7

Among the committee's recommendations is for the Surf Life Saving network to be brought into the emergency planning system to deal with the impact of increasing storm hazards. The report also recommends the Australian Emergency Management Committee examine an improved early warning system for coastal areas in the event of extreme seas, storm surges, major erosion or flooding.

During its 18 months of work, the committee heard pleas from the Torres Strait, where thousands of people face the prospect of losing their homes. It recommends a study into the vulnerability of the area by the CSIRO, the Department of Climate Change and the Queensland Government.

It also wants more research on tropical diseases migrating south, especially dengue fever.

Ms George said one of the most vexed issues before the committee was insurance coverage for homeowners close to the beachfront. The report recommends the Productivity Commission begin an inquiry into the impact of climate change on insurance, including gaps that already exist. Evidence before the committee revealed insurers are already unwilling to cover so-called "saltwater risks" that included the erosion of beachfront properties or flooding by sea water. The committee also wants the commission to examine a prohibition on the occupation of land that is extremely vulnerable to sea rise hazards.

The committee will deliver its report to the Climate Change Minister, Penny Wong, and the Environment Minister, Peter Garrett. It recognises the Government has already begun a series of studies and actions to adapt to climate change. Senator Wong is expected to deliver the first major assessment of the vulnerability of Australia's coast to sea level rise next month.

But the committee found there were serious gaps in the planning guidelines, the law, insurance and emergency planning that need to be addressed.

One of its main recommendations is that the Federal Government consider adopting a national sea level rise benchmark on projected sea level rise as states and local governments struggle to work out their response.

### WHAT LIES AHEAD

**200,000** buildings  
vulnerable in NSW

**484,000** buildings  
vulnerable nationally

Up to **\$50 billion**  
of property at risk

**20%** of the  
Tasmanian  
coastline  
under  
threat



Risky business... Kylie Lambert in the garden of her home in Wetherill Street, Collaroy. She is unable to get insurance for her home.  
Photo: Sallan Hayes

### 'I do worry what's going to happen to it'

Ben Cubby ENVIRONMENT

KYLIE LAMBERT is getting used to waves crashing on her back lawn.

"After every storm my friends ring me and ask if I'm still here," she says.

Ms Lambert lives with her twin daughters on Wetherill Street in Collaroy. Her home faces the shrinking Collaroy Beach.

As sea levels creep up, the beach on Ms Lambert's doorstep has become one of the world's most scrutinised patches of sand. A series of university studies and council surveys over the past decade have concluded it is one of Sydney's most vulnerable points as seas rise about 90 centimetres by the end of the century.

"We bought here [in 2001] knowing it was beautiful but vulnerable," Ms Lambert says. "I haven't spent any money renovating it because I do worry what's going to happen to it one day. And nearly everybody here has got absolutely no insurance - you can't get it".

The beachfront is starting to resemble the Western Front, with a patchwork of sandbagged walls, concrete slabs and boulders facing off against the Pacific Ocean. Ms Lambert welcomed the news last week that the NSW Government would give people more latitude to fortify their homes, even though it may mean storm damage worsens as water encroaches strong points.

"Like all the beachfront property owners, I'd like the right to be able to defend our properties," she said.

Warrington, and other coastal councils, are grappling with the problem as best they can. Several properties on Pittwater Road and surrounding streets have been bought by Warrington Council in recent years, and at least one more is earmarked for purchase. But funding for "open space embellishment" is down to \$391,000 - not enough to buy more homes, a council spokeswoman said.

Older homes are the most vulnerable, while newer buildings like the three high-rises at Collaroy are anchored in bedrock and should be able to resist the higher sea levels, even if they end up looking like lighthouses.

The long-term answer could be sitting beyond the surf line, said Andy Short, of Sydney University's coastal studies unit.

"What it needs is massive sand nourishment," Professor Short said. "We have enormous sand resources just off the coast on the continental shelf, and it could be dredged up to nourish the beaches at key points in Sydney and along the coast."

**WITH JUST A 20cm RISE**

... and a one-in-50 year storm surge the coastline at Narrabeen would be pushed back 110 metres causing \$230 million of damage

SOURCE: DEPARTMENT OF CLIMATE CHANGE

### Indonesia told to go easy on boat people by Labor

Phillip Coorey and Lindsay Murdoch

THE Federal Government urged Indonesian authorities yesterday to treat asylum seekers humanely as 78 Sri Lankans aboard an Australian Customs vessel prepared to disembark after more than a week at sea.

Amid reports that asylum seekers already at the Australian national detention centre at Tanjong Pinang had been abused, and that the Indonesians were prepared to use force to make the new arrivals disembark, the Foreign Minister, Stephen Smith, called for restraint.

"We would want that to be done in a peaceful, pre-emptive, orderly and civilised way, and at this stage I'm confident that can occur," he said.

As unions and church groups joined the condemnation of the

Government's handling of asylum seekers, the customs vessel, Oceanic Viking, was anchored 10 nautical miles off Tanjung Pinang. It was scheduled to dock about 9pm Sydney time yesterday but was later delayed.

The boat picked up the Sri Lankans in an Indonesian search and rescue zone. Indonesia reluctantly agreed to take the asylum seekers after a meeting between the Prime Minister, Kevin Rudd, and the Indonesian President, Susilo Bambang Yudhoyono.

Under fire from the Opposition, which claims a softening of policy has caused the latest surge of boats, Mr Rudd admitted the Indonesian solution was not popular. But it was worth pursuing if "it deterred people smugglers from taking asylum seekers on dangerous voyages to Australia," he said. "It will not be praised by all Australians; it is not praised by all Australians," he said.

"If detention and processing in Indonesia helps prevent some of these previous journeys, then we must support such a policy."

He accused the Opposition Leader, Malcolm Turnbull, of persecuting Liberal hardliners to save his leadership.

"He is saying to the right wing of the party: 'I hear your pain on asylum seekers...'"

"It is about the right wing of the party deciding to play the asylum-seeker card because they see it is full of good politics for them."

### INSIDE

#### Investors flock to Myer float

Australian retail investors have bid for more than \$1 billion worth of stock in the Myer department store float, including the banker firm offer, early counting last night showed. Float insiders were confident of a 50-50 split between retail and institutional investors when numbers are settled.

Business Day - Page 5

#### 'Anti-Jewish slurs' in HSC textbook

The NSW Jewish Board of Deputies has called for the immediate withdrawal of a book that schools use as an HSC text, which it says contains anti-Semitic slurs. The board said it had asked for a chapter on Judaism to be rewritten and resued to schools that have bought the book.

News - Page 3

#### Cyclists turn on road-rage rider

Cyclists have slammed the actions of a rider who allegedly boarded a bus and assaulted the driver after riding illegally on a 'Y' lane in Sydney's north-west. Cycling forums were buzzing yesterday as many riders and other motorists condemned the alleged assault.

News - Page 3



#### War games weigh Afghan options

The US has held secret war games to evaluate the two main military options for the Afghan war that have been put forward by the Pentagon and are being considered by the President. Barack Obama, as part of a broad-based review of the faltering war.

World - Page 10

#### Union chief vows to stick it out

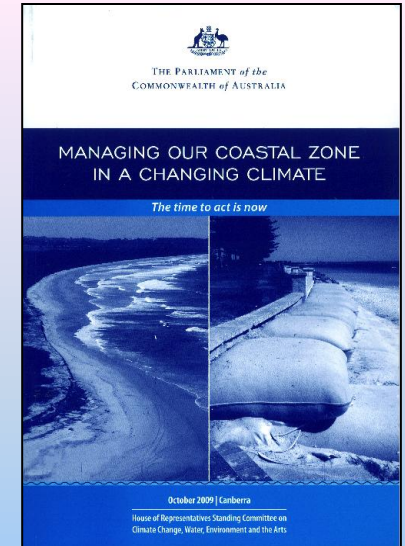
The president of the ACTU, Sharon Burrow, has confided discontent over her leadership head-on, starting down a push to unseat her by telling a gathering of union bosses yesterday that she was not going anywhere.

News - Page 4

# House of Representatives Report

## Key recommendation on sea-level rise

- A nationally consistent sea-level rise planning benchmark (R21)



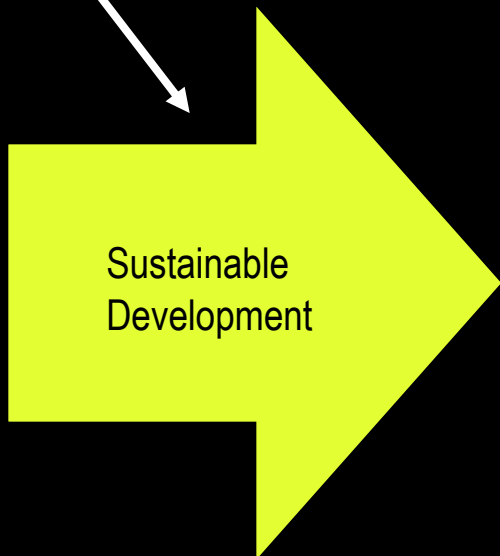
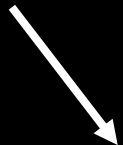
## Sea-level rise benchmarks for coastal planning by state (2011)

<b>State</b>	<b>2050 (cm)</b>	<b>2100 (cm)</b>	<b>date</b>	
South Australia	30	100	1992	<i>(policy following IPCC FAR 1990)</i>
Victoria		80	2008	
New South Wales	40	90	2009	
Queensland	30	80	2010	
Western Australia		90	2010	
Northern Territory				No state-wide policy
Tasmania				No state-wide policy

## Sea-level rise benchmarks for coastal planning by state (2012)

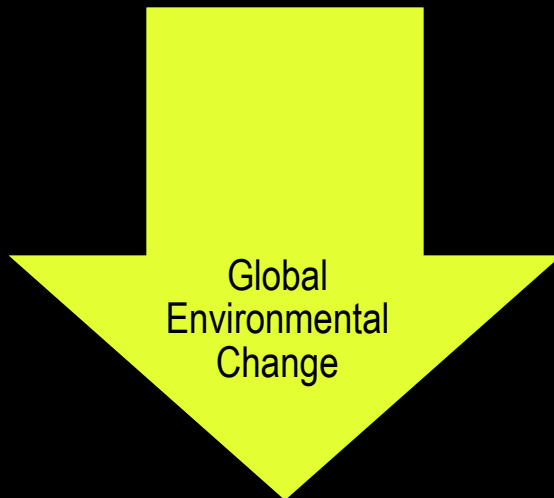
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New South Wales	<del>40</del>	<del>90</del>	<del>2009</del>	<i>(change of gov reversal of policy in 2012)</i>
Queensland	<del>30</del>	<del>80</del>	<del>2010</del>	<i>(change of gov reversal of policy in 2012)</i>
Western Australia		90	2010	
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values needed in  
decision making

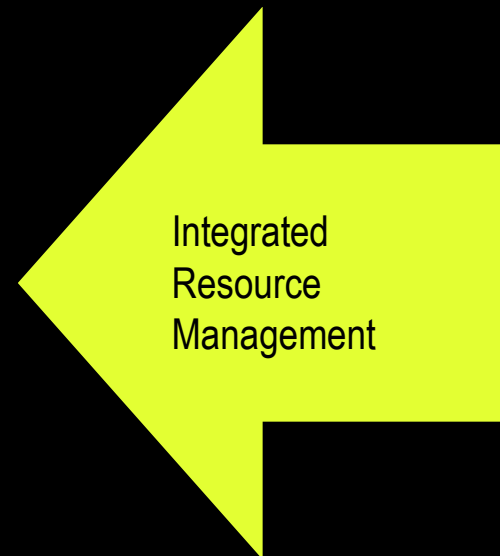


Sustainable  
Development

**Four key global  
Influences on Australian  
coastal management**



Global  
Environmental  
Change



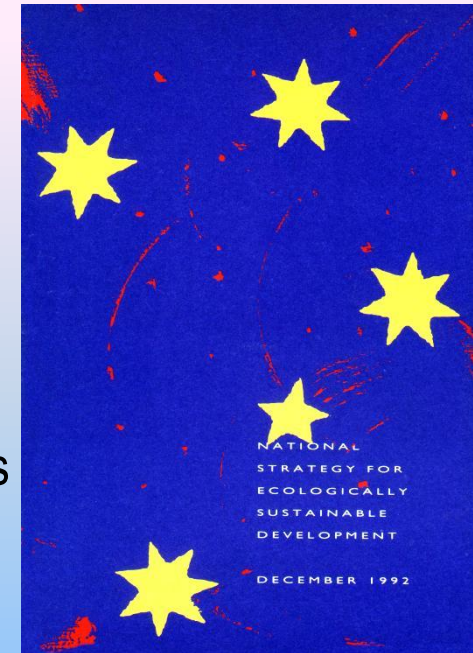
Integrated  
Resource  
Management



Community  
Participation

## Sustainability (ESD) and coastal management

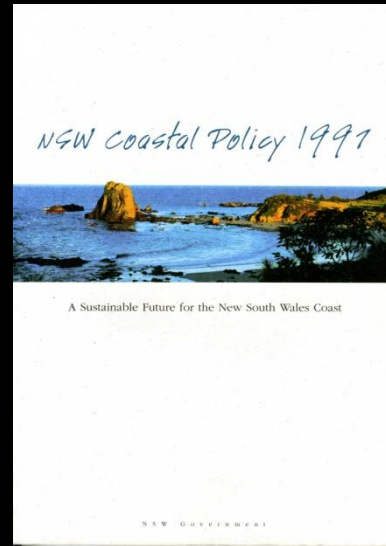
1. Use of coastal resources to safeguard for future generations
  - *Maintain & enhance natural capital (eg pristine coasts, clean beaches, unpolluted waterways)*
  - *Avoid over-exploitation of coastal resources*
  - *Minimise waste in coastal environments*
2. Protection of coastal biodiversity and ecosystem integrity
3. Net community benefits from implementation of coastal proposals
4. Social equity through public participation in decision making
5. Reflection of **full environmental costs** in coastal resource use
6. Caution with environmental risk such as vulnerability and erosion



Australian National Strategy for ESD 1992

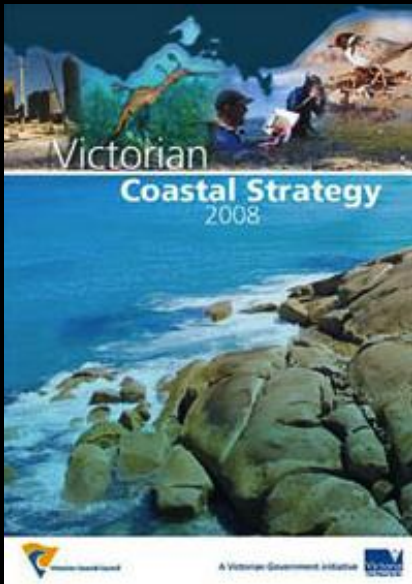
Source: Harvey and Caton, 2003, page 252

# Sustainability principles in State Government coastal plans and policies



## NSW Coastal Policy 1997

*has a strong integrating philosophy based on the principles of Ecologically Sustainable Development*



## Victorian Coastal Strategy 2008 (new draft 2013)

*principles of Ecologically Sustainable Development*



## The Queensland State Coastal Plan 2011

*Opportunities for sustainable development promoted...*

## Sustainability in coastal management for States

### SA

- Coast Protection Act 1972
- Living Coast Strategy (non-statutory)

### TAS

- No dedicated coastal legislation
- State Policies and Projects Act 1993 (includes sustainable development)
- Tasmanian Coastal Policy 1996 (under review since 2004)

### VIC

- Coast Management Act 1995 (amended 2003)
- Local Government Act 1989 (includes sustainability)
- Victorian Coastal Strategy 2008 (new draft released 2013)

### WA

- No dedicated coastal legislation
- Planning and Development Act 2005 (includes sustainability)
- Draft Coastal Zone Management Policy (2001) not released



## Sustainability in coastal management for States

### NSW

- Coast Protection Act 1979
- Coastal Policy (sustainable future) 1997
- Environmental Planning and Assessment Act 1979
- State Environmental Planning Policy 2002

### NT

- No dedicated coastal legislation
- 85% coast under Aboriginal ownership
- Coastal Management Policy 2001 not released (non-statutory)

### QLD

- Coast Protection and Management Act 1995 (amended 2003)
- Sustainable Planning Act 2009
- Queensland Coastal Plan 2011 and SPP 3 (under review 2012-13)

## Sustainability in coastal management for States

1. Use of coastal resources to safeguard for future generations (most except NT)
2. Protection of coastal biodiversity and ecosystem integrity (VIC, TAS, SA)
3. Net community benefits from implementation of coastal proposals (VIC)
4. Social equity through public participation in decision making (not explicit any States)
5. Reflection of **full environmental costs** in coastal resource use (**not explicit any States**)
6. Caution with environmental risk such as vulnerability and erosion (SA, VIC, NSW, QLD)

Source: Harvey et al 2012 page 85

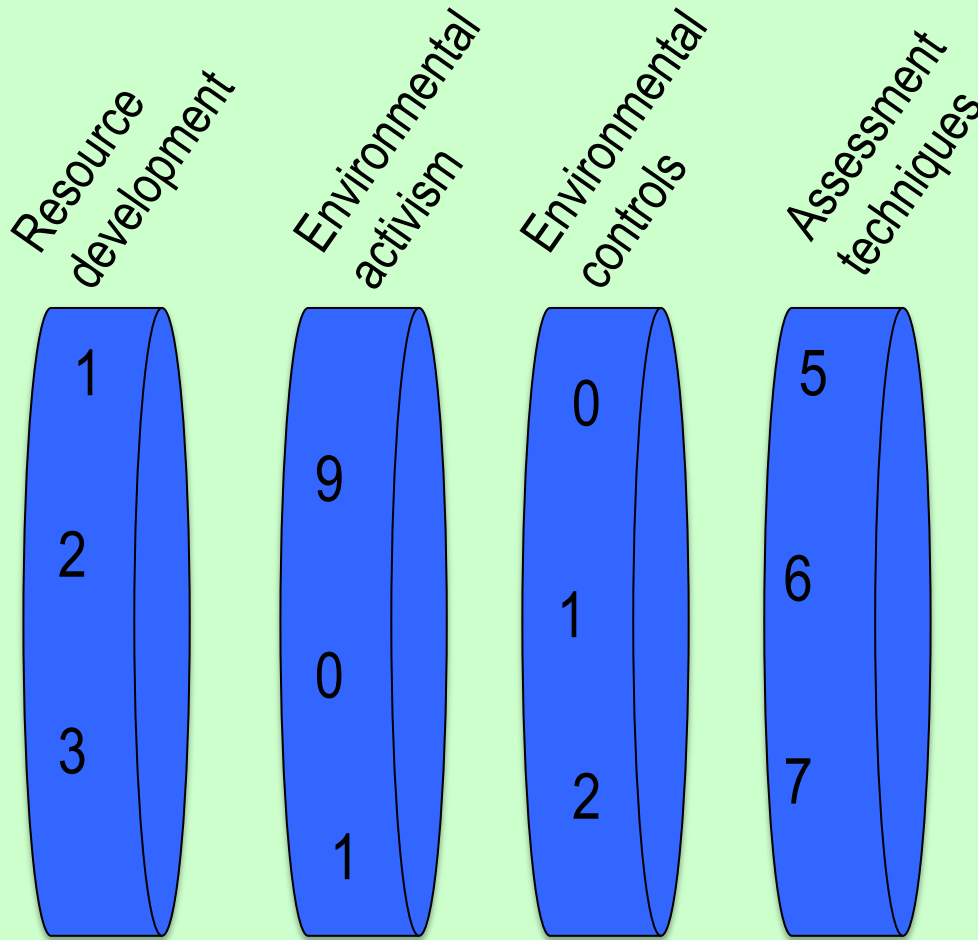
## Talk outline

1. The value of the coast, globally and nationally
2. **The ‘combination lock effect’ on coastal policy and management**
3. Putting the ‘value’ into decision making in coastal management

## 'Combination lock effect' on policy and management

- Multiple influences on policy development
- Each influence has its own cycle and timing
- Some influences counteract each other
- Alignment of key influences at a point in time provides the right 'combination' for acceptance of a policy (eg the NEPA in the US in 1970)

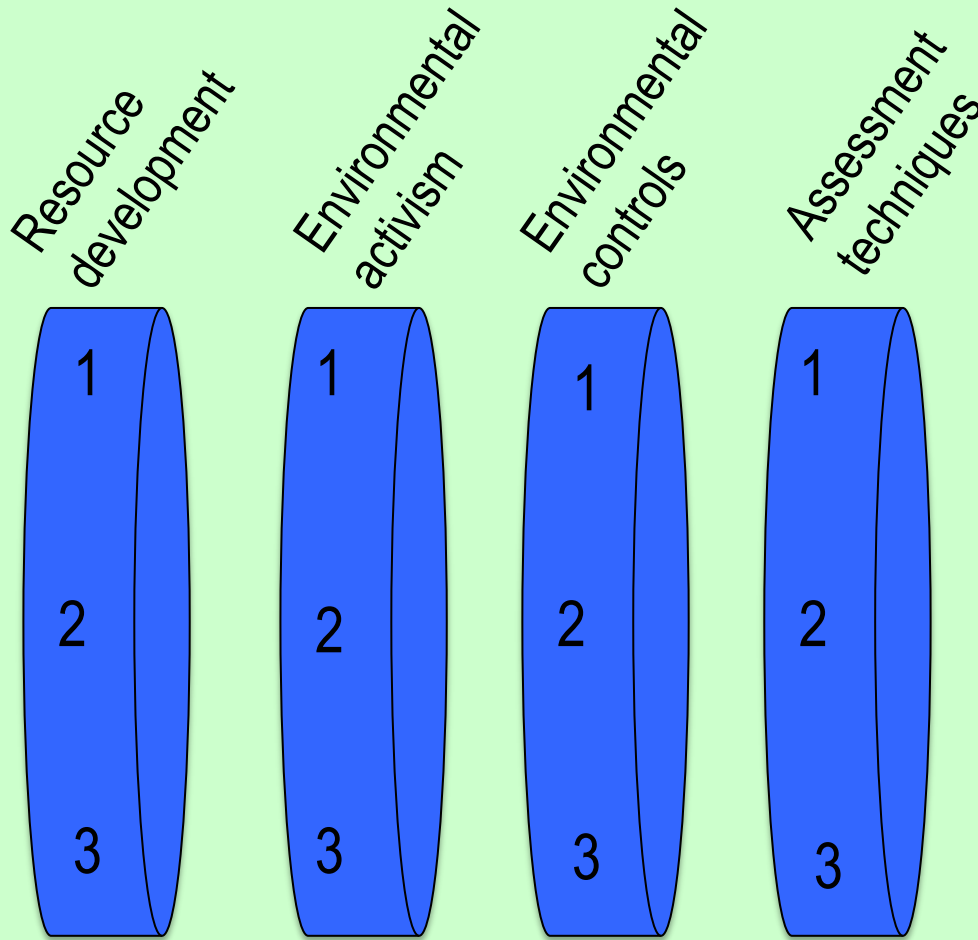
# Influences on US Resources and Conservation Act 1959



- *Lack of alignment of key influences*
- *Legislation rejected*

The 'combination lock effect' on the Resources and Conservation Act

# Influences on US National Environmental Policy Act 1969



- *Alignment of all key influences a decade after the first proposal*
- *Successful introduction of NEPA legislation in 1970*

The 'combination lock effect' on the NEPA

## 'Combination lock effect' on Australian coastal policy development

- Global influences
- Commonwealth government
- State government
- Local government (Coastal Councils)
- NGOs and lobby groups (Coastal Alliance)
- Issue attention cycles

# The 'issue attention cycle' in policy formulation

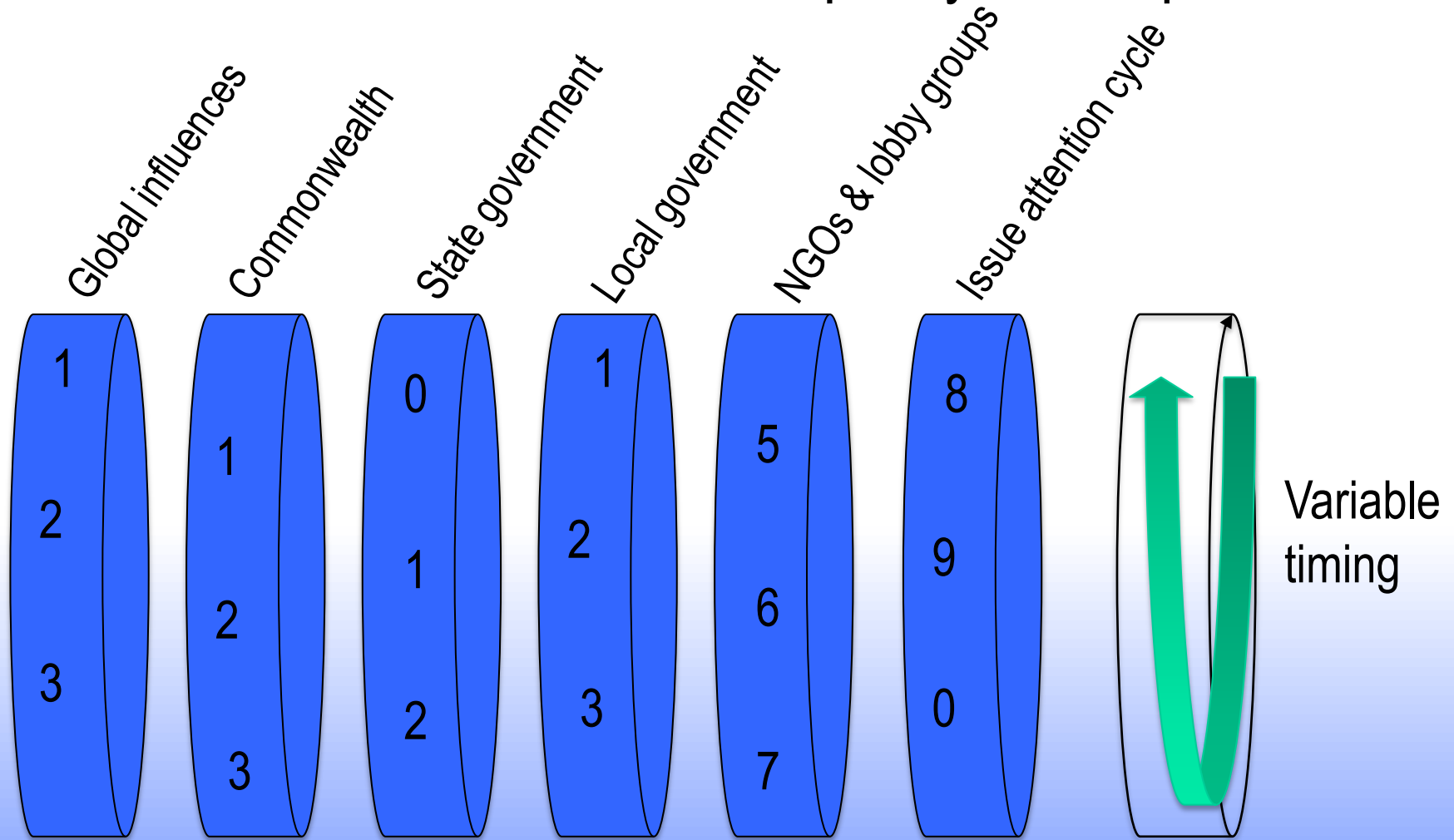
1. Pre-problem stage (*concern of experts, interest groups lobby for public attention*)
2. Alarmed public discovery (*sudden pressure for action*)
3. Cost of significant progress (*action may require lower priorities elsewhere*)
4. Gradual decline in public interest
5. Twilight realm of lesser attention

Source: Downs 1972

Australian rise of public interest on climate change as 'number one' environmental issue then gradual decline in interest culminating in changed government in 2013 with reduced focus on climate change



# Influences on Australian coastal policy development



The 'combination lock effect' on national coastal policy

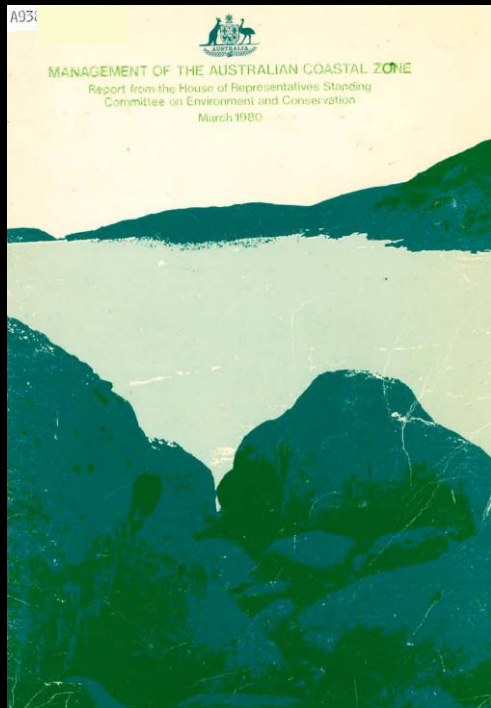
## The Australian context – the 'issue attention cycle' in coastal issues

- National focus on integrated coastal management 2003-06 starts to fade
- Federal Department of Climate Change takes lead on coastal matters 2005-10
- Bi-partisan national coastal inquiry 2009 provides (missed) opportunity for reform
- Federal Environment Department gradually loses coastal expertise
- Change of state governments NSW and QLD reverse coastal planning policies
- Threats to cut federal Department of Climate Change (loss of coastal expertise)
- Federal political disarray in 2013 not conducive to national coastal policy initiatives

# 'Combination lock effect' prevents action on national coastal strategy although all key national coastal inquiries (over last 33 years) agree

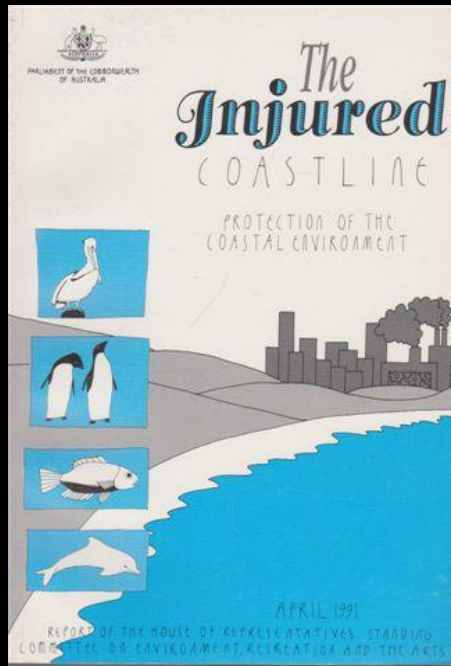
2009

1980



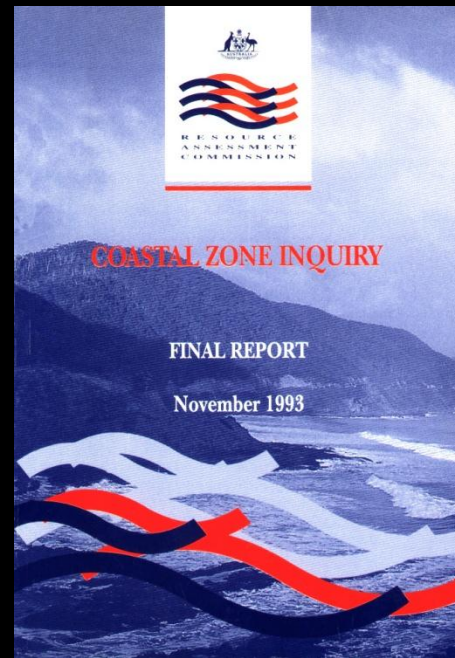
House of Representatives  
*Management of Coastal Zone*

1991



House of Representatives  
*Injured Coastline*

1993



RAC Coastal Zone Inquiry

THE PARLIAMENT of the  
COMMONWEALTH of AUSTRALIA

MANAGING OUR COASTAL ZONE  
IN A CHANGING CLIMATE

*The time to act is now*



House of  
Representatives  
*Managing the Coast in  
Changing Climate*

## Australian calls for institutional integration

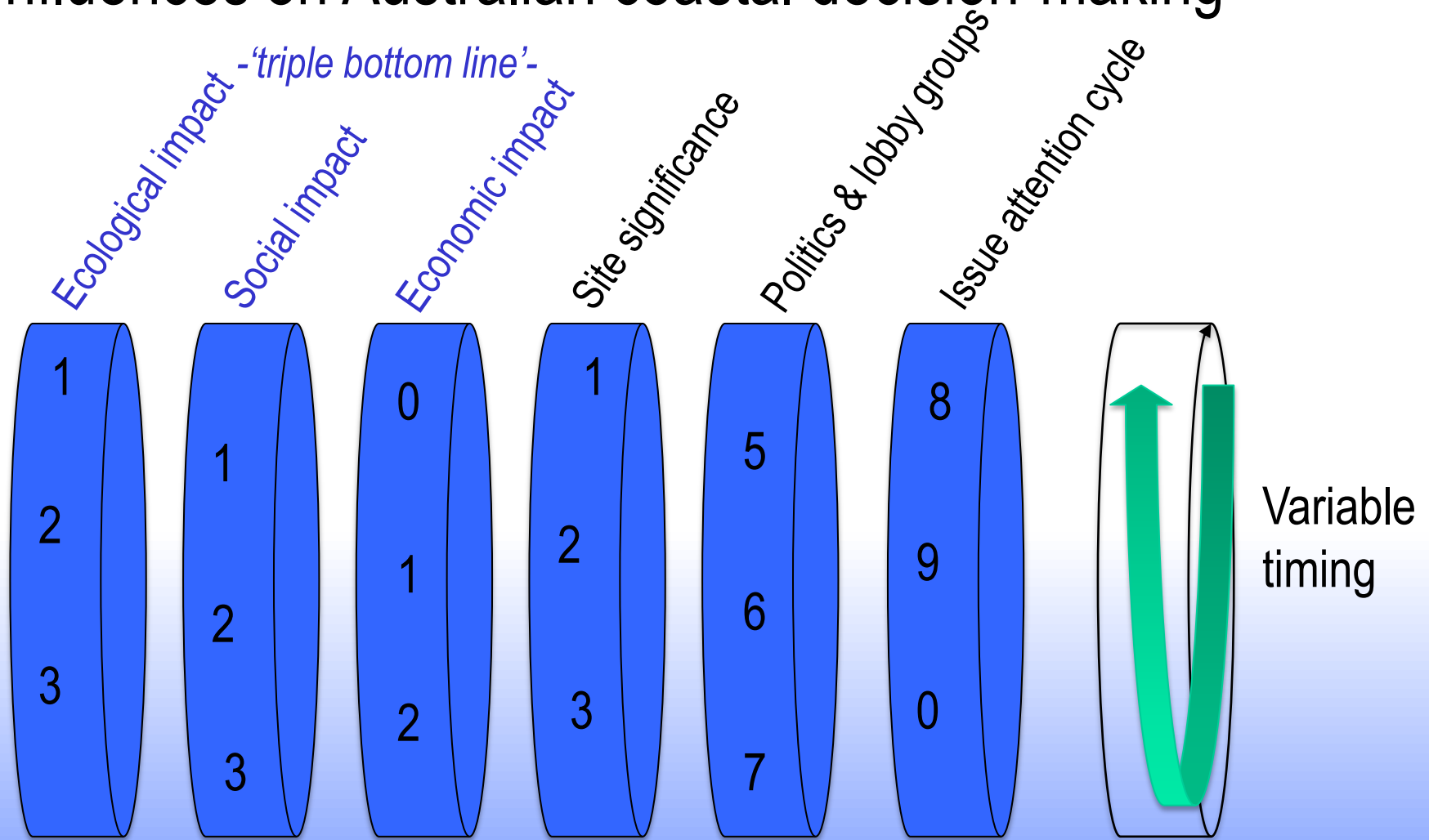
\*(after: Haward, 1995)

	*HOR (1980)	*HOR (1991)	*ESD (1992)	*RAC (1993)	HOR (2009)
National coastal strategy	√	√	√	√	√
Integration of Commonwealth and state	√	√	√	√	
Intergovernmental agreement on coast		√	√	√	√
Community - citizen participation		√	√	√	√
Finance to state/local government	√	√		√	√
Commonwealth coastal legislation		√		√	
Integration of local government		√		√	
Regional basis to management			√	√	√
Commonwealth coastal agency				√	
Ministerial Council	√				√

## 'Combination lock effect' on coastal decisions

- State and local government have responsibility for most coastal development
- Planning or EIA legislation mostly include 'triple bottom line' in decision-making
- Weighting on economic, environmental or social importance will vary
- Specific coastal sites may have their own significance (eg heritage, scientific)
- Lobby groups may skew decision (eg property developer or resident group)
- Each influence has its own cycle and timing and may counteract each other
- Alignment of key influences provides 'combination' at point of decision-making

# Influences on Australian coastal decision-making



The 'combination lock effect' on coastal management and decisions

## Talk outline

1. The value of the coast, globally and nationally
2. The 'combination lock effect' on coastal policy and management
3. **Putting the 'value' into decision making in coastal management**

## Value of the coast at the state and local government level

- Conservation (eg WHA coasts – linked to national values)
- Coastal amenity, recreation and tourism
- Beaches for both recreation/amenity and as coast protection
- Fishing, boating and water-based recreation
- Putting the ‘value’ into decision making in coastal management



## Assessing the value of the coast

- Various methods used (eg market price, hedonic pricing, travel cost, contingent valuation, benefit transfer)
- Australian valuation studies on beaches (Gold Coast, Sunshine Coast, Sydney, Adelaide), coastal ecosystems (Victoria), surfing (Gold Coast), coral reefs (GBR, Ningaloo), seagrass, wetlands & estuaries (South Australia and Queensland)



## Value of World Heritage coasts ?

Great Barrier Reef WHA

Wet Tropics WHA



value of sand-bypassing, beach nourishment and cost sharing

NSW  
QLD

Administrative boundary for State coastal management

An aerial photograph of a coastal city, likely Brisbane, Australia. A large river flows through the city, curving around a peninsula. The city is densely packed with buildings, including several high-rise apartment blocks. The coastline is rugged with rocky outcrops and sandy beaches. Waves are breaking against the shore. A dashed yellow line runs across the city, separating the area labeled 'NSW' (New South Wales) to the north and 'QLD' (Queensland) to the south. The text 'Administrative boundary for State coastal management' is written in yellow on the left side of the image.

# Value of Queensland beaches ?

Gold Coast – multi-million \$ on beach replenishment



Cairns – multi-million \$ on creating an artificial beach



## Value of Adelaide mangrove coast ?

Salt evaporation ponds with artificial levees near St Kilda occupy supratidal area constraining natural mangrove migration



Salt evaporation ponds and artificial levees near Barker Inlet aquatic reserve (important fish hatchery) cut across natural mangrove habitat

# Artificial salt evaporation ponds now attract multiple species of migratory birds, many subject to international agreements

## Competing values

1. Natural mangrove/samphire coastal ecology avoiding 'coastal squeeze'
2. Artificial environment attracting migratory birds (\$ millions to maintain)
3. Development potential on periphery of city



## Value of Adelaide beaches (2005)

- Economic study (2003) valued beaches for properties with access \$5M pa; properties in walking distance \$16M pa; day visitors \$23M pa; public finance \$2M pa
- Visitation study (2003) showed 9 million visitors pa at cost of less than \$1.00 per visit based on annual sand management operating costs of \$6.2M pa (comparison of amenity cost of \$2.5 per visit for Adelaide Botanic Garden)
- Long term average storm protection value of beaches estimated ~\$1.7M pa
- Value of assets at risk (footpaths, roads, services) estimated at \$66M (2005 dollars) could be lost in 50 yrs time without protection

# Artificial beach replenishment for Adelaide beaches pre 2005 ~\$1.7 million pa

Dredging and pumping



Photo: Coast Protection Board

Sand carting



Photo: Nick Harvey



# Sand bypassing for harbours within beach system pre 2005 ~\$1.9 million pa

Glennelg bypass with dredging and pumping



West Beach bypass with dredging and pumping

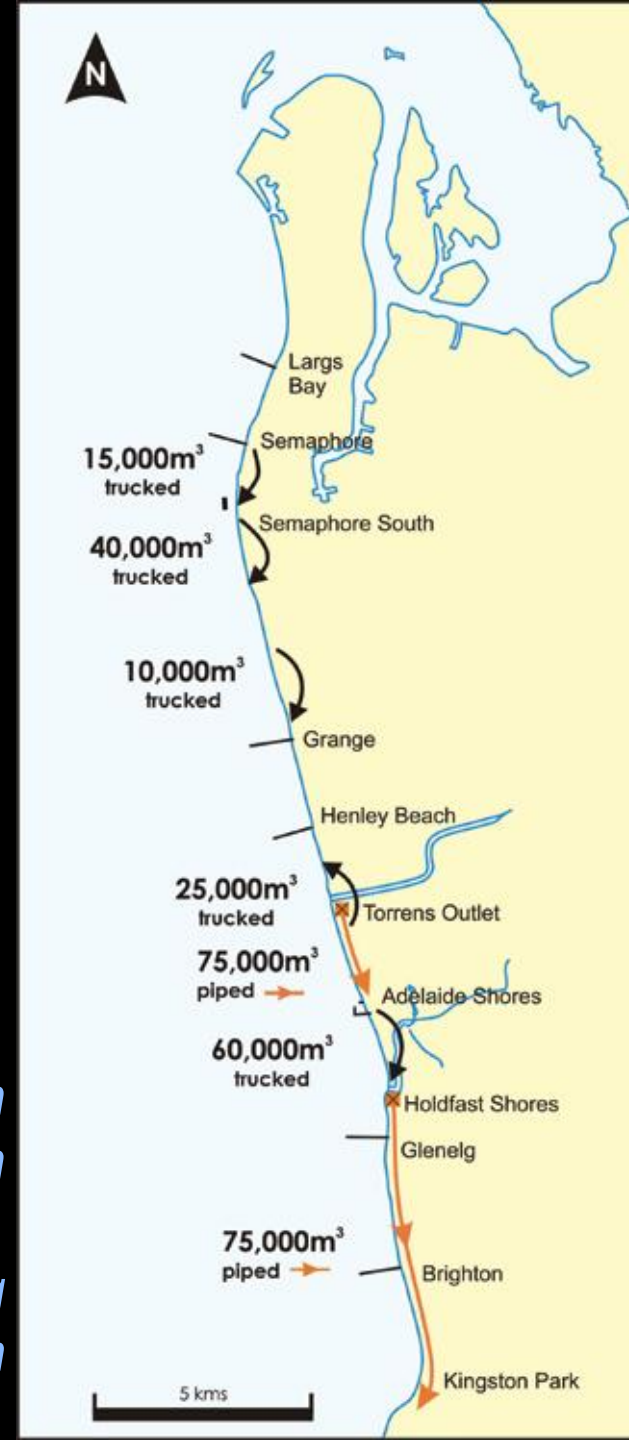


# Coast Management Strategy 2005-25

- Continue beach replenishment 160,000 m<sup>3</sup> pa
- Install pumping system south from Semaphore
- Integrate system with harbour management
- Using discount rate of 7% - cost of strategy ~\$56M over 20 yrs compared to current management costs of ~\$70M over same period
- Costs will increase with sea-level rise

*Costs blown-out - no pipeline between Semaphore and Henley Beach*

*Recently completed \$23 million sand pumping system for only southern half of system*



## Conclusion

- Coasts have a high value globally and nationally for ecosystem services
- ‘Combination lock effect’ often restricts coastal policy development
- Beaches have a high value for amenity and coast protection
- Sea-level rise linked to climate change will reduce value of beaches
- Various methods for determining value of beaches and coasts
- Need to have proper economic evaluation in any coastal management strategy or coastal development proposals