Committee Secretary,

Senate Standing Committees on Environment and Communications,

PO Box 6100,

Parliament House,

Canberra, ACT 2600

Re: Recent Trends in and Preparedness for Extreme Weather Events

Introduction

I am an oceanographer with an expertise in sea-level rise and its impacts. In recent years, I have worked in CSIRO and at the Antarctic Climate & Ecosystems CRC, based in the University of Tasmania. I am now a University Associate at the University of Tasmania.

There are two main impacts of sea-level rise. One is *inundation*, which is the direct flooding of land by the rise of the sea. The other is *recession*, which is a secondary effect, whereby soft (e.g. sandy or muddy) shorelines tend to recede under rising sea level; the shoreline is actually eroded away. This submission only deals with the former of these, *inundation*.

My recent research has been into the expected change in the frequency of flooding events caused by sea-level rise, and in the planning allowances required to mitigate this effect. These two topics are the subject of this submission.

The Increase in the Frequency of Flooding Events With Sea-Level Rise

Sea-level rise, like the change in many other climate variables, will be experienced mainly as an increase in the frequency or likelihood of extreme events. Flooding from the ocean generally occurs as a result of a combination of a high tide, a storm surge and a rise in long-term sea level (although other effects such as seasonal and interannual variations may play a part). Research shows that the rise in long-term sea level, rather than any change in storminess, is generally the dominant cause of any observed increase in the frequency of flooding events from the sea (see Hunter, et al., 2013, for supporting information). We can estimate, from existing sea-level observations, how much the frequency of flooding events (at a given height) will increase for a given projected sea-level rise. For a relatively modest sea-level rise of 0.5 m, Hunter (2012) showed that the frequency of flooding events at a given height would increase by a factor of typically 300. In other words, a flooding event which presently happens on average only once every 100 years (the '100-year event') would happen several time per year by the time sea level has risen by 0.5 m.

Planning Allowances

All Australian States have now declared a 'planning allowance' for future sea-level rise. This allowance is the height by which infrastructure needs to be raised in order to cope with rising sea levels. Most of these allowances have been based on a perceived upper limit of the projections of the Intergovernmental Panel on Climate Change (IPCC), mainly from the Fourth Assessment Report (AR4); the resultant Australian planning allowances for 2100 are in the range 0.8 – 1.0 m.

Tasmania, the most recent State to declare an allowance, has used a method which treats the uncertainty in the sea-level rise projections in a more objective manner (Hunter et al., 2013), resulting in an allowance which preserves the frequency (or likelihood) of flooding events under sea-level rise[1]. In other words, any asset raised by this allowance would experience the same frequency of flooding events under sea-level rise as it would without

[1] See www.dpac.tas.gov.au/__data/assets/pdf_file/0003/176331/Tasmanian_SeaLevelRisePlanningAllowance_TechPaper_Aug2012.pdf

sea-level rise and without the allowance. The resultant Tasmanian planning allowance, which takes into account regionally-varying projections of sea-level rise and vertical land motion, is 0.8 m for the period 2010–2100, which is similar to the allowances of the other States. This technique is currently being used by Fisheries and Oceans Canada to derive planning allowances for their numerous coastal assets.

Present Australian planning allowances for sea-level rise were mainly based on the projections of the IPCC AR4. The Working Group I report of Fifth Assessment Report of the IPCC (the volume relevant to climate projections) should be released in September 2013; Australian sea-level rise allowances may need to be revised based on this new information. Any revised allowances should also take into account expected regional variations in sea-level and vertical land motion, with an appropriate treatment of uncertainty.

References

Hunter, J., 2012. A simple technique for estimating an allowance for uncertain sea-level rise. Climatic Change 113:239–252, DOI:10.1007/s10584-011-0332-1.

Hunter, J.R., Church, J.A., White, N.J. and Zhang, X., 2013. Towards a global regionally-varying allowance for sea-level rise, Ocean Engineering (in press).

John Hunter, 31 January 2013