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Water use efficiency and related issues

Introduction

5.1 A critical issue raised during the course of this Inquiry was the urgent need for Australians to use their water resources more efficiently. While the focus of this chapter is on rural water use, some of its recommendations are also relevant to urban water use.

5.2 This chapter looks at key issues of water use efficiency in rural Australia both off-farm and on-farm, financing options, prospects for turning rivers inland, and other innovations such as recycling, desalination, and enhancing household water efficiency. The chapter also reviews the need for public awareness and information programs, and tax incentives to encourage investment in technology and improved infrastructure.

Rural Water Use Efficiency

5.3 'Off-farm water use efficiency' refers to the savings made in the transmission of water to the farm. If transmission is made more efficient and water losses are reduced, that generates savings which can be used for other purposes. 'On-farm water use efficiency' refers to the savings made through better water management practices and improved technology on the farm itself.

5.4 Increasing water use efficiency on-farm and off-farm involves better management practices and improved technology. Efficiency in storage and delivery systems can involve replacing open channels with pipes, thereby reducing both evaporation and seepage; lining channels; lining and / or covering storages; and automating delivery systems to reduce response times to orders for water. Piping also opens the way for pressurisation, thereby further reducing response times and maximising benefits of water use efficiency on-farm.

5.5 Storages can be better organised. Mid-stream storages place water closer to its destination, allowing better response times to orders and more efficient management of releases from main storages. Use of natural storage sites, such as wetlands, can provide a low-cost, environmentally beneficial, option for mid-stream storage.

5.6 On-farm efficiencies can involve replacing flood irrigation with overhead sprinklers or subsurface drips; the use of soil moisture probes to monitor and control watering; identification of soil types to establish best practice watering regimes; and the automation of irrigation systems providing faster response times to plant and soil needs. It can also involve better management of flood irrigation through laser levelling of land to ensure more efficient and even watering, and the storage and reuse of run-off.

5.7 During the course of this Inquiry, the Committee has been impressed by both the economic and environmental benefits that can accrue from better water use efficiency. Inspections conducted in Mildura in Victoria, Renmark in South Australia, and Dareton in New South Wales, clearly identified the benefits of investment in water use efficiency. The Committee is convinced that investment in water use efficiency is vital to the future of Australian agriculture.

On-farm water use efficiency

5.8 During its inspections of orchards and vineyards at Yandilla in South Australia, Deakin Estate in Victoria and Coomealla in New South Wales, the Committee was impressed by the impact of improved technology—such as soil moisture monitoring, drip irrigation, and automated irrigation controls—and improved management practices upon productivity and water use efficiency. However, new technology and irrigation practices come at a price. The principal barrier to the wider uptake of water efficient irrigation technology appears to be cost.

5.9 In his evidence, Mr Burnett explained the difficulties of increasing on-farm water use efficiency:

> First and foremost, as with all small to medium sized businesses, the driver for the implementation of new technology is improved profitability. But there are many other aspects that confuse that particular driver. Access to capital is probably first and foremost, but there is also the intellectual capacity and knowledge to implement that new technology. The point has been made to me—and it may be overstating the case somewhat—that asking a grower to move from, for example, flood irrigation to subsurface drip irrigation would be like asking an office to move from writing left to right to writing right to left. It would be a profound change in the way they managed their business and, from some strategic decisions at the highest level down to very mundane day-to-day operations, things would have to change. So it is often no easy task to ask a farmer to implement new technology, even though from an outside perspective the technology is there, it may clearly work and it may clearly lead to water savings and even cost savings and improved profitability. If they do not believe they can implement that new technology without a severe disruption to their business, then all those other things do not matter.[1]

5.10 Along similar lines, Mr Andrew McMillan, Director of Policy for the Western Australian Farmers Federation, told the committee:

> On an individual farmer basis, subject to the cost price squeeze that our members face on a day-to-day basis, there is a continuing need for improving the way they use any resource on their farms. The capital cost of extensive improvements to irrigation is prohibitive and we have been indicating for some time that there is a need for some type of incentive to assist farmers to adopt more efficient irrigation practices.[2]

5.11 Direct evidence of these problems was presented in the submission of Mr Matthew Arkinstall, a farmer from Rathdowney, Queensland, who wrote:

> Technology exists today that would enable me to reduce my water usage 50% or so and grow the same amount of crop, and run the same amount of cattle. However, at around $5000 per acre to install, and with a lifespan of perhaps only 5–7 years and increased maintenance costs, the costs are too prohibitive. In areas with

1 Transcript of evidence, p. 597.

2 Transcript of evidence, p. 656.

> flood irrigation there are significant water savings possible by capping flowing bores and piping flood irrigation channels. In both these instances as well, the costs are often too much to be borne by the individual.[3]

5.12 In his evidence before the Committee, Mr Paul Emmerson, Chairman of the Upper Lockyer Water Users Association, discussing the economics of installing drip irrigation said:

> We call it trickle irrigation rather than drip irrigation. It is being used increasingly and there are issues with its use. A lot of irrigation is for one-off use and the economics of using it on a lot of crops are very limited. On our particular place with dairying, we are looking at over $2,000 an acre to put trickle irrigation under our pasture. If we did not have deregulation, we might think about it but with the current price of milk, you just cannot do it. And there are the current problems with water access, so the whole question makes it all very marginal.[4]

5.13 In her evidence, Ms Jacqueline Knowles of the NSW Irrigators Council argued:

> … the investor in the process that delivers savings should be able to use those savings, whether it is to be able to grow more crop or to trade excess water, but that is not to say that governments might not have an opportunity to invest in those sorts of things as well … there are opportunities there for governments to be partners in those sorts of projects to use water. If they invest 20 per cent then 20 per cent of those savings should be reverted to the government to use for whatever purpose they might find for it.[5]

5.14 Mr Ralph Leutton, a member of the National Farmers' Federation Water Task Force, endorsed government investment in water use efficiency:

> Say government were to invest in efficiency. We think that is a far better way to go than buying back licences, because then you get a much more pragmatic and proactive approach to looking after the environment. If that were to be the case then we would get better outcomes.[6]

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3 Submission no. 24, p. 99.

4 Transcript of evidence, p. 119.

5 Transcript of evidence, p. 575.

6 Transcript of evidence, p. 699.

5.15 It is the Committee's view that a national public investment scheme would greatly enhance the adoption of on-farm water use efficiency measures. The caveat is that where public money is invested, the savings generated should be the property of the government in proportion to the level of public investment (for example, where government contributes half the cost, it gets half the water savings).

5.16 Furthermore, any investment should be determined by recognised on-farm planning processes, such as Land and Water Management Plans, which set out costs, savings and external impacts of any water efficiency investment. Any on-farm improvements in water use efficiency must be agreed to voluntarily by the owner.

Recommendation 15

5.17 **The Committee recommends that the Commonwealth Government, working through the Council of Australian Governments, seek to establish a national scheme for investment in on-farm water use efficiency, utilising established on-farm planning processes, with water savings becoming the property of government in direct proportion to the level of public investment.**

Off-farm water use efficiency

5.18 Of equal importance as improving on-farm water use efficiency, in the Committee's view, is the development and improvement of the nation's water infrastructure. Significant decisions about the redevelopment of our water infrastructure currently face the nation. Indeed, in his evidence before the Committee, Dr Don Blackmore of the Murray-Darling Basin Commission argued that the decisions we make now about how we develop our rural water infrastructure would define us as a nation:

> You invest in infrastructure—so you make a choice on what is of net benefit. This is whether it is in pipelines, in flush channel technology. Australian products are now leading the world in relation to channel technologies—and, quite frankly, we will need to put those in to modernise our channels … That [$300 million] would modernise our systems, set them apart as world's best practice and get most of our gravity irrigation systems operating at about 85 per cent efficiency, accurate measurement, two- to three-hour watering, so you can order water within two to three hours.

> It has cracked all the problems we have had. It is solar energy driven. It is pretty flash stuff. Those sorts of technologies should sit there. These things that we should roll out define us.[7]

Water storage

5.19 The Committee received a number of submissions calling for an increase in water storage capacity, principally the building of more dams.[8] In evidence before the Committee, Mr Stephen Struss, a member of the Beaudesert Community Advisory Panel and chair of the water subgroup of the Community Reference Panel, argued strongly for the creation of more storage capacity:

> My big push at this point is for more water storage, as I feel very strongly about it. I feel that we have been pushed into a corner and that in years to come we are not going to have enough water. For all the talk about conserving water, which I appreciate is very important, through the re-use of grey water, I think the big push should be for more water storage.[9]

5.20 Mr Chris Lawson, Director, Civil Operations, Beaudesert Shire Council, told the Committee:

> There are … two more dams that could reside within our area—one within this [Boonah] shire and one within Beaudesert shire. I guess it is a question of whether they ever get built. Sooner or later, they will be built, we will use an enormous amount less water or, I suppose, we will go to desalination. Those decisions are up for grabs in a study we are hoping to kick off in south-east Queensland some time next month.[10]

5.21 In its submission, the Tasmanian Government identified increased storage capacity as a major factor in future economic development. Tasmania's Water Development Plan provides for further water storage development to meet the target for doubling the value of primary production by 2008.[11]

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7 Transcript of evidence, p. 414.

8 Citizens Electoral Council of Australia, Submission no. 30; R. K. McDonald, Submission no. 89; Local Government Border Rivers Project Group, Submission no. 107; Mr David Downie, Submission no. 120; Mr Max de Mestre–Allen, Submission no. 143.

9 Transcript of evidence, p. 60.

10 Transcript of evidence, p. 69.

11 Submission no. 157, p. 2.

The Western Australian State Water Strategy also identifies two new dam developments.[12]

5.22 The Committee notes, however, that the simple construction of water storage is no guarantee of water security. In many parts of Australia, storage capacity exceeds diversions, and yet shortages still occur. In the Murray-Darling Basin, for example, storage capacity exceeds annual flow by 50 percent, and annual diversions by 350 percent.[13] The critical factor in water security is rainfall, and very few dams have been full in recent years due to low rainfall, posing the question why build more dams when we can't fill the ones we have now?

5.23 Under the COAG water reform framework, investments in water infrastructure schemes or extensions to existing schemes are only to be undertaken if economically viable and ecologically sustainable. This policy aims to avoid subsidies for uneconomic projects so that future generations do not have to pay for poor investment decisions, and environmental impacts are fully investigated before major projects proceed.[14]

5.24 Professor Peter Cullen endorsed the position taken by COAG in his evidence before the Committee, stating:

> I would not build any more dams until we are using the water we have more efficiently than we are. To think that we are not going to have to implement that COAG requirement for full economic and environmental appraisal of a dam is silly. That will come back to us some time, with our urban communities and with others, and we are going to have to go through those tests. They are appropriate tests and they should stay there.[15]

5.25 It is the Committee's view that the development of major water storage infrastructure should only take place in accordance with the requirements of the COAG water reforms, i.e. that major infrastructure developments should be economically viable and ecologically sustainable. The critical factor in Australia's water future is greater water use efficiency.

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12 Government of Western Australia, *Securing Our Water Future: A State Water Strategy for Western Australia—Summary Document*, February 2003.

13 Transcript of evidence, p. 395.

14 Submission no. 160, p. 17.

15 Transcript of evidence, p. 15.

Technical innovation

5.26 The opportunity to use existing storages more efficiently or open new avenues for water storage has great potential.

5.27 One such innovation is the lining and covering of existing storages to prevent losses from seepage and evaporation. In its submission to the Inquiry, Evaporation Control Systems Pty Ltd, indicated that progress had been made in making light weight, cost effective, covers for water storages.[16] On its tour of inspection of the Tod Reservoir, the committee saw the covers used on one of the secondary storages above the main reservoir.

5.28 While in Port Lincoln, the Committee heard from Councillor Peter Davis, Mayor of Port Lincoln, on the success he had enjoyed using plastic sheeting to capture rainfall on his property on Boston Island.[17]

5.29 It is the Committee's view that such technological innovation offers considerable scope for creating cost effective water savings, and that the development and use of such systems should be encouraged by governments.

5.30 Another means of managing water better is the use of mid-system storages (i.e. between the main storages and use on-farm). Mr Hetherington of Murray Irrigation regarded mid-system storage as one option with great possibilities in terms of water conservation and environmental management that till now had been largely neglected:

> I am going to suggest one [option] that gets recorded for your committee; that is, if river managers looked at en route storage along some of the irrigation systems to avoid excessive flooding in forests and other environmentally sensitive areas when you cannot avoid it through nature—spring thunderstorms and things—it would be far more efficient and beneficial if some of that funding that is available up there were allocated to a project such as this or at least be investigated as a priority. A lot of savings can be found in river management that have been totally neglected in my view.[18]

16 Submission no. 145, pp. 1-3.

17 Transcript of evidence, p. 368.

18 Transcript of evidence, p. 512.

5.31 At the same hearing, Mr John Howe, Water Policy Manager for Murrumbidgee Irrigation, highlighted the work that was being done in his area to improve the storage efficiency of natural wetlands:

> The way that we are currently looking at reduced evaporation losses is in our mid-system storages. Those storages are necessary for the management of water within the system, but your evaporation losses fall with the depth and lower surface area of those storages. So we investigated a project to take a mid-system storage and effectively halve the area of it. That is, covert one-half back to the original wetland and use the other half. In fact, active storage would be only one-third, with a bit in addition to that for very high flow periods that would be a spill to more often 'inundated' wetland than the other 'returned to its natural state' wetland. That is the project that will reduce evaporation losses by up to 30,000 megalitres per year. Currently, we lose from that mid-system storage about 60,000 megalitres a year. With the new approach, it would be just 30,000.[19]

5.32 The importance of water storage to economic development was emphasised by Councillor William McCutcheon, Mayor of Chinchilla Shire Council, who advocated off-stream storages for capturing the intermittent high flows of the Condamine River.[20]

5.33 Mr Stephen Struss of the Beaudesert Community Advisory Panel also identified water harvesting of floods and high flows as a potential source of supply:

> I see the potential for water harvesting as a big issue, although it is not suitable for all properties, particularly those in the Logan basin. But with those properties that meet the geographical requirements needed for water harvesting, the carrot approach is needed to get people to spend money on water harvesting. I know that with my operation my water harvesting system effectively doubles the amount of water which I take from the Logan. Half of it would be otherwise just wasted water going past. The potential is huge, even if you just get 20 or 30 per cent of farmers to harvest water.[21]

19 Transcript of evidence, p. 512.

20 Transcript of evidence, pp. 100–1.

21 Transcript of evidence, p. 60.

5.34 The Committee sees potential in the use of mid-stream storages and wetlands, and believes these options should be further investigated. However, it is important that the environmental impacts of such practices should be taken into account, and that the harvesting of flood waters not cost downstream users their entitlements. Just because water flows past one farmer's land does not mean the water is wasted.

5.35 During its tour of inspection in South Australia, the Committee was impressed with work of the City of Salisbury in using artificial wetlands to harvest, clean and reuse stormwater, creating both natural habitat and a valuable economic resource. As part of this scheme, the City of Salisbury has established a system of aquifer recharge, storage and recovery—to store high winter flows and then utilise them for summer watering.

5.36 The Committee is also aware that some inland cities (such as Canberra and Albury) return significant stormwater and treated effluent to inland water systems. This suggests that coastal cities should also be able to return at least some stormwater to inland rivers systems or storage dams.

5.37 In evidence to the Committee, Dr John Radcliffe, a former Director–General of Agriculture in South Australia and former Deputy Chief Executive of CSIRO, and currently a member of the South Australian Arid Areas Water Catchment Management Board, supported aquifer storage and recovery (ASR), but emphasised the need for good research and management practices:

> You need to have a good knowledge of the aquifer structures beneath the area where you might put your ASR, and you also have to manage the water so that it does not clog up, say, sand strata through which it might need to go … You also need to be careful that you do not have fractured aquifers, because you might put it into one aquifer and then suddenly, if there is a fractured rock structure, it might disappear into another aquifer and you will not be quite sure where it finishes up. So you do need to have a good knowledge of the local geology.[22]

5.38 Professor Don Bursill, Chief Executive Officer of the CRC for Water Quality and Treatment, described to the Committee another successful example of aquifer storage and recovery operated by SA Water at Clayton Bay. [23]

22 Transcript of evidence, pp. 317–18.

23 Transcript of evidence, p. 297.

5.39 The Committee believes that aquifer storage and recharge is now proven technology and that it has great potential for wider use. The necessary research should be undertaken to determine where and how the best use could be made of aquifer storage and recharge for domestic, industrial and agricultural purposes. Aerial magnetic surveys could be used to map aquifers. Much more research needs to be done on the whole issue of Australia's groundwater supplies and potential.

Recommendation 16

5.40 **The Committee recommends that the Commonwealth Government facilitate the establishment of a Cooperative Research Centre for Groundwater Management which would:**

- **Map Australia's groundwater resources;**
- **Investigate the current and potential use of Australia's groundwater resources; and**
- **Research the use of aquifers for water storage purposes.**

Piping open channels

5.41 In the evidence presented to the Committee, the system of open earth channels used to transmit water from the headworks to the farm was identified as one of the major sources of inefficiency in Australia's irrigation systems. Mr Richard Pratt, Chairman of Visy Industries, stated in his submission:

> It is well known that open irrigation channels are a highly inefficient method of transporting water—especially over long distances. Losses through evaporation and leakage can account for up to 80% of water volume from the time water leaves its source until it reaches its destination.[24]

5.42 Mr Pratt's solution was to replace open irrigation channels with pipes, helping to eliminate evaporation and leakage, and making more water available for rural, urban and environmental uses. His submission concluded:

24 Submission no. 4, p. 14.

> A scheme to pipe Australia's open irrigation channels would be one of the most effective, far reaching and imaginative steps the Government could undertake to address the water management challenges facing Australia. It would capture the nation's imagination and send a clear message that water management is one of the greatest issues facing this country. The financing, planning, administration and implementation of such a scheme requires considerable analysis. However it has the potential to have a major positive environmental and economic impact for the future of Australia.[25]

5.43 The benefits of replacing open channels with pipes are clearly illustrated in the Wimmera Mallee region of north-west Victoria. The Northern Mallee pipeline project replaced open channels across 650 000 hectares of the Mallee, resulting in water savings of 50 GL per year, of which 35 GL is available for environmental flows. A feasibility study was undertaken, and the preparation of a detailed business case is currently underway for the completion of the entire project, representing potential total water savings of around 83 GL per annum.

5.44 Western Murray Irrigation, which the Committee inspected in late July, is another example of a successful pipeline investment. There, a joint government–irrigator investment has resulted in the replacement of open channels with a low pressure piped system. Savings of up to one-third have been achieved through piping, and water use has declined a further one-third with the uptake of new technology. Piping and pressurisation has meant that water is available on demand, allowing growers to adopt sophisticated growing techniques. It has also cut drainage outflows by two-thirds.[26]

5.45 Piping is not, however, a universal panacea. Some channel systems are more efficient than others, and the level of investment required to pipe some systems may not match the efficiencies gained. Professor Cullen told the Committee that the feasibility to pipe an open-channel system depended on cost-benefit analysis being undertaken. He thought that 'a lot of the real savings and benefits from investment through piping will be at the on-farm level rather than at the system level'.[27]

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25 Submission no. 4, p. 15.

26 http://www.agric.nsw.gov.au/reader/16146

27 Transcript of evidence, p. 7.

5.46 In its submission, the Department of Agriculture, Fisheries and Forestry noted that where investment costs were over $3000 per megalitre, which is often the case, the necessary investment was generally considered unviable. Piping is best targeted at areas where channels have very poor water efficiency due to high losses through seepage in sandy soils.[28]

5.47 Mr Mark Bramston, Chief Executive Officer of Coleambally Irrigation Cooperative Ltd, told the Committee that his company had investigated replacing open channels with pipes, but had found pipes 'significantly not cost-effective' because of the high sediment loads in the Murrumbidgee and the consequent energy requirements for operating and cleaning the pipes.[29]

5.48 Mr Ian Wisken, Assistant Project Director, Pratt Water, a company which has invested heavily in testing the feasibility of piping and other water saving technology, agreed that piping everything was not necessary or feasible. He told the Committee of low cost piping options Pratt Water was investigating, using material that was cheaper and less durable than traditional piping materials, making it easier to repair and replace, and less costly to abandon as land uses change.[30]

5.49 Despite the difficulties associated with replacing open channels with pipes, the Committee is convinced by the evidence it has received that piping water is the way of the future. Cost-benefit analysis may rule piping out as a short-to-medium-term option in some areas, but the benefits associated with piping combined with the increasing value of a scarce resource—water—will make this option increasingly attractive in the future. The key objective now is to develop research and investment strategies to facilitate piping of those areas urgently in need of upgraded irrigation infrastructure, such as north western Victoria.

Recommendation 17

5.50 **The Committee recommends that the Commonwealth Government, working through the Council of Australian Governments, seek to establish a national scheme for investment in water infrastructure, giving priority to the development of more efficient water storage and the piping of open channels.**

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28 AFFA, Submission no. 160, Attachment A, p. 19.

29 Transcript of evidence, p. 512.

30 Transcript of evidence, p. 713.

5.51 The Committee believes that income accruing to governments from the sale of 'saved' water, either on-farm or off-farm, should be used to upgrade other water-related infrastructure, rather than go into consolidated revenue.

Recommendation 18

5.52 **The Committee recommends that the Commonwealth ask the Council of Australian Governments, as part of the National Water Initiative, to ensure that income accruing to governments from the sale of 'saved' water, either on-farm or off-farm, should be used to upgrade other water-related infrastructure, rather than go into consolidated revenue.**

Water Use Efficiency and the Environment

5.53 In its submission, the New South Wales Irrigators' Council insisted that if more water was to be provided to the environment then it should be obtained first and foremost from 'savings' generated by improved water use efficiency.[31]

5.54 Mr John Howe, Water Policy Manager for Murrumbidgee Irrigation, expressed the same view in his evidence before the Committee at the round-table discussion in Deniliquin, stating:

> Finally, what we would argue is that improving water use efficiency and generating additional flows are the only way that water savings can be made for redistribution to the environment without reducing the income and welfare of user communities. As we have heard today, that is the primary goal at least of the people around this table.[32]

5.55 In its submission, Murrumbidgee Irrigation estimated that one set of projects in the Murrumbidgee Irrigation Area (MIA) and Districts 'may be able to save 100 GL of water at a cost of about $200 million' and speculated that similar savings could be made in other regions.[33]

31 Submission no. 105, pp. 759, 764.

32 Transcript of evidence, p. 509.

33 Submission no. 127, p. 7.

5.56 In its submission, Murray Irrigation was much less sanguine about the prospect of using water use efficiency savings to generate environmental flows, arguing that 'water efficiency savings that are currently economic have either been implemented or are being implemented'.[34]

5.57 The MDBC commissioned two companies to investigate the potential for savings from increased water use efficiency.

5.58 A study by consultants CapitalAg identified savings of up to 3000 GL in the Murray–Darling Basin from increased water use efficiency.[35] This report noted that capital requirements and investment risk to upgrade irrigation practices are often large and beyond the scope of individuals.[36] From a farm enterprise perspective, investment in water use efficiency was not necessarily profitable:

- Increasing water prices and additional revenue from water sales means that investment in water saving practices is increasingly becoming feasible for some growers. However, for most growers, the main incentive to upgrade irrigation practices (installing new irrigation systems, improving management and changing enterprise mix) appears to be to save labour and increase yield / quality of production.
- Costs of installing new irrigation systems ranged from $2,500–5,000 / ha depending on technologies used and associated farm structures. Changes in enterprise structure can cost much more. For example, the cost of replacing existing citrus crops with wine grapes would cost over $10,000 / ha.
- A switch to more efficient technologies (eg from flood and overhead sprinkler to drip and microjet) could lead to annual savings … of the order of 3ML / ha for changes in enterprise mix. Simulations show the efficiency of overall irrigation systems could be improved by around 10–15 per cent.
- In all regions, revenue from permanently selling any water saved appeared to only cover around 70 per cent of the costs of installing new irrigation systems, indicating such investments may not be profitable for many farmers.[37]

34 Submission no. 161, p. 1308.

35 CapitalAg, *The Potential for Improving Water Use Efficiency: a scoping study of opportunities for change and possible policy approaches for the Murray Darling Basin*, MDBC, August 2002.

36 CapitalAg, *The Potential for Improving Water Use Efficiency*, p. 41.

37 CapitalAg, *The Potential for Improving Water Use Efficiency*, p. 36.

5.59 While the CapitalAg report identified water savings that were technically feasible, it did not cost them. Another report, by ACIL Tasman, drawing upon a number of earlier studies, did cost potential savings. It was less optimistic in its evaluation of what was economically feasible.[38]

5.60 The ACIL Tasman report argued that economic efficiency as well as technical efficiency was the key to greater water use efficiency. It found that there was limited scope for savings at a marginal cost of less than $1000/ML, and that where viable on-farm savings had been identified they had been or were being implemented already.[39] It also found the ability of growers to improve application efficiency is often limited by off-farm irrigation systems that cannot provide continuous and preferably pressurised supplies.[40] On the other hand, the piping of open channels was only considered cost effective where there was demand for pressurised supplies, as with drip irrigation.[41]

5.61 In terms of off-farm savings, the report found 'there could be up to 365 GL of potential savings at a marginal cost of around $1000 -1500/ML. Costs then rise reaching $4500/ML at around 420 GL. Above 488 GL marginal costs rise sharply'.[42]

5.62 The report identified on-farm savings of some 123 GL in the Murrumbidgee Irrigation Area at a cost of around $1000 - 1500/ML, and total savings of about 200 GL at a cost of between $1000 - 3000/ML. The list of savings identified was not exhaustive, but the report also noted that:

> …it cannot be assumed that one particular irrigation application method is universally more efficient than another, given that soil type, climate and land-form will have a significant influence on the performance of a given technology or management technique. For example, only marginal gains may be made by switching irrigation technology on the heavy clay soils of Victorian dairy farms that are believed to be well suited to traditional flood/furrow techniques … It would be unwise to attempt to form generalised judgements about the most economic water saving measures.[43]

38 ACIL Tasman, *Scope for Water Use Efficiency Savings as a Source of Water to meet increased Environmental Flows—Independent Review*, MDBC March 2003.

39 ACIL Tasman, *Scope for Water Use Efficiency Savings*, p. i.

40 ACIL Tasman, *Scope for Water Use Efficiency Savings*, p. v.

41 ACIL Tasman, *Scope for Water Use Efficiency Savings*, p. 34.

42 ACIL Tasman, *Scope for Water Use Efficiency Savings*, p. 52.

43 ACIL Tasman, *Scope for Water Use Efficiency Savings*, pp. 52–4.

5.63 This conclusion was supported by the evidence of Mr Bruce Finney, Central Region Manager of Twynam Agricultural Group, who, in evidence before the Committee, pointed out that new technology was not necessarily appropriate to all situations:

> That is why in our heavy soils in the north-west we have focused on managing the slopes of the fields by levelling … and the run length, and making that system as efficient as possible. It is quite feasible to have irrigation farms on that soil type, with flood irrigation being 80 per cent efficient. The economic benefit of taking that from 80 per cent to 95 per cent with drip is questionable. It is cost prohibitive.[44]

5.64 Mr Leon Ashby, a South Australian farmer, and convenor and founder of Landholders for the Environment, concurred. He told the Committee:

> I have been involved with drip irrigation and I have centre pivots. I have done a bit of open flood and I have done a bit of water spreading. So I have played around with the water in different parts of Australia … I know of some flood irrigation set-ups where they flood very large amounts in very quick amounts of time in the evening. Those set-ups are very efficient for minimal evaporation.
>
> In regard to set-up cost, if you are going to do drip irrigation or pipes or whatever else, they are going to have less evaporation, but they are going to have a lot more infrastructure costs. So there is this sort of play-off there. It is not quite as straightforward now. It depends also on your soil holding capacities. Some soils are just right for flood irrigation. They allow the right amount in for the plants. Others drain too quickly and they use too much water. It goes straight into the subsoil, away from the plant roots, and so on and so forth.[45]

5.65 This picture has been further complicated by research suggesting that water 'saved' through improved water use efficiency would probably be used to increase irrigation rather than for additional environmental flow. In an article entitled '*Robust Reform: The Case for a New Water Entitlement System for Australia*', Professor Mike Young and J. C. McColl explored the potential environmental implications arising from greater water use efficiency and land use change in the Murray–Darling Basin. Their

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44 Transcript of evidence, p. 614.

45 Transcript of evidence, p. 190.

research indicated a estimated loss from all sources of 2065 GL in net flows in the River Murray over time, made up of:

- Water use efficiency savings would be used to increase irrigation rather than environmental flow, reducing net flows by 723 GL.
- Sleeper and dozer entitlements would continue to be activated, reducing net flows by 373 GL.
- Land use changes, such as increased forestry, would reduce net flows by some 600 GL.
- Salinity interception schemes were outside the Cap, reducing net flows by 20 GL.
- The failure to cap groundwater extraction would impact on river flow, reducing net flows by 349 GL.[46]

5.66 In his evidence to the Committee, Dr Stephen Beare, Research Director of ABARE, made a similar point about the impact of greater water use efficiency upon the environment. He said:

> I have heard people say that in the Goulburn–Broken area it is a really good thing that they are going to be moving a lot of irrigation from furrow to either drip or sprinkler, and they will be saving virtually half their losses. That is not necessarily a good thing, because if the farmers retain that water right and they use it and they expand their activities it will actually work the river harder, and they will transpire more and there will be water that is not coming downstream for other users—and that is clean and potentially quite fresh water.[47]

5.67 Dr Beare suggested that 'in some cases there is an argument to be made that potentially if you save water in this particular location, you should have to share it with the environment or the other downstream irrigators'. On the other hand, increasing water use efficiency in environmentally problematic areas would produce 'a net environmental benefit. In fact, irrigators need more incentives than they would naturally see, for that to happen. So it is where it is happening that matters.'[48]

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46 M. D. Young & J. C. McColl, 'Robust Reform: The Case for a New Water Entitlement System for Australia', *Australian Economic Review*, vol.36, no. 2, pp. 225–34. Suggested solutions: groundwater allocations should be capped and linked to surface water allocations; land use changes such as increased forestry should require separate allocations within the Cap; sleeper and dozer licenses should be removed from the system; and salinity interception schemes should be brought within the Cap.

47 Transcript of evidence, p. 386.

48 Transcript of evidence, p. 387.

5.68 These findings were disputed by Mr Howe of Murrumbidgee Irrigation who argued that Young and McColl were using a very narrow definition of water use efficiency:

> At least in our system, that is not a very good representation of the circumstances. Reduced evaporation losses are an extremely important part of in-system and on-farm flows—they are not actually a flow; it is a loss of water in-system and on-farm that, if retained, becomes a flow—and by reducing evaporation you have no impact on basin flows; you create more water without impacting on the discharge of the basin. Neither does a reduction in drainage to waste, and in our system sometimes we have drainage to environmental damage. So actually stopping those drainages is both good for irrigation and good for the environment.[49]

5.69 Traditionally, any savings created through investment in water use efficiency have remained the property of the water entitlement holder. Young and McColl have suggested two remedies to this issue:

- Either any interest in a stream of periodic allocations should be defined as a 'net' interest reflecting the quantity consumed not the volume pumped, i.e. where 50 percent water use efficiency is achieved and 50 percent of water pumped returns to the river, farmers are entitled to 50 percent of their allocation.
- Or as water use efficiency increases there is an across the board reduction in the quantity of water per unit periodically allocated.[50]

5.70 Both these solutions conflict with current notions of water property rights. Ms Michelle Ward, a consultant for the New South Wales Irrigators' Council, told the Committee:

> We would like to clarify that the principle of receiving assistance to do water efficiency savings is that if an irrigator is investing in water savings technology, that irrigator should be able to receive the benefit of those savings in terms of using the water that he saves to grow more product—or trade. Savings should be the property of the person who invests in them.[51]

49 Transcript of evidence, pp. 509–10.

50 Young & McColl, *Robust Separation*, pp. 30–2.

51 Transcript of evidence, p. 571.

5.71 This was a position supported by Mr Jolyon Burnett, Chief Executive Officer of the Irrigation Association of Australia, who agreed that where irrigators made the investment, they should be the beneficiaries of that investment. He qualified this, however, by saying that where government had also invested in those savings, it was not unrealistic to expect it to have a say in how those savings were distributed.[52]

5.72 An ABARE report found that the direct purchase of water entitlements for environmental purposes is often more cost-effective than generating additional water through improvements in water use efficiency, although that cost-effectiveness will diminish as the price of water increases.[53]

5.73 The Committee opposes any form of water saving measure that involves the confiscation of water entitlements or their diminution by increment. Governments should acquire water savings through direct investment, either by purchasing entitlements or through investment in water saving technology.

Financing investment in water use efficiency

5.74 In his submission, Mr Richard Pratt, Chairman of Visy Industries and Pratt Water, proposed a system of water bonds to finance the development of major water infrastructure projects in Australia. He believed that such bonds would provide a highly sought after investment while providing economic opportunities in regional Australia. While Mr Pratt thought the Commonwealth Government was justifiably proud of its record in reducing public debt, water bonds 'would have the advantage of helping keep more of Australia's superannuation fund money onshore as well as providing considerable economic stimulus and job creation in rural areas through a major environmental infrastructure project'.[54]

5.75 Pratt Water envisages water bonds being the primary funding mechanism for significant national water infrastructure investment:

> Governance of the financing mechanism could be through a Water Bond Vehicle (WBV), which would need to be established to control and manage proceeds from the sale of Water Bonds to investors. The WBV would award and supervise contracts for

52 Transcript of evidence, p. 603.

53 T. Goesch & A. Heaney, *Government Purchase of Water for Environmental Outcomes*, ABARE, Canberra, 2003, pp. 10–11.

54 Submission no. 4, p. 15.

> appropriate infrastructure developments (including new pipelines), and could also provide long-term finance to farm and regional organisations for approved projects. Bond finance may also be allocated to qualifying urban water infrastructure projects, if that accords with government policy and demonstrated need.[55]

5.76 The new and redeveloped water infrastructure would be owned by the Water Bond Vehicle, as would water savings created through the investment. Water savings could then be reallocated via agreed market mechanisms to the government for environmental purposes or to other primary producers for regional development. In the case of long term finance provided to farmers and regional organisations, the assets acquired would remain the property of the financed body, but any surplus water savings would be allocated to the Water Bonds Vehicle according to agreed rules.[56]

5.77 The Committee believes the water bonds concept has considerable potential to arrest underinvestment in rural water infrastructure without placing a significant burden on public finances. The savings, both in terms of agricultural productivity and environmental sustainability, are potentially huge. This is a proposal worthy of further investigation by both state and federal governments.

5.78 Priority areas for investment include on-farm irrigation systems; piping open channels; desalination plants; and reducing evaporation in storages.

Recommendation 19

5.79 **The Committee recommends that the Commonwealth Government investigate the introduction of a scheme of investment in National Water Bonds, with a view to implementing said scheme in 2005, as part of the National Water Initiative, and seek to encourage fund managers to invest in water infrastructure.**

55 Submission no. 178, p. 1.

56 Submission no. 178, pp 2 – 3.

Turning rivers inland

5.80 The Committee received evidence both for and against turning rivers inland. Most of the evidence for turning rivers inland compared the vast quantities of unutilised water in northern Australia with the over-allocated systems of the south. Several submissions identified the opportunity to divert the massive flows of Australia's northern monsoonal rivers to the agricultural regions of the south.[57] Another identified the suitability for diversion inland of the Clarence River in northern New South Wales.[58]

5.81 A submission from engineering firm T. Bowring & Associates Pty Ltd, advocated the construction of canals from the mouths of the Burdekin and Burnett Rivers in north Queensland to the Darling River at Bourke. The use of concrete lined canals would reduce transmission losses, while aquifer storage enroute would allow for management of the water. The company estimated the cost of the canal and pumping infrastructure for a 2000 GL per annum flow at $2 million per kilometre, with a canal between Rockhampton and Bourke costing around $1.5 billion.[59]

5.82 On the other hand, Professor Cullen thought that the dangers associated with turning rivers inland were great, and neither the benefits nor the risks had been properly quantified. He believed the existing waters of the Murray-Darling Basin should be used more efficiently before looking for new water sources.[60]

5.83 Dr Wayne Meyer, Business Director of CSIRO Land and Water, regarded the turning of rivers inland as an enterprise fraught with danger:

> Diverting high volume coastal rivers into inland river systems has many challenging and attractive engineering prospects. What are the likely biological consequences and social responses? Significant decreases in flow and seasonality of the diverted river and increases in the receiving river will affect the ecosystems of both rivers. Major changes in either system are not likely to be acceptable in today's more environmentally sensitive political environment. Increasing flow in the inland rivers and subsequent use for irrigation especially in arid areas will increase salt loading, and in the absence of excellent water control, will almost certainly

57 Hon. Bob Katter MP, Submission no. 49; Mr. A. S. Davey, Submission, no. 61, p. 309; Mr Jack Pearson, Submission no. 172.

58 Submission no. 107, p. 803.

59 Submission no. 146.

60 Transcript of evidence, pp. 7–8.

> increase accessions to groundwaters. Extraction in the upper reaches of the river will negate any advantages for increased supply downstream and the real risk of increased drainage returns will adversely effect water quality. If supplies of quality water are required downstream it is certainly not very efficient to transport water through long, open inland rivers.[61]

5.84 The submission from the Department of Agriculture, Fisheries and Forestry noted that such schemes are generally not economically viable or environmentally sustainable, two key COAG criteria. The submission provided estimates of delivery costs of diverted water: for example, the proposed pipeline from the Fitzroy River to Perth – estimated at $4,000 / ML; and the Bradfield Scheme to divert the northern coastal rivers of Queensland – estimated at $1,500 / ML.[62]

5.85 While the Committee is impressed with the technical possibilities for diverting rivers from the northern and eastern coasts to the inland, it is concerned that the economic and environmental hazards of such schemes have not been properly addressed by their proponents. Crucially, the Committee received no evidence during the Inquiry that potential users would be willing to pay the huge costs per megalitre which diverted water is estimated to cost.

5.86 The Committee believes that investment in more efficient use of existing resources should be the priority of government. Furthermore, the Committee is of the view that governments should investigate the potential to establish new industries in the north, at the source of the water, rather than moving the water south. The Ord River scheme is indicative of the agricultural potential of northern Australia, and of the problems associated with its development. The potential is there. The key is to develop it in an economically responsible and environmentally sustainable way.[63]

Recommendation 20

5.87 **The Committee recommends that the Commonwealth Government urge the Council of Australian Governments to establish programs to investigate the development of irrigated agriculture in northern Australia as part of the National Water Initiative.**

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61 Wayne S. Meyer, '*Water in Australia*', attachment to CSIRO, Submission no. 59.

62 Submission no. 160, Attachment A, p. 19.

63 Submission no. 160, Attachment A, pp. 21-22.

Other Water Saving Measures

5.88 During the course of its Inquiry the Committee received a considerable amount of evidence relating to other potential water saving measures mainly associated with urban water management, particularly water recycling, desalination, and household efficiency measures including the adoption of rainwater tanks. About twenty percent of water in Australia is used in urban areas—for both household and industrial/commercial use.

5.89 The Committee notes that a Senate committee conducted a recent inquiry into Australia's urban water management and tabled its report in December 2002.[64] This is a comprehensive report with several sound recommendations. The discussion of urban-related water issues in this report (which is focused on rural water) will, therefore, be kept short. Nevertheless, it is evident that particularly the recycling of stormwater and treated effluent has the potential to make significant quantities of additional water available for rural use.

Recycling water

5.90 The opportunities to improve overall water use efficiency through the recycling and reuse of water was raised throughout the Inquiry. Mr John Lawson, an urban planning consultant, told the Committee that '50 per cent of the potable water supply in most … cities could actually be recycled, because 31 to 35 per cent of water in Melbourne goes on gardens and 14 to 19 per cent is on toilet flushing'.[65]

5.91 Governments are cognisant of the need to make better use of available water resources. For example, the Victorian Government has set a 20 per cent reuse target for Melbourne's sewage water by 2010. The Western Australian Government has set the same target for 2012.[66]

64 Report of the Senate Environment, Communications, Information Technology and the Arts Reference Committee, '*The Value of Water*', tabled December 2002.

65 Transcript of evidence, p. 228.

66 Government of Victoria, *Melbourne 2030: Planning for sustainable growth*, policy 7.1; Government of Western Australia, *Securing Our Water Future: A State Water Strategy for Western Australia—Summary Document*, February 2003.

5.92 The submission from Barwon Water, the regional water authority based at Geelong, identified the recycling of treated wastewater as an integral element in the water cycle and urged the Commonwealth to facilitate the adoption of national standards for recycling to strengthen community acceptance of recycled wastewater as a valuable resource.[67]

5.93 In its submission, the Lower Hawkesbury Nepean Water Users Association highlighted the impact upon river health of the fact that 90 percent of the flow of the Hawkesbury River was diverted to Sydney for urban and industrial use, leaving 10 percent for agricultural use and the environment. The Association argued that water quality in the Hawkesbury would improve dramatically if a large proportion of this water was cleaned and returned to the river system, increasing the water available for both the environment and agriculture. The Association called for the adoption by the Commonwealth of a strategic objective to return 50 percent of water diverted to the Hawkesbury–Nepean system.[68]

5.94 There appears to be considerable potential for increased urban water recycling and reuse. In its submission, the Victorian Government noted that over the next five years a number of projects will be completed which will increase the use of recycled water in metropolitan Melbourne by between 17 and 35 gigalitres per annum. The submission cited the Aurora development, a new housing estate which will process and reuse all its own waste water using a third pipe system; the Werribee Plains scheme, which will divert up to 35 gigalitres per annum of treated waste water from Melbourne's Western Treatment Plant; and the Sunbury–Melton pipeline, which pumps 2.2 gigalitres of tertiary treated water to properties between Sunbury and Melton, to irrigate vineyards, olive groves, plant nurseries, golf courses and council reserves.[69]

5.95 There are costs associated with recycling and reuse. Third pipe schemes, while readily installed in new developments, are difficult and expensive to retrofit. Supplying water for agricultural use requires transmission and storage facilities for the recycled water. Water still has to be treated to minimum standards to remove salt, metals and pathogens to make it fit even for non-potable uses. Mr Lawson told the Committee that only selected agricultural industries could afford to pay the costs involved in treated water:

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67 Submission no. 2, p. 1.

68 Submission no. 6, pp. 1-4.

69 Victorian Government, Submission no. 175, pp. 6–7.

> The gross margins for selected crops with regard to the ability to pay for water are a major issue in relation to treated water. By and large, we believe we can treat the water for about $300 per megalitre … So you do have a problem with what you can pay. Generally speaking, it is wine grapes, apples and other intensive agriculture [that can afford recycled water].[70]

5.96 Nonetheless, Mr Lawson believed that much greater levels of reuse than those targeted were possible:

> The government in Victoria has a target to reuse 20 per cent of Melbourne's sewage water by the year 2010. I am saying that you could have a much higher target and that our overall objective should be to try and reuse all of the water. I believe that, over time, that may be practical and possible.[71]

5.97 Dr Radcliffe cited examples in South Australia where wastewater had been diverted to agricultural use, 'at Bolivar and Virginia … and in the southern vales', thereby saving investment in waste water treatment.[72]

5.98 A number of witnesses from Queensland spoke in support of a proposal to pipe waste water from Brisbane to the farming districts west of the Great Dividing Range. Mayor of Boonah Shire, Councillor Brent told the Committee:

> We have a particular project here in south-east Queensland … It is about collecting effluent from Brisbane city and adjoining local governments and turning that water inland to the west of Brisbane, into the lower end of Boonah shire, into Laidley shire and Gatton shire and extending further westward to Toowoomba and out onto the Darling Downs. There currently is a draft report that is in the final stages of titivation prior to public release. I believe I can say that it is around an $800 million project.[73]

5.99 Representatives of Chinchilla Shire Council were enthusiastic about the proposed pipeline, not because they would benefit directly from it but because the water saved upstream as a result of this scheme—around 130 GL per annum—would mean more water availability in their region.[74]

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70 Transcript of evidence, p. 228; see also Submission no. 160, Attachment A, p. 20.

71 Transcript of evidence, p. 19.

72 Transcript of evidence, p. 315.

73 Transcript of evidence, p. 42; see also Transcript of evidence, p. 72.

74 Transcript of evidence, pp. 97, 103.

5.100 The media reported that the feasibility study estimated that the price of water from the scheme would be around $1000 per megalitre[75]. As there was no indication that farmers would be willing to pay such prices for this water, the Queensland Government decided not to proceed with the project citing economic costs and environmental concerns, two key COAG criteria.

5.101 Professor Bursill voiced caution because of the potential health risks involved. He did 'not believe this country needs to have effluent reused for potable purposes, broadly speaking',[76] and was concerned at the implications of the push to greatly increase the use of recycled water:

> You hear, in public consultations and workshops within various sectors of Australia, people say, 'This is too restrictive; we ought to loosen up on guidelines so that other options are more readily available and we can be more innovative.' What that translates to, in reality, is: 'We want to take more risk with public health to enable these water sources to be used.' I am against that; I do not think that is being more innovative at all. Surely one should be challenging this system where we can use this water. Here in South Australia, there are very good programs in aquifer storage and recovery with effluents and stormwaters. We are reusing our waste waters here at a fairly high level for various horticulture endeavours, but with a very clear view about what the health risks are and how to manage them, and that is what needs to be done.[77]

5.102 During the public hearing in Adelaide in April 2003 Dr Radcliffe mentioned that he had been asked by the Australian Academy of Technological Sciences and Engineering (AATSE) to undertake a detailed review of water recycling in Australia, under a project funded by the Australian Research Council.

5.103 The AATSE's very timely report, titled '*Water Recycling in Australia*', was published in April 2004. This is the first time a comprehensive review of all facets of water recycling in Australia has been undertaken. The Committee congratulates the AATSE for taking the initiative in compiling this report which will be an essential reference document for policy makers. Findings indicate that nationally about 9 percent of treated

75 *Courier Mail* (Brisbane), 13 August 2003, p. 2, 16 August 2003, p. 12.

76 Transcript of evidence, p. 295.

77 Transcript of evidence, pp. 294–5.

effluent is being recycled at present (166GL out of a total of 1824GL), although this proportion is often much higher in rural areas.[78]

5.104 A key observation in the AATSE report is that 'Governments and water agencies must come to recognise that in a dry country, wastewater effluent, stormwater and rainwater are complementary additional water resources rather than disposal problems.'[79]

5.105 The Committee is of the firm belief that recycling of treated effluent and stormwater is an important part of Australia's water future. While the difficulties and costs associated with recycling are considerable, smart-thinking and technology will overcome most problems. The AATSE report provides the ideal foundation on which to quickly build a workable national water recycling policy. The best way to ensure that water recycling receives the priority and attention it deserves, is to make it an integral part of the National Water Initiative.

Recommendation 21

5.106 **The Committee recommends that the National Water Initiative incorporate a national policy on the recycling and reuse of stormwater and treated effluent around Australia.**

Desalination

5.107 During the course of its Inquiry, the Committee received evidence concerning desalination as a potential source of future water supplies.

5.108 In its submission to the Inquiry, URS Australia advised that it was recently contracted by the Department of Agriculture, Fisheries and Forestry and the Department of the Environment and Heritage to examine the technical and economic issues surrounding desalination in rural regions of Australia, particularly the priority regions identified under the NAP. Various desalination technologies were examined for their technical and economic feasibility, and several were identified as having potential for commercial application in the not-too-distant future.

78 '*Water Recycling in Australia*', a report published by the Australian Academy of Technological Sciences and Engineering, April 2004, p. 7 of the Introduction.

79 '*Water Recycling in Australia*', a report published by the Australian Academy of Technological Sciences and Engineering, April 2004, p. 2 of the Summary.

5.109 The main conclusion of the study was 'that desalination is currently only cost competitive with traditional forms of water supply (i.e. mains) in certain limited scenarios'. These were where water was not otherwise available or the cost of accessing other sources of water was very high.[80]

5.110 One example cited in the URS study was the reverse osmosis desalination plant at Penneshaw, on Kangaroo Island in South Australia. The capital cost of establishing a desalination plant at Penneshaw was significantly less than the cost of linking the town to a water supply. On the other hand, the operating costs of the plant are higher than the unit costs of providing water through the mains.[81]

5.111 URS noted that the costs of operating desalination plants, particularly reverse osmosis, had been declining and desalination was becoming increasingly cost-competitive in many regions. Pricing water to reflect its true value would accelerate this process.[82]

5.112 Moreover, desalination had distinct environmental benefits. The URS study cited the case of Merredin, in Western Australia, where groundwater was desalinised. This lowered the watertable, thus reducing the salinity risk to the town while providing another source of drinking water which reduced dependency on piped supplies.[83] The URS study stressed, however, that desalination was not cost effective as a salinity management tool.[84]

5.113 The Western Australian Government has also investigated the possibility of using desalination to enhance Perth's water supply. A feasibility study had been undertaken into seawater desalination, but the Government had decided not to pursue the development at this time.[85] Mr Ed Hauck, Manager of the Hydrology and Water Resources Branch, Resource Science Division of Western Australia's Department of Environment, informed the Committee:

> I think it is well recognised that the scale of development for desalination does bring down the cost somewhat. But, considering energy inputs, the efficiencies may not go too much further than what we see today. The costings that have been provided on desalination are associated with a 45 gigalitre unit, which is a large

80 Submission no. 80, p. 551.

81 URS Australia, '*Introduction to Desalination Technologies in Australia*', 2 September 2002, p. 7.

82 Submission no. 80, p. 1.

83 URS Australia, '*Introduction to Desalination Technologies in Australia*', p. 4.

84 URS Australia, '*Introduction to Desalination Technologies in Australia*', p. 33.

85 Government of Western Australia, *Securing Our Water Future: A State Water Strategy for Western Australia—Summary Document*, February 2003.

> unit. By far the most cost efficient water source development in WA is related to catchment management and water conservation measures.[86]

5.114 Nonetheless, desalination is being increasingly seen as a viable water supply option. Professor Bursill noted that 'even desalination of sea water has got within the realms of affordability of major communities—Adelaide, for example'.[87]

5.115 Dr Radcliffe cited the example of the Luggage Point Wastewater Treatment Plant in Brisbane as an example of water being successfully treated and reused for industrial purposes:

> There is a contract between Brisbane Water, which is owned by the Brisbane City Council, and BP Australia to provide something like 10 megalitres of water per day to the oil refinery. It has gone through a microfiltration process, a reverse osmosis process, so the water is very low in salt and can be used in boilers with no ill effect. It proved to be a more satisfactory solution than bringing a large water pipeline to a fairly distant location which happened to be close to a waste water treatment plant.[88]

5.116 Desalination is also being attempted on the Eyre Peninsula in South Australia, where the Tod reservoir now contains saline water. It is planned to have a 2.3 gigalitre desalination plant operational at the Tod reservoir by the end of 2004. A pilot project processing some 40 kilolitres a day is already under way. The plant is expected to produce 85 percent fresh water, substantially enhancing the region's supplies, although the region will remain dependent on already stressed groundwater resources. The desalination process is also expected to be highly energy intensive.[89]

5.117 In evidence to the Committee, Mr Vance Thomas, Executive Officer of the Eyre Peninsula Local Government Association, emphasised that desalination was becoming increasingly cost competitive:

> I got very interested in desalination back in the mid-1990s. At that time Israel was leading the field with a different process—boiling it and cooling it, basically. The cost of our water right now is 97c a kilolitre. Back in the mid-nineties, in 1993–94, Israel was producing water by desalination at a time when our water was at the higher end of the 80–90c range for a kilolitre. The cost of producing

86 Transcript of evidence, p. 649.

87 Transcript of evidence, p. 294.

88 Transcript of evidence, p. 320.

89 Submission no. 97, p. 2; Transcript of evidence, pp. 362–3.

> desalinated water by that process at that time was 700 per cent more than the current asking price for state provided water. Now you are talking about—and I know we can get into arguments about real and actual costs—a gap, particularly with reverse osmosis technology, where that is down to somewhere between $1.50 or $2 a kilolitre. You have a factor of 50 to 80 per cent added onto it, rather than 700 per cent. That gap is getting smaller. At the same time, the technology of how efficient these things are becoming is improving exponentially as, in the reverse direction, the cost is coming down. So it is looking promising.[90]

5.118 The Committee believes that, as the technology becomes more affordable, there is huge potential in the future to enhance water supplies in rural and urban Australia through desalination. It also believes that there is considerable scope for finding other uses for saline water, such as aquaculture.

5.119 What is required are targeted desalination research and development programs followed by investment at the appropriate time. Given Australia's huge coastline, solar energy sources, and resources of saline groundwater, the development of solar-powered desalination should be a top priority. To ensure that solar-powered desalination receives the attention it warrants, it should be recognised as a priority area under the National Water Initiative. The proposed national scheme for water infrastructure investment should make special provision for solar desalination projects.

Recommendation 22

5.120 **The Committee recommends that the proposed national scheme for water infrastructure investment includes solar desalination programs, based particularly on solar energy, but also based on wind and other energy sources. Farm-scale desalination units should also be included in such a scheme.**

90 Transcript of evidence, p. 364.

Household Water Use Efficiency

5.121 While household water use is a relatively small proportion of total water use[91], the Committee believes that opportunities for greater water use efficiency in towns and cities should not be overlooked.

5.122 Household water restrictions are current in most towns and cities as a result of drought in Australia's south east. The Committee believes that these restrictions represent sound water conservation measures and that they should become permanent.

5.123 As part of its submission, Melbourne Water Corporation provided the Committee with a copy of the Victorian Government's *21st Century Melbourne: a WaterSmart City Strategy Directions Report*. The report identified average patterns of residential water use as:

- Garden 35%
- Bathroom 26%
- Toilet 19%
- Laundry 15%
- Kitchen 5%[92]

5.124 Numerous measures have been identified to reduce the dependency of households on potable supplies, including water tanks and the use of recycled water for non-potable purposes. Other measures include the use of water efficient appliances such as low volume shower roses and AAAA washing machines.

5.125 As part of its State Water Strategy the Western Australian Government has established a $7 million financial incentive package to encourage the uptake of water efficiency measures, including rebates for the installation of garden bores, rainwater tanks, water efficient shower heads and washing machines rated AAAA or better. It has also implemented a tiered pricing structure designed to encourage household water conservation, with steep price rises above basic levels of consumption.[93]

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91 The National Land and Water Resources Audit estimated that urban water use represented 20 percent of total water use (*Australian Water Resources Assessment 2000*, p. 57, Table 14). This is divided roughly equally between household and industrial/commercial use.

92 Government of Victoria, *21st Century Melbourne: a WaterSmart City Strategy Directions Report*, May 2002, p. 40.

93 Government of Western Australia, *Securing Our Water Future: A State Water Strategy for Western Australia—Summary Document*, February 2003.

5.126 The Victorian Government has, or is in the process of, implementing a range of similar measures. Rebates are available for connection of rainwater tanks to toilets, retrofitting of dual flush toilets, AAA shower roses, AAAA washing machines, AAA dishwashers and home water conservation audits. Permanent watering bans are proposed, as are mandatory water conservation measures for new housing developments, and mandatory minimum standards for household appliances.

5.127 The Victorian Government is also participating in the development of a National Mandatory Water Efficiency Labelling Scheme for appliance, fixtures and fittings, expected to be in place by the end of 2004.[94]

5.128 The Committee strongly supports such measures and believes they should be implemented nationwide. For example, all new major sub-divisions across Australia should be based on principles of water sensitive urban design.

5.129 Just as important as introducing tough new standards in urban design and household appliances, however, is raising public awareness. Many household water conservation measures are about smarter water use—better garden design, watering at night, washing cars with buckets, capturing cold flow from hot water systems. The Committee believes that first and foremost household water use efficiency is about public education.

Rainwater Tanks

5.130 During the course of the Inquiry the Committee received a considerable amount of evidence on the efficacy of rainwater tanks. A visit to the Bushman Tanks factory in Adelaide revealed both the quality and variety of the products available, ranging from 500 litre slimline models that will sit at the side of a house to 48 000 litre water tanks for agricultural or industrial use. From the perspective of product availability and quality there is little reason why any landholder could not have a rainwater tank attached to their house or business.

5.131 Several submissions to the Inquiry urged the uptake of rainwater tanks as a matter of policy. The Toowoomba & Region Environment Council suggested 'mandatory standards for water conservation and efficiency in local building codes', including 'compulsory rainwater tanks and

94 Victorian Government, *Securing Our Water Future*, Green paper for discussion, Melbourne, August 2003.

compulsory dry toilet systems'.[95] In its submission, Beaudesert Shire Community Advisory Panel stated:

> A Federal Government incentive for the installation of rainwater tanks in domestic premises would assist to make better use of the available water resources across Australia. It is acknowledged that there may be some negative impact from such a policy, but these would only occur in the event of an overwhelming participation in a single catchment.[96]

5.132 There was some concern expressed about using rainwater tanks as a source of potable water. In its submission, Derwent Valley Council identified rainwater tanks as the lowest cost option for providing domestic water supply to rural communities, but, given recent dry conditions, also the least reliable. The Council also identified health risks from direct contamination and atmospheric contamination. It preferred the extension of reticulated supplies to outlying communities for, while this option was expensive, it carried the least health risks and was the most reliable.[97]

5.133 Two other submissions highlighted the dangers of lead poisoning and other forms of contamination. The Lead Advisory Service Australia has found that tank owners were generally unaware of their responsibility to manage and maintain the quality of their tank water, and that building codes to prevent lead contamination were either inadequate or not properly enforced. The result was that lead poisoning remained a real threat to those dependent on rainwater for drinking water in rural and regional Australia.[98] Associate Professor N. A. Gibson, an expert in inorganic chemistry, also stressed the dangers of lead in roof catchments.[99]

5.134 In evidence before the Committee, Professor Bursill said:

> Rainwater very rarely meets the microbiological requirements of the Australian drinking water guidelines and sometimes does not meet some of the chemical requirements. What do we do about that? If it is circulated, for example, through the hot water system for a certain time, does this eliminate microbiological risk? This has not been studied properly and is not known. We have to watch out for having the temperature too high because then there is a scalding risk. If you have it too low, there is a Legionella

95 Submission no. 35, p. 1.
96 Submission no. 25, p. 2.
97 Submission no. 46, pp. 10-11.
98 Submission no. 1, pp. 1-8.
99 Submission no. 26, pp. 3–5.

> problem. There are some serious issues that need to be resolved there, and it is not known what we can do about utilising even rainwater in those situations and maintaining public health.[100]

5.135 Professor Bursill reiterated the risk of lead and cadmium poisoning, and highlighted the cost of treating rainwater to potable standards and installing such systems on a large scale:

> As I said, on my rainwater tank I spent $700 and I have very good water for drinking and cooking in the holiday house. But if you multiply that, if you include the cost of the tank, you could spend in excess of a billion dollars making adequate rainwater collection and supply available for a community the size of Adelaide. That amount of money could go a lot further in a major public system. The costs of treating water are only of the order of 10 per cent to 15 per cent of the total supply costs in a public system.[101]

5.136 In its submission, Urban Rainwater Systems advised that the technology is now available to ensure that rainwater tanks are a safe and reliable source of potable water which can be connected to the normal mains supply without risk of cross contamination. It noted that the key barrier to utilising rainwater as a new and secure source of water was State government regulations, and urged the Commonwealth, through COAG to ensure that State governments:

- acknowledged the right of property owners to the unrestricted use of water from rainwater tanks; and
- confirmed the right of property owners to distribute both mains water and rainwater in household plumbing systems, provided backflow into the mains was prevented.[102]

5.137 Cost effectiveness, however, remained a consideration. Mr Brian Foster, a member of the Eyre Peninsula Catchment Water Management Board, while supportive of the use of rainwater tanks, emphasised that in low rainfall areas tanks could not make households self-sufficient in potable water.[103] Mr Geoff Rayson, General Manager of the Eyre Peninsula Catchment Water Management Board, did not believe, given the current low price of water, that rainwater tanks were cost effective.[104]

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100 Transcript of evidence, p. 289.

101 Transcript of evidence, p. 299.

102 Submission no. 158.

103 Transcript of evidence, p. 350.

104 Transcript of evidence, pp. 354–5.

5.138 Councillor Patrick Brassil, of Wagga Wagga, Chair of the Water Management Committee of the Local Government Association of New South Wales, acknowledged that many local Councils were now actively encouraging the use of rainwater tanks, and some had made them mandatory in new housing developments. He, nonetheless, questioned the effectiveness of rainwater tanks as a water saving measure—'you could do a lot better by simply restricting the water supply for gardens'.[105]

5.139 It is the Committee's opinion that rainwater tanks should become a mandatory water saving measure throughout Australia. Strict codes should be enforced to provide for the maintenance of rainwater tanks and associated appliances to prevent the chemical or biological contamination of the tank water or the reticulated water supply.

Recommendation 23

5.140 **The Committee recommends that the Commonwealth Government, working through the Council of Australian Governments, encourages the adoption of rainwater tanks as a mandatory water saving measure throughout Australia, subject to appropriate health codes being in place.**

Education and training

5.141 The Committee believes that an important aspect of water use efficiency is access to information, extension services and incentives for better water management.

Education

5.142 In evidence before the Committee, Professor Cullen said, 'we really do not have a water literate society where people think 'water' and take appropriate actions. We must use this drought to try to lift the general level of water literacy amongst Australians'.[106]

105 Transcript of evidence, pp. 586–7.

106 Transcript of evidence, p. 16.

5.143 The Committee heartily agrees with these sentiments. Indeed, creating a 'water literate society' may be the most important task governments can undertake.

5.144 It is a big challenge. Mr Campbell of Land and Water Australia, cited the rice and cotton industries as examples of industries committed to improved water use performance, but noted that the dairy industry was less interested in new water-saving techniques. [107]

5.145 Mr Colin Nicholl, President of the Western Australian Farmers Federation, highlighted the absence of adequate extension services as a serious obstacle to educating farmers on the latest water use efficiency methods and technology.[108]

5.146 The Committee believes that public information and extension services are vital to the propagation of water use efficiency ideas and technology. It is a vital part of Australia's water future. The Committee therefore expects that such services will be an integral part of COAG's National Water Initiative.

Recommendation 24

5.147 **The Committee recommends that the Commonwealth Government propose that the Council of Australian Governments, as part of the National Water Initiative, develop strategies for establishing a water literate society through**

- **public awareness campaigns;**
- **public information services; and**
- **the provision of extension services throughout rural and regional Australia to promote water use efficiency techniques and technology.**

5.148 Cooperative Research Centres (CRCs) play an important part in the process of finding solutions and disseminating knowledge of water use efficiency. Rice and cotton are two industries where research and development have contributed to impressive savings in water use. Both have established CRCs.

107 Transcript of evidence, pp. 31–2.

108 Transcript of evidence, pp. 661–2.

5.149 A more recent development was the launch of the CRC for Irrigation Futures on 1 July 2003. The CRC for Irrigation Futures has the goal of doubling profitability while halving water use in Australian irrigation. It will define and promote sustainable irrigation areas and practices. It will also examine issues of urban, industrial and rural communities sharing and reusing water.[109]

5.150 The Committee endorses the establishment of the CRC for Irrigation Futures, and supports its aims and the thrust of its programs.

Training

5.151 Another important part of water use technology is training. In evidence before the Committee, Mr Burnett of the Irrigation Association of Australia stated:

> The participation and levels of training and qualification in the irrigation industry are some of the lowest throughout primary industry and yet it is increasingly one of the most technologically sophisticated areas of farming. Just recently, the Australian National Training Authority has endorsed for the very first time ever national qualifications in irrigation, independent of agriculture or horticulture. We see it as vital that support and encouragement is given to get the industry participating in those new qualifications.[110]

5.152 Mr Burnett argued that training was an essential element to the successful implementation of new irrigation technology, a system of nationally recognised qualifications was important, and that 'perhaps some link between demonstrated competence or training and continued licence access is worth investigating'.[111]

5.153 Mr Ian Wisken, Assistant Project Director, Pratt Water, told the Committee:

> We have seen examples of a pressurised system being used on a horticultural operation and the farmer knows it is working because he can see the water flooding down the drain. That is not what is meant to happen. So, as part of this package we are putting together, there has to be some accreditation process, some training and some after-market support. We have met with representatives of the irrigation supply industry with a view to supplying better

109 http://www.agric.nsw.gov.au/reader/crc/irrigationcrc.htm

110 Transcript of evidence, p. 596.

111 Transcript of evidence, p. 599.

> after-market support. It is no good just selling the equipment and leaving it there. There has to be an ongoing program to ensure that farmers are using it correctly; otherwise it just defeats the purpose.[112]

5.154 To address some of these issues, the Irrigation Association of Australia has:

- initiated and funded the development of a National Irrigation Training Plan;
- contracted a national education officer to coordinate training and education for the association and the industry;
- established the School of Irrigation, which provides practical training and skills development at a regional level;
- established an internationally recognised certification program for irrigation installers and designers that now underpins access to adjustment and development assistance in a number of States; and
- holds the largest irrigation related trade exhibition and conference in the southern hemisphere every second year.[113]

5.155 The Committee agrees that the development of a national system of training and accreditation of irrigators should be developed in conjunction with industry in order to maximise the benefits of new irrigation technology and techniques. The effective implementation of innovation is the best solution to the supply constraints now facing irrigators.

Recommendation 25

5.156 **The Committee recommends that the Commonwealth Government pursue through the Council of Australian Governments, as part of the National Water Initiative, the development of:**

- **a national training and education strategy for the irrigation sector; and**
- **a national system of accreditation for irrigators.**

112 Transcript of evidence, p. 710.

113 Submission no. 28, p. 109.

Taxation incentives

5.157 Incentives, either directly through subsidies, or indirectly through tax measures, form an important part in shaping public perceptions and facilitating investment. In his evidence, Dr Beare of ABARE told the Committee:

> First of all, what we want to do, to the maximum degree possible, is set up the right investment incentives; to get people investing in the right activities and to provide an incentive, whether it be a subsidy or a tax, so that it makes up the differences between what is right from a private investment point of view and what is going to get the right investment from what we think is a public investment point of view.[114]

5.158 A number of specific issues related to taxation were raised in the evidence presented to the Committee. Some concerns related to tax arrangements for investment in water use efficiency applied to primary producers, and the different rules applying to others. In its submission, Murrumbidgee Irrigation noted:

> At present accelerated depreciation allowances are available to primary producers (individuals and companies) for investment in water efficiency and savings. However, this does not extend to water suppliers. That is, Murrumbidgee Irrigation shareholders are eligible but the Company is not. This acts as a disincentive to larger scale investment in water efficiency and savings. But such investments may have very high social returns.[115]

5.159 Dr Hurditch representing Pratt Water raised the same issue, proposing tax equivalent status for water investment on-farm and off-farm:

> One small but not insignificant issue involves the tax treatment of near-farm infrastructure. At the moment a farmer who invests in water-saving infrastructure can obtain a deduction for that expenditure as a primary producer. However, with certain cooperatives, quangos or quasi public or private water companies or incorporated bodies who have to supply, as Ian said earlier, the near-farm infrastructure to allow that pressurised irrigation, there is a major gap in the tax treatment of that investment which I think

114 *Transcript of Evidence,* p. 390.

115 Submission no. 127, p. 971.

> has been kicked back and forward for five years between various portfolios and Treasury. I believe there would be a very strong case for recommending an equivalent tax treatment for that type of infrastructure; it may need a public ruling or something of that nature.[116]

5.160 Murrumbidgee Irrigation also suggested that the Commonwealth consider tax and other incentives for private investment in projects that directly deliver better river health and increase water use efficiency, including a 150 per cent tax deduction for investment in water savings.[117]

5.161 Councillor Davis, the Mayor of Port Lincoln, made a similar point in his testimony to the Inquiry, urging that any individual or company should have access to the same tax deductions as are available to primary producers for investment in water catchment, storage and delivery. He also argued for an immediate 100 per cent write off of water efficiency investment and the abolition of the GST on water storage and service delivery for domestic users—tanks, pumps, plumbing and fire-fighting facilities.[118]

5.162 An issue facing recently privatised irrigation entities in NSW was raised by Pratt Water in a supplementary submission to the Inquiry. These entities have often inherited from government infrastructure in need of new capital investment. The funds raised by the irrigation entities through shareholder subscription or government grants have, however, been treated as income by the Australian Taxation Office. This poses a dual problem:

(a) Much of the inherited water infrastructure was / is in need of restoration, and had a low capital value that could be depreciated for tax purposes, over a very long period of time. Hence, little or no annual tax deduction would be available, and

(b) The much –needed funds raised by the irrigation entities for specific works designed to enhance water-use efficiency are depleted to the extent of the tax charge on the funds raised.

116 Transcript of evidence, p. 718; see also Pratt Water, Submission no. 178.

117 Submission no. 127, p. 8.

118 Submission no. 149, p. 2; Transcript of evidence, p. 370.

5.163 Pratt Water believes there is a strong case for government intervention to rectify this problem which compounds the lack of access to deductions for off-farm investment. Suggested solutions are:

(a) Deeming by the Tax Office the collective irrigation entities to be primary producers for the purpose of asset depreciation. This measure could be prescribed further to deal specifically with water supply infrastructure assets, and/or

(b) Establishment of rural water infrastructure investment funds, which would enjoy tax-free status with respect to fund receipts (with appropriate prescriptions).[119]

5.164 The Committee notes with approval an announcement in relation to the 2004 Budget which removes the previous discrepancy between on-farm and off-farm investment in water infrastructure.[120] The two forms of investment are, after all, organically linked. The Committee also believes that funds provided by governments, or raised by levy, by irrigation entities for the sole purpose of infrastructure spending should be tax deductible.

5.165 Professor Mike Young proposed a system of levies and rebates as a way of promoting water savings in homes and businesses, and providing money for environmental management. He wrote:

> Imagine what would happen if we valued ecosystems as if they mattered? Imagine what would happen if good environmental managers had the advantage and bad environmental managers got penalised? All we need to do is reverse the onus of responsibility and create opportunity. One simple way of doing this is to raise everyone's income tax by 1 per cent and give this increase back as a rebate to all those who are looking after the environment.
>
> Earn $50,000, pay your $11,380 plus $114, live responsibly and get the $114 back. To get the $114 back, you would need to live in a "five-frog" rated house. A house with a five-frog certificate would have, among other things, smaller roof areas and less paving to avoid excessive run off of rainwater, a rainwater tank, low volume showers, a front-loading washing machine and so on. The choice would be yours.

119 Submission no. 178.

120 Joint media release by the Minister for Revenue and the Minister for Agriculture, Fisheries and Forestry dated 11 May 2004, titled '*Taxation concessions for irrigation water providers*'.

> The same five-frog system could apply to every business. A five-frog small business would need to show that it is water and environmentally efficient. Big firms would need to maintain a full spectrum of leading-edge water and environmental management practices. [121]

5.166 While the Committee is loath to recommend any form of additional taxation, it sees merit in Professor Young's proposal to link water use efficiency in households and businesses to tax rebates. Such rebates would provide a simple and effective incentive to encourage smarter water use.

Recommendation 26

5.167 **The Committee recommends that Commonwealth taxation laws be amended to provide:**

- **that water sold to meet specified environmental objectives, or to an environmental trust, has tax deductible status in the same manner as a charitable donation; and**
- **the establishment of a system of tax rebates to encourage the uptake of water use efficient technology and practices in households and businesses.**

121 Mike Young, '*Imagine if we valued ecosystems as if they mattered—Towards Opportunity and Prosperity*', reprinted from The Australian, 25 March 2002, p. 10, attachment to CSIRO, Submission no. 59.