



Editorial

The view from the front line: Adapting Australia to climate change

If we are looking for examples of adaptation, and maladaptation, to extreme climate variability, and for a country which sits closer to the edge of climate change than most, Australia offers some useful lessons. These lessons address three key areas: adapting to a reduced water supply, managing extremes, and understanding the limits of adaptation.

Some of the characteristics that place Australia on the climate change front line stem from its environmental vulnerability—its geography and, especially, its demography. The current population of Australia is 22 million, scattered over a country the size of Western Europe. Many are relatively new arrivals, depending on your timescales: the First Fleet reached Australia in 1788, and in 2006 it was still the case that nearly one in four (24%) Australian residents were born overseas. This population is highly urbanised – 89% live in urban areas, two-thirds alone in the eight capital cities – and coastal – something like 85% live within 50 km of the coast. So, this immigrant population is not one which over millennia has attuned itself to its environment. Rather, it has bought into the Sea, Sun and Surf lifestyle of the urbanised coast, living around the rim and turning its back on the interior.

The Indigenous population is another matter: the oldest human remains discovered in Australia have been dated to 40,000 years ago. But, comprising only 500,000 people, their capacity to contribute to the national adaptation response is limited.

To sustain this urban coastal lifestyle, Australia is one of the highest per capita consumers of electricity and water in the world. The biggest users of electricity are the metal and mining companies, taking close to 40% of the national supply. Their importance to the national economy cannot be underestimated—something like 60% of the country's export earnings are from metals and fossil fuels. The biggest user of water is agriculture, taking some 23% of the total consumption. And that brings us to the Murray-Darling Basin.

1. Adapting to a reduced water supply

The Murray-Darling Basin produces one-third of Australia's food, and one-third by value of her agricultural production. It is an icon in Australia's cultural heritage, and a source of endless national *angst*, arguments between the States who draw their water supplies from the Basin, and between the States and the Commonwealth government. For decades, environmental degradation in the Basin has been growing, exacerbated by, on the one hand, continuing drought and, on the other, by management practices. There has always been over-allocation of water licences for irrigation but, more-recently, cutting the link between these licences and farm properties has led to the development of water markets, and over-extraction by a smaller number of larger farms.

There is substantial headroom for technological improvements in this drought-prone region—in 2006–2007, some 70% of irrigation water was applied using flood/furrow systems.

Rainfall has been below average across much of southwest and southeast Australia since 1997, while the Murray-Darling Basin has experienced below average rainfall since 2002. This on-going drought has brought home to Australia the management failures of the Murray-Darling Basin. It has highlighted the insecurity of the Adelaide domestic water supply, 40% of which on average comes from the Murray. As a first step, the Commonwealth government is buying back water licences so that the water can remain in the river to maintain environmental flows. A basin plan will be completed in 2011, described by the Chairman of the Murray-Darling Basin Authority as “at a scale and complexity that has never been undertaken anywhere else in the world”. Adelaide is taking steps to secure its water supply through a multi-pronged approach including installation of a desalination plant, grey water recycling and measures to reduce demand.

Most cities in Australia are facing similar problems to those experienced by Adelaide. Not only is Australia one of the biggest per capita users of water, it is also the driest inhabited continent. Some solutions are sustainable: SE Queensland more than halved household water consumption during the recent drought from over 300 to less than 140 l/person/day, and although drought restrictions have now been lifted, consumption has not bounced back. However, other solutions look less sustainable—all the capitals have energy-hungry desalination plants, and Perth is currently building a second.

But the bottom line for Australia is, is there enough water to sustain lifestyles now, and, will we have enough in the future under climate change? Indications from the climate models, despite their characteristic uncertainties for rainfall, are that southern and eastern Australia will dry under climate change. The added implication must be that the current drought in the region may be linked to climate change.

2. Managing extremes

The second key area of adaptation already being faced by Australia is in managing extremes. In January and February 2009, Australia faced a coincidence of events starting with the heatwave in Southern cities. Melbourne temperatures on the 28th to 30th January exceeded 43 °C, and for two nights they did not drop below 25 °C. As a result, the number of excess deaths is estimated at 374, there were widespread blackouts as the electricity supply companies failed to maintain supplies and resorted to load shedding, and disruption to the commuter rail service as air conditioning failed and rails buckled. The direct costs are estimated at \$100 million, and \$300–400 million indirect.

The Black Saturday bushfires of 7th February 2009 in Victoria took 173 lives. The intense heat wave together with very dry conditions and high wind speeds led to bushfires of unprecedented violence, which overwhelmed the capacity of the emergency services and tragically rendered the policy of allowing people to stay and defend their properties totally disproportionate to the magnitude of the threat. A Royal Commission was set up on 16th February 2009, and published interim findings in August 2009. These stop short of recommending compulsory evacuation, but stress the need to assess every property individually for its defensibility. The report recommends improved warning systems and provision of refuges.

Meanwhile, through early February 2009 much of Northern Queensland gradually disappeared beneath the flood waters, and on 5th February the media announced that 60% of the state was under water. What was perhaps most surprising about this event was the lack of coverage in the national press—there seemed to be a widespread opinion that this was something that happened every year. But in fact, with damage amounting to around \$250 million, flood levels exceeding 12 m in places, and some small towns cut off for over a month, this event was far from normal. Traditional North Queensland houses are ‘high-set’ – up on poles – which means that immediate damage to household goods is minimised. But the psychological effects of prolonged isolation are substantial, and the move to cheaper on-ground housing construction is increasing vulnerability.

3. Understanding the limits to adaptation

Finally, watching the effects of climate variability and change in Australia can teach us something about the limits to adaptation, and to the interaction of climate change with other stresses. Small towns in inland Australia are already losing population. Their glory days were in the first decades of the twentieth century, when they thrived as market centres, railheads and links along the droving roads. Today, unless they can re-invent themselves as centres of tourism, mining or oil and gas exploration, their reason for being is increasingly undermined. The addition of climate factors to an already fragile existence may be the last straw. Some of these towns are threatened by disappearing water supplies. And some are facing flooding at a frequency which is gradually driving private businesses to relocate or close. And yet how much would be lost if these settlements were abandoned? They offer an alternative to the large-city Sun, Sea and Sand lifestyle, and one which fully recognises and addresses the full diversity of Australian environments. They are also evocative of the “real” Australia to millions of third or fourth generation Australians. Many of Australia’s greatest cultural heroes came from these inland communities.

4. Contributing to the problem

Not only is Australia highly exposed to climate change, but it makes a considerable contribution to the problem. It has one of the highest per capita emissions of greenhouse gases, due mainly to being a large electricity user (22% above the OECD average in per capita terms) and to generating that electricity mainly from coal. Although a late signatory to the Kyoto Protocol (in 2007), the current government seeks to contribute to global efforts to reduce emissions. A recent bill to introduce the Carbon Pollution Reduction Scheme has been presented to Parliament on three

occasions, and been defeated on each. Although humble in its targets, it is at least a step in the right direction, although Ross Garnaut was widely reported as being unable to decide whether or not it was better than nothing. Its targets are emissions reductions of at least 5% below 2000 levels by 2020, but more depending on the scale of international actions, and 60% by 2050. The renewable energies section of the CPRS bill was separated out, and recently passed through parliament, imposing a mandatory target of 20% of electricity to be generated from renewable sources by 2020.

5. Looking forward

Looking into the future, what challenges lie ahead? As temperatures increase, safety from bushfire will require wide-reaching lifestyle changes. For temperature increases of 2 °C, living in or close to the bush is likely to be too dangerous – people will have to live within fire breaks with good multiple exit routes – a far cry from the rural idyll sought by many. Beyond 4 °C, only large urban area will provide safety from bushfire.

As rainfall becomes increasingly variable and extreme, ghost towns will emerge in the interior as private enterprise and public services gradually desert settlements too frequently threatened by bushfire, floods and droughts. Small coastal towns will be abandoned as they lack resources to protect against increasingly frequent flooding at high tide.

We can visualise an Australia where, in 30 years, the population is to all intents entirely located in large urban developments within 15 km of the coast. These will rely on cleared firebreaks to protect against bushfire, coastal defences to protect against sea-level rise, water grids and desalination plant to provide freshwater. Inland, agriculture will be a fly in-fly out operation as mining is today. Vast tracts of land will be given over to energy generation through wind and solar which, together with other renewable sources (geothermal, tidal and wave) will provide the principal energy sources. As sea level continues to rise, coastal developments will have to look to the interior for land to develop. This will imply increasingly interventionist management of the environment to reduce fire risk.

These changes imply intensification of socio-demographic trends already in place. The greatest risks lie around allowing these trends to continue while failing to recognise or address the continuing and increasing threat from climate change. This would mean that migration to large coastal urban settlements would be allowed to continue in the absence of well-planned frameworks to deliver sustainable energy and water supplies. Complacency would imply failure to protect against bushfire and sea-level rise, and loss of cultural heritage embedded in the myriad small country towns scattered across Australia.

Australia sits at the front line of the battle for climate change adaptation. The issues Australia faces today will be faced by increasing numbers of rich, well-educated and smoothly running societies globally over the next decades. There are lessons for all to learn from Australia’s experience and response—the importance of sustainable management of resources, the risk of becoming complacent, the undermining of defining cultural values.

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