Senate Standing Committee on Economics
ANSWERS TO QUESTIONS ON NOTICE
Innovation, Industry, Science and Research Portfolio
Budget Estimates Hearing 2010-11
31 May 2010

AGENCY/DEPARTMENT: COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION

TOPIC: Sea Levels

REFERENCE: Written Question –Senator Eggleston

QUESTION No.: BI-51

Can you explain why different states have different expectations as to the change in the sea level? (*Weekend Australia* on 6/3/2010)

ANSWER

Local sea level rise may be higher or lower than the predicted global average. This is due to a number of factors affecting individual regions including local rising or subsiding of the land along the coast, warming of the oceans along the coastline, changes in patterns of wind direction and strength, and changes in ocean currents.

In late 2009, the Department of Climate Change released the report *Climate Change Risks to Australia's Coasts:* www.climatechange.gov.au/publications/coastline/climate-change-risks-to-australias-coasts.aspx. The second chapter of this report, *Climate Change in the Coast – The Science Basis* shows two diagrams which help to explain why different states have different expectations as to the change in the sea level: *www.climatechange.gov.au/publications/coastline/~/media/publications/coastline/2-chapter.ashx*. Relevant extracts from this chapter follow.

From Climate Change Risks to Australia's Coasts page 25:

2.2.2 Historical sea-level rise
Global mean sea level has risen about 20 centimetres since pre-industrial times (Figure 2.6), at an average rate of 1.7 millimetres per year during the 20th century.[16]

Since 1993, high-quality satellite observations of sea levels have enabled more accurate modelling of global and regional sea-level change. From 1993 to 2003, global sea level rose by about 3.1 millimetres per year, compared to 1.8 millimetres per year from 1961 to 2003. These rates of increase are an order of magnitude greater than the average rate of sea-level rise over the previous several thousand years.

Sea level around Australia rose by about 17 centimetres between 1842 and 2002 – a rise in relative sea level of about 1.2 millimetres per year.[17] The rise in sea level has been very variable from decade to decade. The rate of increase was low between the 1970s and early 1990s due to more frequent and severe El Niño events.[18] During neutral conditions, easterly trade winds blow across

the tropical Pacific and the sea surface is about 50 centimetres higher and 8°C warmer in the far-western Pacific than in the eastern Pacific. The trade winds relax in the central and western Pacific during El Niño events, resulting in lower sea levels and cooler temperatures than normal in the Australian region. Conversely, La Niña is characterised by higher sea levels in the far-western Pacific, affecting northern and western Australia. Episodes of high sea level on these timescales can affect the severity of extreme events and also accelerate the salinisation of coastal aquifers.

Recent rates of sea-level rise in eastern and southern Australia are similar to the global rate (Figure 2.7). In western and north-western Australia, the current rates are more than double the global rate. These trends are most likely a combination of climate change and shorter term variability.

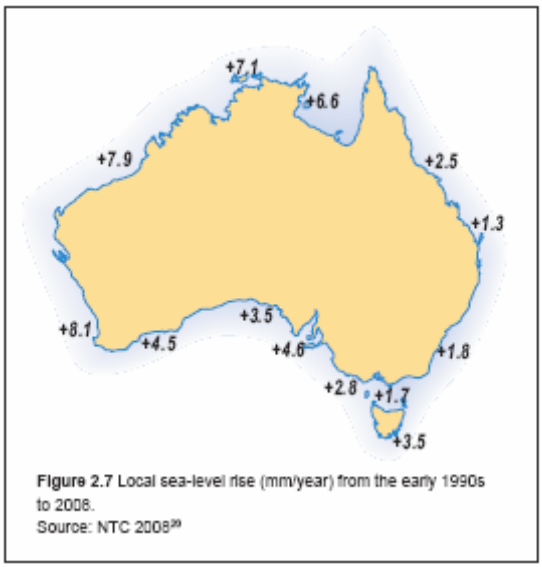

Figure 2.7 Local sea-level rise (mm/year) from the early 1990s to 2008.
Source: NTC 2008[20]

Endnotes:

16. Church J and White N 2006, A 20th century acceleration in global sea-level rise, *Geophysical Research Letters*, 33: L01602.
17. Church J, White N, Hunter J, McInnes K, Cowell P and O'Farrell S 2008, Sea-level rise, in *Transitions: pathways towards sustainable urban development in Australia* [P Newton (ed.)], CSIRO Publishing.
18. National Tidal Centre (NTC), Bureau of Meteorology (BOM) 2008, *The Australian Baseline Sea Level Monitoring Project, Annual Sea Level Data Summary Report, July 2007 – June 2008*, NTC BOM, Kent Town, South Australia.

From Climate Change Risks to Australia's Coasts page26 & 27:

Sea-level rise greater than the global average is projected for south-eastern Australia, while the rise for north-western Australia is less (Figure 2.11). The rise in south-eastern Australia is influenced by a warming East Australian Current moving further south. These estimates are for eustatic, not relative, sea-level rise and they do not consider regional sea-level responses from melting icesheets.

CSIRO has developed three simple scenarios for sea-level rise (relative to 1990), at three time-steps across the 21st century (Table 2.1):

Scenario 1 (B1) considers sea-level rise in the context of a global agreement that brings about dramatic reductions in global emissions. This scenario represents sea-level rise that is likely to be unavoidable.

Scenario 2 (A1FI) represents the upper end of IPCC AR4 'A1FI' projections and is in line with recent global emissions and observations of sea-level rise.

Scenario 3 (High end) considers the possible high-end risk identified in AR4 and includes some new evidence on icesheet dynamics published since 2006 and after AR4.

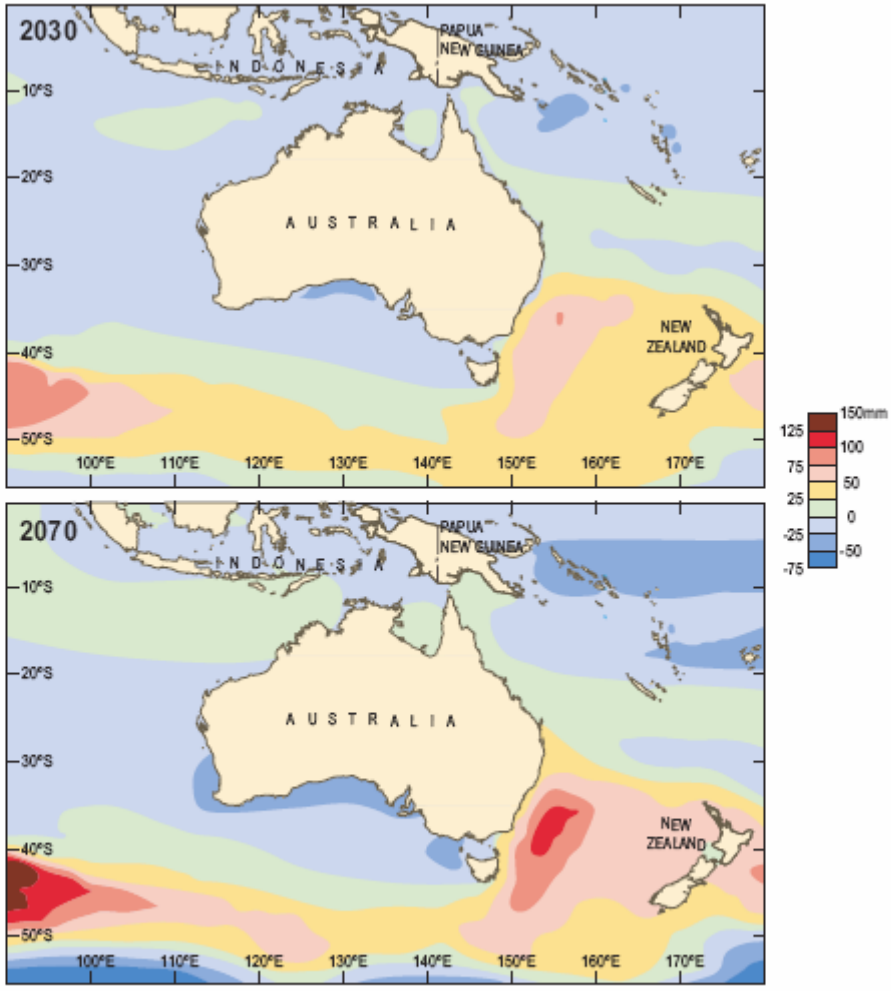

Figure 2.11 Projected sea-level rise for Australia, 2030 and 2070 (departures from the global multi-model mean run for the IPCC A1B scenario).
Source: CSIRO and BOM 2007[25]

Table 2.1 Three sea-level rise scenarios, 2030–2100 (metres).

Year	Scenario 1 (B1)	Scenario 2 (A1FI)	Scenario 3 (High end)
2030	0.132	0.146	0.200
2070	0.333	0.471	0.700
2100	0.496	0.819	1.100