Chapter Four

Adapting to Climate Variability

The impact of reduced rainfall

4.1 The current severe drought has highlighted the impact of reduced rainfall on the sustainability and security of our water resources. The situation is particularly difficult in the eastern and south-eastern states where the majority of Australians live and water use is high. Whether the drought is considered to be part of the recognised cycle of climate variation or the direct result of climate change, the implications for the Murray Darling Basin are significant and the long-term predictions of climate experts paint a pessimistic picture. Studies by the International Panel on Climate Change (IPCC) show that water flows in the MD basin could fall by as much as 35 per cent by 2050. Associated rainfall scenarios predicted by CSIRO show decreases of 0-8 per cent by 2030 and 0-20 per cent by 2070 for much of Australia. These forecasts also include temperature increases of between 0.8 -3.9°C by 2050 and 1.0- 5.9°C in 2080, which means increased evaporation from the rivers.[1]

4.2 CSIRO's Professor Michael Young told the committee that there is at least a two to one relationship between decline in rainfall and water availability from run-off:

> As a rule of thumb, if you have a decline in rainfall, normally the decline in water available for use is roughly twice the reduction in rainfall A 15 per cent reduction in rainfall, which is what a lot of people are talking about, means a 30 per cent reduction in yield… This is a general rule of thumb; you would need to run the models everywhere. [2]

4.3 Professor Young's estimate has proved to be very conservative in the light of the experience in southern Western Australia (including the Perth region) where a threefold reduction in run-off has been experienced in the past 30 years. The CEO of WA's Water Corporation, Dr Gill told the committee:

> There has been a phenomenal shift of climate and weather in the south of WA and it does appear to be unique worldwide… there seems to be no other place that is drying quite as fast as the south of Western Australia… We have had to cope with that over the last 10 years. It has been a trend, we now know with the best of hindsight, for about 30 years.
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> For the last eight or nine years the rainfall has been down by about 21 per cent on what it was up until 1974, and the run-off has been down by 64 per

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1 *Submission* 40, CSIRO, p.9.

2 Prof. Michael Young, (CSIRO), Committee Hansard, 7 March 2006, p.48.

> cent. Actually now it is becoming clear that for the last four or five years, since 2001, we seem to be down still further. [3]

4.4 In such a situation, it becomes crucial to manage the water available so that it yields the maximum benefit to all water users, regardless of location. The Western Australian government and its agencies, including the WA Water Corporation, have made some progress towards achieving a balance between urban and rural water needs, in part because they have had the benefit of good climate decision-making tools developed through the Indian Ocean Climate Initiative (IOCI), funded by the WA government since 1998.

Monitoring drought

4.5 The committee was fortunate to attend a demonstration of the National Agricultural Monitoring System (NAMS), a drought monitoring system developed by the Bureau of Rural Science (BRS) in collaboration with the Bureau of Meteorology and CSIRO. Although developed with the aim of streamlining decisions in the Exceptional Circumstances process, the NAMS has the potential to be applied to a wide range of uses in the process of adaptation to a drier climate. It contains climatic and production information for dryland and broadacre industries for over 600 regions throughout Australia and can be developed for other agricultural sectors. The committee sees a need for a decision-making tool such as the NAMS to be developed to its full potential so that it can be of benefit to a wide range of agricultural industries. The committee urges the Minister for Agriculture, Fisheries and Forestry to make funds available to BRS and its partners to facilitate further development of the NAMS.

4.6 While recognising the valuable information provided by IOCI to the Western Australian government, the committee is concerned that not enough climate forecasting and rainfall prediction information is currently available to decision-makers in other parts of southern and eastern Australia. As a result, it is not yet possible for the potential impacts of climate change to be factored into water entitlements and management plans. CSIRO stated in its submission:

> Current water allocation systems do not take into account the state of the art in climate forecasting methods and therefore it is often not until the irrigation season is well underway that irrigators have any idea of how much water will be available. Thus there is considerable risk associated with planting and crop establishment decisions, and therefore there is a need for climate forecasting tools aimed at risk management. [4]

4.7 In its submission to the inquiry, the Bureau of Meteorology also argued for "ongoing investment in basic meteorological and related data systems and in the

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3 Dr James Gill, Water Corporation of Western Australia, Committee Hansard, 16 August 2006, p.19.

4 *Submission* 40, CSIRO, p.9.

science and technology that will ensure best use is made of the data." [5] Among the Bureau's initiatives is a new coupled climate model for generating seasonal to inter annual climate predictions called POAMA (Predictive Ocean Atmosphere Model for Australia). POAMA is based on mathematical representations of the interactive physical and dynamical processes of the atmosphere, ocean and land surface domains that together control climate variability.

4.8 There is a need for projects like POAMA to be adequately funded as part of the Australian Climate Change Science Programme to which the Australian government through the Department of Environment and Heritage and the Australian Greenhouse Office has committed $30.7 million over four years to 2008. The programme supports research for:

- addressing key knowledge gaps about drivers of change in the climate system relevant to Australia;
- determining climate changes at the regional scale and the causes of these changes;
- further developing Australia's world class climate modelling capacity to reduce uncertainty and more accurately simulate past, current and projected climate;
- investigating how climate change will affect frequency and intensity of extreme events such as heat waves, cyclones storm tides fire risk and drought *and*
- developing more reliable and more comprehensive regional climate change projections for Australia, including for use in impact and adaptation studies.

4.9 The following climate science projects are also currently underway and focus on the task of predicting rainfall and water availability:

- the Australian Community Climate Earth System Simulator (ACCESS) project. ACCESS is developing a mathematical model of the earth's climate system to provide more detailed and accurate predictions of the Australian climate over forthcoming seasons. It will also enable climate projections for several decades ahead. ACCESS is being developed by the Australian Bureau of Meteorology and CSIRO with support from the Australian Greenhouse Office.
- the South East Australian Climate Initiative, (SEACI) project. SEACI is a $7 million research partnership between CSIRO, Land and Water Australia, the Murray Darling Basin Commission, the Australian Greenhouse Office and the Victorian Department of Sustainability and Environment.

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5 *Submission* 42, Bureau of Meteorology, p.4.

4.10 The committee believes that in a country with high levels of climate variability like Australia, it is of the utmost importance to encourage more climate research. In its submission to the committee, the Bureau of Meteorology quoted research findings that an estimated $600 million to $1200 million were saved by the grazing industries alone in the years 1991/92 to 2002/03 because their farm management decisions were based on improved seasonal climate forecasting.[6]

4.11 The committee notes that water resources and climate change will be on the agenda for the next COAG meeting (a decision taken by the participants at the Southern Murray Darling Basin summit on 7 November 2006). The committee welcomes the fact that COAG's policy makers will have the benefit of data from the projects mentioned above on which to base future water management decisions. However, the committee believes that more real-time integrated climate forecasting, rainfall prediction and water extraction data is needed to provide better decision making tools for those involved in managing the risks posed by climate variability.

Recommendation 14

4.12 The committee recommends that, at its next meeting, COAG come to an agreement about data sharing and the development of protocols relating to climate forecasting, water measurement and water extraction information, and the need to support and resource the development of more accurate monitoring and forecasting systems such as WRON, POAMA and ACCESS.

The Water Resources Observation Network (WRON)

4.13 In evidence to the committee, Dr Bryson Bates made a plea for additional government funding for the Water Resources Observation Network (WRON) project into which CSIRO has already invested $9 million. WRON is modelled on South Korea's Water Resources Operations Centre (WROC) operated by that country's Water Corporation. The Australian network will facilitate the sharing of information on the web about Australian water resources by standardising the data through a Water Resources Mark-up Language (WRML). WRON's developers are also establishing agreements on how data will be shared and how the system will integrate information from electronic and conventional sources.

4.14 The system will integrate new data received through satellite feeds and ground-based sensor networks to provide real-time hydrologic information, using state-of-the art visualisation resources to facilitate decision making about the water resources available. The development of the WRON is supported by an Alliance that includes the Bureau of Meteorology, the Bureau of Rural Sciences, Geoscience Australia, ABARE, the Australian Bureau of Statistics, eWater Cooperative Research Centre, the National Land and Water Resources Audit, the Murray-Darling Basin Commission and Sinclair Knight Merz.

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6 *Submission* 42, Bureau of Meteorology, p.25 quoting C.J.Paull (2002).

4.15 By improving both the water accounting and water reporting systems, WRON, together with climate forecasting tools such as ACCESS, SEACI and projects similar to IOCI will enable water managers, policy makers, water users and those involved in the water markets to make decisions that "incorporate climate variability and change scenarios into understanding the sustainable footprint of irrigation, irrigation demand management, whole farm planning and environmental management" as advocated by CSIRO in its submission.[7] The committee sees a vital need for that type of integrated approach to water management data. CSIRO told the committee that the WRON's national scale approach could result in a saving of 15% to 20% in the annual $2.6 billion costs of water resources management.[8]

4.16 The committee recognises that by taking into account the impact of climate and rainfall variation on water availability, a system such as WRON can help scientists and water managers ensure the longer term security of our water supplies. They can do this by integrating WRON data with the work done by the Bureau of Meteorology, CSIRO and other agencies. The CRC for Catchment Hydrology (CRCCH), for example, has developed techniques for generating long sequences of climate data that may be used to assess the risk of supply failure of our water supply systems. The committee believes that with long-term drought and possible climate change making conditions drier, every possible step should be taken to fast-track the development of WRON so that its potential benefits should be realised more rapidly for farmers and irrigators around the country.

Recommendation 15

4.17 The committee recommends that the government allocate to the CSIRO's Water Resources Observation Network (WRON) project an additional $10 million over three years from the National Climate Change Adaptation Programme.

Farming innovation and Adaptation

4.18 Few submissions to the inquiry addressed in any great detail, terms of reference (c) and (e):

- (c) farming innovation *and*
- (e) the implications for agriculture of predicted changes in patterns of precipitation and temperature.

4.19 The Queensland Farmers' Federation (QFF) was one of the few. Its submission stated:

> QFF recognises that responding to and managing for climate variability and change is fundamentally a responsibility of farmers and rural industries. It

7 *Submission* 40, CSIRO, p.9.

8 Dr Bryson Bates, Power Point presentation to the committee, 18 October, 2006, Tabled document.

> is also recognised that this management effort must also be supported by clearly defined government policy and targeted scientific research.[9]

4.20 QFF identified the possibility that changes in seasonal rainfall patterns could deliver rain when it is not needed but also longer periods of drought. With the predicted increases in temperatures, broad acre crops could face heat stress and increased susceptibility to pests and diseases. The submission recognised that climate change might bring both threats and opportunities for rural industries and it called for research into plant varieties and farming practices that might be better suited to climate change. It also called for government funds to be allocated for a research programme to develop adaptation scenarios to climate change for the benefit of farmers. [10]

Improved irrigation practices

4.21 Other submissions to the inquiry dealing with term of reference (c) farming innovation, tended to focus on improved irrigation practices.[11] For example, the manager of Cubbie station compared its very efficient water storage practices to the high evaporation losses of Menindee lakes.[12] Coleambally Irrigation Cooperative Limited referred to its $9 million investment in Total Channel Control technology, a programme aimed at to making water savings by installing improved metering systems and reducing water lost through channel escapes.[13]

4.22 Central Downs Irrigators said in evidence to the committee:

> We have fully enclosed tail water re-circulations, basically representing best practice in furrow irrigation, with overhead systems partly being installed in the area, and drip and various other forms being trialled in the interests of greater efficiency. [14]

4.23 Cotton Australia told the committee that the industry meets the international FAO benchmark of 60 per cent whole farm water use efficiency and that its members are aiming for 75 per cent water efficiency. Cotton farmers do this by using a water budgeting tool called WATERTRACK to:

> …monitor seepage and evaporation losses from farm dams, channels and fields and develop remediation strategies when required.[15]

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9 *Submission* 34, Queensland Farmers' Federation, p.18.

10 *Submission* 34, Queensland Farmers' Federation, p.20.

11 *Submissions* 44, 57 and 63.

12 Mr J. Grabbe, *Committee Hansard,* 2 August 2006, p.29-30.

13 *Submission* 3, Coleambally Irrigation Cooperative Limited, para. 3.1.1.

14 Mr J. Lafrenz, *Committee Hansard,* 2 August 2006, p.46.

15 Cotton Australia Ltd., *Submission* 57, p.6.

Water losses due to seepage and evaporation

4.24 In a period when Australia faces increasingly frequent droughts and the prospect of a drier climate, the large amounts of water lost to evaporation has become an issue of concern to irrigators and water policy makers alike. In December 2004, the Pratt Water report, *The Business of Saving Water* sounded the alarm on unaccounted water flows and water losses in the Murrumbidgee river valley. Even if the often quoted figure of 1,333,000 megalitres of water lost is the subject of some dispute, there is no doubt that the losses to evaporation from our rivers, lakes and irrigation channels are huge. The report's research team leader, CSIRO's Dr Shahbaz Khan, pointed that in arriving to an accurate measure of water losses, it was important to distinguish between real water loss to evaporation and seepage into saline groundwater from apparent water loss into good-quality aquifers, or back to the river, where the water is often recovered by water users further downstream.[16]

4.25 For the Murray-Darling Basin, the MDBC's CEO estimated yearly losses as high as 700 GL to 1000 GL before the water reaches South Australia – the equivalent volume of water that the Murray system can expect to get from the Snowy scheme in a year.[17] Referring to another body of water, the Menindee Lakes, Queensland Irrigators and the manager of Cubbie station complained that "on average, 80 per cent of all the water take in Queensland evaporates at the Menindee Lakes".[18] Evaporative losses from the Menindee lakes is often put at an average of 425GL per year, a volume of water equivalent to Melbourne's yearly water consumption. In some years, evaporative losses can go as high as 750 GL.

4.26 At the farm level, the Pratt Water study in the Murrumbidgee Irrigation area suggested the use of 'lay flat' fabric pipes as a cost-effective option for dealing with excessive evaporation of water as it is being delivered to the farm.[19] In a recent major study for grain growers in the Coleambally and Murrumbidgee irrigation areas, CSIRO found that a systems approach could save them more than 300GL of irrigation water with the costs of water saving technologies ranging from $50 per ML to an excessive $5,000 per ML. [20]

4.27 A range of ways of saving water were investigated as part of the study including canal lining, irrigation scheduling, high-tech irrigation technologies, improved cropping patterns and conversion to crops with higher economic returns. In addition, the researchers looked at reducing the break-even period by leasing water for

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16 http://www.cmis.csiro.au/healthycountry/updates/apr05/story2.htm

17 Dr Wendy Craik, *Committee Hansard* , 12 October 2006, p.5.

18 Mr John Grabbe, *Committee Hansard,* 2 August 2006, p.20.

19 DAFF, *Submission* 41, p.38.

20 http://www.csiro.au/csiro/content/standard/ps1jm,,.html

the environment from farmers and providing preferential access rights to saved water for farmers who invested in water-saving technologies.

Storage and irrigation infrastructure

4.28 Evaporation is inevitable in our dry climate but better storage management and better irrigation infrastructure can help reduce the loss of excessive amounts of precious water. The committee welcomes the recent announcement by the Australian and New South Wales governments of joint funding for a feasibility study to establish ways of reducing evaporative losses from the Menindee lakes and securing Broken Hill's water supply. [21]

4.29 In evidence to the inquiry, Engineers Australia expressed concern about the parlous state of Australia's water storage and irrigation infrastructure:

> In the Engineers Australia's Infrastructure Report Card, irrigation assets have been given a C-minus rating, which means 'not fit for purpose'.
>
> Looking at the remaining life of irrigation assets around Australia, …they range from 73 years down to 15 years, so it is a non trivial issue.[22]

4.30 In 2003, the Australian National Committee on Irrigation and Drainage (ANCID) put the annual losses from regional water authorities at around 320 GL. The committee notes that the Department of Agriculture, Fisheries and Forestry indicated in its submission that reducing water loss from water transport and storage infrastructure was a federal government priority as part of the Living Murray Initiative's projects:

> The Australian Government has indicated an interest in investing up to… 40% of the costs of these projects, equating to potentially $71.6 million.[23]

4.31 South Australia has responded to the evaporation problem by building piping systems to replace open channels as a means of carrying water. The water savings more than justify the extra costs involved. An independent assessment of the situation by Professor Peter Cullen found that in South Australia:

> There has been considerable public investment in water delivery systems to farms that sees most water piped rather than transported in open channels".[24]

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21 The Hon. Ian Turnbull, Parliamentary Secretary to the Prime Minister and the Hon. Ian Macdonald, NSW Minister for Natural Resources, Press Releases, 5 Oct 2006.

22 Mr A. Kaspura, Engineers Australia, *Committee Hansard*, 7 March 2006, p.54.

23 DAFF, *Submission* 41, p.17.

24 *Submission* No.52, SA Government, p.14

Drought-resistant crops

4.32 Central Downs Irrigators and Cotton Australia gave evidence to the committee that, in addition to better irrigation practices, the cotton industry has adopted GM technology such as Bollgard cotton which yields more lint per megalitre of water.[25] The committee's view is that the development of new plant varieties is an essential component of the effort to adapt to a drier climate. In that context, the committee notes the work of CSIRO in developing more drought-tolerant grain varieties.[26] In 2003 for example, CSIRO released the wheat variety Rees, developed using innovative gene selection criteria. Rees can produce about five per cent more grain despite receiving the same rainfall. It also has outstanding resistance to major wheat diseases. [27]

4.33 The development of Rees was supported by the Grains Research & Development Corporation (GRDC), the departments of Agriculture in WA, and Queensland as well as Agriculture NSW, AWB Ltd and Enterprise Grains Australia. This cooperative approach illustrates the benefit of partnerships in pursuing innovative ways to adapt to a drying climate. The committee urges government and private agencies involved in agriculture to continue to join forces to fund the search for solutions to the problems that climate change will inevitably bring to the agricultural sector.

4.34 CSIRO is involved in developing other adaptation techniques. Advances in geophysical science are making it possible for CSIRO's Land and Water to develop techniques to "map" the plant-available water storage capacity (PAWC) of farm soil.[28] In addition, CSIRO's ICT centre is developing a system of Wireless Sensor Networks (WSNs) to assist farmers in optimising their water (and other) resources on the farm. According to the Project Leader, Dr Tim Wark,:

> A Wireless Sensor Network comprises a group of "nodes" each measuring a variable, for example soil moisture, which wirelessly interact with their neighbours creating an ad-hoc network which passes information to a central database. By covering a farm with these nodes, the farmer can always have an accurate picture of soil moisture levels to determine the most effective irrigation needs for a field.[29]

4.35 There is no doubt that around Australia, many scientists are involved in developing techniques that will assist farmers and rural industries to adapt to a drier climate. However, all the scientific innovative techniques in the world are useless if

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25 Mr I. Haylor, *Committee Hansard,* 2 August 2006, p.48.

26 CSIRO, Science for Tomorrow, October 2006, http://www.csiro.au/csiro/content/file/pfll,,.html

27 CSIRO Plant Industry, Rees - More crop per drop, www.csiro.au/files/files/p2ik.pdf

28 'Farming Ahead', No. 177, October 2006, p.54, http://www.csiro.au/csiro/content/file/pflt,,.html

29 CSIRO builds smart farm, Press release, 15 September 2006 http://www.csiro.au/csiro/content/standard/ps29v,,.html

they remain a mystery to those who are working the land and who have the means to apply them – the farmers and those engaged in rural industries. The committee sees a need for the Department of Agriculture, Fisheries and Forestry (DAFF) to develop an integrated database of information about farming innovations currently being developed to assist farmers cope with drier climate conditions. The committee believes also that DAFF should undertake a communications programme aimed at making farmers and all those involved in rural industries aware of new research and new sources of online information about adapting to climate change.

Rural and urban water trading

4.36 A number of utilities, individuals and organisations around the country are addressing the need to save water by exploring new avenues. The following two examples from opposite ends of the Australian continent, south east Queensland and Western Australia were brought to the attention of the committee during its inquiry.

4.37 One of the ways in which the WA Water Corporation has responded to the serious drop in rainfall and run-off in the south-west of the state is by buying water from a group of rural irrigators at Harvey, south of Perth to supplement urban demand. The arrangement includes payment in kind through replacing open irrigation channels with a pipe network that makes water delivery to the farmers more effective by eliminating loss to evaporation.

4.38 The committee is firmly of the view that such examples of urban-rural cooperation on water initiatives can be of great benefit to those who engage in it and it would like to urge water authorities around the country to look for opportunities to develop similar approaches.

4.39 In other innovative (at least in the Australian context) approaches to ensuring a reliable water supply for Perth in a drying climate, WA Water Corporation has constructed a large desalination plant at Kwinana, about 40 kilometres from the city, which is now supplying 17 per cent of Perth's water needs. It is also exploring other, if somewhat controversial possibilities, including extracting water from the south-west Yarragadee ─ a big aquifer about 300 kilometres south of Perth.

Water Recycling in Toowoomba

4.40 The committee held a public hearing in Toowoomba, a city that has experienced water restrictions since 1992 and the only Australian city to have considered a serious direct potable reuse proposal, that is, a plan to recycle waste water to supply one quarter of its water needs including all domestic uses and drinking water. The reason Toowoomba considered this plan is that the city currently has just enough water for two years consumption and according to Toowoomba's mayor:

> There is both depleting rainfall and depleting run-off. We get a bit of rain and it fills the catchment, but before we get the next bit of rain it has dried out and we have to go again, so our catchment never stays wetted up enough for us to get run-off. We have seen a fairly substantial lack of run-off over the last 30 years. I should tell you that our major dam in the last 15 years has run over on only 16 consecutive days on one occasion. In the two previous years, it ran over on 285 days.[30]

4.41 The committee's visit took place on 2 August 2006, just 4 days after the people of Toowoomba had rejected the recycling proposal in a plebiscite by a vote of 68 per cent to 32 per cent. Concern was expressed in the hearings that the period for consultation was too short to allow an effective public education campaign, and that an alternative solution to secure the city's water supply was not put forward. The direct potable reuse campaign had been conducted intensely for three months prior to the referendum and the idea had first been talked about less than 10 months before the vote. Toowoomba's mayor told the committee that, in her opinion, three or four years were needed to educate the public about the scientific aspects of the issue under consideration. The plebiscite decision effectively leaves the city still searching for a solution to an increasingly pressing problem. The irony is that legitimate public concerns about the health and safety of their water ultimately led the citizens of Toowoomba to reject a water source which is arguably cleaner than their current supply.

4.42 Direct potable reuse is only one of a range of approaches to water recycling, and systems based on the substitution of recycled water for industrial, agricultural and other non-potable uses (such as watering parks and gardens) are more likely to receive public endorsement in the shorter term. The Chair and Chief Executive Officer of the National Water Commission, Mr Ken Matthews, sees water recycling as one of key policy areas that have to be addressed by the National Water Initiative. He told the committee:

> there is a need for more widespread and objective consideration (of water recycling) across Australia. Surely Australia, as the driest inhabited continent in the world, should be an early adopter of new and cost-effective recycling technologies that are now becoming available.[31]

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30 Councillor Di Thorley, *Committee Hansard,* 2 August 2006, p.9.

31 Mr Ken Matthews, *Committee Hansard,* 7 March 2006, p.3.

4.43 It appears that in the first instance, using recycled water for watering parks and gardens and for industrial purposes will prove more acceptable to the public than using it for domestic purposes.[32] Twin-pipe or 'purple pipe' domestic systems, which use recycled water for non-potable domestic purposes (like flushing toilets or watering gardens) are another less-controversial option for new developments, but the cost of retro-fitting such systems to existing suburbs is prohibitive. Western Australia's Water Corporation is currently involved in a joint project with CSIRO to research the possibilities of managed aquifer recharge, in which recycled water is infiltrated into an aquifer. The method increases water storage in the aquifer, to make more water available for irrigation and other uses and also to preserve water levels in wetlands that are maintained by groundwater. The intention is to use the aquifer's water initially for watering parks, ovals and golf courses.[33]

4.44 Ideally, recycled urban wastewater should not only be available for use in cities and for industry but, where possible, it should add to the volume of water available for irrigation in rural areas. This is happening to some extent already, for example in South Australia as explained by the South Australian government in its submission to the committee:

> Trials involving the storage and recovery of treated wastewater for irrigation of horticultural crops are currently being undertaken at Bolivar on the Northern Adelaide Plains and in the McLaren Vale area.[34]

4.45 Elsewhere in the country treated town water is routinely returned to various rivers and streams but a concerted effort should be made to make this the norm rather than the exception. More importantly, town and shire councils should not be reluctant to reveal this to ratepayers since it would assist in making the concept of using recycled water more acceptable, and would constitute an important step in encouraging judicious use of a precious resource that is becoming scarcer in many areas through reduced rainfall at the same time as a growing population means that demand for it is growing.

4.46 Toowoomba's mayor, Councillor Thorley, argued that seeing an advanced water recycling plant in operation would help people make a decision based on facts rather than emotion.[35] In the committee's view, there is a case for governments to invest in one or more water recycling plants around the country as part of a community education project designed to raise the awareness of the Australian public in regards to how a water recycling plant would work and how safe the water would be.

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32 Note: The committee is only too aware that this does not solve the water shortage problems of cities like Toowoomba and Goulburn.

33 http://www.watercorporation.com.au/M/mar.cfm?uid=4994-1407-5238-5959

34 *Submission* No.52, SA Government, p.29.

35 Councillor Di Thorley, *Committee Hansard,* 2 August 2006, p.14

4.47 The reason why this would make sense is that, while the issue has been decided in Toowoomba, it is highly likely that at some future date, other cities and regions may wish to consider putting recycled water to uses that have not been contemplated previously in this country. Politicians of all persuasions are on the public record as backing this idea.[36]

Recommendation 16

4.48 The committee recommends that the federal government should commit to the construction of one or more advanced water recycling plants to produce water for a range of both potable and non-potable uses in order to raise public awareness about the safety of recycled water.

Conclusion

4.49 Managing our water resources is a difficult balancing act. We are a growing nation living on a dry continent with extremely variable rainfall patterns, and recent years have brought water supply security problems to our agricultural industries, major rural centres and a number of our cities. The challenge for policy makers is how to best balance competing demands for a limited precious resource in a manner that ensures the sustainability of the resource, equity among competing users, predictability and security of supply for our industries and populations, and still guarantees the survival of treasured environmental assets. The issue is made more difficult by the complexity and uncertainty of the science of assessing the resource, and predicting the impacts of drought and increased climate variability. Ultimately we need to be able to make good decisions on the basis of the available information knowing that we cannot predict the future. We need flexible and adaptable water management systems that can deliver equity and certainty to all users. At stake is the viability of our cities and towns, our industries and our ecosystems, our very way of life.

4.50 Although there are gaps in the information available on all aspects of climate forecasting, a number of promising initiatives are underway to gather more accurate climate data and develop better forecasting methods. While uncertainties in climate science are being reduced, it is still important to recognise that we are dealing with probabilities and risks when talking about climate forecasts. New drought and rainfall forecasting tools and scientifically-based suggestions for adaptation will only be of full benefit to those working on the land if they are made aware of the usefulness of new research through effective communications programs. Funds must be made available for education programs for rural industry groups right around the country. Only by tailoring the message to the needs of the end users can that message be communicated effectively. For this to happen, those who undertake such education programs must be adequately trained for the job.

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36 Kim Beazley, *Media statement*, 5 April 06, John Howard, *SMH*, 17 July 06, Andrew Bartlett, *The Bartlett Diaries*, 28 July 06, Rachel Siewert, *Aust Greens Online*, 15 August 06, Andrew Stoner, *Press Release,* NSW Nationals, 26 August 06.

4.51 The evidence gathered during the course of this inquiry has convinced the committee that Australian scientists and researchers have the creative capability to find ways to adapt to climate change and use the country's water resources most efficiently. In addition to its $30.7 million investment into the research effort as part of the Australian Climate Change Science Programme, the Australian government has made $14 million over four years to the National Climate Change Adaptation Programme. Those funds should be used to pursue every avenue of research that will enable all Australians, in rural as well as in urban areas, to adapt in the face of the challenge posed by climate change.

Senator Bill Heffernan
Chair