

Jim, Melaney, Nicole -

Re-reading the article I sent you about Australia by Peter Gleick, I found his recommendation to read this article below. It's excellent, and includes lessons for other countries. I've tried to winnow the many documents I read while doing research, and not send too much, but the sections on "where there's a will there's a way" and "what can we learn" merit sending, and might be informative when you structure your report.

I think we need to bring in a team of Australians, and hold highly visible, publicized forums about the comprehensive changes they've enacted. Many believe we can't follow Australia's lead, but I think sooner or later we're going to have to.

Have a good week - Madeline

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**In this paper I present a short history of Australian droughts and the government's response to the current crisis. This narrative is important for two reasons: first, for the striking parallels that we might draw with our attitude to climate change; and second for the lessons we might learn about how best to respond to this challenge.**

**“This is the death of the earth”[\[1\]](#)**

Australia is the driest continent outside of Antarctica and the threat and presence of drought is just a part of life down-under. Since the first recorded drought in 1791 there hasn't been a single decade when some part of Australia has not been in drought.

Each time that drought has descended on Australia it has ravaged the country. It has wiped out crops, decimated stock numbers, raised terrible, choking dust storms, destroyed outback communities, drained rivers and dams, driven murderous bush fires and marred hundreds of thousands of lives. It has also cost the Australian economy billions of dollars.

The history of Australia is the history of drought. The Federation drought, which began in the mid-1890s and reached its devastating climax in 1902 one year after Federation, threatened water supply in Australia's largest city, prompting the government to declare 26 February 1902 a day of “humiliation and prayer”. At Bourke the mighty Darling River was reduced to a trickle and in Queensland the State's sheep flock was all but wiped-out[\[2\]](#).

The 1914-15 drought, which was ushered in by soaring temperatures and widespread bushfires, culminated in the catastrophic failure of the wheat crop. Flows in the Murray River were reduced to just 2% of normal levels and the outback town of Charleville was forced to import water by train.

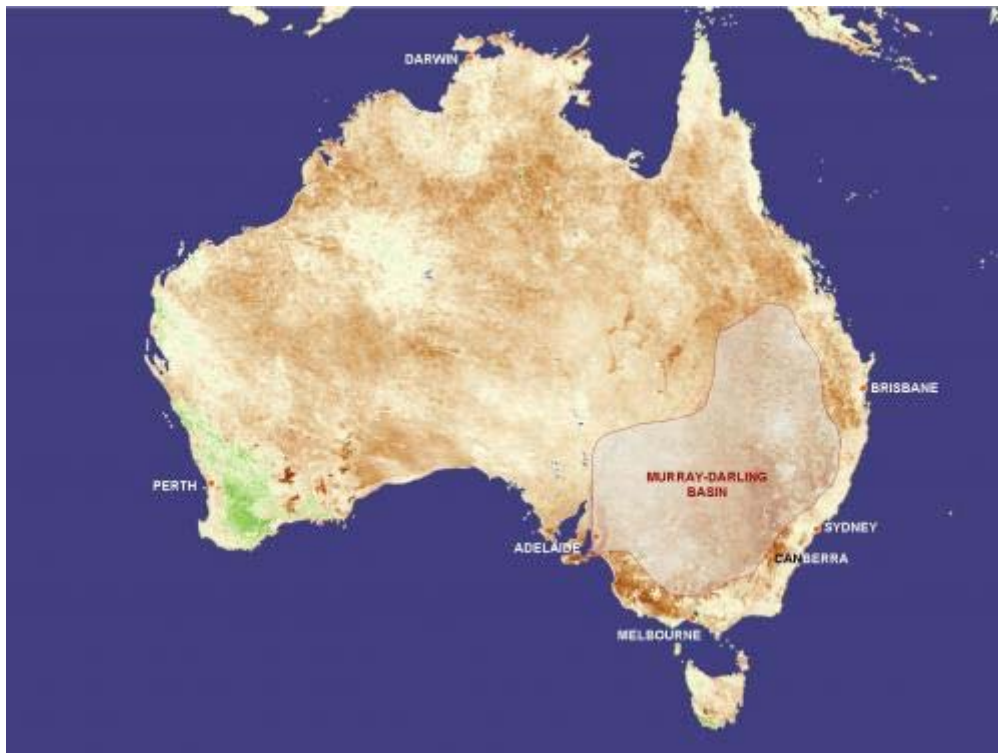
The World War II drought set-in in 1937 and lasted until 1945. The wheat crop was devastated and sheep and cattle numbers plummeted. Bush fires raged across the States reaching their peak on 13 January 1939 – “Black Friday”. By August 1940, the Nepean dam in New South Wales was empty and water restrictions were put in place in Brisbane, Sydney and Melbourne.

The 1982-83 Drought was short and sharp. Once again the wheat crop failed and stock numbers were decimated. On the 8 September dramatic dust storms, the likes of which Australia had never seen, enveloped the state of Victoria and its capital city Melbourne, and then one week later bush fires added to the misery on what became known as “Ash Wednesday”. In total, the economic losses from the drought were estimated at A\$3 billion[3].

**“We should all pray for rain,”**

The Federation drought was considered to have been the worst drought on record...until now. The current drought, which Australians disarmingly call ‘The Big Dry’, is the most severe drought that Australia has experienced in over 100 years and it is probably the worst since European settlement in 1788.

The drought ‘began’ in 2002 and it is now in its seventh year. It has affected different regions at different times and to differing degrees. By April 2007 the situation was so dire that it prompted the then Prime Minister, John Howard, to appeal to higher powers – “We should all pray for rain,” he said. At that moment, 65 percent of all viable land in Australia was in drought and the water supply in Australian dams had declined to 25 percent of their total capacity[4]. The image below from NASA’s Earth Observatory Satellite, shows the extent of the drought in May 2005. Only the south-west corner of the continent has escaped the ravages of the drought.



**Extent of drought, May 2005[5]**

Nowhere was the situation more desperate than in the Murray-Darling Basin. The Murray-Darling Basin is the heart of Australia and its precious water its lifeblood. The basin, which

covers an area the size of France and Spain combined, comprises more than 150 distinct waterways, supports an agricultural industry worth A\$9 billion a year, is home to 16 internationally recognized wetlands and supplies water to more than 3 million Australians[6]. By mid-2007, flows in the Murray-Darling were at 5% of their average, and all along the river system giant red gums were dying from lack of water, fish were floating dead in deoxygenated pools and the precious soil had either been blown away as dust, or baked to concrete[7].

### **“Man must share the blame with Providence”**

We live under the misguided belief that drought is a wholly natural phenomenon over which we have no control. This belief is false. Extremely low rainfall over an extended period of time is a natural phenomenon over which we have no control. But drought arises when this natural phenomenon is combined with a failure to anticipate, plan and adapt.

The drought in Australia was not caused by extremely low rainfall alone. It was also caused by the mismanagement of the country’s water resources over decades and by the public’s casual use of a precious resource and its indifference to the threat. That is not to say that drought could have been avoided even with the most complete planning. Some parts of Australia will always experience severe drought – that is part of the boom-bust cycle that some communities are willing to live with.

It was evident to all concerned that we were heading towards a disaster, yet the Government and the public were unable to take the difficult decisions before the catastrophe was virtually upon us. (And it is worth remembering that for many families the catastrophe was upon them). State Governments were still arguing over the allocation of water rights and citizens in Toowoomba, Queensland were still voting in a referendum *against* the recycling of their water, when water levels in many of Australia’s largest dams were as low as 15 percent.

It wasn’t until the drought had cost the Australian economy more than A\$20 billion, forced 10,000 farming families to flee the land[8], reduced wheat production by more than 60 percent, forced the NSW Government to appropriate water from farmers in order to cover the shortfall in the cities, and caused electricity black-outs because power stations were forced to shut-down production for lack of cooling water, before – finally – there was sufficient will on the part of the Government and the public to act.

### **Where there is a will, there is a way**

As we so often see, where the political will exists, action can be swift. The Australian government and public finally, after years of procrastination, began to respond to the drought with a series of coordinated measures.

These measures included regulatory reform, strict water rationing backed up by heavy penalties, a steep increase in the price of the resource to better correspond with its value, investment in new

infrastructure and (critically) a powerful and highly visible public awareness campaign. The response was unprecedented and would have been unimaginable just a few years earlier.

### *Government cooperation and coordination*

After decades of bickering and wrangling over priorities and funding, the Federal and State Governments finally reached agreement on how best to manage Australia's precious water resources. First came the National Water Initiative, which was signed by the last State government in April 2006<sup>[9]</sup>. The initiative reforms the way in which Australia's water resources are regulated and managed, set-outs a framework for water entitlements and the foundation for water trading and underwrites massive funding for water infrastructure programs throughout the country. Then in July 2008, the State and Federal governments finally signed the Intergovernmental Agreement on Murray-Darling Basin Water Reform. It marks the first step to coordinate the management of Australia's most precious water resource. It is a landmark agreement that has been a long time coming, though many fear that it may have come too late to save the Murray-Darling.

### *Strict Limits and Penalties*

The State governments introduced strict limits on water consumption which they rigorously enforced and backed-up with heavy penalties. These measures placed restrictions on the use of water and in some cases put quantitative limits on household water consumption. Water restrictions were introduced throughout Australia and water consumption targets were introduced in the major urban centres – and on the whole they have been met<sup>[10]</sup>. Bans were placed on the use of hosepipes, washing your car, watering your garden, or filling your swimming pool. It was made compulsory to install rainwater tanks and water efficient shower heads. Such measures would have been politically unthinkable in other circumstances.

### *Higher Water Prices*

Water prices were increased in most major cities to better reflect the scarcity and value of the resource. Prices in Sydney rose by 20 percent between 2005 and 2006, then by 17 percent in 2008. In Melbourne a 5% levy was introduced. And at the height of the drought, water prices in Brisbane were increased twice within the space of one week<sup>[11]</sup>. Further price increases are planned by all major water authorities. Water prices in Melbourne will increase by 60 percent over the next four years<sup>[12]</sup>. By 2018 Brisbane residents will have to pay almost double for their water<sup>[13]</sup>. And in Sydney, water prices will rise by a further 14 percent between now and 2012<sup>[14]</sup>.

### *Significant New Investment*

The Australian government also made commitments to spend more than A\$50 billion on water improvement measures over the next ten years. This will include major projects such as the building of desalination plants and new pipeline infrastructure, as well as investment of A\$3.7

billion in water conservation measures in the Murray-Darling Basin. In 2006, Perth became the first Australian city to operate a reverse osmosis seawater desalination plant, which now supplies 17% of Perth's drinking water supply. Desalination plants are also being planned in other parts of Australia, including Sydney, Melbourne, Adelaide and the Gold Coast. In total, there are hundreds of water improvement projects being funded by government, ranging from the creation of a comprehensive water accounting programme and better water metering in homes, to the construction of massive new water pipelines and improvements to farm irrigation systems[15].

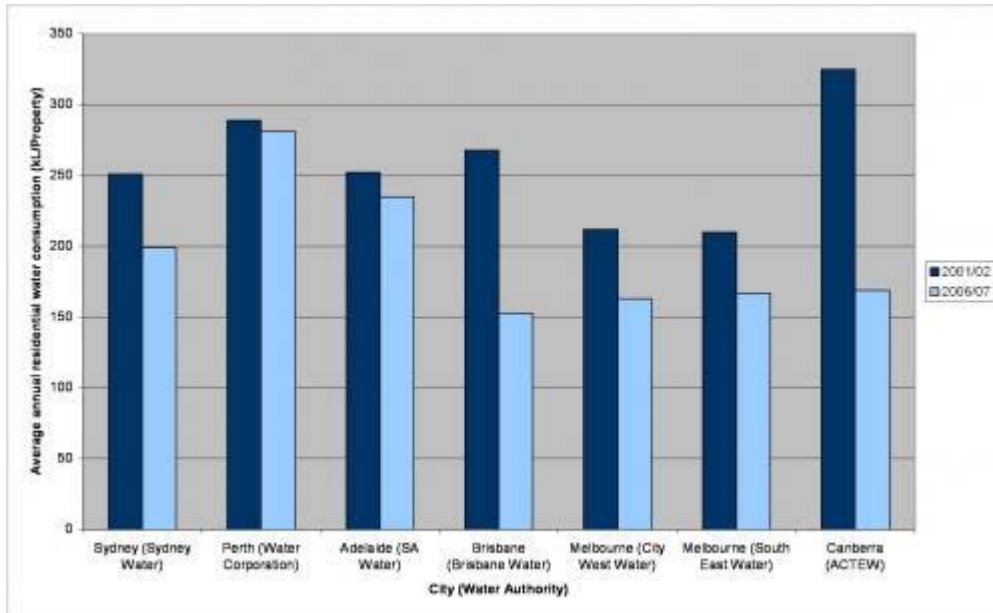
### *Public Education Campaign*

All of the above measures were supported by a powerful and highly visible publicity campaign which stigmatized water misuse. Using water to clean your driveway was now as socially unacceptable as smoking in the office or letting your kids run around in the sun all day without proper sun protection. The drought sensibilised Australian's to the impact of drought and to the real value of water. Public attitudes to water changed. Between November 2005 and May 2007 (arguably the height of the drought) the percentage of Australians who cited water shortages as their primary concern rose for 22 percent to 55 percent[16]. In a similar vein, in October 2007, on the eve of the national election that unseated then Prime Minister John Howard, NewsPoll ranked water planning as equal second in the nation's list of political priorities; equal with education, just behind health, and well ahead of national security which ranked eighth. The merits of different shower heads and the best place to find a new rainwater tank became the subject of conversation around dinner tables in most Australian cities.

### **And the results?**

Throughout Australia, water consumption has been reduced. Since the start of the drought, average household water consumption has fallen by more than 40 percent in Brisbane and Canberra and by about 20 percent in Sydney and Melbourne[17]. In Brisbane, at the height of the drought, the average person's water consumption fell to as low as 116 litres per person per day – compared with levels of 260 before the drought began[18]. In Canberra, water consumption was reduced by 35 percent within the space of just one year. In Melbourne, per capita water consumption in 2008 fell to its lowest level since 1934. And in Sydney, water consumption today is at the same level as it was in 1974, despite 1.2 million additional residents (imagine if we could say the same thing for energy!). These results are even more impressive when you consider that they reverse a nation-wide trend of increasing water consumption between 1993 and 2001, when per capita water consumption increased by 8 percent[19].

City (Water Authority)	Average annual residential water supplied (kl./Property)						Percentage change	
	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2001-2007	2006-2007
Sydney (Sydney Water)	251	255	224	211	203	199	-21%	-2%
Perth (Water Corporation)	289	260	285	277	268	281	-3%	5%
Adelaide (SA Water)	252	273	245	235	233	235	-7%	1%
Brisbane (Brisbane Water)	260	256	258	264	185	153	-43%	-17%
Melbourne (City West Water)	212	214	188	187	183	163	-23%	-11%
Melbourne (South East Water)	210	209	186	184	187	167	-20%	-11%
Canberra (ACTEW)	325	320	248	240	261	169	-48%	-35%



**Average annual residential water use in selected Australian cities, 2001 to 2007**

### What can we learn?

What makes the above narrative important are the lessons we might learn for combating climate change. The lessons are striking.

1. The threat of drought was clearly understood, yet implausible as it may seem, the government and public alike were unable to act despite a compendium of scientific evidence and a long history of repeated severe droughts.
2. A decades-long period of wrangling between different state governments, gross mismanagement of the water resource and public apathy, disbelief and inaction led directly to the catastrophe.
3. It was only when this catastrophe was upon us – when the situation was dire – that the government and the public found the collective will to act. Without this near catastrophe, we would have continued to walk into oblivion using too much water in the driest inhabited continent on the planet.
4. But when they did act it was swift. The Government was prepared to put in place and the public were prepared to accept draconian measures that would previously have been considered unthinkable.
5. The response was unprecedented in nature and in scale.
  - cooperation across state and federal governments;
  - root and branch reform of water management and planning;
  - introduction of strict limits on the use and consumption of water;
  - increased water prices and the introduction of water trading; and
  - massive public investment in new infrastructure.

6. That response was backed up by a powerful public awareness and education campaign that changed the public's attitude towards drought and made it socially unacceptable to waste water. This social element underpinned the regulatory and market response.
7. The results show that substantial reductions in the use of an essential resource – in the order of 20 to 40 percent – can be achieved in the space of a few years and at relatively low cost.
8. The public was prepared to accept significant price increases in an essential resource – of between 40 to 70 percent – where the reason for that price increase was understood and where the resource represented a relatively small proportion of the household's total expenditure.
9. Both the invisible hand of the market and the visible hand of strong, government intervention were required to achieve these outcomes.
10. But there can be no 'quick fix'; the above measures are just a start. We will need many more years of action and many more initiatives before the threat of drought is overcome.

### **Postscript**

There is no happy ending to the above story – not yet. You don't solve a problem as great as this in a few years. While the drought has broken in some parts of Australia, large parts of the country, particularly the south-east, are still gripped by the Big Dry. Dam levels are still low. The Thomson Dam that was supposed to 'drought-proof Melbourne' is still at just 18% capacity[20]. Our responses have not always been the most cost-effective. Studies that examined the cost-effectiveness of different measures found that the cost per megalitre of water saved ranged from A\$770 to A\$33,395[21]. The Murray-Darling system is "beyond repair" according to the environment minister Penny Wong – a statement quickly denied by other stakeholders and subsequently corrected by the minister herself. The water consumption targets that were introduced have not always been met. Melbourne's water target of 155 litres per day was exceeded by 15% this summer. Water prices have risen, but Australians still spend less on water than they spend on any other essential services. The typical Australian household spends three times as much on electricity and twenty-five times as much on food and drink as they spend on water[22]. Each year water companies lose large quantities of water due to leaking pipes and overflows. Water losses in Brisbane, Sydney and Melbourne in 2007 were between 107 and 76 litres per connection per day. For the largest water authorities serving populations of more than 100,000 persons, the cumulative water losses amounted to 129 gigalitres – more than the total water consumption in Brisbane[23]. Many of the promised infrastructure projects are delayed or behind schedule or over budget or all three. And finally, in those areas where the drought has ended, there are signs that average daily water use is already creeping back up[24].

In Australia, it won't be until we have adapted the social and economic order to the natural order that we will have finally overcome the threat of drought. The same will be true for our global response to climate change.

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[1] From the second stanza of T. S. Eliot's poem *Little Gidding*

There are flood and drought over the eyes and in the mouth,

Dead water and dead sand contending for the upper hand.

The parched eviscerate soil gapes at the vanity of toil,

Laughs without mirth. This is the death of the earth

[2] Sheep numbers fell from 91 million to 54 million, and cattle from 11.8 million to 7 million.

[3] Australian Bureau of Statistics, 1988, *Year Book Australia, 1988*, Commonwealth Government, Canberra.

[4] CSIRO, 2009, *Water Resources Observation Network, Dam Level Index* (<http://www.wron.net.au/DemosII/DamData/DamNodeView.aspx>)

[5] NASA, Earth Observatory Satellite, Vegetation Anomaly Image, May 2005, NASA, Goddard Space Flight Center, Greenbelt.

[6] The Murray-Darling Basin encompasses 14 percent of Australia's land mass and generates 39 percent of the national farm income. The Basin produces 53 percent of Australia's cereal grain, 95 percent of its orange crop and 54 percent of its apple harvest. In 2007 the World Wildlife Fund listed the Murray-Darling as one of the world's top ten rivers at risk.

[7] CSIRO, 2008, *Water Availability in the Murray-Darling Basin*, CSIRO, Canberra.

[8] Australian Bureau of Statistics (ABS), 2009, The ABS calculated that 10,636 families gave up farming during the most severe drought years between 2001 and 2006.

[9] The National Water Initiative was signed by the Commonwealth and all State Governments, except Western Australia and Tasmania, in June 2004. Tasmania signed the Agreement in July 2005. Western Australia signed the agreement in April 2006.

[10] Targets of 140, 155 and 135 litres per person per day were introduced in Brisbane, Melbourne and Sydney respectively at the height of the drought. The target in Brisbane has since been increased to 170 litres per person per day following the 'end' of the drought.

[11] ABC News, *Brisbane water price rises again*, 12 May 2006.

[12] Essential Services Commission, 2009, *Melbourne metropolitan water price review 2009-10 to 2012-13*, Essential Services Commission, Melbourne.

[13] Queensland Water Commission, 2009, *Bulk Water Prices 2008/2009 – 2017/2018*, Queensland Water Commission, Brisbane.

[14] Independent Pricing and Regulatory Tribunal of New South Wales, 2009, *Review of Prices for the*

*Sydney Catchment Authority From 1 July 2009 to 30 June 2012: Water — Determination and Final Report, June 2009*, Independent Pricing and Regulatory Tribunal of New South Wales, Sydney.

[15] Investments include A\$450 million for the Bureau of Meteorology to set up a comprehensive water accounting programme; A\$620 million is proposed to improve water metering; and A\$1.6 billion will be made available to improve the efficiency of farm irrigation systems.

[16] Roseth N., 2008, *Research Report 48: Community Views on Recycled Water. CRC for Water Quality and Treatment*, National Water Commission, Canberra.

[17] National Water Association of Australia (NWAA), 2008, *National Performance Report 2006-07*, NWAA, Melbourne.

[18] Queensland Water Commission, *The Water Report, 15 February 2009*, Queensland Water Commission, Brisbane.

[19] Department of Environment, Water, Heritage & the Arts, 2007, *State of the Environment, 2006: Indicator: HS-42 Water consumption per capita*, Commonwealth Government, Canberra.

[20] CSIRO, 2009, *Water Resources Observation Network, Dam Level Index* (<http://www.wron.net.au/DemosII/DamData/DamNodeView.aspx>)

[21]. Crase & Dollery studying the subsidies paid in Melbourne on water-saving investments for households found the cost per megalitre of water saved ranged from \$770 for AAA shower roses, through \$9,069 for rainwater tanks, to \$33,395 for AAA dishwashers. Crase, L. and Dollery, B. 2005, 'The inter-sectoral implications of 'Securing Our Water Future Together'', *International Journal of Environmental, Cultural, Economic and Social Sustainability*, Vol. 1, No. 5, pp. 13–22.

[22] The low price of water remains a major obstacle to serious water reform. The typical Australian household spends 0.7% of total expenditure on water, 2.6% on electricity and heat and 17% on food and non-alcoholic beverages. Australian Bureau of Statistics, 2004, *Household expenditure Survey and Survey of Income and Housing 2003/04*, Commonwealth Government, Canberra.

[23] Losses amongst the 11 largest Water Authorities serving populations of more than 100,000 persons were 128,966ML in 2006/07. Water consumption in Brisbane over the same period was 112,935ML. National Water Association of Australia (NWAA), 2008, *National Performance Report 2006-07*, NWAA, Melbourne.

[24] Queensland Water Commission, *The Water Report, 15 February 2009*, Queensland Water Commission, Brisbane.

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**From:** Jim Barry [mailto:jbarry70@cox.net]  
**Sent:** Saturday, August 22, 2009 11:44 AM  
**To:** 'Madeline Kiser'  
**Subject:** RE: Memo - Best Practices and Peer Review for Large-Scale Water Managements Plans

Madeline:

Thanks for this information; I'll look at it ASAP.

Jim

**From:** Madeline Kiser [mailto:mkiser@dakotacom.net]  
**Sent:** Saturday, August 22, 2009 10:15 AM  
**To:** 'Jim Barry'; 'Melaney Seacat'; 'Nicole Ewing-Gavin'  
**Subject:** Memo - Best Practices and Peer Review for Large-Scale Water Managements Plans

Jim, Melaney, Nicole:

It was uplifting to see you the other night, still at the table, laughing, doing your singularly good work. Many thanks for your tenacity; I've missed you.

I'm writing to share the memo I promised I'd write. It needs editing and more effort, but I'm about to start a new teaching year and need to turn my attention to it. I wish I could have formatted more carefully and placed footnotes, etc. - all the important professional touches.

I'm also including as part of the memo and related research one short document and one page-long article (the link is below), both about Australian reforms, mentioned in the memo. More than what I've written these documents will give an overview of Integrated Water Resources Management concepts, and related plans, taking shape elsewhere and held up as best practices.

Again, for your service and dedication - thank you.

Best wishes, Madeline

[http://www.sfgate.com/cgi-bin/blogs/gleick/detail?entry\\_id=42949](http://www.sfgate.com/cgi-bin/blogs/gleick/detail?entry_id=42949)