Submission to:

Inquiry into climate change and environmental impacts on coastal communities

Professor Will Steffen
Director, Fenner School of Environment and Society
The Australian National University
Hancock Building West, 43
Canberra ACT 0200

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My submission deals with the third bullet of the terms of reference: "the impact of climate change on coastal areas and strategies to deal with climate change adaptation, particularly in response to projected sea-level rise"

The recent coastal vulnerability assessment, being carried out by the Department of Climate Change, will do an excellent job of addressing the climate-related terms of reference of this inquiry. In addition, the national adaptation plan to be developed and implemented under the auspices of the National Climate Change Adaptation Research Facility will deal with this term of reference in much more detail, based on wide community consultation, but here I wish to emphasise a few critical points (by way of supporting these other activities):

1. Science: uncertainty about the level and rate of future sea-level rise

The science surrounding the sea-level rise issue in in a state of rapid change, and, in fact, has progressed significantly since the publication of the IPCC AR4 last year. The most important features of recent scientific advances are:

- The observed rate of sea-level rise (ca. 20 cm over the past century or so, but with an acceleration since the 1990s) is tracking at or near the upper limits of the envelope of IPCC projections. With no further changes in the rate of sea-level rise, this would suggest that sea levels in 2100 would be ca. 0.75 to 1.0 m above the 2000 levels.

- More recent studies of the rate of sea-level rise in the past (e.g., when the Earth shifted from a glacial state (ice age) to an interglacial state (such as now) suggest that rates of ca. 1 m/century are not unusual and that a rate of 4 m/century is possible.

- The biggest uncertainty in the projected rates of sea-level rise is associated with the behaviour of the large polar ice sheets (Greenland, West and East Antarctica). Greenland appears to be the most vulnerable, and over the past decade has changed from being in mass balance (no net loss or gain of ice) to now experiencing a net loss of ice, of about 300 km^3 per year. The concern is that a threshold ,may soon be passed beyond which we'll be commited to losing most or all of the Greenland ice sheet. This would lead to 6 m of sea-level rise (with enormous implications for Australia), although the timeframe

required to lose this amount of ice is highly uncertain, ranging from a century to a millennium or more. Much less is known about the stability of the Antarctic ice sheets.

- The other critical factor associated with sea-level rise is the coincidence of storm surges that accentuate the impacts of sea-level rise itself. In that regard, the projections suggest (and there is some observational evidence to support them) that the intensity of tropical cyclones is increasing and will continue to increase. This would lead to more destructive storm surges.

2. Risks associated with sea-level rise

The most direct risk associated with sea-level rise is linked to inundation, whether it be a creeping, slow inundation from sea-level rise or an extreme inundation event associated with a storm surge or heavy rainfall. Three sectors particularly at risk are:

- Settlements/built infrastructure – in this case the extreme inundation effects are most important, and the combination of storm surges associated with tropical cyclones or intense low pressure systems coupled with sea-level risk will create high risk situations. The national assessment of coastal vulnerability will be able to provide a detailed assessment of which settlements/regions are most vulnerable.

- Natural ecosystems/biodiversity – the classic example here is Kakadu National Park. Natural ecosystems have very low adaptive capacity to climate change, so the (geologically) fast rise of sea levels we are experiencing now will place increasing pressure on coastal ecosystems. There is some evidence that Kakadu is already being affected by sea-level rise (reported in the National Assessment of Vulnerability of Biodiversity to Climate Change, to be released in November).

- Water resources – this is probably a minor issue for Australia in general, but some settlements on islands or in remote areas may have low-lying, coastal water supplies that are vulnerable to saltwater intrusion as sea level rises. This is a more common problem in Pacific island states.

3. Strategies to deal with the risks

The most important principle in developing adaptive strategies is that they need to be driven by the coastal communities themselves, with strong collaborative roles for local government, the private sector and civil society. Science/research is also important, in terms of (i) providing the background knowledge of risks associated with changes in the physical climate system, and (ii) working with local communities to help develop adaptation strategies suited for local situations (co-production of knowledge). Point (ii) envisages a strong role for social sciences and economics.

In terms of overall strategies, three stand out as being more universal, relevant across specific places:

- Mitigation, as vigorously and rapidly as we can, is the best insurance against the worst of the projected coastal impacts. Obviously this is a global task, but as a country with a very high percentage of population and infrastructure in the coastal zone, it should be a high priority for Australia that the international community achieves an effective mitigation strategy at Copenhagen next year.

- Given the risk of high rates of sea-level rise, a prudent adaptive strategy is to adopt strict zoning laws that prevent construction of infrastructure too near to sea-level. Further discussion is required on precisely what that level might be (and it depends somewhat on the expected lifetime of the infrastructure), but a value around 5 m above current sea-level would be conservatively prudent for long-lived infrastructure.

- In terms of water supplies, it seems obvious that any new storages should be built well in-land and up from any possibility of salt-water intrusion, and that any current groundwater sources that are vulnerable to sea-level rises up to 5 m should be replaced with more secure sources.