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**Department of Climate Change**

**Submission to the House of Representatives Standing Committee on Climate Change, Water, Environment and the Arts Inquiry into Climate Change and Environmental Impacts on Coastal Communities**

**12 June 2008**

## Summary

Australians will be affected in a major way, and to an increasing extent, by climate change and its impacts on the coastal zone. In Australia the highest concentration of people, housing, infrastructure and industry is within the coastal zone. Due to the sea change phenomenon, this exposure is increasing.

Decisions made today on the form of our cities, our transport options and on the building stock have very long term implications for the extent of Australia's exposure to the range of climate change impacts. However, a significant knowledge deficit is a barrier to effective decision making.

In recognition of the need for urgent action, the Australian Government is working to meet the medium to long term adaptation requirements for Australia. Priority actions and areas of national vulnerability have been identified and are being addressed.

The current 'first pass' National Coastal Vulnerability Assessment (NCVA) of key assets within Australia's coastal zone will begin to address our knowledge deficit. The NCVA will provide the first, whole of nation understanding of the magnitude and spatial extent of risk and will drive the national development of essential tools for climate change adaptation.

The Australian Government will coordinate a National Coastal Climate Change Forum in early 2009. This forum will bring together the key stakeholders and provide the information and tools so that the participants can develop a clear and consistent set of guidelines that coastal communities can use in adapting to climate change impacts.

## Impacts of climate change in the coastal zone

Climate change is a global phenomenon and the impacts of this change will be felt at all scales around the world. The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report identifies that:

- There is strong evidence that the global sea level gradually rose in the 20<sup>th</sup> century and is currently rising at an increased rate, after a period of little change between AD 0 and AD 1900.<sup>1</sup> Sea level is projected to rise at an even greater rate in this century. The two major causes of global sea level rise are thermal expansion of the oceans (water expands as it warms) and the loss of land-based ice due to increased melting<sup>2</sup>
- The observable evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases and changes in patterns of precipitation<sup>3</sup>
- Impacts of climate change will vary regionally but...they are very likely to impose net annual costs which will increase over time as global temperatures increase

While all areas of Australia are at risk from impacts of climate change to some extent, the impacts on the coastal zone will be considerable. These impacts will effect a majority of

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<sup>1</sup> IPCC, 2007: *Climate Change 2007: The Physical Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., Qin M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, UK. p 409.

<sup>2</sup> IPCC, 2007: *Climate Change 2007: The Physical Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., Qin M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, UK. 996 pp.

<sup>3</sup> M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds. (2007). *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, UK. 976 pp.

Australians an associated infrastructure because 80% of the Australian population lives in the coastal zone, and approximately 711,000 addresses are within 3 km of the coast and less than 6 m above sea level<sup>4</sup>.

Climate change will be manifest in the coastal zone through:

- sea level rise;
- rising sea and land temperatures;
- changes in wind and wave climate, with storm events such as tropical cyclones becoming more intense;
- changes in patterns of precipitation across coastal catchments, including frequency, extent and duration of droughts and heavy rainfall events; and
- changes to chemical properties of seawater including acidity and salinity.

The implications of these physico-chemical changes will vary across regions. Potential impacts on coastal systems include:

- shoreline erosion. For example, it is estimated that erodable coasts will recede one metre for every one centimetre rise in sea level. Storm surges will exacerbate coastal erosion;
- progressive inland migration of coastal ecosystems such as mangroves and saltmarshes;
- increased salt water intrusion into fresh water aquifers;
- changes to patterns of streamflow in coastal rivers and streams;
- increased coastal flooding especially associated with spring high and king tides, and potentially affecting all areas of former floodplains;
- increased coral bleaching events as temperature-sensitive zooxanthellae migrate out of the coral polyps and that delicate symbiotic relationship breaks down;
- changes to ocean chemistry which will affect the ability of corals and other marine calcifiers to build and maintain their skeletons. For corals, this would make reefs less robust to the forces of erosion; and
- changes to species composition in biological communities and ecosystems in the coastal zone as individual species respond to changed environmental conditions. These changes in biodiversity values are likely to lead to a reduction in the delivery of ecosystem goods and services.

The net effects of these impacts on coasts will be damage to or loss of property, disruption to commerce, energy and water services, transport and communication<sup>5</sup>, and the loss of biodiversity values supporting those human communities. For the built environment, infrastructure and housing design criteria are likely to be exceeded more frequently, and this will result in damage and loss. Climate change is predicted to have serious impacts on iconic natural areas such as the Great Barrier Reef and the Kakadu wetlands, with significant consequences for biodiversity and the tourism industry.

Some degree of impact is unavoidable because of the elevated levels of greenhouse gases already in the atmosphere. Projected global emissions of these gases over the next 10 – 20 years and onwards will increase the magnitude of the impacts.

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<sup>4</sup> M.L. Parry et al (2007). *op cit*

<sup>5</sup> IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK. p. 18

## **Assessing risk from climate change impacts**

The magnitude of the value of natural and built assets in the coastal zone, and its importance as a conduit for our export economy, afford the coastal zone high priority in the national assessment of risks from climate change impacts. The imperative for this risk assessment is highlighted by the very long term implications of decisions we make today on the form of our cities, our transport options our building stock and a significant part of our critical national infrastructure.

Today's decisions will leave future generations with a greater or lesser degree of vulnerability to the impacts of climate change and hence a bigger or smaller bill for adaptation costs. It is likely that the sea change phenomenon, whereby the proportion and extent of people, housing, infrastructure and industry in the coastal zone is increasing, is actually increasing our vulnerability to climate change.

To address this need, the Australian Government is working with States and Territories on a 'first pass' National Coastal Vulnerability Assessment (NCVA) of the impacts of climate change on key assets within Australia's coastal zone. The NCVA is designed to help decision makers better understand the range of problems that will require solutions, and to provide the tools for developing those solutions. The NCVA will deliver:

1. an analysis of the magnitude of the risks facing Australia's coastal zone and key assets (coastline, biodiversity, settlements and infrastructure) from climate change impacts.
2. tools to assist in the development of more sustainable coastal zone management policies, including a digital elevation model (DEM) for Australia (discussed in more detail below)
3. an understanding of the high priority regions and issues to target for future research and investment
4. an understanding of the gaps in information and decision making tools that prevent development of integrated policy responses to the impacts of climate change.

In conjunction with the 'first pass' NCVA, the Australia and New Zealand Land Information Council (ANZLIC) has led a national process to identify user needs and assess the science case for a national DEM system. Through expert engagement including a workshop hosted by the Academy of Science in March 2008, ANZLIC found that the development of a strategically designed national DEM would meet the needs of decision-makers to assess the risks of inundation from climate change in the coastal zone. ANZLIC also found that a collaborative national approach would allow all governments to benefit from improved access to data as a result of standardised license agreements for public purposes, and considerable cost savings for example through scale of data processing.

The NCVA is the first nationally-consistent approach to identifying and quantifying the magnitude of the risk facing Australia's coastal assets. Results of the NCVA will assist all jurisdictions in effectively targeting research and development to deliver regionally-specific, yet nationally-consistent adaptation plans. The 'first pass' NCVA will be completed in late 2008. This 'first pass' assessment will provide a sound basis on which to make decisions for future work.

## **Direction of Australian Government Action**

The Australian Government has a comprehensive response to the threat of climate change that is built on three pillars:

1. Reducing Australia's greenhouse gas emissions

2. Adapting to climate change that is already happening
3. Helping shape a global solution

Activities in Australia focussed specifically on the coastal zone are mainly under the second of these pillars. The importance of adaptation has been recognised by the Council of Australian Governments (COAG) which in April 2007 agreed to a National Climate Change Adaptation Framework. The Framework identified targeted strategies in the medium term to build capacity to deal with climate change impacts and reduce vulnerability in key sectors and regions.

In December 2007, COAG established a Working Group on Climate Change and Water (WGCCW) to (inter alia) progress *a national cooperative approach to long-term adaptation to climate change ... including accelerating implementation of actions under the agreed National Adaptation Framework across all jurisdictions*. It is expected that the products from this Working Group will be considered by COAG in October 2008.

The Australian Government has commenced priority work on climate change adaptation. The three key elements of the Australian Government's adaptation agenda, each of which is further described, are:

- Improving our knowledge about the impacts of climate change
- Strengthening the ability of Australians to respond to the impact of climate change
- Assisting areas of national vulnerability to climate change impacts – including our coastal zones, our infrastructure, our agriculture sector and our world heritage and iconic sites.

#### Improving our knowledge about the impacts of climate change

A lack of targeted knowledge on how the climate is likely to change at particular locations and what this means for sectors and decision-makers is a major barrier to effective adaptation. The Australian Government is supporting key programs, notably the Australian Climate Change Science Programme and the Adaptation Research Facility, to improve our knowledge on the nature, timing and magnitude of climate change and its implications in the coastal zone.

The Australian Climate Change Science Programme (ACCSP) is delivered in partnership with CSIRO, the Bureau of Meteorology and the Australian Academy of Science. It coordinates the national climate change science effort to address questions of utmost priority for Australia, including areas of global science requiring Australian leadership such as the role of Antarctica and the Southern Ocean in regulating climate change. A key research area in the ACCSP is the development of improved projections of climate change. The most recent projections were released in October 2007<sup>6</sup> and can be found <http://www.climatechangeinaustralia.gov.au/>. Work is continuing to improve the resolution of these projections, and the array of variables covered, in recognition of the information needs of decision-makers.

In late 2007 the Australian Government announced the establishment of the Adaptation Research Facility. The Facility will harness the breadth of expertise across Australia's research institutions to address major knowledge gaps currently constraining adaptation action. The Facility is hosted by Griffith University in partnership with seven other universities and the Queensland Government. The Australian Government is providing up to \$50 million for adaptation research led by the Facility, including up to \$10 million over five years for

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<sup>6</sup> CSIRO and Bureau of Meteorology (2007) Climate Change in Australia – Technical Report 2007. CSIRO, Canberra, Australia.

Adaptation Research Networks and up to \$30 million for research grants. Its priorities include adaptation research relevant to the coastal zone.

### Strengthening the ability of Australians to respond to the impact of climate change

The provision of decision-support tools and appropriate standards, which allow for a changing future climate, are critical to underpinning the capacity of business, industry and the community to respond effectively to climate change. In addition to the tools arising from improved projections of climate change referred to earlier, the Australian Government is supporting:

- the development of a national DEM through investment in whole-of-coastline mid resolution data, high resolution data in highly vulnerable urban areas, and a focus on addressing priority bathymetric data sets
- consistent geomorphologic risk classification so that decision-makers can readily access information on coastal systems at particular risk from erosion
- work to review and as appropriate revise the Building Code of Australia to ensure that the risks of future climate change are recognised in building practices, and possible climate change adaptation measures considered
- work to update the Rainfall and Runoff Handbook by Engineers Australia to ensure that all future construction take into account future changes to heavy rainfall and flooding events
- the provision of general climate change risk management tools in alignment with the Australian Risk Management Standard.

### Assisting areas of national vulnerability to climate change impacts

The Great Barrier Reef Marine Park Authority, with the support of the Department of Climate Change, has conducted a detailed vulnerability assessment for the Great Barrier Reef.<sup>7</sup> A Great Barrier Reef Climate Change Action Plan<sup>8</sup> has been developed, and there is a commitment of funding for implementation for the five year life of that Plan (\$8.9 million).

A Climate Change Adaptation Plan to help protect other iconic areas including the other World Heritage Properties from impacts of climate change is being developed. The plan will ensure that impacts of climate change on these iconic areas and their World Heritage values are closely monitored and reported so that remedial actions can be taken as necessary.

More broadly, the *Caring for our Coasts* initiative is helping coastal communities deal with the unavoidable impacts of climate change. Actions the Australian Government has agreed to take include:

- Establishing a \$100 million, five year, Community Coast Care Program to better protect our precious coastal environment
- Improving the quality of water flowing from coastal rivers into the waters adjacent to the Great Barrier Reef Rescue Plan by investing \$200 million over five years
- Embarking on a national consultation with coastal councils, coastal Natural Resource Management (NRM) groups, capital city mayors, academics, community groups and State and Territory Governments to develop a blueprint for coastal cities and towns to meet current and future climate challenges.

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<sup>7</sup> J.E. Johnson and P.A. Marshall (Editors)(2007) *Climate Change and the Great Barrier Reef. A Vulnerability Assessment*. Great Barrier Reef Marine Park Authority and Australian Greenhouse Office, Canberra, Australia.

<sup>8</sup> Great Barrier Reef Marine Park Authority (2007) Great Barrier Reef Climate Change Action Plan 2007 – 2011. Great Barrier Reef Marine Park Authority, Townsville, Australia.

- Updating and improving the Australian Disaster Mitigation Package to take into account severe weather and storms due to climate change.

In early 2009, the Australian Government will host a national forum on the challenges of climate change to coastal communities. This forum will provide essential ingredients to develop a blueprint to guide coastal communities' efforts to put in place effective adaptation strategies. The blueprint will provide a framework for decision makers at all levels of government to assist them in developing effective policy to deal with the predicted impacts of climate change, meeting the current and future climate challenges in a coastal context.

