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

Re: Inquiry into climate change and environmental impacts on coastal communities

I have been involved in coastal research in Australia for 40 years and in research into the coastal impacts of climate change since 1987 and wish to make the following submission with regards to the terms of reference:

1. Existing policies

The existing policies are a start, however the new government needs to use this inquiry to review, enhance and enact policies that will safeguard our coast for future generations, not only against climate change but also inappropriate development.

2. Environmental impacts of coastal population growth & sustainable use of coastal resources

The concentration of people on the coast will remain a characteristic of Australian demographics and will likely accelerate in line with increasing population and the seachange drift. To minimise the impact of this growth it must be planned well in advance and carefully controlled, with a focus on expanding existing coastal centres, and minimising the spread of new development outside of these areas.

Coastal resources include fishing, some sand, heavy mineral and bauxite mining, as well as a node for sea transport. However the biggest resource is the coast as a site of relaxation, recreation and tourism, all of which have minimal impact and are sustainable so long as no section of the coast is over utilised. Tourism use of the coast will continue to increase, and this must be controlled by planning, which identifies and support intensive tourism in certain coastal areas (e.g. Gold Coast), while most of the coast is 'quarantined' for local consumption

and the few independent tourists. We really need to manage tourism. It can bring tremendous benefits to the country however we need to decide when and where we want coastal tourism to develop and leave most of the coast undeveloped for tourism. In this way we can maintain the natural Australian coast that is integral to our heritage and lifestyle at the same time as supporting and encouraging a major tourist industry.

In line with the quarantining of the coast there remains substantial room in some states for more coastal national parks and reserves. Whereas New South Wales has 45% and Victoria 41% of their coast in national parks and reserves, all the other states have less than 30% of their coast in parks. Such parks are a very effective way of maintaining a natural coastline, which can fend for themselves in relation to climate changes, as well as eliminating the demand for coastal development in the park areas.

3. Coastal impacts of climate change and strategies for adaptation, esp. sea level rise

The impact of sea level rise will increase at the inverse of shoreline gradient. That is, there will be little impact on steep rocky shore, minor to moderate impact on sandy beaches, but major impact on low gradient tidal flats, floodplains and deltas. The latter are both rich ecosystems (salt marshes, mangroves, seagrasses), and also the floodplains are the site of much intensive agriculture and grazing, as well as in places urban and tourist development. These low lying areas, often located kilometres inland will bare the brunt of sea level rise though higher tides, higher water table, increasing salinisation and higher flood events. These areas will require more attention than the open coast systems, particularly in east and southeast and southwest Australia. Each of the main systems is briefly considered below:

Tidal flats

A major issue facing the coast with sea level rise is the 'coastal squeeze' that will occur in inter- and supra-tidal ecosystems (salt marshes, mangroves, intertidal flats and seagrass meadows) as they encroach inland into either steeper terrain and/or occupied land. Where they encounter steeper terrain we have to recognise that the vast intertidal flats that provide the habitat for these systems were accumulated over thousands of years (post 6500 years ago sea-level still stand), and these flats will not and cannot keep up with sea-level rise. They will be flooded, as will the ecosystems they support. This will generally lead to a decrease in inter- and supra-tidal systems (salt marsh and mangroves) and expansion in sub-tidal seagrass meadows. In some regions of northern Australia there will be a return to the 'big swamp' as mangroves expand out over present extensive high tide salt flats. The degree of habitat migration, shift and squeeze can readily be predicted using high-resolution mapping (see below). There is nothing that can be done about this. It is an accelerated natural change that must be accepted.

Where the intertidal systems abut developed and occupied low-lying land there will be two options. Build levees to maintain the land, if sufficiently valuable, or transfer the land to the public and permit sea-level encroachment. The Dutch have already had to confront both these issues in management of their polders.

Beaches

There are approximately 400 popular-developed beaches around Australia and about 3000 beaches with some form of development (out of a total of about 11 000), with most of the 8 000 undeveloped beaches unnamed, inaccessible and little known or visited. Any expenditure should be focused on the already well-developed and popular beaches, with the lesser and undeveloped beaches left to respond naturally to sea level rise. The major impact of sea level rise will be slow retreat, together with regionally variable impacts of changes in wave climate. In the intermediate future (decades) the retreat can be countered by massive sand nourishment on highly vulnerable and popular beaches. Australian should invest in the dredging technology to nourish affected beaches around the coast. Massive sand resources suitable for beach nourishment are located along much of the southeast coast, including the Sydney coast. This material could be dredged and dumped or pumped onshore to nourish the beaches.

Other more difficult and expensive options are seawalls and levees, buyback of affected properties and planned retreat. Seawalls and levees should only be used as a last resort as they will result in the replacement of the beach with a wall. Buyback is already used to a limited extent on Sydney's Narrabeen-Collaroy beach, but this is very expensive and needs federal-state support. Buyback of beachfront property should be seriously considered over the coming decades, as I am sure the broader community would prefer a naturally retreating and possibly nourished beach, over seawall defended private property replacing the beaches. Planned retreat is only possible where there is somewhere to retreat too. It may be feasible in some smaller communities. Any new development should have a broad hazard and buffer zone between the shoreline and first line of development, so the shoreline can naturally encroach into this zone.

Coastal dune systems

Australia's beaches are backed by over 2000 coastal sand dune systems. As sea level rises the frontal dunes of all these systems will be exposed to greater erosion. During past sea level rises this has been accompanied by massive release of sand from the frontal dune and major dune transgression, i.e. wind blown sand moving inland. We need to be cognisant of this fact and keep a watching brief on our dune systems if we wish to minimise dune transgression, particularly where it may threaten infrastructure or valuable habitats. Dune can be managed through dune fencing, controlled access and planting to maintain the stability of the frontal dune, as has already occurred over the past few decades on most developed beach-dune systems. Such management would provide an opportunity for local community to be involved in an extended dune care type program.

Lidar mapping

In order to assess the vulnerability of the Australian coast to sea-level rise, high resolution mapping with a vertical scale of centimetres, of the priority areas, and eventually the entire coast is required. The most cost effective way to achieve this is using LIDAR (Light detection and ranging), that is airborne radar. At present most mapping of the coast has a resolution of 10 m or 20 m, of little use for assessing vulnerability. Only with accurate high-resolution mapping can the level of vulnerability be accurately accessed.

Once the coast is mapped and vulnerability known then contingency plans can be developed along the lines discussed above.

4. Promoting sustainable coastal communities

Coastal communities need to be designated, planned and managed, with ideally little urban development in between. In this way their impact is concentrated which will generate the economies of scale required to provide the necessary services, support and sustainable practices.

On a personal and community level the general public needs better information about climate change and its potential impacts than is presently presented in the media, which tends to focus on extreme events. The public needs to know what is really happening and likely to happen, least they become sceptical when the media hype does not eventuate. This could be achieved through an annual climate change report (a "state of the climate report") that provides accurate information on trends in temperature (air and sea), sea level, as well as related climate indicators that may be attributed to climate change such as rainfall patterns, cyclone frequency and intensity, habitat and shoreline shifts.

We also need to be mindful that the potential impacts of climate change have been tremendous beneficial in achieving a change in the way individuals, through to businesses, industries and countries consume energy and attempt to live and work more sustainably. Without the climate change debate this would not be happening to the scale that has been achieved to date. To maintain this momentum, again accurate, honest information is required, together with increasingly refined climate models to predict future trends and changes.

5. Governance and institutional arrangements for the coastal zone

Climate change and its coastal impacts are worldwide and nation-wide and need commonwealth leadership, with strong federal, state and local government collaboration and cooperation. The commonwealth needs to develop the policy and national guidelines for dealing with climate change and provide the funds for state and local government to implement via climate change management plans for various sections of coast. The development of the management plans should also engage the local community.

The keys steps for mitigation climate changes impact on coastal communities are:

1. Lidar mapping of priority areas, and eventually entire coast.
2. Overlay lidar maps with landuse including natural systems, via GIS.
3. Develop a vulnerability index based on topography, landuse and exposure to coastal processes.
4. Develop management plans at state-regional level for vulnerable areas, based on commonwealth policy and community input.
5. Implement plans implements at state and local government level, with commonwealth support.

One mechanism to arrange this is to have the following:

1. Commonwealth Climate Change Task Force
2. Part of which deals with 'coastal impacts of climate change'
 - a. Develops policy
 - b. Undertakes lidar mapping

3. State climate change task forces
 - a. In collaboration with commonwealth develops GIS using lidar maps and landuse for relevant areas of each state/territory.
 - b. Develop vulnerability index.
4. Local/regional climate change task forces
 - a. Reviews coastal GIS and involves local community
5. Based on above management plans are developed at the state/regional/local area with community input.
6. Once the management plans are developed then they are implemented on a relevant space-time matrix by state and local/regional government, in some cases assisted by local community (e.g. dune care).

Climate change is coming, but it is coming relatively slowly. This means that a relatively wealthy, well-educated and environmentally aware country like Australia has the time, funds and incentive to plan for its impacts. We do however have a very long open coast (30 000 km) and even far greater shoreline (>100 000 km). Most will be left to fend for itself as sea level, tides, waves and habitats change. We do have the time and resources to ensure that that part that is development and vulnerable can be managed to prepare for and accommodate climate change.

Yours sincerely

A handwritten signature in black ink, appearing to read 'A Short', written in a cursive style.

Andrew D Short
Professor