- water storage requirements;
- land availability in dedicated reuse schemes;
- the environmental effects of effluent use; and
- crop choices.

3.195 Where there are no suitable crops in the vicinity of a sewage treatment plant, the costs of building pipes, together with the ongoing costs of pumping, may defeat the economic viability of a reuse scheme. At the same time, the high overall energy requirements may negate any net environmental benefits.

3.196 The major difficulty with agricultural use is that many crops only require water for a certain proportion of the year and yet treated effluent from municipal schemes is available all year round. This means that alternative uses must be found for the water, or the water must be stored until it is needed again.

3.197 Sugar cane has been identified as a good crop to be grown with reclaimed water. One of the reasons for this is that sugar is a processed product and does not require as high a quality water as that required for crops that are eaten raw. Mr Waldron from Wide Bay Water advises that sugar cane yields for crops grown with reclaimed water increased by approximately 50 per cent per hectare.[98] However, sugar cane only requires water for 5 months and only grows in Queensland and approximately halfway down NSW. This example illustrates the point that agricultural reuse needs to be site specific.

3.198 Mr Waldron identified trees as being one of the best crops for taking up water; and turf farms are useful as they can use water all year round.

3.199 There are other costs for prospective rural water recyclers, who in addition to capital infrastructure requirements to access the water, must also develop an environmental management plan, agreed to by the EPA.[99] While these are clearly a necessary precaution, it is important that procedures to implement agreements are not so onerous as to become a disincentive to using the water.

3.200 If reclaimed water use replaces dependence on stretched river or groundwater systems it is likely there will be environmental benefit. However the danger is that by artificially deflating the cost of reclaimed water to encourage its use, agriculture will expand into regions that would not otherwise be promoted. This can result in increasing sediment and agricultural chemical loads downstream. For example, much of the sediment that is threatening the ecosystems of Moreton Bay, comes from agricultural areas upstream of Brisbane. It is also the case with the Great Barrier Reef where sediment and agricultural runoff is a threat to the health of the reef. Once industries are established it is very difficult politically to shut them down.

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98 Mr Waldron, *Proof Committee Hansard*, Sydney, 18 April 2002, p 202.

99 Mr Waldron, *Proof Committee Hansard*, Sydney, 18 April 2002, pp 202 and 213.

3.201 The Committee is concerned that such increases in negative environmental effects should not be permitted because of an expansion in reclaimed water use. As for any new venture, strict environmental assessment must be done to gauge the sustainability of the project.

3.202 Two agricultural reuse schemes are considered below.

Wide Bay Water, Sugar Cane irrigation

3.203 Irrigation of sugar with recycled water in Hervey Bay, Queensland, offers a good example of how these schemes can operate.

3.204 In 1998 Hervey Bay became the first region in Australia to reuse almost 100 per cent of its wastewater thereby eliminating the cost of providing tertiary sewage treatment and an ocean outfall.[100] The water is used to irrigate cane farms, golf courses, a turf farm, airport and tea tree plantation, and more than 100 hectares of pasture and native trees.

3.205 Wide Bay Water built large storage dams to disinfect the secondary treated effluent by exposing it to 30 days of sunlight.[101] This saved on the cost of installing tertiary treatment systems at the sewage plant.

3.206 The greatest cost in establishing the Wide Bay Water effluent reuse scheme was the capital cost to introduce it. After research showed that sugar cane would be the most suitable crop to make use of the effluent, approximately 50 per cent of the capital works cost was paid by the sugar industry. The State Government contributed funding and the Hervey Bay City Council paid approximately one-third of the cost. For the first 10 years of the scheme, the sugar industry pays only operational costs for the water. At the end of this period, a pricing structure to take account of such things as depreciation will be worked out.

3.207 Mr Waldron made the point that although Wide Bay Water incurs higher unit costs per megalitre of treated sewage as a consequence of the reuse scheme, Hervey Bay has not attracted the high cost to the environment that would have been incurred by dumping effluent into the sea.[102]

Virginia Pipeline, South Australia

3.208 The Committee visited the Bolivar Wastewater Treatment Plant that treats approximately 55 per cent of Adelaide's wastewater before discharging it to Gulf St Vincent. As part of the Environment Improvement Program to address the quality of effluent discharges to Gulf St Vincent, the plant was upgraded.

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100 Wide Bay Water, *Submission 20*.

101 Mr Waldron, *Proof Committee Hansard*, Sydney, 18 April 2002, pp 205 and 211.

102 Mr Waldron, *Proof Committee Hansard*, Sydney, 18 April 2002, p 202.

3.209 Effluent that has undergone secondary treatment is stored in lagoons for a minimum of 16 days and is then further treated in a Dissolved Air Flotation and Filtration (DAFF) plant. It is then piped to the vegetable growing region of the Northern Adelaide Plains for use by the growers whose demand for groundwater was exceeding the natural recharge rate of local aquifers in the area. It is anticipated that 50 to 70 per cent of Bolivar's output will eventually be used for irrigation.

3.210 Currently growers have contracted for 19,658 megalitres of treated effluent per year.[103] Actual use is dependent on the facilities in place to utilise the product plus climatic conditions. Since the scheme commenced, the volumes of water used have been:

1999/2000	6,446 ML
2000/2001	10,327 ML
2001/2002 (to Feb 2002)	7,017 ML

3.211 The scheme is also testing an aquifer storage and recovery initiative where excess water that is not required by the growers, for example in winter, can be stored in aquifers to be pumped to the surface when required.

3.212 The pipeline cost $22 million, $7.15 million of which was provided under a BOOT[104] contract with SA Water that expires in January 2018. The Building Better Cities program contributed $8.15 million and SA Water $6.7 million. The project has more than 240 customers, who pay 9.5 cents per kilolitre in summer, 7.5 c/kL in shoulder and 5.0 c/kL in winter under their initial contracts. Future contracts will be at market rates.

3.213 Because much of the produce of the area is to be exported, it was imperative that stringent standards were adhered to in relation to the water so as not to jeopardise overseas markets for product from the area. The water supplied is rated Class A Reclaimed Water and complies with the national guidelines for the use of reclaimed water making it safe for direct irrigation on food and salad crops. Comparisons show that the reclaimed water is of a higher, more reliable quality than most surface waters used in irrigation anywhere in Australia.

3.214 Continuous monitoring of water quality is a feature of the scheme, which also demands that the health authorities be notified if there is any disruption to the water treatment process and immediate shutdown of the supply of water until normal operations resume.

3.215 To safeguard the region's soils, research and education programs have commenced with the support of the Department of Primary Industries and Resources

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103 SA Water, *Submission 78*.

104 Build, Own, Operate, Transfer

SA, the University of Adelaide, the Horticulture Research Development Corporation and the Natural Heritage Trust.

3.216 To participate in the scheme, growers must use good irrigation practices and soil management especially as the salinity of the reclaimed water is higher than that of the groundwater in the area. A best practice farming program has been started which aims to assist growers improve their performance. It involves workshops on soils, irrigation techniques, salinity and plant nutrition and demonstrations of techniques to achieve improved but sustainable crop growth and yields.

3.217 In recognition of potential environmental issues, the scheme is subject to a South Australian Environment Protection Agency license and an authorised irrigation management plant that deals with the issues of environmental monitoring.

Sewer mining

3.218 As previously mentioned, one of the limiting factors in establishing markets for reclaimed water is the proximity of users of the water to the sewage treatment plant. This difficulty can be overcome by a technique known as sewer mining, which involves taking raw sewage from the sewer and treating it on-site in a miniature version of a treatment plant. However, the unit cost of treating water in this manner is higher than at larger scale treatment plants, and higher too than the cost of potable water. In these cases there is no incentive to move to sewer mining as a source of water supply unless water restrictions imposed during hot dry periods make water unavailable,[105] or the costs of potable water increase significantly.

3.219 The Committee inspected two of these sewer mining facilities: one in Canberra at Southwell Park and the other at Kings Domain in Melbourne. Both utilised the latest technology to produce a high quality water suitable for watering playing fields and parks close to the plants.

Southwell Park watermining facility

3.220 The Southwell Park Watermining Facility is a cut-down version of Canberra's major sewage treatment plant, the Lower Molonglo Water Quality Control Centre (LMWQCC), and it is operated remotely from that plant. The local electricity and water authority, ACTEW, chose the site based on the stable sewage supply from the local suburb, and the close proximity of playing fields that could be irrigated with the reclaimed water.

3.221 From the outside the plant looks quite small, and in fact it was designed to be very visually unobtrusive. However, it is much larger inside as the bulk of the development is underground. An additional part of keeping the plant unobtrusive is the use of air scrubbers which ensure that no odours reach the outside.

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105 CSIRO, *Submission 47*, p 54.

3.222 This facility cost $2 million and a large part of the expense was from the excavation required to place the majority of the facility underground. Production costs for the reclaimed water are approximately 50 per cent higher than for potable water available through the mains.[106]

3.223 The treatment process in the facility works as follows:

- sewage is taken from the sewer;
- a screen keeps the larger solids out of the treatment system;
- lime is added to assist treatment;
- smaller solids are separated from the water by allowing them to settle;
- all the solids are returned to the sewer;
- soluble impurities and ammonia are removed by biological treatment;
- microfiltration removes fine solids and bacteria (the first health protection barrier); and
- disinfection kills any remaining bacteria (the second health protection barrier).

3.224 All solids are returned to the sewer to be treated at LMWQCC, so there is no solids treatment and disposal at Southwell Park.

3.225 The watermining facility provides water of a high enough quality for irrigating the playing fields of Southwell Park. It is also of high enough quality to be potentially used around the home for garden watering or car washing.

3.226 Protecting the health of the public was a major consideration in the design and operation of the facility and the plant uses two disinfection processes working in combination, which satisfy the strict standards of the ACT Department of Health.

3.227 ACTEW identified the need for steady reuse opportunities as a significant barrier in the proliferation of sewer mining schemes. When reclaimed water is used for irrigating sports fields it is not needed during winter or when it rains. The reclaimed water could be stored in underground tanks, but in the case of the Southwell Park facility, such tanks were prohibitively expensive to construct. When the Committee visited the site in winter, sewage continued to be treated but the cleansed water was being returned to the sewer to enable the equipment to continue to run even though the reclaimed water was not needed.

3.228 ACTEW subsidises the cost of this project as a demonstrator to encourage uptake of reclaimed water use.

106 CSIRO, *Submission 47,* p 54.

King's Domain sewer mining

3.229 The Committee visited Melbourne Water's sewer mining trial in the King's Domain gardens in Melbourne. The aim of the trial is to demonstrate that water from sewers can be successfully recycled and used to irrigate parks and gardens. It is also expected to provide useful information that will guide decisions on how Melbourne Water will achieve its target for recycling 20 per cent of its water.

3.230 The demonstration plant was particularly configured to both reduce nutrients in the recycled water to prevent pollution of Melbourne's waterways and Port Phillip Bay, and to control the salt and major ion levels that could harm the botanical assets of the gardens.

3.231 The on-site recycling plant is housed in a portable shipping container. Raw sewage is pumped from the sewer main, screened and fine screened with all particulates larger than 3 mm returned to the sewer. A membrane bioreactor reduces organics and removes particles in the product water down to 0.04 micron using an aerobic biological treatment process coupled with an ultrafiltration separation membrane. The product water is then preconditioned for a reverse osmosis treatment by filtering, UV disinfection and descaling. Reverse osmosis reduces nutrients, pathogens and salts to acceptable levels.

3.232 The plant can produce 30,000 litres per day of high quality recycled water, at a cost of 1.4 cents per litre. The recycled water, which is used to irrigate one hectare of the King's Domain gardens, exceeds Victoria's Class A requirements, and makes it suitable for high contact end uses, such as residential garden watering.

3.233 These two examples of sewer mining show that there is a clear potential to substitute potable water with recycled water on a large scale, but there are obvious cost constraints that need to be addressed.

Aquifer Storage and Recovery

3.234 A technique with growing use in Australia is that of Aquifer Storage and Recovery (ASR), which involves injecting water (often either stormwater or recycled water) back into the underground aquifers using one of three main methods: injection wells, infiltration basins and bank filtration.[107] The water remains in the aquifer until it is needed, whereupon it can be pumped back out again.

3.235 ASR offers two particular advantages to the practical problems that occur in storing water from recycling operations, or harvested from stormwater. Firstly, where the water source is recycled water, utilities have the problem that the supply of recycled water from a city is almost constant, but agricultural uses for that water vary across the year:

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107 Department for Water Resources, South Australia, *Aquifer Storage and Recovery in South Australia*, Fact Sheet 2.

> The effluent is there 365 days a year. Irrigation is not required for a lot of these sorts of crops for significant proportions of the year, either because of natural rainfall or because the climate is not good enough to grow the crop. For example, the irrigation season for grapes is very short but the effluent is there the whole time, so ASR and other things have to be looked at in terms of storing the winter flows so that they can be used more in the summer.[108]

3.236 Secondly, in parts of Australia such as Perth with a 'Mediterranean climate' where most of the rainfall occurs in short intense events, huge above ground rainwater tanks would be required to store the water. There are obvious advantages in using natural aquifers to store the water, instead of tank construction (although this is less of an issue in south-eastern Australia where the rainfall occurs in numerous smaller events, making above-ground storage much more cost effective).

3.237 In either case, ASR also has the capacity to purify water as well as store it. Research has found that many pathogens that survive the disinfection process at water treatment plants quickly die-off once introduced into the groundwater system.[109]

3.238 ASR is increasingly being used in South Australia with fifteen projects currently in operation using around one gigalitre, with a further nine under consideration.[110]

3.239 The widespread use of ASR in South Australia is also likely to ease the pressure on aquifers in the Virginia region (referred to previously) where the extractions for irrigation had reached unsustainable levels leading to a cone of depression in the aquifer that was not being replenished, with groundwater receding to 55 metres below its natural level. Injecting class A treated water back into the aquifer therefore both relieves some of the demand pressures from irrigation and prevents discharge of nutrient rich wastewater to the sensitive Gulf St Vincent.[111]

3.240 Ultimately the project to store reclaimed water from the Bolivar Wastewater Treatment Plant aims to encompass the entire winter excess of 10GL[112] with the long term potential to store many times this amount.[113]

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108 Mr Ringham, *Proof Committee Hansard*, Adelaide, 30 April 2002, p 484.

109 Government of South Australia, *Aquifer storage and recovery trial using reclaimed water*, briefing sheet, p 4.

110 Government of South Australia, *Submission* 51, p 18. See also *Proof Committee Hansard*, Adelaide, 30 April 2002, Mr Allen, p 461.

111 Department for Water Resources, South Australia, *Aquifer Storage and Recovery in South Australia*, Fact Sheet 2.

112 Department for Water Resources, South Australia, *Aquifer Storage and Recovery trial using reclaimed water*, Fact Sheet 2.

113 Department for Water Resources, South Australia, *Aquifer Storage and Recovery in South Australia*, Fact Sheet 2.

Industrial reuse

3.241 Industrial use of reclaimed water can overcome the difficulties associated with agricultural reuse: it is used year round and concentrates use in one facility.

3.242 Thirty-two per cent of current water reuse occurs in the mining industry, with a further 5 per cent in the electricity and gas industry; 3 per cent in the metals industry; and 3 per cent in other industries.[114] In many instances, the company will fund its own treatment plant so that it can reuse water on site.

3.243 In relation to Sydney Water's industrial reuse programs, Ms Howe told the Committee:

> as far as major use of effluent from a sewage treatment plant, that there are two different types of programs. Steel making is of course a big one. We have a 20-million litre per day contract signed with BHP in the Illawarra to recycle water. It will kick in in 2003. Paper manufacturing and cogeneration facilities are prime candidates for large volumes of recycled water and offer significant opportunities. Many times they are cost effective in their own right so they happen.[115]

3.244 As always proximity can present a barrier to reclaimed water uptake.[116]

3.245 The Committee received little information on industrial reuse around Australia, however one example is at Luggage Point in Brisbane.

Luggage Point Wastewater Treatment Plant, water reclamation project

3.246 BP Oil's Bulwer Island Refinery in Queensland underwent a $500 million upgrade to produce low sulphur fuels which had the effect of increasing its daily water demand from five megalitres to ten megalitres. To cater for this increase, Brisbane City Council constructed a 14 megalitres per day dual membrane filtration plant treating secondary effluent from the Luggage Point Wastewater Treatment Plant.

3.247 The company now uses the reclaimed water in cooling systems, fire water and for steam generation in the refinery, resulting in a major reduction in its demand for potable water. Brisbane City Council is considering expanding the scheme to other users in the future.

Barriers to water reuse

3.248 The main barriers to water recycling identified by witnesses are cost, price differentials, health issues, public acceptance and a lack of leadership. However, it is also relatively early days so far as the various State water recycling strategies are

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114 CSIRO, *Submission 47*, p 59.

115 Ms Howe, *Proof Committee Hansard*, Sydney, 18 April 2002, p 183.

116 CSIRO, *Submission 47*, p 54.

concerned and use of reclaimed water is set to significantly increase over the next few years.

3.249 It is self evident that there is enormous potential in Australia to improve on our current levels of reused water from urban centres for domestic, irrigation and industrial uses. At the moment though recycling is currently limited to niche markets such as market gardens, land utilised for recreation and some industrial processes. Limiting factors such as prevailing weather conditions, location of land within catchments and more viable economic alternatives for customers also limit the ability of water businesses to pursue reuse.[117]

Cost and price differentials

3.250 As this chapter has shown, the technology to recycle water exists but in some circumstances it is very expensive. Recycled water cannot compete on price with users who are currently using either groundwater or stream water because those sources of water are so cheap.[118] On top of the treatment costs are the relatively high costs of distributing and storing the treated effluent.[119]

3.251 Mr Harvey from VicWater identified the price differential between potable water and treated effluent, as well as security of supply, as being the two most important influences on water reuse. Without a real or significant price differential, there is little incentive to take up reuse schemes on a commercial basis as most schemes involve some infrastructure costs to establish.

Lack of understanding

3.252 Current arrangements relating to supply of water and wastewater services for towns and cities are fundamentally focussed on ensuring the health of populations. It is paramount that these health considerations are maintained even as there are increasing moves towards greater water reuse. Even when effluent is treated to a high quality, health authorities and the community need to be satisfied that adequate protection of public health is being taken care of before extensive reuse will be possible.[120]

3.253 However, the community does not have a good understanding of the ability to treat used water to produce high quality water that can be safely used for most purposes up to and including drinking:

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117 The Australian Urban Water Industry, 2001 WSAA*facts*, Water Services Association of Australia, p 41.

118 Mr Young, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 330.

119 Mr Wills, *Proof Committee Hansard*, Adelaide, 30 April 2002, p 452.

120 The Australian Urban Water Industry, 2001 WSAA*facts*, Water Services Association of Australia, p 41.

> The community has little knowledge of water quality and treatment. We don't even know the difference between wastewater and effluent or a bacterium and a virus.[121]

3.254 In many parts of Australia people already drink effluent when their water supply is downstream of a sewage treatment plant, but this relationship is not given prominence, and there is not sufficient understanding of the water cycle to bring it home to many:

> I think there is a sort of wilful blindness thing; we do not want to think too much about that. The concentration tends to be on recovering natural flows from dam storages and other diversions rather than treating wastewater to potable standards. I think we are probably 40 or 50 years ahead of getting to that culturally. … I would have thought in Australia now there is generally an acceptance that we have sufficient water—fresh potable supplies, whether partially treated or not. There are lots of other things we should be doing to cease using potable or to improve our use of wastewater so that we cut down potable use.[122]

3.255 People's lack of understanding of water issues is on many occasions reinforced by the media. The Committee was told that an ill-informed media pounce on recycling opportunities and can often 'kill off' projects[123] and the evidence of sensational reporting of water reuse is not difficult to find. The Sunshine Coast Environment Council notes that:

> water quality issues have the potential to form strong, negative headline material, which has great attraction to the media. It is easy to generate emotive, scaremongering headlines. The water industry does little, if anything, to counteract this; it is at best reactive, rarely proactive. It sometimes gives the impression of being 'caught out'.[124]

3.256 Mrs Simpson suggests that there are gaps in our knowledge, especially about health issues. As a consequence, water managers find it difficult (and are therefore reluctant) to explain hazard, risk, risk assessment and risk management to the community.[125]

3.257 However, an understanding of risk and the management of it, is a fundamental part of assessing the feasibility of reuse opportunities. The conventional approach is one of risk aversion that ensures potable water is used for all purposes, used once and then disposed. This approach may not provide the best allocation of resources. According to the Australian Water Association:

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121 Sunshine Coast Environment Council, *Submission 17*, p 2.

122 Mr Bartley, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 319.

123 Brisbane City Council, *Submission 28*.

124 Sunshine Coast Environment Council, *Submission 17*, p 2.

125 Sunshine Coast Environment Council, *Submission 17*, p 3.

> If we treat all "potable" water supplies to ensure the maximum possible reduction of risk to public health, including addressing emerging concerns such as endocrine disruptors, then we run the risk of "over-treating" some 95% of the water. In the interests of sustainability, we have to ask whether this sort of expenditure of limited funds will result in the greatest net public health benefit.[126]

3.258 By understanding the risks associated with using different sources of water, there is greater opportunity to manage those risks and widen the choices available in water management. A corollary to this is the necessity of understanding the risk factors associated with innovation, which range from financial risk, through operational risk to, critically, human health and environmental risk lest the requirement to demonstrate an approach should get ahead of the science.[127]

Education

3.259 Improved urban water management will depend largely on the implementation of new programs and initiatives designed to increase individual and institutional awareness of water usage. Mrs Simpson, of the Sunshine Coast Environment Council (SCEC), referred to the Australian community's poor understanding of water matters, a factor that constitutes one of the greatest barriers to the adoption of more sustainable methods of managing water.

3.260 This 'knowledge deficit' also encompasses professionals such as government planners, architects, builders, and even many water managers. According to the Sunshine Coast Environment Council:

> Much of what we think we know is negative and we are often wrong. This is because we haven't been taught—it has never been part of a school curriculum and is covered in only a very limited number of specialised University courses. This lack of knowledge extends to senior members of Government Departments and elected representatives of the community who make decisions about water issues.[128]

3.261 There is a widespread lack of understanding of the natural water cycle, of the effect that urban water systems have on the environment, and of the need to manage water more sustainably. As Senator Tierney noted:

> The average person turns on a tap and clean water comes out, and they press a button on the floor and it goes away. It is not an issue that is there at the centre of their lives.[129]

3.262 In fact, the general community seems oblivious to the subject.[130]

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126 Australian Water Association, *Submission 41*, p 2.

127 CSIRO, *Submission 47*, p 9.

128 Sunshine Coast Environment Council, *Submission 17*, p 2.

129 *Proof Committee Hansard*, Brisbane, 4 April 2002, p 126.

3.263 A notable contrast is discernible between the attitudes of urban and rural dwellers towards water conservation:

> In an agricultural community, every time it rains people know the tanks are being filled. They are more aware of it than are people in the city. People in the city believe, just as milk comes out of a carton, water comes out of the tap and that's it.[131]

3.264 The negative consequences of little knowledge, scant incentive to learn and a fear of the unknown in the sphere of urban water management are that:

> An uninformed community will have poorly formed opinions. This impedes change; the community has become dependent on water managers for provision of its water and management of its waste; and water managers presume the community is incapable of taking responsibility for itself.[132]

3.265 The so-called 'community' that needs to be educated about urban water management is not a single entity, but rather a four-part one: the broad community; the developer community; the design community; and the officials responsible for ensuring the implementation of water sensitive urban design (WSUD) policies and practices.[133]

3.266 Dr Essery, of the New South Wales Department of Land and Water Conservation, is convinced that Australians must be provided with both the information and the tools necessary to enable them to make informed water use choices and decisions. This is crucial to the entire integrated water cycle planning approach.[134] Germane to this approach is a wide-ranging educational undertaking supported by an information system containing the latest international and Australian water industry data.

Information systems

3.267 Central to education are the issues of the amount, the quality and the transfer of information on water use and management. The focus and effectiveness of urban water systems are also important elements in the water usage debate. Although the National Action Plan for Salinity and Water Quality (NAPSWQ), for example, places a strong emphasis on disseminating information about water use, its urban coverage is selective. The NAPSWQ's programs include the rural but exclude the major coastal cities within its regions.[135]

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130 Australian Conservation Foundation, *Submission 68*, p 6.

131 Mr Boyden, *Proof Committee Hansard*, Sydney, 18 April 2002, p 166.

132 Sunshine Coast Environment Council, *Submission 17*, p 2.

133 Knox City Council, *Submission 70*, p 25.

134 Dr Essery, *Proof Committee Hansard*, Sydney, 18 April 2002, p 187.

135 Ms Hunt, *Proof Committee Hansard*, Canberra, 22 March 2002, p 9.

3.268 Professor Troy, of the Australian National University's Centre for Resource and Environmental Studies, referred to an 'alarming' absence of spatially based information on water consumption, sewage production and stormwater run-off. He argues that it is possible to collect such information, the need for which is especially strong in urban areas, by preparing regular, spatially disaggregated statements of water consumption. Such data could be used in future water management planning.[136] One leading water industry body—the Australian Water Association (AWA)—is concerned about the serious absence of basic technical data on urban water matters (for instance, comprehensive plans for the design of water reticulation systems); the availability of little empirical information on domestic water use; and the few sources containing this data.[137] Environment Business Australia's Mr Crockett, however, stated that a substantial body of knowledge relating to urban water management exists. He attributed the failure to use it more judiciously to the absence of an integrated national urban water strategy.[138]

3.269 Mr Ryan, of Perth's Eastern Metropolitan Regional Council, pointed to the lack of relevant quantitative data available for water planning in his area.[139] The Secretary of the Perth Urban Hills Land Conservation District Committee, Mr Hill, also referred to the poor standard of current information on the city's water quality.[140] Western Australia's Water and Rivers Commission disputed this, however, describing its comprehensive water database as a sound source of baseline material.[141] Information provided to the Commonwealth Government on water matters is not, in the AWA's view, always as comprehensive or representative of industry opinion as it could be. To address this, the AWA advocated closer and more regular government consultation with industry peak bodies.[142] The performance of such organisations in countering ill-informed media reports and information on water matters could also be improved.

3.270 A more coordinated approach to gathering, collating, processing, and sharing information between and within jurisdictions is essential to improved urban water management. Queensland's water recycling strategy—the first initiative of its kind in any Australian state—is an example of this form of information transfer. The Environmental Protection Agency (Queensland) (QEPA) developed this strategy in conjunction with industry over a three-year period during which past and current practice were investigated and gaps in present knowledge and patterns of water usage

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136 Prof Troy, *Proof Committee Hansard*, Canberra, 22 March 2002, pp 27–8, 29; *and* Centre for Resource and Environmental Studies, *Submission 50*, p 7.

137 Mr Lehmann, *Proof Committee Hansard*, Sydney, 18 April 2002, p 217.

138 Mr Crockett, *Proof Committee Hansard*, Canberra, 23 May 2002, p 575.

139 Mr Ryan, *Proof Committee Hansard*, Perth, 29 April 2002, p 403.

140 Mr Hill, *Proof Committee Hansard*, Perth, 29 April 2002, p 442.

141 Water and Rivers Commission, *Submission 12a*, p 1.

142 Mr Lehmann, *Proof Committee Hansard*, Sydney, 18 April 2002, p 216.

identified.[143] The need for a more sustained governmental and community effort has been emphasised by Mr Bruce of the Townsville City Council (TCC). In the case of stormwater, for instance:

> Managing stormwater requires an integrated and collaborative approach … This may sound logical, but it is not necessarily well understood … Trialing difficult techniques and technology and sharing information on how to manage stormwater quality are of major benefit to all.[144]

3.271 The Townsville City Council conducted an urban stormwater quality management workshop in March 2001 aimed at promoting discussion and increasing knowledge and understanding of the subject. In individual states a clear determination is apparent at the local government level to ensure that 'good information [gets] out there so we can learn from each other's successes and not by our own mistakes'.[145] On a national scale this function is performed to a degree by the Australian Water Association. The AWA, comprising some 3,500 individual and 500 institutional members, is primarily concerned with urban water and wastewater issues. Its emphasis is on the exchange of information and dialogue, rather than on reflecting all the views of a highly diverse membership.[146] Information dissemination is also a major task of the Water Services Association of Australia (WSAA), a twenty-one member body formed in 1995 to represent Australian urban water industry interests.[147]

3.272 A successful national initiative in sharing urban water management information and expertise is the WaterWise program in which all states (except South Australia) participate.

3.273 WaterWise Queensland was formed in 1993 by that state's Department of Primary Industries and local authorities as a general and specialised education initiative. Its information programs have included training courses for members of Queensland's Master Plumbers, Master Builders, and Nursery Industry Associations, as well as caravan industry stakeholders.

3.274 There is other evidence of fruitful information sharing at the local government level and between institutions and individual water management specialists. The Local Government Association of Queensland Inc has noted the increasing promotion by local councils of water demand management in the community.[148] The Brisbane City Council (BCC), as part of the South Queensland Regional Organisation of Councils, undertakes a prominent role in water saving and water efficiency.[149] An important

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143 Mr Wiskar, *Proof Committee Hansard*, Brisbane, 4 April 2002, pp 138–9.

144 Mr Bruce, *Proof Committee Hansard*, Townsville, 3 April 2002, p 80.

145 Cr Johnstone, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 362.

146 Mr Davis, *Proof Committee Hansard*, Sydney, 18 April 2002, p 214.

147 Water Services Association of Australia, *Submission 55*, p i.

148 Local Government Association of Queensland Inc, *Submission 56*, p 1.

149 Mr Woolley, *Proof Committee Hansard*, Brisbane, 4 April 2002, pp 595–6.

means of achieving this is to provide access to the most current and comprehensive sources of water management information.

3.275 Representatives of Environment ACT referred to a Canberra example of government-community-private sector cooperation in creating a wetland. The knowledge and experience gained has been shared with other urban jurisdictions, and employed in establishing and improving wetlands in Melbourne, Brisbane and Adelaide.[150] Information transfer is also occurring between major water provision stakeholders and key research organisations in the field. The BCC, for instance, works closely with urban water experts at the University of Newcastle, the Institute for Sustainable Futures at the University of Technology, Sydney, and the CSIRO's Urban Water Program.[151]

Problems with information exchange

3.276 Despite the interchange taking place, the process of collaboration is being handicapped by the absence of 'formalised structures',[152] as well as an unsatisfactory amount of direct cooperation between the Commonwealth and state governments and local authorities. Councillor Ferrara, of the Western Sydney Regional Organisation of Councils (WSROC), emphasised 'the complexity of the issues involved, and the need for better coordination and integration of information gathering and distribution, research, planning, legislation and expenditure'.

3.277 The need for an Australia-wide water management approach resting on more effective use of existing information and improved education has been explained by Mr Crockett:

> If we had a clear statement of what constitutes an agreed national strategy for achieving ecologically sustainable development in the urban water context and more broadly, it would be a challenge to get people to apply this knowledge. Often the people who have the most knowledge are those who are too busy or otherwise not capable of influencing decision makers. The answer is that we all have to work together in an integrated way and no one discipline has an adequate knowledge to make these things advance.[153]

Conclusions

3.278 More effective Commonwealth Government coordination of water information gathering and transfer is highly desirable. This could best be achieved if the state and local tiers of government cooperate with their federal counterpart to establish mechanisms aimed at ensuring efficient collection, collation, processing and sharing of information within and between jurisdictions.

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150 Ms Fowler and Mr Wilkinson, *Proof Committee Hansard*, Canberra, 23 May 2002, p 556.

151 Mr Woolley, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 598.

152 Mr Wiskar, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 145.

153 Mr Crockett, *Proof Committee Hansard*, Canberra, 23 May 2002, p 575.

Government

3.279 According to Mr Oliver and Mrs Simpson of the Sunshine Coast Environment Council, the 'dialogue' about water usage and infrastructure has for too long been unsatisfactory,[154] chiefly because the issue of water quality is not well understood by Australians.[155] While there is no single solution to this problem,[156] governments, community groups and individuals, educational institutions and industry all have a role to play in increasing understanding of water management through education.

Commonwealth

3.280 Elements of the Council of Australian Government (COAG) National Water Reform Framework (1994)—the principal vehicle for Commonwealth water reform policies[157]—and the National Water Quality Management Strategy (NWQMS), display a substantial commitment to water management education. The example of Landcare, which has demonstrated a capacity to alter community attitudes to conservation, is an instructive one.[158] However, financial and technical problems have emerged in community group implementation of the NWQMS initiatives.[159] The National Action Plan for Salinity and Water Quality and the Natural Heritage Trust (NHT) reflect a strong Commonwealth recognition of the significance of education in relation to water resource management. The NHT funded River Murray schools education program, introduced in 2001 has the chief aim of educating school students about River Murray region water issues.[160] Yet the NAPSWQ compass is selective. It excludes the main coastal cities and its remit should clearly be expanded.

3.281 The NHT-funded WaterWatch program consists of some 50,000 members across Australia. Its regional facilitators work with community groups and schools to improve awareness of water quality; to train individuals in water quality monitoring techniques; and to quantify and record the results, which are made available through the Internet to interested bodies and individuals.[161] WaterWatch South Australia grew from ten groups in 1993 to over 260 in August 2001, when they were engaged in monitoring 565 sites in seven major catchments across the state.[162]

3.282 An example of a WaterWatch awareness-raising initiative is the Australian Junior Water Prize, produced in conjunction with the AWA and awarded annually to

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154 Mr Oliver, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 128.

155 Mrs Simpson, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 125.

156 Mr Reynolds, *Proof Committee Hansard*, Canberra, 22 March 2002, p 14.

157 Victorian Water Industry Association, *Submission 42*, pp 4–5.

158 Ms Hunt, *Proof Committee Hansard*, Canberra, 22 March 2002, pp 8–9.

159 CRC for Freshwater Ecology, *Submission 52*, p 4.

160 Mr Charter, *Proof Committee Hansard*, Adelaide, 30 April 2002, pp 487–8.

161 Mr Hooy, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 589.

162 Government of South Australia, *Submission 51*, pp iv and 16.

an individual or a secondary school for an outstanding water science project or piece of research.[163]

3.283 WaterWise, contrary to some received opinion, is more than a school education program.[164] It provides guidance concerning the most efficient use of resources and concentrates on 'the educative battle' of altering the mind-set of local government officials responsible for delivering water related services.[165] In Queensland, for example, the WaterWise campaign, launched in late 1992, now reaches 97 per cent of the population. Water usage is monitored by WaterWise through evaluations of specific programs and via studies of overall demand trends.

3.284 The Commonwealth is also in a position to address through education and legislation the issue of inadequate current labelling practices for household products destined ultimately for discharge to the sewer. Better identification of product content and improved product description—similar to that employed for food items—would enable Australians to make more informed purchasing decisions, thus increasing the number of sustainable water reuse options.[166] Another desirable innovation in water industry education and practice would be the introduction of national standards of design and manufacture for items such as septic tanks. This would result in a more consistent approach to construction and better use of water as a natural resource.[167]

State

3.285 A good example of the potential for state education programs is provided by the QEPA. Its initiatives include organising seminars for members of peak industry bodies; in partnership with local governments offering locally based seminars for the construction industry; and devising water advisory and practice manuals in collaboration with groups such as the Hotel Engineers Association of Queensland.[168] The Committee considers these types of programs to be essential to achieving sustainability in urban water matters. As to the success of the QEPA's schools program, Mr Wiskar stated that in schools exposed to QEPA water education courses, water use has declined.[169] The NSW WaterWatch network incorporates Catchment Crawls into their program: environmental experts take WaterWatch volunteers from the top of a catchment, working their way to the bottom carrying out litter surveys, site and habitat assessments, water quality monitoring and water bug surveys.[170]

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163 Leaflet, *The Australian Junior Water Prize*.

164 Mr Woolley, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 602.

165 Mr Wiskar, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 140.

166 Robert A. Patterson (1999), *Reuse Initiatives Start in the Supermarket*, NSW Country Convention, Northern Group, Institution of Engineers Australia, Armidale.

167 Mr Bartley, *Proof Committee Hansard*, Melbourne, 23 April 2002, pp 316–17.

168 Mr Wiskar, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 138.

169 Mr Wiskar, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 143-4.

170 Sunday Telegraph, *Crawl is key to health*, 20 October 2002, p 107.

3.286 In South Australia several education projects are in place. The South Australian Government's principal water quality education campaign is Watercare. It comprises Watercare I and II (primary school students) and III (Certificate of Education students) and includes subjects in the fields of natural resources management and environmental science.[171] However, the Committee notes that overall, the South Australia Water Corporation, which determines the amount of money allocated for water use education, allocates less than 0.02 per cent of its budget to educating South Australians about water usage.[172]

3.287 In Victoria, VicWater's extension activities include its work as a member of the Victorian Water Week Coordinating Committee.[173] In July 2002, the Western Australian Government announced that a number of community forums would be convened across the state to discuss Western Australia's water situation, culminating in a Water Symposium held at Parliament House, Perth, in October.[174]

Local

3.288 Western Sydney Regional Organisation of Council's submission emphasised the central role that local government can play in providing a forum for environmental cooperation in a regional context.[175] Mr Gellibrand, of Sydney Water, indicated how education could assist in solving the key problems bedevilling a major water management area—stormwater:

> Sydney Water has responsibility for some stormwater management inside Sydney. Outside of that, the responsibility is central to local government. From our experience in dealing with local government, the level of expertise and performance in managing stormwater is quite variable: some councils are cutting-edge experts that are leading the debate and the development of water sensitive urban designs while others do not acknowledge it. So you have quite significant extremes. Certainly from my experience, the limited number of professionals move from council to council according to the most interesting thing happening and the best paid jobs, but they do not seem to be becoming more numerous. So there is a shortage of properly trained and expert people in stormwater management.[176]

3.289 A culture prevails in many local councils whereby the option of treating stormwater for reuse is rejected in preference to disposing of it as quickly as

171 Government of South Australia, *Submission 51*, p 16.

172 Ms Howe and Mr Williams, *Proof Committee Hansard*, Adelaide, 30 April 2002, pp 481–2.

173 Victorian Water Industry Association, *Submission 42*, p 11.

174 Sunday Times, Perth, *Water tax may hit $205*, 13 Oct 02, p 21.

175 Western Sydney Regional Organisation of Councils Ltd, *Submission 62*, p 11.

176 Mr Gellibrand, *Proof Committee Hansard*, Sydney, 18 April 2002, p 171.

possible.[177] A similar perception often characterises local authority attitudes to the utilisation of technology in water management. As Associate Professor Wong argues:

> We talk about the technology being there and perhaps … being able to convince all councils to start to change their planning requirements and planning law. What will still be required is sufficient funding to ensure that there is capacity within councils to understand the technology and to assess development based around the new technology. So perhaps, in one sense, this is about the dissemination of the technology that we have, and the handful of really good consultants that we have, back to council offices. I think that is going to be the one issue that will ultimately lead to a widespread adoption. It is about providing councils with the capacity to review these things.[178]

3.290 The optimal use of technology will indeed be essential to successful future water management, but only as part of well-informed, more broadly-based solutions.[179]

3.291 Mr Baltais, representing the Wildlife Preservation Society of Queensland (Bayside Branch), referred to a lack of knowledge of pollutants on the part of local council officers and builders, and to a failure to appreciate the importance of environmental monitoring of development projects.[180] To emphasise the degree to which litter is a community problem, the City of Port Phillip aims to empty its gross pollutant traps during busy parts of the day so that people can observe what is collected by these units and thus better comprehend the consequences of littering.[181]

3.292 Local government consultation with community groups as a vehicle for educating people about water matters has resulted in a measure of success. Through groups of volunteers the Townsville City Council pursues educational activities dealing with water quality issues as part of its obligations under state government environmental legislation.[182] Similarly, the Brisbane City Council has instituted an 'Integrated Water Management Strategy' to better focus its water administration and education efforts.[183]

3.293 The City of Port Phillip has taken this further as one of five Australian local councils to participate in the pilot Water Campaign implemented by the International Council for Local Environmental Initiatives. It has also established the Sustainable Living at Home Program to facilitate education in fields such as water conservation

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177 Mr Reynolds, *Proof Committee Hansard*, Canberra, 22 March 2002, p 12.

178 Prof Wong, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 276.

179 Mr Russell Cadman, *Submission 22*, p 10.

180 Mr Baltais, *Proof Committee Hansard*, Brisbane, 4 April 2002, pp 110–11.

181 Cr Johnstone, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 358.

182 Mr Bruce, *Proof Committee Hansard*, Townsville, 3 April 2002, pp 83–4.

183 Brisbane City Council, *Submission 28*.

and purchasing.[184] In South Australia, the River Murray Urban Users Committee (RMUUC) devised an action plan that identifies and supports collaboration with local government in areas including education through, for example, the Water Conservation Partnership Project.[185]

Community groups and individuals

3.294 In the area of water management 'community education is really important … Working with the community is critical',[186] because 'you cannot get very far if you do not have an educated community'.[187] In the case of a major constituent of water resource management—stormwater—the only means of persuading the public of its value is through education.[188] The Stormwater Industry Association (SIA) stresses that community understanding of stormwater can be enhanced by fostering a view of stormwater as a valuable part of the urban water cycle.[189] Dr Essery argues that, instead of concentrating on the technological means (for example, gross pollutant traps) of addressing undesirable water outcomes, more is to be gained from education in, or 'end-user understanding' of, the effects of factors like litter.[190] In similar fashion, CDS Technologies, which manufactures gross pollution traps, stresses the need for a dual approach combining education and pollution control devices.[191]

3.295 Mr Oliver identifies three audiences for community water education programs: those engaged in water management; people interested but not directly involved in the work of catchment groups, community organisations, or wildlife preservation societies; and the uninterested and uninvolved.[192]

3.296 Education must be focused on specialist groups like builders as well as consumers. A representative of the Housing Industry Association (HIA), when discussing its GreenSmart campaign, referred to:

> … the education component of GreenSmart: as much as we can educate the builders, we certainly need to get that message out to consumers. That is what drives best practice. If you have an aware consumer looking for

184 City of Port Phillip, *Submission 71*, pp 4–6.

185 River Murray Urban Users Committee, *Submission 32a*, p 1.

186 Mr Bruce, *Proof Committee Hansard*, Townsville, 3 April 2002, p 83.

187 Mrs Simpson, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 121.

188 Mr Baltais, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 109.

189 Mr Boyden, *Proof Committee Hansard*, Sydney, 18 April 2002, p 166.

190 Dr Essery, *Proof Committee Hansard*, Sydney, 18 April 2002, p 188.

191 CDS Technologies, *Submission 63*, p 2.

192 Mr Oliver, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 118.

> GreenSmart product, then it is very easy to provide that product for them—and that is the message of GreenSmart.[193]

3.297 A major problem confronting environmental agencies and educators is public ignorance of 'environmental values':

> They are manifestly failing because the community does not know what environmental value is—couldn't care less—and it is an extremely vague term that nobody can define. They cannot ask the right questions because the level of knowledge in the community is not there. They cannot actually ask a question to get a sensible answer … uninformed people have uninformed opinions.[194]

3.298 Education will almost certainly result in a population that is more informed and knowledgeable about urban water management. Nevertheless, the little-discussed question of the significance of a water usage education campaign in comparison with that of other public education campaigns, such as that relating to drug use, needs to be further explored. According to Senator Tierney:

> There are a whole lot of community education programs on a whole range of things … Why should this become a top-of-the-head issue for people compared with every other community message we are trying to get through at the moment.[195]

3.299 The Sunshine Coast Environment Council, after pointing out that past attempts at water education have been confined to matters of water quantity and demand management, offered the following advice on the development, form and content of future education programs. They:

- must be factual and impartial to enable people to reach their own conclusions on the subject;
- they should be entertaining and fun;
- must cater for all learning styles, all levels and all ages in the community;
- should be delivered with skill, imagination and enthusiasm;
- must be provided well in advance of any consultation on specific local issues; and
- should be adequately funded.[196]

3.300 A principal aim of groups like the Sunshine Coast Environment Council is to educate and alter the environmental outlooks of water industry managers by ensuring that the general public becomes better informed about water matters.

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193 Mr Gersbach, *Proof Committee Hansard*, Sydney, 18 April 2002, p 261.

194 Mrs Simpson, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 121.

195 *Proof Committee Hansard*, Brisbane, 4 April 2002, pp 125–6.

196 Sunshine Coast Environment Council, *Submission 17*, p 4.

3.301 One AWA member rated the importance of water education so highly as to warrant the appointment of a full-time officer responsible for this task and for the development of a national water education strategy.[197] Cultural change, such as a transformation in perceptions of stormwater, from being a useless and disposable commodity to a treatable and reusable one, will clearly take time.[198] Mr Head, representing the Planning Institute of Australia (PIA), spoke of the necessity of persuading people to regard urban rivers and creeks as significant land use and landscape elements, and not as drains. This attitudinal change, along with that concerning dual-flush toilets and differently-shaped shower roses, will occur only over a long period. [199]

3.302 Dr Essery cited an example of a New South Wales effluent reuse scheme in which the community was willing to pay up to 25 per cent more for sewerage services. He referred also to a water reduction scheme where the public was prepared to greatly exceed the expected demand management and to pay more for water. 'People will pay for it if they understand why—that is crucial'.[200] Community education and consultation were essential to the success of both initiatives.

3.303 As well as advertising campaigns and schools based education, an effective means of reaching the community is to make use of existing networks of community groups and to persuade the public in that way:

> The sort of thinking that we are trying to engender is for people to look at not dealing just with the crust of the community, the people who are exposed to issues, but looking to the other people, the uninterested and uninvolved, and providing benefit to the networks that allow you access to that part of the community.[201]

3.304 A notable instance of this form of community engagement is the Sullivans Creek Catchment Group Inc, whose main area of concern is stormwater management in the Australian Capital Territory. Whether working with government, the community or industry, the Group involves the public at all levels of catchment management; bases its planning directly on community consultation outcomes; coordinates the successful integration of stakeholders through a process of shared decision-making; facilitates agreement on objectives and actions; and incorporates the expertise of specialists in its initiatives so as to ensure the latter's technical and practical feasibility.[202]

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197 Mrs McGregor, *Proof Committee Hansard*, Brisbane, 4 April 2002, pp 119–20.

198 Mr Reynolds, *Proof Committee Hansard*, Canberra, 22 March 2002, p 12.

199 Mr Head, *Proof Committee Hansard*, Canberra, 22 March 2002, p 38.

200 Dr Essery, *Proof Committee Hansard*, Sydney, 18 April 2002, p 189.

201 Mr Oliver, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 123.

202 Ms Gilles, *Proof Committee Hansard*, Canberra, 22 March 2002, pp 55–6.

3.305 A similar undertaking is the community-driven Seagrass Watch program on Queensland's south-eastern coast, a cooperative effort between the Bayside Branch of the Wildlife Preservation Society of Queensland, the Moreton Bay Alliance, state government agencies and several community organisations.[203] According to Professor Bursill, Chief Executive Officer of the Cooperative Research Centre (CRC) for Water Quality and Treatment, community consultation is now regarded as an important component of the water education and planning processes, one ignored or underestimated at a price. Such consultation, in order to be effective however, must rest on the best possible understanding of the known facts of each case.[204]

3.306 The Victorian Government in its development of a a long-term water resources plan for Greater Melbourne followed this approach. By generating an informed discussion in the wider community, it aims to build general community understanding of water issues, leading to greater consensus, and support for decision making.[205]

3.307 Other considerations should be borne in mind when discussing community consultation and education. The Sunshine Coast Environment Council contends that community consultation generally encompasses a small number of interested individuals. More effort is required to enable better communication of the water message to the large number of less interested members of the public. Also of concern is the fact that 'during a consultation process about water issues people learn and often change their views. They are therefore no longer representative of the rest of the community. To extrapolate their views to the majority who have not been involved gives (sometimes disastrously) incorrect results'.[206]

3.308 In water management education 'the learning experience needs to be interactive. It is not just a question of standing up in front of an audience and presenting to them. They need to get involved'.[207] The Sunshine Coast Environment Council sought to devise a water education program which could be implemented jointly with large water infrastructure community consultation programs.[208] Members of the SCEC, in partnership with the AWA, developed an education kit designed for use in schools. They found the public more receptive to the discussion of matters of water quantity than water quality.[209] They also discovered an absence of a water focus in compulsory subjects, though the kit would be compatible with non-compulsory

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203 Mr Baltais, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 104.

204 Prof Bursill, *Proof Committee Hansard*, Adelaide, 30 April 2002, pp 532–3.

205 Water Resources Strategy for the Melbourne Area Committee, *Submission 57*, p 1.

206 Sunshine Coast Environment Council, *Submission 17*, p 5.

207 Mrs Simpson, *Proof Committee Hansard*, Brisbane, 4 April 2002, pp 123–4.

208 Mr Oliver, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 118.

209 Mr Oliver, *Proof Committee Hansard*, Brisbane, 4 April 2002, pp 116–17.

ones such as geography.[210] This suggests a serious water education deficiency in the Queensland school curriculum.

3.309 However, evidence from the QEPA suggests otherwise. One of its representatives informed the Committee that it has developed curriculum-based resources accepted by Education Queensland and utilised in teaching numerous subjects:

> … we have spent a lot of time, money and effort putting those resources together and they link into all areas of English, science, maths and the arts. I have even got a home economics module which talks about water efficiency. From my experience it certainly can fit into a whole range of school education parameters. So we have attacked it through those curriculum packages. We have also worked very closely with local governments in actually going out into schools, taking the education materials out to students and teachers and working in schools with teachers.[211]

3.310 There is ample evidence that community water management education is yielding benefits.[212] The methods adopted and the results achieved in Dubbo, New South Wales, deserve attention:

> In Dubbo, they have an enormous salinity problem. [It] is driven by the fact that people irrigate their lawns. There is no cost on water and no overuse cost, so everyone competed for the greenest lawn in town … What happened initially was they said, 'Let's put in a $1,000 levy.' It did not stop anything. What was put in then was a moisture metre. They said, 'We will put in this technology and we will recommend irrigation systems which will only turn on when the ground moisture requires it. You still finish up with the greenest lawn. Not only that, but it pays for itself in three years.' That was an enormous success because they could see that there was a long-term economic gain.
>
> Once again, with water, people will make their own decision in terms of putting in water tanks. Developers will put it as an on-cost to their development and the public at large—once again, the proof of the exercise is probably in the leading township in water managements, Dubbo—when it was explained what was happening in regard to stormwater and water management, accepted an individual rate per lot, unanimously. And then the next year, they backed it up again, unanimously.
>
> They went from a $50,000 allocation for stormwater management to $500,000 in one year because people—if you explain it to them, if they see the reasoning behind it, and it is local so that they can see the investment—have no real problem in paying for it. It will happen over time.

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210 Mrs McGregor, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 119.

211 Mr Wiskar, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 138.

212 Mr Harvey, *Proof Committee Hansard*, Melbourne, 23 April 2002, pp 285–6.

> It will not be something that will happen overnight, but in 10 years it will happen. However, 10 years comes around very quickly if you do nothing.[213]

3.311 A number of projects set up under the first NHT program, such as the Clean Seas Program and the Living Cities Program, are also proving to be useful learning tools in the processes of public and specialist water management education.[214] The City of Port Phillip informed the Committee of its EcoHouse initiative, which has involved the redevelopment of a former gardener's cottage and gardens within the St Kilda Botanical Gardens. The purpose of the project is to establish a model of urban sustainability. The building comprises an open house and an office, allowing the public to study the available products and materials; to observe the recycling of stormwater in a practical manner; and to view recycling systems, water conservation appliances, water efficient gardens, and a composting toilet.[215] It demonstrates the high priority attached by the Council to education in water issues.[216]

3.312 The success or otherwise of community education campaigns can only be determined with difficulty, given the high number of variables involved.[217] Nevertheless, there is persuasive evidence to suggest that properly targeted public education campaigns can be an important agent for reform in addition to having a beneficial impact on water usage.[218] It also seems to be clear that 'overall education and communication requires well-prepared strategies, resources for implementation, a dedicated and sustained effort in communication, monitoring, and periodic review'.[219]

Educational institutions

3.313 Mr Head made the point that urban water management is a new and growing field.[220] It is also an increasingly complex one. Australia's experts in land use and engineering must be trained or, where necessary, retrained in the interconnectedness of relevant areas of knowledge and expertise:

> We have this silo approach in the schools: we will teach you about land use planning but you do not need to know about water or, in the engineering school, we will teach you about water but you do not need to know anything about land use planning.[221]

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213 Mr Boyden, *Proof Committee Hansard*, Sydney, 18 April 2002, p 158.

214 Mr Bruce, *Proof Committee Hansard*, Townsville, 3 April 2002, p 81.

215 For further detail, see Appendix 4

216 Mr Holdsworth, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 354; *and* City of Port Phillip, *Submission 71*, p 5.

217 Australian Conservation Foundation, *Submission 68*, p 7.

218 Water Services Association of Australia, *Submission 55*, p 14.

219 Australian Conservation Foundation, *Submission 68*, p 7.

220 Mr Head, *Proof Committee Hansard*, Canberra, 22 March 2002, p 38.

221 Mr Head, *Proof Committee Hansard*, Canberra, 22 March 2002, p 38.

3.314 At present, the CRC for Catchment Hydrology is the only Australian institution providing postgraduate level training specifically in water sensitive urban design, in which the key emphasis is on integrating freshwater ecology, landscape architecture, urban design, engineering hydrology, and urban stormwater quality.[222]

3.315 A central difficulty in the education and training spheres is geographical in origin:

> Australia's distance from a lot of other countries means it restricts the international knowledge transfer. It is notable that the training that is done in the water industry is isolated and perhaps has not taken account of international experience. The training industry associated with the water industry needs to be reformed.[223]

3.316 A recurring problem in education is that many key professional courses only provide training in specialist aspects without offering a more holistic overview of water management as a whole. Various witnesses raised this issue with the Committee.

3.317 Representatives of the Royal Australian Institute of Architects noted that a problem in the university education of its members is the failure to integrate urban design into mainstream teaching. Subjects such as water and sustainability are taught as electives, which are likely to be taken by students only if they fail to secure a place in a more 'glamorous' course.[224]

3.318 Similarly, the Director of the CRC for Catchment Hydrology, commented on the fragmented nature of much current tertiary training of professionals involved in water management,[225] with a discernible 'disconnect' between the university training of engineers and environmental scientists. A joint approach to water management education and training is needed requiring contributions from engineers, scientists, economists, accountants and members of the community. The solutions to water problems 'are all multidisciplinary—they go across the community and across the water cycle and there is a real need to expand the ability of professionals to understand all those components'.[226]

3.319 Professor Taylor, of the Planning Institute of Australia, argues that Australian urban planning is devoid of 'a holistic approach' that takes into account considerations of development or redevelopment. 'In the education of planners, we seem to have lost that appreciation of the importance of biophysical context, and of cultural context as

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222 Profs Mein and Wong, *Proof Committee Hansard*, Melbourne, 23 April 2002, pp 276 and 277.

223 Mr Waldron, *Proof Committee Hansard*, Sydney, 18 April 2002, p 209.

224 Ms Owen and Mr Williams, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 347.

225 Prof Mein, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 276.

226 Ms Howe, *Proof Committee Hansard*, Sydney, 18 April 2002, p 171.

well—the idea that we are actually planning for people in our cities'.[227] This view has also been advanced at the local and federal levels of government.[228]

3.320 The present system of training engineers and planners does not appear to be conducive to a balanced and integrated approach to sound urban water management. In an attempt to address this, Macquarie University, supported by the Stormwater Industry Association, devised a postgraduate certificate course in stormwater management designed to meet the interdisciplinary needs of the industry by combining treatment of land use and scientific and engineering imperatives. The course has not proceeded. According to the Royal Australian Planning Institute and the Planning Institute of Australia, 'what is needed, is improved research, education and training for professional[s] involved in the combined area[s] of land use planning and water/hydraulic engineering'.[229]

3.321 It is likely that there are limits to how far this problem can be addressed. Professor Tony Wong thought it too high an expectation to ask universities to skill their undergraduate students to the level required for implementing water sensitive urban design because of the interdisciplinary nature of the work. He argues that students' time is best spent in acquiring a strong fundamental understanding of the basic concepts of urban water planning and management. 'The way that the university conducts its undergraduate degrees is such that it is always going to be difficult to try and mesh those multi-disciplinary aspects together'.[230]

3.322 For education generally, the best time to begin changing attitudes towards water use and its wider management, according to Mr Williams, is at the primary and secondary levels of schooling. 'That will probably change the demands in tertiary education. Spreading the message at a young age bears fruit further down the track'.[231]

3.323 A project of interest in the schools context is an initiative devised and implemented by the Ballarat Grammar School. Its Environmental Committee, and, more particularly, its Year 9 students, have established the Heinz Centre for Environmental Studies. This has proved a successful attempt to create a learning environment and to develop programs designed to foster the principles necessary for sustainable living. The three-year-old initiative is the result of collaboration with

227 Prof Taylor, *Proof Committee Hansard*, Canberra, 22 March 2002, pp 38–9.

228 Department of Agriculture, Fisheries, Forestry–Australia and Environment Australia, *Submission 54*, p 5.

229 Royal Australian Planning Institute/Planning Institute of Australia, *Submission 61*, p 3.

230 Prof Wong, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 14.

231 Mr Williams, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 347.

several bodies, among them Greenhouse Australia, Ecorecycle Vic and the City of Ballarat.[232]

3.324 In its submission to the Committee, the Sunshine Coast Environment Council claims that:

> The conservative attitude of water managers is often encouraged in University courses that do not question established practices and promote creative thinking. Universities could do more to promote a more liberal, dynamic approach to water management.[233]

3.325 In the realm of training, another consideration is assuming increasing significance. Victoria's water industry, for example, has an ageing workforce, many of whom have spent their entire career in the industry. They are approaching retirement, and the need to train their successors in what will be a greater range of skills, is urgent. In response, VicWater has participated in the development of a national water training package aimed at improving future employees' capacities through traineeships.[234]

3.326 Dr Stratton, a member of the Sunshine Coast Environment Council, discussed the development of a tertiary qualification as a vehicle for training those whose task it is to educate individuals, members of the community and institutions about optimal water management. As she put it, 'if we want people to go out there and be educating the community, school groups or whoever, we need to have trained people—we need to train the trainers'.[235]

Industry

3.327 Changing the work practices and skills of industry is also fundamental to any successful reforms, and there are several examples of how this can be effectively achieved.

3.328 The QEPA has undertaken significant work in collaboration with peak secondary industry organisations such as Commerce Queensland and the Australian Industry Group in an endeavour to improve water management practices. This activity includes offering locally based seminars for plumbers, builders and nursery employees.[236] The HIA's GreenSmart Awards to organisations and individuals for innovative building design and practice (much of which involves water management considerations); the GreenSmart Training and Accreditation course for builders;

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232 Ballarat Grammar School, Environmental Committee, *Heinz Centre for Environmental Studies*, Ballarat, 2002.

233 Sunshine Coast Environment Council, *Submission 17*, p 5.

234 Mr Harvey, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 287.

235 Dr Stratton, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 120.

236 Mr Wiskar, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 138; *and* Environmental Protection Agency (Queensland), *Submission 43*, pp 7–8.

GreenSmart Villages; and the PATHE (Partnership Advancing the Housing Environment) initiative represent 'the housing industry's response to growing community awareness of the environmental impact of daily life'.[237] The Committee has also noted the extensive program of workshops, seminars and training programs around the country that have been developed by groups such as the AWA, and the Master Plumbers and Mechanical Services Association of Australia.[238]

3.329 Associate Professor Wong emphasised the importance of knowledge transfer between academic institutions and industry in dealing with water problems and in the design and construction of projects like wetlands. 'It is really about progressively building capacity in all the various sectors in the industry to ensure that we have this flow from technology and science to construction that reflects the intent of technology and science'.[239] Clearly, in order to best utilise current research in achieving water sensitive urban design, it is necessary for contractors to be sufficiently skilled in translating these designs into practice.

Conclusions

3.330 The authors of the education kit "We All Use Water" (members of the Sunshine Coast Environment Council) were convinced that the community lacked sufficient knowledge to engage adequately in the water debate, and they developed educational materials in an attempt to remedy this:

> … the one thing we saw was that the water decision makers and professionals and the community were frustrated by the dialogue they were having about water infrastructure. That has been the unashamed focus of this activity.[240]

3.331 They set out to achieve several goals:

> There would be much better acceptance of recycling and much greater application of recycling. It would cease to be terrifying to people and there would therefore be a lot more confidence amongst the decision-makers in making decisions that were, perhaps, slightly more controversial—and they could do that with confidence instead of not doing it at all … I think there would be a greater awareness of water quality so we would understand better what it is we do that causes water quality to deteriorate, and therefore we would have more options to manage that—and more acceptable options. At the moment we cannot communicate with the community about this. They do not understand about water quality so they do not understand what it is that they do that degrades it. So we do not know how to improve that.

237 Housing Industry Association, *Submission 59*, pp 2 and 3.

238 For example, the National Green Plumbers Conference, Shepparton, October 2002.

239 Prof Wong, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 273.

240 Mr Oliver, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 128.

> We cannot make decisions about the best way to spend our money on improving it.[241]

3.332 More optimistically, Mr Rose, of the Melbourne Water Corporation, contends that a notable increase in community awareness of water conservation issues has occurred over the past two decades. Yet he stresses that, while some of these changes are traceable to community peer pressure, the message needs to be reiterated through education programs.[242]

3.333 By early 2002, the Sunshine Coast Environment Council's Mrs Simpson believed that education has increased Australians' preparedness to modify their water use habits and practices. As to whether there had been any notable shift in government and industry attitudes towards sustainable water usage, she commented in similar vein:

> I think so, yes. I think one has to look back quite a long way. Like all these things, they are very slow, so when something happens you do not realise that that actually was a significant change. Yes, there is definitely more discussion. There is more acceptance of the fact that the way we do things at the moment is not sustainable… There is a very slow change in thinking, but yes, it is happening.[243]

3.334 Certainly, it now seems to be accepted that in water management reform 'educating the community is one way—and probably the best way—to get them to change'.[244] Dr Essery asserts that the preventative measure of education is more important in improving water practices than mechanical solutions. 'Treatment is not necessarily the panacea', he stated, before advising government and the water industry to focus not on 'the engineering' but on 'the community'.[245]

3.335 Notwithstanding the progress that has been made, a question remains regarding the effectiveness of educational programs and initiatives, whether undertaken by government, community groups and individuals, educational institutions, or industry. The QEPA provides evidence concerning its joint pilot water efficiency initiative with Education Queensland at Merrimac High School on the Gold Coast. This institution reduced its annual water costs from $25,000 to $11,000. This program is now being implemented where appropriate across the state.[246] Nevertheless, Mr Wiskar admits that the QEPA could do more to monitor water usage in Queensland schools:

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241 Mrs Simpson, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 125.

242 Mr Rose, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 327.

243 Mrs Simpson, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 130.

244 Mrs Simpson, *Proof Committee Hansard*, Brisbane, 4 April 2002.

245 Dr Essery, *Proof Committee Hansard*, Sydney, 18 April 2002, p 188.

246 Mr Wiskar, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 138.

> We have quite a deal of information which suggests that, when our education materials and officers are out there, school water use is reduced. But my honest assessment is that we could get a lot better at monitoring that.[247]

3.336 He argued similarly, and more specifically, in relation to the effectiveness of QEPA's school education kits:

> We need to be more rigorous in that area of monitoring … Having said that, we have got strong evidence, from the point of view that our teachers tend to go back to schools on a yearly basis, that [our education] kits are being used.[248]

3.337 In his ambitious study of Australians and their environment, Graeme Aplin concludes that only education in the broadest sense can provide the necessary foundation for a new 'meta-theory' of environmental change, one which would encompass both water use and management:

> I would like to think that public opinion could force those in politics, business and other positions of power to adopt the new meta-theory, whatever its eventual form. But that presupposes that a large part of the general public has already adopted it and, as consumers, voters and activists, can then influence others.[249]

3.338 The main vehicle for change would be 'education in the broadest sense, and hopefully with a sympathetic media, since so much public education now occurs through television sets and newspapers by an osmosis-like process'. As well, 'the knowledge and data base will need to be strong and the arguments based on it convincing, as there are formidable obstacles and attitudes based on short-term self-interest to overcome.'[250]

3.339 Mr Aplin cautions that:

> … the present meta-theory is so thoroughly ingrained that it will be difficult to displace. Unfortunately, a few real environmental catastrophes, hopefully not of an irreparable kind, will probably need to occur to drive the message home. Perhaps resource and energy shortages and degraded local environments will bring a more gradual realisation that change is sorely

247 Mr Wiskar, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 144.

248 Mr Wiskar, *Proof Committee Hansard*, Brisbane, 4 April 2002, pp 143–4.

249 Graeme Aplin (1998), *Australians and Their Environment: An Introduction to Environmental Studies*, Oxford University Press, South Melbourne, p 525.

250 Graeme Aplin (1998), *Australians and Their Environment: An Introduction to Environmental Studies*, Oxford University Press, South Melbourne, p 525.

> needed. One way or another, the change needs to be driven by a groundswell of public opinion, like a massive wave breaking on a beach.[251]

3.340 The scope of the water management information provided by the NAPSWQ needs to be broadened. In order to reach those who remain largely unaware of water issues, community water education groups and interested individuals should adopt more active methods of increasing public interest, such as involving Australians as participants in water conservation initiatives. Machinery for creating stronger links between industry and educational institutions so as to achieve better specialist understanding of water management must also be established. In pursuit of a more flexible and creative approach to water issues, tertiary training institutions could ensure that undergraduate education of engineers, scientists and other professionals engaged in water management is more multidisciplinary in content. The three tiers of government should cooperate with water industry peak organisations to fund a tertiary course designed to provide formal training for water educationists. The already considerable institutional and individual efforts to improve Australians' understanding of water matters would be enhanced by increased NHT funding for existing programs.

Knowledge

3.341 In urban water management, questions of knowledge, research and development, monitoring and evaluation are of paramount significance. They encompass the state of scientific knowledge and the identification of research priorities; the effectiveness of institutions and individuals in pursuing knowledge and managing research and development; and the success or failure of present arrangements for disseminating and implementing research outcomes. When addressing the issue of whether Australian water managers have the information necessary for best practice urban water management, factors such as funding, research prioritisation, and formulating future directions in water delivery and technology must be accorded a high level of importance.

Adequacy of existing knowledge

3.342 The size of this report's bibliography (Appendix 6) attests to the large amount of information, both general and specific, that is available to water managers and researchers in the field of urban water design and use. Nevertheless, opinion remains sharply divided as to the value of much of this information. Mr Bruce argues that little knowledge existed of pollution in tropical catchments and of how to manage such contamination.[252] Mrs Simpson observes that 'the knowledge of water quality in general in the community is pathetically low. There is a chasm, a big hole, which is generally filled with emotive misinformation'.[253]

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251 Graeme Aplin (1998), *Australians and Their Environment: An Introduction to Environmental Studies*, Oxford University Press, South Melbourne, p 525.

252 Mr Bruce, *Proof Committee Hansard*, Townsville, 3 April 2002, p 81.

253 Mrs Simpson, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 120.

3.343 In contrast, Mr Crockett contends that a large corpus of information exists on water management.[254] Professor Mein, Director of the CRC for Catchment Hydrology, points out that an extensive 'knowledge base' on stormwater management is being built up in Melbourne.[255] Indeed, Dr Essery believes that there is already a surfeit of 'research and knowledge' about water issues.[256]

3.344 Opportunities exist to expand the 'knowledge sharing exercise';[257] to better utilise existing technological expertise;[258] and to disseminate knowledge more efficiently to state agencies, local government, consultants and community groups.[259]

3.345 The main task confronting today's water industry planners, researchers and managers has been defined by Ms Tarte, of the Moreton Bay Waterways and Catchments Partnership:

> The big issue for us is finding the balance between management, research and monitoring … in the past … management has really been a series of knee-jerk responses, often to hot-spot problems. Research has really been curiosity-driven rather than informing good management.[260]

3.346 Opinion varies considerably on the form, value and utility of water management research. Mr Waldron, Chief Executive Officer of Wide Bay Water, states that more research aligned with water industry needs should be undertaken. 'I have worked in the industry for 30 years', he told the Committee, 'and I have actually seen very little research that has been of benefit to me in that 30 years'.[261] There is also an increasing reluctance by water industry members to share information:

> The tradition in our industry … was to share information. If you did some work, you wrote it up in a paper, you went to a conference and you told your colleagues. Now what happens is that water utilities are meant to be competitive, and suddenly what was industry knowledge is now intellectual property. So the Water Corporation in WA has done wonderful research work on what its community does with water, but they are not about to tell anyone because that is intellectual property. That to me is a tragedy.[262]

3.347 The principal institutions presently conducting research into urban water management are universities. Key centres for water research include: the Australian

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254 Mr Crockett, *Proof Committee Hansard*, Canberra, 23 May 2002, p 575.

255 Prof Mein, *Proof Committee Hansard*, Melbourne, 23 April 2002, pp 275–6.

256 Dr Essery, *Proof Committee Hansard*, Sydney, 18 April 2002, p 190.

257 Mr Bott, *Proof Committee Hansard*, Canberra, 22 March 2002, p 17.

258 Environment Business Australia, *Submission 79*, p 3.

259 CRC for Freshwater Ecology, *Submission 52*, p 8.

260 Ms Tarte, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 89.

261 Mr Waldron, *Proof Committee Hansard*, Sydney, 18 April 2002, p 201.

262 Mr Davis, *Proof Committee Hansard*, Sydney, 18 April 2002, p 217.

National University's Centre for Resource and Environmental Studies; the Environment Technology Centre at Murdoch University; the Australian Academy of Technological Sciences and Engineering (AATSE);[263] the Institute for Sustainable Futures at the University of Technology, Sydney; the CSIRO's Urban Water Program; the Australian Water Quality Centre (AWQC); the Water Research Centre at the University of Western Australia and four of the Cooperative Research Centres (CRCs) – for Catchment Hydrology, Freshwater Ecology, Water Quality and Treatment, and Coastal Zone, Estuary and Waterway Management. The role of the first-named CRC is :

> … to provide resource managers with the capacity to predict the effects of land use changes at a whole-of-catchment scale. That covers rural and urban catchments, but in the urban area we produce software tools and knowledge for quantitative evaluation of the options for urban water management.[264]

3.348 According to Mr Daniell, from the University of Adelaide, CRC activity has shown evidence of an encouraging and steady trend from a 'straight disciplinary' to an 'interdisciplinary', or more 'holistic', approach to research and development between its first and second rounds.[265] A number of CRCs have formed the Water Forum, a successful initiative designed to better coordinate and avoid duplication of their activities.[266] While the CRCs are highly representative - the CRC for Water Quality and Treatment comprises twenty-nine parties from the water industry, the research community and government - their research has been criticised on the grounds that, though of an excellent standard, it is too scientific and cannot be readily applied. Mr Crockett asserts that a less 'segmented and compartmentalised' approach based on closer cooperation between the field's researchers and its practitioners would prove more effective.[267]

3.349 A significant problem hindering research and development relates to the role of universities in the process. Mr Head refers to the reluctance of universities to devise specialist water management courses in view of the small demand for, and non-fee paying nature of, such courses.[268] Universities do appear to have a monopoly on establishing research priorities:

> … research seems to be dominated through universities and they set research directions. I would like to see a facility for industries rather than universities to lead research, and that government money should be directed to industry as well as to universities. From time to time, we have tried to

263 Its publications include the major report *Water and the Australian Economy* (1999).

264 Prof Mein, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 267.

265 Mr Daniell, *Proof Committee Hansard*, Adelaide, 30 April 2002, p 508.

266 Prof Bursill, *Proof Committee Hansard*, Adelaide, 30 April 2002, p 542.

267 Mr Crockett, *Proof Committee Hansard*, Canberra, 23 May 2002, p 576.

268 Mr Head, *Proof Committee Hansard*, Canberra, 22 March 2002, p 40.

> obtain funds for research. It is extremely difficult unless you know the system and know how to get the money. If you do not come from a university, it is almost impossible to secure funds for research.[269]

Research priorities

3.350 A number of research and development areas warrant special attention. WSROC, after emphasising the difficulties involved in repairing water provision infrastructure under pressure from population growth and urban expansion, called for further research into the problems of salinity and stormwater and their implications for WSUD.[270] Dr Johnstone, from Melbourne's Bayside City Council, stresses the need for more research into the source of pollutants, along the lines of a past Bayside-Melbourne Water-CSIRO project. It employed faecal sterols as indicators of human pollution and a means, albeit a costly one, of determining the origin of pollutants and identifying key linkages, for example, sewage overflow into stormwater drains.[271] It is also clear that the range of chemicals being added to Australia's water supply systems affects human health in ways which need to be better understood. Some research in this direction is already underway, such as the Sydney Water-CSIRO joint initiative examining the relationship between rates of bladder and bowel cancer and chlorinated water supplies.[272]

3.351 The effects of endocrine disruptors in effluent, which remain in dispute, also requires additional inquiry, as will be discussed in Chapter 5.

3.352 The variability of Australia's ecosystems and rainfall patterns necessitates highly localised and adaptive research and development and water management techniques.[273] As Chapter 1 shows, each part of Australia requires a different management approach that is tailored to the particular local climate. Mr Campin, of the QEPA, contrasts parts of Queensland and Victoria:

> We have very significant short-duration high-intensity storms and the amount of water that is trapped by a rainwater tank is relatively small in proportion to the overall downfall, whereas the typical Melbourne weather is much more gentle rain spread throughout the year. We have much more intense, peaky rainfall, and it is very difficult to intercept a significant proportion of that annual rainfall. It may only occur in half a dozen events. So if you have a 10-cubic-metre stormwater tank, the actual amount of water you have intercepted is very small in comparison to, say, the

269 Mr Lehmann, *Proof Committee Hansard*, Sydney, 18 April 2002, p 217.

270 Cr Ferrara, *Proof Committee Hansard*, Sydney, 18 April 2002, p 234.

271 Dr Johnstone, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 310.

272 Ms Ridge, *Proof Committee Hansard*, Sydney, 18 April 2002, p 249.

273 Water Services Association of Australia, *Submission 55*, p 1.

> Melbourne situation where you have nice gentle light rain and it works very well. That is quite a difference.[274]

3.353 A need is apparent for a greater, more refined focus on infrastructure research:

> There is not a lot of data about some of the most basic work you do … There is not much information about statistics on pipes and what percentage of the pipe is sized for fire, what percentage is sized for peak demand and what percentage is sized just for garden watering and that sort of thing. There is not much data on basic information about how much water people use or where it goes in houses. There is a lot of stuff around, but it basically comes from the same source and there is not much data that has been derived by physical measurement.[275]

3.354 Dr Johnstone refers to a Port Phillip Bay project aimed at reducing nitrogen inputs to the Bay. The CSIRO advised that fifteen years of research data would be required in order to properly evaluate this project—a lengthy and expensive exercise.[276] He also admits that, while the Bayside City Council's stormwater drainage pipes are well-mapped on the relevant Geographic Information System, more research is required into the effectiveness of the system and the condition and size of its pipes.[277] Because approximately one-third of water charges is linked to depreciation of assets, 'asset life can be extended enormously through better research'.[278] Yet, as most water industry assets are located underground,[279] 'it [is] not unheard of for [Melbourne] councils to have trouble locating some of their assets'.[280]

3.355 An adviser to the Planning Institute of Australia emphasises the importance of increasing our knowledge of the hydrological cycle, or groundwater recharge, as a means of combating the rising incidence of flooding in cities.[281] The water industry and the wider community respectively could also initiate and participate more in water research. AWA members have indicated their preparedness to finance increased research.[282] A representative of the Moreton Bay Waterways and Catchments Partnership has spoken, in the context of freshwater measurement, of 'fairly robust types of indicators which community groups can do, like finding the percentage of exotic species of fish'.[283]

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274 Mr Campin, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 151.

275 Mr Lehmann, *Proof Committee Hansard*, Sydney, 18 April 2002, p 217.

276 Dr Johnstone, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 303.

277 Dr Johnstone, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 305.

278 Mr Waldron, *Proof Committee Hansard*, Sydney, 18 April 2002, p 207.

279 Mr Waldron, *Proof Committee Hansard*, Sydney, 18 April 2002, p 207.

280 Mr Young, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 326.

281 Prof Taylor, *Proof Committee Hansard*, Canberra, 22 March 2002, p 36.

282 Mr Davis, *Proof Committee Hansard*, Sydney, 18 April 2002, p 218.

283 Dr Abal, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 98.

3.356 Data gathered by WaterWatch and other groups has also assumed greater significance. There exists, for instance:

> … a water warehouse database in Victoria. They are putting the monitoring data from WaterWatch on that database and identifying it as WaterWatch data. A lot of this data has been collected… in an educational fashion by a lot of people over 10 years and it has gone into shoeboxes under beds and things. Now they are focusing it more on what it is going to create and lead to. Also, there is benchmarking, scientific input and checking on the processes.[284]

3.357 The Canberra-based Institute of Australian Geographers suggestw that this be taken further by enlisting some 250,000 of Australia's 1.3 million school children to contribute to a carefully-designed national water mapping project supervised by teachers. Its objectives could include the investigation of water issues as an important component of Australian ecology, raising awareness of environmental matters and gathering data.

A national institute

3.358 One suggestion to the Committee was for the creation of a National Water Institute, that would amalgamate the functions of the CRCs when their lifespan concludes.[285] This proposal was obliquely supported by CSIRO's July 2002 call for the creation of a national water research (and funding) body, on the grounds that Australians had not adequately embraced water recycling; due to the poor prevailing use and reuse of urban run-off and effluent; and because of the fact that, notwithstanding twenty-three research projects in five years designed to address the issue, no national approach to water conservation has emerged.[286]

3.359 The call for a more integrated research approach[287] could be met by creating a truly representative national institute for water studies—what Mr Chris Davis has described as 'not necessarily a bricks and mortar institute but a virtual institute that brings all the players together and tries to coordinate research so that it is coherent rather than competitive'.[288]

Knowledge sharing

3.360 To be useful, knowledge must not only be created but also shared, and the Committee has seen a number of successful models for maximising the process of information exchange. One such method is the creation of partnership arrangements between specialist research institutions and local governments.

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284 Mr Reynolds, *Proof Committee Hansard,* Canberra, 22 March 2002, p 18.

285 Mr Lehmann, *Proof Committee Hansard,* Sydney, 18 April 2002, p 217.

286 The Australian, *Waste not, want not: CSIRO*: 19 July 2002, p 6.

287 Dr Essery, *Proof Committee Hansard,* Sydney, 18 April 2002, pp 187–8.

288 Mr Davis, *Proof Committee Hansard,* Sydney, 18 April 2002, p 217.

3.361 The University of Queensland for example, acknowledging that its research was not being adequately utilised by industry, embarked on research and monitoring work with the Moreton Bay Waterways and Catchments Partnership.[289]

3.362 Strong support for the establishment of a Wide Bay Innovation and Research Centre has been expressed by the Wide Bay's four local councils in the form of a signed memorandum of understanding with the University of Southern Queensland and Wide Bay Water. The reasons behind such an undertaking are fivefold. A recognition that water industry research and training is essential for Queensland's future; a large void presently exists in these areas; Wide Bay Water is already accredited as a national leader in industry innovation; a business plan for such a Centre indicates that it would be self-funding within three years; and a need to develop the necessary scientific and control technology for meeting national water industry needs, especially those of regional Australia.[290] The reasons for the university's involvement were explained by Wide Bay Water's Chief Executive Officer:

> The university recognised that there is obviously a need for industry associated research, because they tended to agree that research that they had seen done was not being taken up too much by the industry. The four councils around our area agreed that the expertise that we had gathered at Wide Bay Water, if associated with the university, could perhaps help with the training needs of a far wider area. That would obviously be financially beneficial to the university concerned and perhaps to us. More pointedly, my aim would probably be to make sure that universities are doing some research work that can be taken up by the university that is of direct benefit to them.[291]

3.363 When attempting to ensure optimal catchment management, for instance, detailed knowledge is required of the catchment concerned. University-industry cooperation on projects benefits both parties, allowing water managers to base their planning on sound local knowledge attained by a specific and detailed university research effort. The university is also able to observe how the knowledge generated by its researchers is used for specific outcomes. An example of the value of detailed scientific research can be found in work by the Moreton Bay Waterways and Catchments Partnership, which, using quantitative measurement devices and a sewage plume map, established after much dispute that a major pollutant originated in two locations, rather than in a single one.[292]

3.364 The results of water industry research have not always been well communicated, and fresh approaches are required in this sphere. Associate Professor Wong, of the CRC for Catchment Hydrology, told the Committee that:

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289 Dr Abal, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 98.

290 Wide Bay Water, *Submission 20*, pp 5, 6.

291 Mr Waldron, *Proof Committee Hansard*, Sydney, 18 April 2002, p 209.

292 Dr Abal, *Proof Committee Hansard*, Brisbane, 4 April 2002, pp 90–1.

> … we are moving into a new era … in urban water management. Urban stormwater management is now aimed at reducing the impact of urbanisation; it is not just about drainage. In the past, adoption of this integrated approach was slow and sporadic; it is still slow and sporadic. There are a number of reasons for that which we have been able to address. Research outcomes in the past have not necessarily resulted in these beneficial outcomes. A lot has to do with us perhaps thinking a little bit more about how we can facilitate the adoption of our work. It is not just about publications in journals and things like that.[293]

3.365 There are opportunities for both industry and government to enhance current research and development. Sydney Water, for example, already undertakes joint research and development projects with Australian and international organisations.[294] Sponsorship—government and business—could help to foster the design and production of water independent housing, and small-scale water treatment and recycling plants for domestic, commercial and industrial use.[295] Research and development initiatives could also assist in the invention of low-cost, user-friendly water and wastewater technology.[296] Environment Business Australia advocates the introduction of a reinvestment taxation concession policy to strengthen the commercialisation of innovation.[297]

Monitoring

3.366 Monitoring is an important foundation for assessing changes to the environment over time; the effectiveness of policies and projects; and for basing enforcement actions.

3.367 The National Land and Water Resources Audit (NLWRA) judged current monitoring of water industry resources and management and the exploration of new resources to be inadequate.[298] Mr Willett, Executive Director of the National Competition Council, argues that evaluation of Commonwealth-State monitoring and adjustment processes was also proving unsatisfactory. Too little was known, for example, about the effect of water industry reform on key players like farmers.[299] Notwithstanding these problems, it remains clear that:

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293 Prof Wong, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 270.

294 Sydney Water, *Submission 45*, p 15.

295 Centre for Resource and Environmental Studies, *Submission 50*, p 7.

296 Baw Baw Shire Council, *Submission 11*, p 2.

297 Environment Business Australia, *Submission 79*, p 2.

298 Dr Humphries, *Proof Committee Hansard*, Perth, 29 April 2002, p 429.

299 Mr Willett, *Proof Committee Hansard*, Melbourne, 23 April 2002, pp 294–5.

> Monitoring is one of those activities like baseline research, that is expensive to conduct properly, may not yield benefits for a decade or more, but is absolutely necessary.[300]

3.368 Despite the availability of sectional data like that provided by the National Pollutant Inventory on the discharge of pollutants to metropolitan estuaries and coastal waters, no comprehensive national urban water quality monitoring program exists.[301] As a partial solution to this, the CRC for Freshwater Ecology has proposed that state governments institute their own monitoring systems.[302]

3.369 Several shortcomings characterise present water industry monitoring arrangements. The amount of data available is insufficient to enable conclusive monitoring of the effects of stormwater on important tropical environments. Mr Bruce informed the Committee that 'monitoring, generating useable data and understanding catchment pollution characteristics is critical to managing stormwater quality'.[303] Mr McCarthy, of Perth's Eastern Metropolitan Regional Council, emphasises the significance of data to water management planning and administration, and of carefully monitoring the performance of new institutions and practices.[304]

3.370 Local councils' practice of scrutinising building proposals to ensure that they satisfy environmental criteria, and of then failing to adequately monitor the implementation of appropriate standards in development projects, also constitutes a serious problem.[305] There is obviously a need to monitor progress at all stages of construction, not merely at selected stages.[306] Similarly, attempts by the New South Wales Environment Protection Authority and several catchment trusts to control the effects of sedimentation on building and development sites have continued to produce positive results only while these sites are regularly inspected.[307] Mrs Morris, of the Great Barrier Reef Marine Park Authority, points out that, in the one area within the Great Barrier Reef World Heritage Area where Queensland's Environmental Protection Act was activated in order to monitor water quality—the Trinity inlet around Cairns—the statutory requirements for water standards have not been met.[308]

3.371 The difficulties besetting urban water management are balanced by a number of positive developments. The NWQMS has had considerable success in identifying

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300 Dr Nicholas Fleming, *Submission 8*, p 7.

301 Department of Agriculture, Fisheries, Forestry−Australia and Environment Australia, *Submission 54*, p 6.

302 CRC for Freshwater Ecology, *Submission 52*, p 9.

303 Mr Bruce, *Proof Committee Hansard*, Townsville, 3 April 2002, p 81.

304 Mr McCarthy, *Proof Committee Hansard*, Perth, 29 April 2002, pp 405−6.

305 Mr Baltais, *Proof Committee Hansard*, Brisbane, 4 April 2002, pp 110−11.

306 Mrs Morris, *Proof Committee Hansard*, Townsville, 3 April 2002, pp 71−2.

307 Mr Gersbach, *Proof Committee Hansard*, Sydney, 18 April 2002, p 258.

308 Mrs Morris, *Proof Committee Hansard*, Townsville, 3 April 2002, p 68.

and monitoring progress towards water quality objectives.[309] WaterWatch identifies the sources of Australia's national water quality problems; evaluates water practice and management; and trains individuals in water quality monitoring and measurement techniques 'in terms of hard-edged outputs'.[310] Such community monitoring programs have progressed from being primarily educational in character to becoming a significant element in water industry decision-making. According to Mr Bott, this reflects USA experience:

> … there is some very strong information out of the United States where community based water monitoring has been in place for some time. It has very strict quality assurance and quality control protocols which show that the data collected by community groups is not statistically different from that collected by professional contractors. So the message there is that, if it is done with all the appropriate quality assurance and quality control possible, the data can be a very valuable adjunct to state monitoring networks.[311]

3.372 Monitoring by water organisations is also improving. Sydney Water has instituted an ocean outfall initiative as part of a broader environmental indicators program, monitoring taking place before and after the introduction of the outfalls.[312] VicWater's reporting statistics appear annually in its *Urban Water Review*, providing a guide to the organisation's environmental performance.[313] The Melbourne Water Corporation monitors the condition of its assets by means of a yearly audit. It also prepares annually a twenty-year capital program containing an assets renewal component.[314]

3.373 Queensland's Moreton Bay Waterways and Catchments Partnership monitors the effect of its management practices through an 'Ecosystem Health Monitoring Program'. It is based on conventional indicators such as nutrients and sediments as well as state-of-the-art indicators that examine ecosystem response. A yearly report card rating is published indicating whether or not targets have been reached in the relevant estuary and bay waterways (a pilot exercise is under way for freshwater environments).[315] NHT funding for monitoring—$500,000 to the Townsville City Council in north Queensland, for instance[316]—has assisted with traditional forms of monitoring and, in Townsville's case, with developing innovative approaches to

309 Mr Bott, *Proof Committee Hansard*, Canberra, 22 March 2002, p 6.

310 Mr Hooy, *Proof Committee Hansard*, Canberra, 23 May 2002, p 589.

311 Mr Bott, *Proof Committee Hansard*, Canberra, 22 March 2002, p 18.

312 Ms Meeske, *Proof Committee Hansard*, Sydney, 18 April 2002, p 172.

313 Victorian Water Industry Association, *Submission 42*, p 10.

314 Mr Rose, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 324.

315 Dr Abal, *Proof Committee Hansard*, Brisbane, 4 April 2002, pp 94–5, 98.

316 Mr Bruce, *Proof Committee Hansard*, Townsville, 3 April 2002, p 81.

monitoring artificial wetlands and gross pollutant traps.[317] Mr Bruce pointed out that 'water quality monitoring and analysis is exceptionally expensive'.[318] As a result, the TCC has sought to combine its resources with those of organisations like Citiworks and the James Cook University of North Queensland. The Water Corporation of Western Australia published its first *Community and Environment Report* on its performance in this field in November 2000.[319]

3.374 Other monitoring successes have been Environment ACT's joint venture with the CRC for Freshwater Ecology and the regulation of drinking water quality via the *Australian Drinking Water Guidelines* (1996) and a drinking water code of practice.[320] Mr Bott signalled Environment Australia's commitment to detailed monitoring of the performance of the projects it funds.[321] Progress is also occurring in relation to the role of aquifers, with more frequent provision being made for aquifers in development plans,[322] and closer monitoring to ensure that the quality of water being recycled to an aquifer system is safe to return. In South Australia, for example, where Aquifer Storage and Recovery (ASR) began more than a century ago,[323] Environment Protection Agency guidelines for this purpose are currently being finalised.[324]

3.375 Prospects for continued monitoring reform also appear promising. The QEPA's Mr Wiskar indicated the Agency's preparedness to improve its monitoring and assessment mechanisms.[325] Mr Campin made it clear that, in the case of stormwater management, a report due for release in 2003 will set out the degree to which local councils have succeeded in satisfying the requirements of the QEPA's Environment Protection Policy for Water.[326] In Western Australia, Mr Hill advocates 'improved governance and accountability' through legislation, specifically, the production of annual reports containing water management assessment information.[327]

3.376 Monitoring is of vital importance to water management. The *Australian Infrastructure Report Card*, produced by the Institution of Engineers Australia, conducted an exhaustive water asset monitoring exercise, which will serve as a valuable tool in future industry planning.[328] The Nature Conservation Council of

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317 Mr Bruce, *Proof Committee Hansard*, Townsville, 3 April 2002, p 86.

318 Mr Bruce, *Proof Committee Hansard*, Townsville, 3 April 2002, p 86.

319 Water Corporation of Western Australia, *Submission 49*, p 24.

320 Ms Fowler, *Proof Committee Hansard*, Canberra, 23 May 2002, p 547.

321 Mr Bott, *Proof Committee Hansard*, Canberra, 22 March 2002, p 12.

322 Mr Pierson, *Proof Committee Hansard*, Adelaide, 30 April 2002, p 530.

323 Government of South Australia, *Submission 51*, pp 17 and 18.

324 Mssrs Allen and Wills, *Proof Committee Hansard*, Adelaide, 30 April 2002, pp 460–2.

325 Mr Wiskar, *Proof Committee Hansard*, Brisbane, 4 April 2002, pp 141–2.

326 Mr Campin, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 148.

327 Mr Hill, *Proof Committee Hansard*, Perth, 29 April 2002, pp 445–6.

328 Australian Water Association, *Submission 41*, p 6.

NSW recommends that an independent environmental ombudsman be appointed to monitor the responsiveness and consistency of government departments in addressing community concerns about water issues.[329]

Evaluation

3.377 Parallel with monitoring the performance of water management and delivery systems is the process of evaluating the structure of the management and supply frameworks themselves. As Dr Essery put it:

> We supply water, we get rid of the effluent, but we do not actually know how and why the people use the water. Sydney Water, Melbourne Water, every utility, will spend a fortune measuring the performance of their system, but they do not measure their users. Therefore, if you do not know your user then, like anyone who is marketing any product, how do you know to meet their requirements and, particularly, how do you know to amend their activities?[330]

3.378 Dr Essery also provided an instance of the importance of effective evaluation, as distinct from monitoring, machinery. He cited:

> … a study which I was involved in where we actually thought our instrumentation was totally wrong and replaced the meters. We monitored the consumption of every tap in 10 houses for a year and replaced some meters four or five times—and we had 300 meters in this small, intensive area. … it turned out that there was nothing wrong with the meters. It was the fact that the family that occupied that house—not the owner of the house, but the people who rented it … was basically using the hot water tap all the time to flush everything down the sink. They had three times the water consumption of everyone else in that block of 10.
>
> That sort of behaviour not only affects water consumption but also affects future planning, because it is the variability in human consumption and production of anything that actually causes problems in the ability to meet demand. So to understand how our consumers use water is fundamental. Once you understand how they use it you can target your strategies, which could be educational, technological—AAA rating devices—or whatever. But how do you know how effective your strategy is if you do not actually have a means of assessing who you are trying to change and how effective you are being at changing them? It is to me a fundamental flaw in our approach.[331]

3.379 Sophisticated evaluation and cost-benefit analysis also needs to be done in relation to demand management programs. Mr Wiskar points out that:

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329 Nature Conservation Council of NSW, *Submission 29*, p 15.

330 Dr Essery, *Proof Committee Hansard*, Sydney, 18 April 2002, p 188.

331 Dr Essery, *Proof Committee Hansard*, Sydney, 18 April 2002, pp 196 and 197.

> We have set up an evaluation framework which operates at two levels. It operates at the level of evaluating specific programs. Let's say we are going to do a leakage activity or a shower rose program: we will evaluate that activity alone and see whether that has had any impact on demand. Overall demand trends … provide another way to monitor programs.[332]

3.380 Mr Bott argues that reducing pollution discharges to coastal waters can best be achieved by systematically gathering information and combining it with financial analysis in order to determine the cost-effectiveness of water management initiatives.[333]

3.381 An influential mechanism in the evaluation process is the National Land and Water Resources Audit (NLWRA), an NHT program established in 1997 for the purpose of improving land, water and vegetation management by providing better information to water resource managers. The NLWRA is a partnership between the Commonwealth, States and Territories based on the sharing and exchange of information. Its *Australian Natural Resources Atlas*—a web-based document containing all Audit information and findings—contains material encompassing its seven main areas of inquiry and the whole Audit output. Between 2000 and 2002, the AWA evaluated and reported on Australia's water industry infrastructure.[334] Environment Australia is currently evaluating its approach to water management and the dissemination of information about its activities and achievements.[335] Some commercial organisations, such as CDS Technologies, manufacturers of gross pollutant traps, have undertaken extensive evaluation of the effectiveness of their products.[336]

3.382 Evaluation machinery should be Australia-wide in scope and familiar to the community. Dr Essery has called for the creation of industry performance reporting mechanisms that would be administered federally. These could include indicators for improved sustainability such as triple bottom line reporting, performance and assessment. He describes the evaluation process as being akin to 'a nationally based, balanced score card, performance target set … something that is fully understood by the community … it must be there to assist in future decision making—in other words, a national framework of some sort or guidance, endorsement or support'.[337]

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332 Mr Wiskar, *Proof Committee Hansard*, Brisbane, 4 April 2002, p 141.

333 Mr Bott, *Proof Committee Hansard*, Canberra, 23 May 2002, p 589.

334 Mr McCrae, *Proof Committee Hansard*, Sydney, 18 April 2002, p 220.

335 Mr Reynolds, *Proof Committee Hansard*, Canberra, 22 March 2002, p 11.

336 Mr Diprose, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 375; *and* CDS Technologies, *Submission 63*, p 1.

337 Dr Essery, *Proof Committee Hansard*, Sydney, 18 April 2002, pp 187 and 198.

Future directions

3.383 Several developments and reform proposals augur well for urban water research and practice. Wide Bay Water, the first local government owned water corporation in Queensland, has also become the first Australian water body to introduce stormwater harvesting for use within its systems.[338] The authors of a Botany Bay plan intend to reintegrate the land use within an existing urban area with its urban water management—an example of 'planning on a regional catchment basis'.[339] The Water Forum—an amalgam of the five CRCs—identifies opportunities for water industry collaboration in research, education and training, technology transfer, communications and international activities.[340] In April 2002, at an International Water Association congress held in Melbourne, the Global Water Research Coalition was formed. Two Australian organisations were among the twelve foundation members: the CRC for Water Quality and Treatment and a peak body of major water utilities, the WSAA.[341]

3.384 The Western Australian Government's water conservation strategy, announced in August 2002, is an encouraging development.[342] In recent years, as Associate Professor Wong contends, there has been a marked increase in water practice and research cooperation between government, research institutions and industry.[343]

3.385 The water industry's professional organisations must also adopt a more practical approach to improving research and development standards by taking a proactive stance.[344] The WSAA, for example, has already indicated its intention to serve as an industry forum in order to stimulate WSUD innovation.[345] Successful demonstrator programs can also be emulated more often, for instance, the Australian Water Quality Centre's Customer Service Unit; awards for excellence in the realm of technology transfer; GreenSmart Villages, which blend well into the existing urban and rural environment (such as that at Kellyville, Sydney);[346] urban stormwater and catchment initiatives;[347] and the St Kilda (Melbourne) EcoHouse Project.[348]

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338 Mr Waldron, *Proof Committee Hansard*, Sydney, 18 April 2002, p 199.

339 Mr Head, *Proof Committee Hansard*, Canberra, 22 March 2002, p 37.

340 Brochure, The Cooperative Research Centres' Water Forum, dated 2000.

341 Prof Bursill, *Proof Committee Hansard*, Adelaide, 30 April 2002, p 535.

342 West Australian, 5 August 2002, p 7.

343 Prof Wong, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 270.

344 Sunshine Coast Environment Council, *Submission 17*, p 2.

345 Water Services Association of Australia, *Submission 55*, p 18.

346 Mr Gersbach, *Proof Committee Hansard*, Sydney, 18 April 2002, pp 255–7.

347 Mr McCarthy, *Proof Committee Hansard*, Perth, 29 April 2002, p 404.

348 Mr Holdsworth, *Proof Committee Hansard*, Melbourne, 23 April 2002, p 354; *and* City of Port Phillip, *Submission 71*, p 5.

3.386 Sections of the community are also beginning to display a more positive attitude to water management reform. In the case of farmers, Mr Timothy Waldron explains:

> It was interesting that, once we had our research farm set up, we needed a farmer to collaborate with us to do tests, and we could not get one farmer to do it; we actually had to pay a farmer to assist with the research. But, once we got the results of the sugarcane yields, they had increased by approximately 50 per cent per hectare; the income to the farmer increased by approximately 85 per cent, because of the geared way that they received money for sugar. Following those results, every farmer in the area then put their hand up wanting to use our effluent. This is a natural way of using the nutrient value that is in the waste water for benefiting a crop.[349]

3.387 Initiatives like Queensland's WaterGuide, an expert decision support system designed to support stakeholders during the early stages of planning a recycling project represents an important advance in water resource management.[350]

3.388 While Australians will continue to benefit greatly by collaborating with international water delivery and research bodies, a cooperative approach to martialling Australia's existing practical knowledge, information and research may well allow its people to deal with many of the nation's water dilemmas themselves. According to the CSIRO's Dr Peter Dillon:

> Water will be in critically short supply for more than a third of the earth's population during the 21st century, so by solving our own problems we will not only help Australia—we can also contribute ideas and technologies for addressing one of the most vital aspects of human survival.[351]

Conclusions

3.389 Community-based water monitoring programs should be reinforced within the framework of appropriate controls. The Commonwealth Government should undertake the ultimate responsibility for monitoring Australia's water management and delivery systems and evaluating the nation's water industry and supply structures. Government, industry and research institutions must also engage in detailed analysis of the cost-benefit of water industry practice. Water industry organisations should play a more active role in industry management and representation.

3.390 It is evident that best practice solutions will generally be very site specific, and their implementation principally a local government responsibility. For this reason, the Commonwealth's focus must be on building the foundations of effective programs: developing the required skills base across Australian professions in order to

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349 Mr Waldron, *Proof Committee Hansard*, Sydney, 18 April 2002, p 202.

350 Environmental Protection Agency (Queensland), *Submission 43*, p 14.

351 The Australian, *Waste not, want not: CSIRO*, 19 July 2002, p 6.

effectively plan and implement local solutions, as well as establishing the necessary bases of technical and scientific knowledge.