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30 May 2008

Committee Secretary  
Standing Committee on Climate Change, Water, Environment and the Arts  
PO Box 6021  
House of Representatives  
Parliament House  
CANBERRA ACT 2600

**ATSE Submission on Inquiry into Climate Change and Environmental Impacts on Coastal Communities**

The Academy of Technological Sciences and Engineering (ATSE) welcomes this Inquiry into Climate Change and Environmental Impacts on Coastal Communities and is pleased to provide the attached Submission addressing the terms of reference of the report.

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Yours sincerely,

A handwritten signature in black ink, appearing to read "Trevor Evans".

Trevor Evans





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Secretary:	..... <i>[Signature]</i> .....

The House of Representatives  
Industry, Science and Innovation Committee

**INQUIRY INTO CLIMATE CHANGE AND  
ENVIRONMENTAL IMPACTS  
ON COASTAL COMMUNITIES**

**Submission by**

**The Australian Academy of Technological Sciences and  
Engineering**

**30 May 2008**

## Background

The Academy of Technological Sciences and Engineering (ATSE)<sup>1</sup> welcomes this Inquiry into Climate Change and Environmental Impacts on Coastal Communities. ATSE notes that over the years there have been a number of inquiries and reviews of coastal zone management at State/Territory and Commonwealth Government levels. Much of this work has produced good analysis and practical suggestions, but very little action has followed. ATSE therefore hopes that the present Inquiry, taking place in a new political climate of cooperation between our three levels of government, may lead to concrete action. ATSE also sees the appointment of a Commonwealth Minister for Climate Change as an indication of the present Government's commitment to addressing climate change issues. ATSE has a strong interest in climate change and has recently provided submissions to the Garnaut Climate Change Review. ATSE counts among its Fellows experts in all aspects of climate change, including adaptation and the sustainable management of Australia's natural resources.

## Summary

In summary, ATSE recommends that Australia should:

- adopt the IPCC definition of climate change, noting that this definition includes naturally occurring changes as well as those attributed to human activity;
- support climate science and its application in order to better understand the potential impacts of climate change;
- collect the necessary data and ensure that it is available to inform assessments of climate change impact;
- reflect potential climate change impacts on the coastal zone in building standards and planning regulations;
- adopt a rigorous risk management approach to coastal management;
- improve coastal zone governance to ensure that buildings are not constructed in areas where the risk of damage from climate change events is high;
- ensure the protection of privately owned coastal wildlife habitat; and
- create a national coastal management council.

## Specific Comments

The 2007 report of the Intergovernmental Panel on Climate Change (IPCC) provides a useful definition of Climate Change: "climate change refers to a change in the state of the climate that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the

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<sup>1</sup> ATSE was established in 1975 with the mission to promote the application of scientific and engineering knowledge to the future benefit of Australia. ATSE is one of four learned national Academies, which have complementary roles and work together both nationally and internationally. ATSE has about 750 elected Fellows who are the leaders of applied science and engineering across the country. ATSE is comprised of experts from a diversity of professions, many of whom have contributed to the preparation of this submission.

atmosphere or in land use".<sup>2</sup> Thus "climate change" includes all changes in climates, both natural and those attributed to human activity.

ATSE believes that, regardless of the cause, the impact of climate change on Australia's coast needs to be managed. Currently there is little investment in the climate science relevant to coastal impacts – observed and modelled sea level rise, storm surges, surface waves, beach erosion and inundation studies are all relevant issues that need attention. Australia also needs better data on sea level changes associated with the El-Niño Southern Oscillation (ENSO)<sup>3</sup>.

ATSE particularly welcomes the Committee's first term of Reference, which sees a continuum between catchment and coastal zone management. Unfortunately this approach is often not reflected in the geographic boundaries of those bodies responsible for the management of catchments and associated coastal zones. While this is primarily a state/territory government matter, it is one that can be influenced by Commonwealth Government policies such as those that provide funding for natural resource management.

ATSE believes that one of the major issues that the Inquiry must address is the important role of the Commonwealth Government in coastal zone management. Several previous inquiries and reviews have recommended the creation of a national coastal management council. ATSE is of the view that the potential impacts of climate change provide an additional compelling argument for the creation of a Commonwealth, State and Territory body, working under the Council of Australian Governments (COAG) to facilitate and coordinate efforts to address the impacts on coastal zones arising from climate change. The impact of climate change on Australia's coastal zone requires national leadership and national policies agreed between all levels of government. ATSE also believes that Commonwealth Government funding is needed to assist state/territory and local governments to address coastal zone management issues.

Assessment of adaptation capacity and development of appropriate adaptation strategies have recently been given increased attention by government - in particular, the COAG-initiated development of a *National Climate Change Adaptation Framework* and a report by the Prime Minister's Science, Engineering and Innovation Council on *Climate Change in Australia: Regional Impacts and Adaptation*. In ATSE's view, these documents provide a valuable basis for the development of consistent methodologies for assessment of adaptation and assessment.

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<sup>2</sup> Climate Change 2007 -the Physical Sciences Basis: contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (Eds.), Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA., October 2007.

<sup>3</sup> The term "El Niño" originated on the west coast of South America to describe unusually warm sea surface temperatures that occasionally appeared around Christmas. In the early part of the 20<sup>th</sup> century, Sir Gilbert Walker noted the tendency for slow, oppositely phased variations in atmospheric pressure between Tahiti in the central Pacific and Darwin, Australia, in the western Pacific. He called these variations the "Southern Oscillation". It has subsequently been shown that the coastal warming near South America (El Niño) and the atmospheric variations noted by Walker (the Southern Oscillation) are related, and the term ENSO joins the oceanic and atmospheric phenomena. ENSO is a slow oscillation in which the atmosphere and ocean interact to produce a slow, irregular variation between two extremes, sometimes called El Niño and La Niña or warm phase and cool phase.

ATSE believes that the Commonwealth Government has a clear role in the provision of data to inform decisions on coastal zone management. A 2006 report<sup>4</sup>, in addition to providing a concise summary of existing knowledge, also identifies and prioritises research needs to address highlighted gaps in methods and data relevant to the impact of climate change on Australia's coastal zone. ATSE commends this report to the Committee.

ATSE, in conjunction with the Australian Academy of Science, hosted a workshop in March 2008, to discuss and critically review a proposal to establish a National Elevation Data Framework (NEDF). The proposal for the NEDF was developed by ANZLIC<sup>5</sup>, at the request of the then Australian Greenhouse Office. The purpose of the proposal is to develop a collaborative framework that can be used to increase the quality of elevation data and related information such as models describing Australia's landform and seabed. The aim is to optimise investment in existing and future data collections and provide access to a wide range of digital elevation data and related information to those who need them. Impetus for a national approach to collection of digital elevation data is coming from a range of sources. Most recently, COAG identified as a priority: "Develop a national digital elevation model for the whole of Australia, with vulnerable regions being mapped using very high-resolution images. This would involve linked topographic and bathymetric information at a resolution relevant to decision-making." One important use of this elevation data will be to inform coastal zone management.

In order to assess coastal vulnerability in low-lying areas and for governments to make priority investments based on relative risk in coastal areas, it is essential that there is reliable data on mean sea level around the Australian coastline. There are concerns about the reliability of current data, which are based on a number of tide gauges. Modern airborne and satellite technology can be used to rapidly map surface elevations and allow the calculation of mean sea level based on gravity measurements. This works well for land and over the deep ocean, but is currently inadequate close to the coast. Inconsistencies are common between heights determined using this method and existing measurements. ATSE considers that there is need to improve the fundamental basis for measuring and monitoring sea level around the Australian coast, by improving the "geoid model"<sup>6</sup> definition in coastal regions.

ATSE believes that Australia will not really embrace adaptation to climate change until it stops being a 'bolt on' and becomes a fundamentally altered part of our future vision. A high priority needs to be given to the development and rigorous implementation of planning procedures for Australia's coastal zones. The risk of increased local flooding in those areas of Australia where increased rainfall is projected has potentially serious consequences, particularly when associated with sea level rise and storm surge. Developments in low-lying coastal areas, which are currently at risk from inundation and erosion, will become increasingly vulnerable. Assessments for such areas require specific physical information and local climate change projection scenarios based on modelling at global, regional and local

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<sup>4</sup> Voice, M., Harvey, N. and Walsh, K. (Edt.) Vulnerability to Climate Change of Australia's Coastal Zone: Analysis of gaps in methods, data and system thresholds. Report to the Australian Greenhouse Office, Canberra, Australia. June 2006

<sup>5</sup> ANZLIC is the Spatial Information Council of Australia and New Zealand (formerly known as the Australia New Zealand Land Information Council).

<sup>6</sup> Although we commonly picture the earth as a sphere, it is actually an irregular spheroidal shape, which is described by the technical term — the "geoid". The geoid comprises a virtual surface where the direction of gravity is perpendicular to all points on it. This can be used to define mean sea level.

geographical scales. Consideration of adaptation strategies needs to take into account analyses of economic and societal impacts.

Adaptation requirements range from no action to major investment and new visions for the future, and are dependent on an assessment of the consequences (including opportunities) ranging from discomfort, inconvenience, economic loss through disruption, societal concerns, property damage through to damage causing injury and loss of life. Future adaptation actions include deferring action pending the emergence of new data, no immediate action with the acceptance of increased future maintenance costs, temporary defensive actions, adoption of new precautionary standards or planning concepts (particularly in iconic and strategically visionary developments), immediate or deferred retrofitting, or replacement of infrastructure elements. The possibility of legal liabilities arising from adaptation actions taken, or not taken, also requires careful consideration.

Transport systems in the coastal zone which have been designed and maintained to current design standards are likely to require moderate investment as a consequence of potential climate change impacts (e.g. possible increased severity of flood damage to roads and bridges). Airports situated in low lying areas (e.g. Sydney Airport's third runway) may be increasingly vulnerable to combined effects of sea level rise, flooding and storm surge, with serious disruption to services.

Climate change is likely to exacerbate damage to buildings in low-lying and coastal areas from flooding and erosion resulting from intense rainfall, particularly if combined with sea-level rise and storm surge. Adaptation strategies must be developed for specific situations. The need for long-term planning and enforcement of regulations for development in the coastal zone is essential to mitigate the potential future impacts of climate change.

Given the existing scientific and engineering expertise in Australia, the regulatory frameworks which are already in place or proposed, and the available economic resources, the built environment sector is generally well-placed to respond to potential challenges arising from climate change and to provide advice on adaptation strategies. Regulations and guidelines must be kept under review as a result of further research on climate change and the development of practical adaptation measures.

Climate change could lead to significant economic losses and result in demands for compensation or other financial assistance. In ATSE's view, a sound risk management strategy adopted now could minimise such problems. The assessment of impacts of events, where there are levels of uncertainty in their likelihood and their consequences, requires a methodology which enables risk to be determined in a systematic and scientifically based manner. Such an approach is available in the risk management process provided by the Australian Standard, Risk Management AS/NZS 4360:2004.

This Standard has been adopted by the Australian Greenhouse Office and developed for application specifically for the assessment of climate change impacts. A detailed description with guidelines for application is provided in the publication, *Climate Change Impacts & Risk Management, a Guide for Business and Government*. The methodology has been tested in a number of practical applications, including coastal infrastructure, and has been shown to provide useful guides for the assessment of risk for specified scenarios. Caution must be exercised in the assessment of 'likelihood', since the scenarios are projections based upon a range of models and

assumptions about future emissions. Both optimistic and challenging scenarios need to be examined to form a view about actions which may need to be taken.

ATSE is also concerned that coastal areas with high value for wildlife should be protected from population growth pressures. In considering the protection of coastal habitat, ATSE suggests that the Committee examine a New Zealand model — The Queen Elizabeth II National Trust was established by an Act of Parliament in December 1977 to encourage and promote the provision, protection, and enhancement of open space for the benefit and enjoyment of the people of New Zealand.<sup>7</sup>

One of the Trust's principal functions is to protect privately-owned areas of open space, without jeopardising the rights of ownership. While private landowners may sell or gift land to the Crown or a local authority as a reserve, many wish to protect their land while retaining ownership. Open space covenants are defined widely in the Act as "any area of land or body of water that serves to preserve or to facilitate the preservation of any landscape of aesthetic, cultural, recreational, scenic, scientific, or social interest or value". A Queen Elizabeth II National Trust open space covenant is a legal agreement between the Trust and a landholder to protect a special landscape feature for a specified time, more usually, in perpetuity. Covenants are almost always owner initiated, reflecting the landholders' goodwill toward this form of protection.

ATSE  
30 May 2008

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<sup>7</sup> See <http://www.justice.govt.nz/pubs/reports/2001/dir-of-info-2001/list-q/q-2.html>