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To: Environment and Communications References Committee

Climate Change Risk to our Coastal Cities

Confronting the nation's coastal urban cities as it approaches 2055, 30 years on, will be both higher sea levels and air and water temperatures. And 50 years from now (in 2075) sea levels will be substantially higher (and continue to further rise into the 22nd century). A high level of confidence exists in projections of future sea levels and temperatures along with less certain but reasonable projections of intensification of rainfall in most of our coastal cities. It is imperative that the nation fully understands future consequences of climate change on the specific functioning of the waterbodies around which each of these cities has been built.

More than 80% of Australia's population lives, works, and plays within c.30km of the coast. They attract much of the nation's international business and tourists, and will remain centres of continued population growth with residents demanding access to healthy waterways. The coastal zone plays a critical role in driving the Australian economy through port cities which serve as the hub for international trade vital to regional productivity and employment.

Economic and social implications for those at the front-line responding to climate change impacts, particularly local governments, will be significant. This was highlighted in the *Climate Change Risks to the Australia's Coasts* reports (2009 and 2011). I was an advisor to these studies conducted by the then Dept. of Climate Change. Estimates were made of the replacement value of residential buildings alone from a sea-level rise of 1.1m of up to $63b with a lower and upper estimate of risk identified from between 157,000 and 247,600 individual buildings (2009 report). Of the order of $226b in commercial, industrial, road and rail and residential assets are potentially exposed to inundation and erosion hazards at a sea-level rise of 1.1m (2011 report).

To my knowledge the scale at which these "first pass assessments" that were undertaken 15 years ago has not been replicated. What is missing is a more contemporary national appreciation of what estuary urban centres will begin to look like under conditions that are "highly likely" to occur in 30- and 50-years' time and beyond. Sea-level trajectories recently made available by BoM indicate acceleration in rate of sea-level rise around Australia. A general increase of 26cm by 2050 and 83 cm by 2100 (an estimate for 2075 is 46cm) is predicted. Of course sea level will continue to rise at some stage reaching the 1.1m level used to define risk in the 2009/2011 risk assessment reports.

We must expect a complex array of impacts as sea level rises. For instance, losing tailwater for drains as low tide rises closing the "drainage window" of stormwater systems leading to back-flooding. In addition, more land will be inundated more frequently affecting road and rail services as well as critical public infrastructure such as airports at Sydney and Brisbane.

Rising groundwater tables and rising damp will harm properties. More places will experience poorer water quality with "bad" water collecting in drains and canals. Increased water temperatures and runoff of nutrients will initiate algal blooms along with other adverse

ecosystem effects. The recent algal toxin outbreak in South Australia under conditions of a warming ocean highlights what can occur in and around our coastal cities.

How these effects will play out spatially will vary according to the hydrodynamic behaviour of individual estuaries and their link to river flooding (e.g. Brisbane). Within an estuary this will first be felt locally and spread more widely over time depending on local topographies. A typical mitigation response would be to construct or raise protective works such as seawalls or drainage gates. However, these will likely become short-term measures as the sea reaches critical levels for them not to fulfil their intended purposes. Without some level of national adaptation leadership leading to more coordinated actions, local and state governments may continue to follow what could be seen as maladaptive practices.

Short-term decision making that does not appreciate the consequences of climate change will create longer-term intergenerational costs and failed outcomes. Worldwide there is an increasing investment in costly engineering structures such as tidal barrages. If deployed in Sydney, Brisbane, Melbourne, Perth, or any of our coastal cities, these barrages could be catastrophic, cutting the estuary into small, dammed zones, with poor water quality and the loss of important values/services. To avoid such outcomes, a plan for a future that is connected, adaptable and nationally coordinated is required.

One could expect that the forthcoming *National Climate Risk Assessment* (NCRA) might be a first step in identifying risk at the scale of our great coastal cities. It is hoped that it will foreshadow a National Adaptation Plan that recognises the need for long-term planning.

We need to know what the NCRA is saying about the likely coastal impacts that will affect these coastal urban areas especially in relation to sea-level rise and associated flooding events. This will help planners and policy-makers get on with the task of developing regional adaptation plans reaching forward to periods when sea level (and water temperatures) will demand greater action to mitigate threats to the nation's well-being.

I am aware of relevant background work being undertaken by groups within federal and state agencies and by coastal engineers within Engineers Australia. We do have the necessary technical skills to help define the pathways to adaptation that rising sea levels and temperatures will demand of our dominantly urban coastal cities. What is needed is a national governance framework that can tie the different efforts together so that the long-term imperative of planning for the future is efficiently managed.

Zali Steggall has prepared a Bill for the Australian Parliament that would provide a legal basis for future governments to take the impacts of climate change seriously. I would argue that such impacts include those that will harm economic, social and environmental conditions in and around urban waterways. Whether this Bill will ever reach the floor of the House of Representatives and be subject to debate is unclear. To not do so is most unfortunate. But her message is clear. Governments now and in the future must regularly assess and demonstrate how they are addressing emerging climate risks "and make informed, long-term plans to safeguard our communities against climate risk".

A future vision of our urban estuaries should be a top priority. The vision needs to establish how we foresee our waterways in a dynamic future where conditions are ever-changing. A future vision based on needs and supported by science should be developed by stakeholders within each coastal urban city within a nationally coordinated framework. A national estuary

adaptation program should be specific component of a National Adaptation Plan whatever form that may take.

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