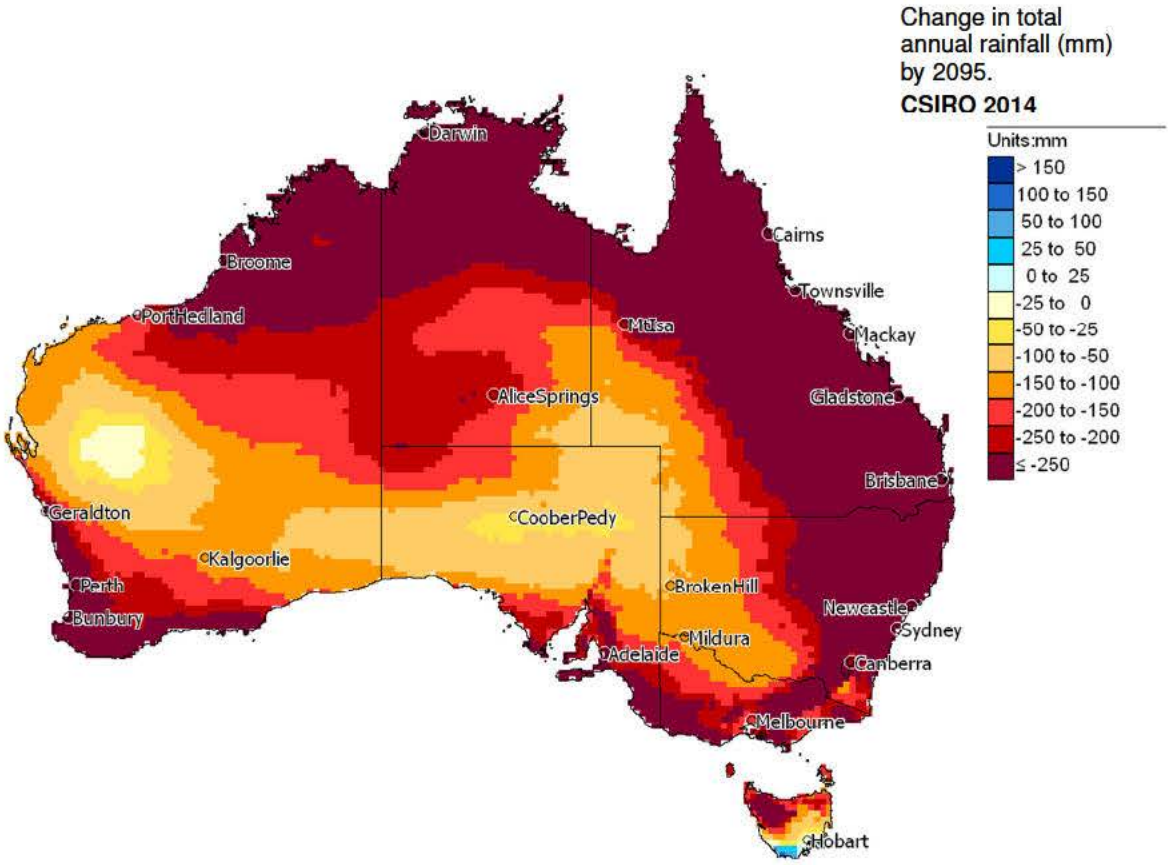
Current and future impacts of climate change on housing, buildings and infrastructure

Environment and Communications References Committee

Feedback from Regional Development Australia – South West



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Opening remarks

Given the very broad scope of this inquiry, it has been difficult to know where to start except to focus on discussion and recommendations that are unlikely to be brought forward in other submissions. For that reason, this contribution may feel occasionally ‘random’ but it is based on local knowledge and experience in a role that crosses all levels of government, community and the private sector.

There is clearly a plethora of information on climate, risk and adaptation. The commentary is broad and there are a great deal of gifted people working in the field. However, there appears to be no co-ordinating point and no organisation has issued a clarion call to muster the troops.

There is a place for government to lead and bring together interested parties. There is also a place for government to break down silos and create a framework for national approaches to mitigation, adaptation and learnings.

Further, there are market failures in this space. Government can take a role in addressing those failures through communication and programmes.

For their part, the business sector and community can benefit through knowledge and information. The more they have, the better their decisions.

About Regional Development Australia

Regional Development Australia (RDA) is an Australian Government initiative that aims to bring together all levels of government to enhance the growth and development of regional Australia.

From 2015, RDAs were tasked with a greater economic focus. That focus is likely to be strengthened with *Regions 2030*, the Commonwealth's regional policy which is underpinned by the Australian Government's Regional Ministerial Taskforce, a cross-portfolio group chaired by Prime Minister, Malcolm Turnbull.

Regional Development Minister Sen Fiona Nash encourages whole-of-government approaches to deliver positive change and notes that RDAs comprise a vital link between their regions and the Commonwealth.

RDAs exist to help and support the Australian Government.

South West background

This feedback is provided at the request of the Senate and has been referred to the Environment and Communications Reference Committee.

Comments will be related to the current and future impacts of climate change on housing, buildings and infrastructure, accounting for a range of projected climate scenarios, having regard to matters, including sea level rises, extreme weather events and housing.

This submission will provide evidence from a predominantly local perspective. The South West of Western Australia has been described as Australia's climate change 'canary in the cage'.

Sea levels

Accepting that a warming climate is unequivocal and will have consequences of changed weather patterns (Inter Governmental Panel on Climate Change[1]) then sea-levels will continue to rise. The Climate Change Commission reported that sea level rises in the South West (1990s-2010) were the highest in Australia at 7.4mm/pa.[2]

The question is not whether there will be rise, but to what extent? This is at the heart of considerations of adaptation in Australia since about 85% of the population live in coastal regions[3] and decisions will need to be made on a scale of activities ranging from 'protect' to 'abandon'. (The above image shows the impact on Bunbury with a 1,000mm rise).

Temporal questions are also important. While Geoscience Australia identifies exponential rise[4], another analysis[5] disputes accelerated rise, instead favouring a slower, steadier rise.

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[1] IPCC5 (2014) *Climate Change 2014: Synthesis Report,* Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Geneva, Switzerland.
[2] Climate Commission (2012) *The critical decade: Western Australia climate change impacts*, Australian Government, Canberra, ACT.
[3] Hennessy K (2011) 'Chapter 4: Climate Change Impacts', *Climate Change: Science and Solutions for Australia*, CSIRO Publishing, ACT.
[4] OzCoasts (2012) Australian Online Coastal Information, Geoscience Australia, Australian Government. <www.ozcoasts.gov.au/climate/sd_visual.jsp>.
[5] Parker A, Saleem S & Lawson M (2012) 'Sea-level trend analysis for coastal management', *Ocean and Coastal Management*, 73: 63-81.

This position is supported by others[6] who note that while rises are gentle, they rapidly increase in oscillating bursts linked with La Nina/El Nino events.

Total rises are also disputed but there is some general common ground. The IPCC predicts that rises will likely be 520-980mm by 2100 which ties with Climate Commission values of 500-1000mmm (750mm±250mm) and CSIRO now tracks an observable band of around 880mm.

In addition to this, the South West is experiencing Australia's highest sea-level rises due to isostatic influences which obviously exacerbate eustatic rises.

Warmer and drier

IPCC AR5 is looking at average rises of 1.5C

In addition to rising sea levels, the South West has experienced a 15% decline in rainfall since 1975, dam run-off decline by 75% and was described by CSIRO as "one of the most water challenged parts of the country."[7]

Extreme weather

The Bureau of Meteorology data shows that WA records (in more than 100 years) shows the highest and lowest temperatures, and, most rain in a month and a year, all occurred in the last decade. The trend in number of "very hot days" (>40C), "very hot nights" (>25C), "very heavy precipitation days" (>30mm), and consecutive dry days are all increasing.

The Bureau also noted in its 2016 Annual Climate Statement that weather is becoming more extreme. The impact is natural disasters – fires, cyclones, flooding and drought.

Image shows Bunbury flooding resulting from Tropical Cyclone Albany in 1978. Alby tracked down to the SW corner of WA almost 2,000km south of where cyclones typically make landfall. This area is the same as that shown 'at risk' on the previous page map.

[6] Morner N-A & Parker A (2013) Present-to-future sea level changes: The Australian case, *Environmental Science*, 8 (2): 43-51.
[7] CSIRO (2010) Estimating the water yield of south-west Western Australia under a changing climate, *Australian Government National Research Flagships*, Water for a Healthy Country.

Infrastructure vulnerability in coastal areas

Construction on high value but exposed beaches and coastline is continuing in the South West despite a general acceptance of the inevitability of sea level rises.

Some of the infrastructure building is by local government on ground that is 1m or less above sea level. It is not expected that sea walls will be constructed, although some have created as basic in-beach sea defences to mitigate against storm events. Foreshore infrastructure projects have been funded by both State and Federal Governments.

Whether this is deemed reasonable social and economic development for medium term gain is another question, but there is little doubt that the projects are publicly popular and will very likely succumb to sea level rises before the end of the century.

Work has been undertaken by GeoScience and the WA Department of Planning. It is publicly available[8] but not publicised. This storm surge risk and an increase in cyclone events will impact on building codes and housing affordability over the longer term.

Recommendations:

- Construction decisions need to become the full responsibility of the investor. Anyone who builds in 'at risk' zones cannot expect government (at any level) to construct coastal defence systems to protect private investment ie there should be an assumption that protective infrastructure will not be provided at public cost.
- A framework should be developed so that infrastructure in 'at risk' zones is built with a view to removal and/or planned retreat.
- Mapping of those areas at risk should be clearly made public at a local level so that more informed decisions can be made.
- Emergency services infrastructure and hospitals should not be located within the vicinity of 'at risk' areas or where disaster events could be reasonably believed to impact on transport, communications or energy infrastructure.

[8] Information sheet: Storm surge modelling for Bunbury available from https://www.planning.wa.gov.au/dop_pub_pdf/storm_surge_information_sheet.pdf

Recent and projected changes in natural coastal defence systems including coral reefs, kelp and mangrove forests

The South West has seen a growing number of destructive rabbitfish migrating south as waters warm. These fish have had a devastating impact on kelp off the Mid West coastline and are expected to do the same in the South West.

So far, South west mangroves (the most southerly in WA) have not been affected.

Geographe Bay benefits from a relatively shallow seabed, being mostly under 30m deep up to 30km offshore. However, the bay is sandy and is susceptible to storm events that feature long wavelengths.

Recommendations:

- Remove fishing bag limits from nuisance species.
- Amend Sea Dumping policy to allow the installation of artificial reefs to both reduce wave energy, reduce erosion and to create habitat.

The impact of climate change on water supply and sewage treatment systems

Given the significant reduction in South West rainfall[9] there have been responses to save water. Much of the dairy farming irrigation district from Harvey through towards Donnybrook has been reticulated and has produced substantial savings over the open channel system that it replaced. There are currently plans to save another 15GL of water by desalinating Wellington Dam and completing the irrigation network.

This projects and others in the region are changing attitudes but implementing necessary change comes at a considerable financial cost. In the case of this project, the final account will be in the order of $450m but this will have far-reaching implications in employment, the timber sector and long-term gains brought about through the major reforestation of catchments.

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[9] CSIRO (2010) Estimating the water yield of south-west Western Australia under a changing climate, Australian Government National Research Flagships, Water for a Healthy Country.

Sewage treatment is a considerable opportunity. Ad hoc efforts to water golf courses and public grounds have been successfully delivered through local government but it must be stated that in Western Australia, water is not a local government responsibility. South West water services are provides by State Government's Water Corporation and two private providers while the WA Department of Water plans and manages water resources.

The division of interests can make investment more complex and can stifle responses. For example, the Greater Bunbury area is beginning to experience salt water intrusion as the aquifer declines. At the same time 7GL of semi-treated water flows into the ocean when it could be used on eight nearby ovals, a racecourse and on multiple local parks. Instead these recreation areas are watered from the aquifer because it is cheaper to continue on this path and the local government cannot afford the infrastructure investment.

Recommendations:

- Targeted funding programmes could support simple projects (under $10m) which make a big difference.
- Introduce home building code standards for water re-use.
- Raise product minimum standards on water use by white goods.

Impact of climate on energy infrastructure, transmission and distribution lines

Technology and opportunities to harness solar energy have been embraced by Western Australians to the extent that commercial issues are impacting on energy providers and their capacity to replace infrastructure.

These issues are exacerbated when hot days increase peak load demand which impacts on the system and creates issues with patchy power upload and download all happening simultaneously. Other impacts have been through extreme weather events bringing down lines and fires destroying key powerlines.

Bushfires in Waroona and Harvey destroyed several kilometres of powerlines which were undergrounded when replaced to mitigate against a repeat event.

More appropriate buildings for the climate would reduce energy demand.

Recommendations:

- Boost insulation standards to reduce energy use, being mindful of affordability.
- Underground power where possible in treed areas.

Climate and housing

The building industry is slow to change, preferring to follow tried and trusted business models. WA is particularly slow with the vast majority of homes still constructed of double brick.

The thermal conductivity of brickwork is 0.6-1.0 compared to building timber (0.12), glass (0.96), gypsum board (0.17), rock wool (0.045) and other insulation materials (0.0035-0.16).[10] The other befit of timber is that it generates a carbon lock.

The South West has seen no significant impact on housing, although more home owners are looking to build with a view to what it will cost to run homes.

Recommendations:

- Encourage first home buyers to build in timber by offering incentives. Home ownership remains an Australian aspiration. Just over half of all future movers within WA (52%) are renters. For 88% of renters who plan to move within WA and purchase their future dwelling, home ownership was the main reason for moving.[11]
- Encourage further home cost savings in timber or light frame homes by supporting the plantation industry and reforesting catchments through incentives, tax concessions and farming programmes.
- Promote good practice (timber frame, double glazing, insulation, solar water etc) in public housing projects.

Climate impact on financing and insurance arrangements

Humans are economic actors and are more likely to act for financial than altruistic reasons. This makes the engagement of private interest integral in any strategies looking to change behaviours.

Lenders and insurers have considerable market power and influence. They are now using climate simulation modelling to calculate risk exposure.

Where sites are at risk of coastal inundation or flood, bank loans are being refused and insurance companies are declining to offer insurance or policies are carrying risk profiles that make costs unaffordable. To some extent these market forces will manage consumer decisions better than government regulation.

Recommendation:

- There should be complete transparency for home buyers on disaster risk profiles so consumers can make more informed decisions.
- Local government has a role to play in informing residents.

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[10] Data shows thermal conductivity. Figures taken from *The Engineering Toolbox.*
[11] ABS: 8710.5 - Housing Motivations and Intentions, Western Australia, Oct 2012

The adequacy of current state and Commonwealth policies

The paradox is the considerable volume of people working on rising sea-level issues have produced so little effective coastal management response.

In Western Australia there are a number of policy notes and/or draft versions but little co-ordination between agencies. This is not uncommon. Taking into account academia, CSIRO, Geoscience Australia, the Australian Oceanographic Data Centre, Australian Hydrographic Service, Bureau of Meteorology, Institute of Marine Science, Department of Environment, and State bodies plus a multitude of international organisations and experts, there is a lack of a widely recognised co-ordination and response body.

It's important to note that collaborative approaches on the ground can be weakened by hierarchical institutional frameworks which can result in a cost to flexibility and even collaboration[12], but despite these costs, there needs to be a single agency approach and planning certainty across an appropriate scale.

Recommendations:

- A respected apex organisation is required to co-ordinate all effort and pull together stakeholders.
- A nationally consistent framework needs to be established.
- Among the bureaucracy and expertise, communities also need to be engaged and learn more to promote better decision-making.[13]

[12] Ananda J & Proctor W (2013) 'Collaborative approaches to water management and planning: an institutional approach', *Ecological Economics*, 86: 97-106.
[13] Bellamy J, Ross H, Ewing S & Meppem T (2002) *Integrated Catchment Management: Learning from the Australian Experience for the Murray-Darling Basin*, CSIRO Sustainable Ecosystems, Canberra, ACT.