THE AUSTRALIAN WATER ASSOCIATION

Inquiry – Sustainable Cities 2025

SUBMISSION November 2003

SUMMARY RECOMMENDATIONS

Environmental and social impacts of sprawling urban development
Layout of urban developments must be designed with regard for water-related impacts and constraints; avoiding habitat loss, including buffers and preserving natural drainage patterns

The major determinants of urban settlement patterns and desirable patterns of development for the growth of Australian cities
Holistic planning is essential to achieve the necessary mix of environmental, economic and social sustainability – urban development is purely dollar driven at present.

A blueprint for ecologically sustainable patterns of development, with particular reference to eco-efficiency and equity in the provision of services and infrastructure

- Planning is crucial – covered in other points
- Pervious surfaces must be minimised and water collected productively from them where possible
- Water Sensitive Urban Design (WSUD) concepts must be embraced and regulations freed up to facilitate WSUD.
- Water services must be integrated, including for the use of rainwater, recycled water and alternative sources on a contextual basis
- Water Efficiency and conservation offer the most cost-effective means of moving towards sustainability; they must be achieved and catalysed by a combination of pricing, regulation, education, technology, a vigorous approach to gardening uses in particular, and a rethink of concepts of water for fire fighting
- Wastewater management can be tackled from different angles: eco-sanitation should be encouraged, urine separating toilets can be introduced, decentralised systems can be beneficial, recycling rates can be increased, tariffs should implement user-pays concepts, equity issues are challenging but should not be ignored and there is scope for technological changes in sewerage – using small, pressure sewers

Measures to reduce the environmental, social and economic costs of continuing urban expansion

- Market measures, such as crediting developers for sustainable attributes; enabling utilities to offer innovative services associated with sustainability
- Regulations have to be consistent and designed to remove impediments to sustainability
- Technology is available, but its adoption must be catalysed by removal of regulatory hurdles
- Research is needed to underpin the development and refinement of new approaches to urban water management that will move cities towards sustainability

PREAMBLE

The Australian Water Association welcomes the opportunity to make this submission to the Sustainable Cities 2025 Inquiry. We are acutely aware that achieving sustainable cities is a multi-disciplinary activity, in terms of which a submission from a water organisation may seem too narrow. However, as our skill base is essentially in water, we can only authoritatively address that area, then allude to links to other disciplines and sectors, and hope that the Committee will be able to integrate the multiple submission strands that it receives.

The Australian Water Association is the largest of its type in Australia, having over 4,000 members, including 750 organisations and the rest individuals. Our mission is to *promote sustainable management of water*, which is a good fit for this Inquiry. As a diverse, impartial organisation, with a substantial pool of expertise amongst its members, AWA hopes to contribute materially to moves towards sustainable cities.

STRUCTURE OF THIS SUBMISSION

In general, we have structured this submission in harmony with the terms of reference provided, but there is a preliminary, over-arching discussion about sustainability which sets the scene in some respects.

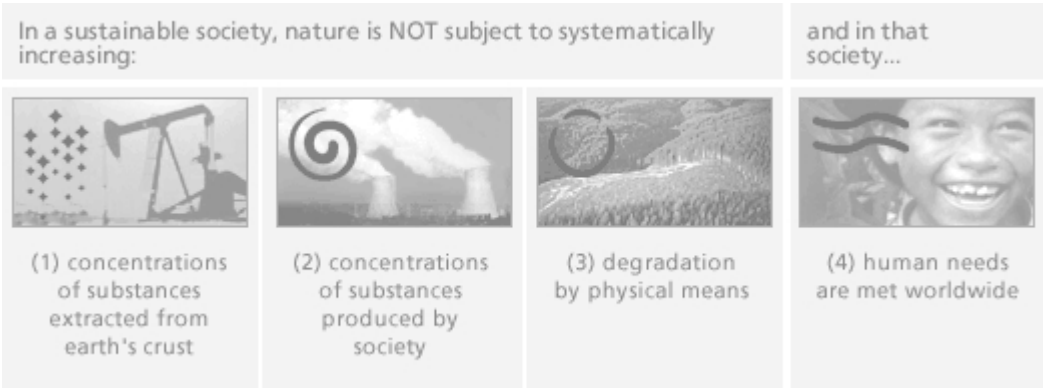
SUSTAINABILITY

Although much used, the term sustainability is slippery, all the more so when discussion moves from theory to operational issues. A useful summary of sustainability concepts was prepared for the Johannesburg Summit in 2002 (Clarke *et al*, 2002), namely:

'Though visions of sustainability vary across regions and circumstances, a broad international agreement has emerged that its goals should be to foster transition towards development paths that meet human needs while preserving the earth's life support systems and alleviating hunger and poverty – ie, that integrate the three pillars of environmental, social and economic sustainability. This should be achieved through forms of governing that are empowering and also sensitive to the needs of future generations.'

Operationalising these concepts presents a significant challenge. Intuitively, certain practices seem more sustainable than others, but a rigorous, life cycle analysis of all factors can sometimes reveal that intuition is not correct. One end-point of a purist approach to sustainability could be to suggest that human activity is all intrinsically 'bad' – which is unproductive for this Inquiry. Many dialogues about sustainability tend towards the conclusion that sustainability is more a journey than a destination; so it is the ability to sustain momentum and progress in the desired direction that is crucial, rather than any prospect of arriving at some magical, 'sustainable' end-point.

The Natural Step embodies four basic principles:



http://www.naturalstep.org/learn/understand_sust.php

The Natural Step has, however, evolved into an organisation which provides consulting services, so implementing the principles involves engaging a representative to assist. At least one Australian urban water utility, Yarra Valley Water (Melbourne retail business, http://www.yvw.com.au) is actively engaged with internalising the principles in its business.

Undoubtedly, a great deal of research and debate will be devoted to the question of sustainability measures, but we have limited resources to delve to that depth, so this submission is more at the coal face than from an ivory tower. It addresses the terms of reference and, for water, picks up on the questions raised in the Discussion Paper which accompanied the request for submission.

ADDRESSING THE TERMS OF REFERENCE

1. **Environmental and social impacts of sprawling urban development**
   Sprawling urban development has a wide range of negative impacts on water-related aspects of the environment. Rivers are seriously affected by runoff from impervious surfaces and the loss of riparian vegetation with its shading, pollution filtering, and other ecosystem services. Extensive urban development tends to use more water than a denser configuration, since much of urban water use (anywhere from 25% to 50%; even as much as 70% in summer in Perth, according to a recent statement by Minister Nick Griffiths) is for gardening; so the overall urban impact on the water cycle is greater than it could be. As urban development is normally laid out without regard to natural drainage patterns, the typical resulting stormwater regime generates flood peaks (hydrographs) which are more intense and hence damaging than natural or slightly modified conditions. Constructing and operating a conventional sewerage network for a typical Australian city is expensive and has environmental impacts, owing to the effects of the sewers which exfiltrate (leak sewage into the ground) and suffer infiltration (collect stormwater inadvertently); and also owing to the impact of partially purified effluent being discharged to the environment. On the coastline, developments tend to cluster along the fringes of wetlands, estuaries and other fragile environments, leading to loss of habitat, polluted runoff and all the other problems enumerated above. An outcome of the pollution, flood peaks and loss of habitat is a serious loss of biodiversity.

2. **The major determinants of urban settlement patterns and desirable patterns of development for the growth of Australian cities**
   This term of reference is largely in the realm of urban planning – not an area of expertise for AWA, so our comments here are confined to noting that a desirable pattern of development would have lesser impacts than those listed in 1 above and they would be in harmony with the blueprint explained in 3 which follows. Under this heading, however, the question of quality of life should be alluded to, since it should be a key driver in urban planning, but it seems generally to have been displaced by a series of unconnected, economic and regulatory decisions, with the result that most urban developments do not contribute as positively to quality of life as they might. As a simple example, the concept of compact, walkable cities, inherited by many European communities, has largely been abandoned in Australia, but could be reintroduced to advantage if holistic planning concepts were to be embraced.

3. **A blueprint for ecologically sustainable patterns of development, with particular reference to eco-efficiency and equity in the provision of services and infrastructure**
   This is the substantive TOR for this submission, so it will be more extensive than the others. We have gathered the points under a series of headings to collect ideas in groups.
   a. **Basic planning concepts:** Although water is just one of the many factors involved in determining what patterns of development should occur, this submission, by its nature, focuses on the water components and makes some allusions to the interactions. Urban development should be conceived with water resources in mind and with the impacts on the water environment in mind too. Urban development should not be permitted in locations where a reliable supply of freshwater is not guaranteed. While it is technically feasible to transport water over long distances and, if necessary, to desalinate seawater, the capital and energy costs of providing such support are not sustainable, except under exceptional circumstances. Flowing rivers, waterways and natural drainage lines should be identified and avoided, with buffer strips as wide as possible between the water or drainage line so that natural drainage can flow unimpeded; urban runoff is slowed and filtered by vegetation; habitat is left intact; and pollution is minimised. Apart from minimising the impact of urban development on water, these measures will ensure variety and texture in the urban landscape, thus fulfilling the some needs of other aspects of the urban fabric. As is the case in al aspects of implementing sustainability principles, there is a gradation from the patently indefensible to what seems to be current best practice. The changing face of best practice has to be monitored, but that is beyond the scope of this submission.
   b. **Pervious surfaces:** One of the worst attributes of urban developments from an environmental perspective is the proliferation of hard surfaces. The two main components that contribute to the total impervious area are roads and roofs.
      i. **Roof water:** The impact of roofs can be ameliorated by collecting rainwater from them and using it – this cuts the flood peak and also reduces the demand on other water sources (see point c below). Another approach to roofs is to plant greenery on them, so that water is collected, mostly retained and any water draining off has been filtered by the vegetation. This method is now quite common in Germany.
      ii. **Roads** are harder to address, but there are materials available now which will make the road surface porous, allowing water to infiltrate and to be collected and, possibly, stored. Pilot schemes of this nature have been implemented in Manly (NSW) and around the Sydney Olympic Park.

It is also possible to build filters on margins so that runoff is purified to some extent. Another beneficial technique is the use of grassed swales instead of conventional drains, so that the grass surface slows down the water and collects pollutants. Finally, of course, smaller areas have a lesser impact, so the current trend to ever-large homes should be curbed and roads should be as narrow as possible. Apart from minimising runoff impacts, narrow roads also tend to calm traffic because they have to be negotiated more carefully to get around obstacles **liked parked cars.**

c. WSUD: All these concepts can be collected under the heading of *Water Sensitive Urban Design* (WSUD) which has been embraced by planners, landscapers and developers. There are many other, more subtle, facets to WSUD which include the fact that water and its flow paths are celebrated and enhanced rather than hidden and suppressed. A development that embraces WSUD principles is more sustainable than a conventional one, provided the principles have been faithfully applied. WSUD requires more attention to detail than current practices, so it is more demanding, but recent estimates suggest that a well-conceived subdivision embodying WSUD concepts can be constructed more cheaply than a conventional design. AWA, in collaboration with other organisations, will be running a conference on the topic of WSUD in Adelaide, in November 2004, the third in a series which has contributed a lot to the national adoption and harmonisation of WSUD practices.

d. Water services/sources: Provision of water for urban development demands, while less than for irrigation, is still a substantial demand in its own right and an integrated approach to water cycle management can ensure that the overall impact of the water system is minimised. Instead of a linear approach to water use, and segregating rainfall and runoff from the water supply, an integrated system makes use of rainwater opportunistically, as well as purifying wastewater and reusing it. A traditional water system collects raw water, treats and stores it, then distributes it for all urban uses, including fire fighting. The proportion of water which is not used consumptively is collected in the sewerage system, purified, usually in a centralised plant, then discharged back into the environment. An integrated system relies on rainwater and recycled water to supplement the raw water supply, thus reducing the demand on that source, as well as minimising the volumes of runoff and effluent that have to be managed. This sub-section addresses water supply, while the other concepts are dealt with elsewhere.

i. **Rainwater** can be collected at the individual lot level or at a neighbourhood level. The economies of rainwater collection generally improve as the size of the storage tank increases. Apart from those approaches, however, it is also advisable to reduce the overall flux within the system by using water efficient appliances, practising conservation and minimising losses (addressed elsewhere). Several Australian utilities now offer, or have offered, rebates for installing rainwater tanks, or they require new developments to include rainwater tanks. While the economics of installing a rainwater tank, at face value, do not stack up, there is a general perception amongst industry practitioners that, when environmental externalities are factored in, a tank of reasonable size (ie 1,000 litres or larger) does make sense. It is important to remember, though, that massive variations in climate across the continent must be factored into choices. The mediterranean climate in the south and west makes tank economics less attractive.

ii. **Alternative sources** of water should not be ignored. The major Australian example is Perth, where many consumers rely on bores to water their gardens.

This takes some pressure off the main urban water supply network and makes it more sustainable. Every urban community has its own, site-specific opportunities and constraints in this area, so no definitive solution can be proposed. Although commonly put forward as a viable alternative, desalination of seawater is not necessarily economically viable nor sustainable in the overall sense, but the cost of desalination is a good benchmark against which to compare other options. At present, costs of less than $1/kL are achievable for seawater desalination. In general, the cost and energy required to desalinate water are directly proportional to the salt content, so it is invariably cheaper and more effective to desalinate used water or brackish water, rather than seawater.

e. Water efficiency: A very cost-effective way to improve the sustainability of urban water systems is to have them use less water overall. This can be achieved through a four-pronged approach to pricing, regulation, education, and the use of water efficient appliances. In a category of its own is gardening practices (see point 1 above). Finally, industrial and commercial/institutional efficiency is a factor in overall sustainability.

i. **Pricing** in Australia tends to be a difficult issue, as state/territory governments, local governments and 'independent' regulators tend to benchmark off one another. The price of water to urban consumers in the major cities in 2000 across Australia ranged from 38c/kL to $1.50/kL (for the consumption charge, excluding access fees). This compares with prices in the developing world, which are often just a fraction of that and in some European countries, where it might be three times as much. Although not much used in Australia at present, the concept of rising block tariffs has been employed (ACTEW, Central Highlands Water, Gold Coast Water etc) and has recently been mooted for Sydney, by the Minister for Energy and Utilities. In a rising block tariff structure, consumers pay more each time their total consumption passes a nominated threshold. Although there are some economic arguments advanced against this approach (on the grounds that the demand for water is relatively price inelastic), there is an equity issue embedded in the concept, as well as the fact that higher prices for potable water supply can make other sources and management options more attractive.

ii. **Regulation** tends to be a blunt instrument, but it can eliminate certain wasteful practices almost completely (eg hosing hard surfaces instead of sweeping them), so it has a major impact on overall usage patterns. As beliefs are often shaped by behaviour, inducing appropriate behaviours through regulation can lead to consumers internalising beliefs about conservation, thus spreading the impact and achieving overall efficiency gains. During the current drought, many cities have restrictions in place and some Victorian communities effectively have permanent restrictions.

iii. **Education** is an important component of efficiency improvement and the Australian Water Association is embarking on a major national project to help catalyse and coordinate better community education efforts. Research in the US has suggested that personal habits have a greater impact on water conservation than any other factor, so education holds one of the keys to changing behaviour patterns and hence overall consumption. AWA is embarking on a national project to coordinate and facilitate community education about water – sustainability will be one of the topics addressed.

iv. **Technology** is a useful tool in that equipment and appliances are available which use much less water than normal. The most cost-effective starting point is showerheads, owing to the combined impact of water and energy consumed. The next candidate is dual-flush toilets, where local manufacturers took it upon themselves to produce only the dual-flush, low flow models. The challenge is to encourage retrofitting of older, single-flush models. Many utilities already offer rebates to accelerate the uptake, and the payback achieved is favourable for the utility. The third option is front-loading washing machines, which use much less water than top-loaders, but which cost more to buy, and which are perceived by many consumers as less convenient. Once again, rebates have been offered to encourage take-up of the front-loading pattern. Low-flow tap aerators offer savings, as do efficient dishwashers. There is an existing program of rating appliances for water efficiency, from 1A up to 5As. This is voluntary at present but DEH has recommended that it become mandatory – that would be a good outcome, but the associated testing methods have to be rigorous to ensure that some nominally efficient, but functionally deficient products do not slip through the net.

v. **Gardening** poses a challenge for sustainability, owing to the large volumes of water used, the peakiness of demands seasonally and diurnally, and the impacts of garden watering on the environment. Although a lot of equipment is available to make garden watering more efficient, implementation of an automatic system generally leads to an overall net increase in water consumption. The generous use of mulch, xeriscape plantings and natives, and the elimination of lawn areas, are probably the main keys to improved water efficiency. There is a strong cultural element to any changes here, as well as a major industry which depends on gardeners. Change will be slow and all players need to be educated to appreciate the advantages of low water-use gardening. A recent initiative here is a seal of approval to be offered for products which, by their nature, contribute to water conservation, but which cannot be evaluated for the 5A program. An example would a hose trigger, which ensures water is used only when needed – it does not have an efficiency as such, but can save water.

vi. **Fire fighting** provisions place a major constraint on the extent to which current service models for water can be modified. The substantial, minimum size of the smallest distribution mains, at 100 mm diameter, is a function of minimum fire fighting standards, not domestic water delivery. In fact, the first water mains to towns were initiated to aid fire fighting, not to service household needs. There is a need to seriously consider how else water could be provided for attacking fires, eg by sprinklers as used in commercial building, or by storing recycled water or rainwater in neighbourhood reservoirs accessible to fire fighters. Until agreement is reached with fire standards regulators, there can be no change in the current water network models.

f. **Wastewater management:** Wastewater and its impacts are a major contributor to the environmental impacts of urban development. Several things can be done to reduce the impact of wastewater and to make its management more sustainable:

i. **Eco-sanitation:** Firstly, and most radically, a portion of the wastewater stream could be eliminated by using dry sanitation, ie composting toilets. Proven technology exists for composting toilets, but it could not be introduced immediately, given cultural preferences and habituation.

However, a gradual adoption of dry sanitation would be beneficial and would allow the concept to seep into the collective consciousness, paving the way for more widespread adoption. A constraint on composting toilets is that they tend to be suited best to low-rise, single-dwelling arrangements and the compost produced must find a use within reach. Also, the height constraints of current designs mean that the process cannot be installed in every location. For the same reason, retrofitting is generally problematic unless the layout and elevation of the extant building are suitable. In the urban context, and in the short term, composting toilets cannot be expected to make a major impression, but enabling their use in appropriate situations would contribute to both sustainability and take-up.

ii. **Urine separation:** Either as part of a composting toilet, or as an adjunct to a flush toilet, urine separation has the potential to remove a nitrogen-rich stream from the system, for use in agriculture or horticulture. Again, this requires gradual acculturation, but that process has already begun in parts of Sweden, for example. Demonstration sites can be very valuable in this context, enabling radical innovations to be proven and for the general community to have access to them for information and education. Collected urine has to be properly managed and put to use in agriculture. This technology is more amendable to urban implementation than composting toilets and should be seriously considered for Australian cities.

iii. **Decentralisation:** Conventional wisdom in the water industry used to be that the best economy of scale was achievable through the use of large, centralised wastewater treatment facilities. That was based on a narrow view of the treatment facility itself, not the total system, including the reticulation system. More recent work by the CSIRO's Urban Water Unit demonstrated that, if the life cycle cost of the full system, including reticulation, is considered, an optimum scale probably lies in the range between 2,000 and 10,000 persons served. Among the advantages of localised, neighbourhood systems is the lesser impact of large pipelines; the ability to reticulated purified effluent for recycling in the local area, economically; and the fact that smaller plants have less impact overall and should be perceived to be part of the fabric of services for the community, so more acceptable than a larger, centralised plant as neighbour.

iv. **Recycling:** As alluded to in the above point, recycling water can serve the dual purpose of relieving pressure on freshwater supplies and reducing discharges. The proportion to be recycled is always variable according to the local context, but it can be 100% if consumptive use is made of part of the flow. The purposes for which recycled water can be used vary according to water quality. At one end of the spectrum, moderately treated water can be used for irrigation and for car washing and toilet flushing while, at the other extreme, the examples of Windhoek (Namibia) and, more recently, Singapore's NEWater plants, could be followed – in which recycled water is simply introduced and mixed with the potable water supply. The concept of potable reuse is still a challenging one for Australian regulators, water practitioners and, in some respects, the community, but a dialogue about the advantages and constraints is healthy. There are some impediments to increased recycling: firstly a lack of uniform, national guidelines and secondly a lack of acceptance; mainly within the regulator community and practitioners, but also in the community. A practical constraint on recycling comes from the salt levels.

This has to be factored in with caution in situations where the elevated salt concentrations might damage soil structure.

v. **Tariffs:** At present, most Australian consumers pay fixed fees for sewerage services. The rationale behind this practice has been that it is practically difficult to measure the flow of sewage (owing to lumps and garbage obstructing meters) so the fallback is to allocate standard fees per household. This provides no incentive to householders to be more frugal in their habits. Some utilities have charged for sewerage on the basis of a fraction of the water used; and this practice, coupled with more aggressive attempts to implement proper measurement systems, would help to provide the necessary incentives for reduction in discharges. One development in sewerage technology has been the advent of pressurised, small-diameter plastic sewers (see below) which use positive displacement pumps. As the pump electrics can be monitored to measure of sewage volume, the pump operation could be used to advantage as a basis for charging.

vi. **Equity** poses a challenge, because the location of each property connected to a system affects the cost of providing the service; but the standard practice is to balance sewer fees, and developer charges, so that all consumers in a system pay the same fee. The result is that people or developers who elect to build in a location that's more expensive to serve do not receive a price signal. Also, new entrants to a system do not pay a differential fee. In some respects, managing differential fee structures would be seen as inequitable, but it has the potential to discourage development in inaccessible locations, often with sustainability issues as well.

vii. **Sewer technology:** One of the contributing factors to the unsustainable nature of current sewerage systems is their propensity to leak water in and sewage out, and the major cost and disruption associated with the construction of conventional, gravity sewers. Modern, small-bore, pressurised sewers are cheaper to construct, have less of an impact in themselves, and ensure a much lower rate of infiltration and exfiltration. The progressive installation of systems of this type would move sewer services towards sustainability. Take-up around Australia is already quite good and it seems likely 10,000 will be in operation before long. This technology offers real advantages and it is also amenable to retrofitting in situations where extant sewerage has reached its useful life.

4. Measures to reduce the environmental, social and economic costs of continuing urban expansion

Given the complexity of the urban water cycle and its multiple interactions, achieving a more sustainable urban environment poses a major challenge and it is abundantly clear that no single measure, in fact, no small basket of measures, can reach the goal. The detailed aspects of urban sustainability were covered in section 3 above, so this section addresses implementation, rather than the specifics already discussed.

a. **Market measures:** At present, there are some perverse incentives for urban development, inasmuch as developers are not credited for installing more sustainable infrastructure. Moreover, the service provision model is skewed towards a traditional model, rather than embracing alternatives and enabling the utilities and developers to offer new service models, eg, supplying a rainwater tank and water system for an annual fee, rather than just delivering water and metering the quantity.

b. **Regulatory hurdles:** A lack of coherence between different regulators creates perverse outcomes. A sustainable city probably requires more stringent regulation than conventional models, but there has to be excellent alignment between multiple regulators to ensure that contradictions are avoided. For example, encouraging the use of rainwater tanks with incentives, but recommending to householders that they do not use the collected water for drinking creates cognitive dissonance, as well as erecting practical hurdles.

c. **Technology:** There is no shortage of technology to assist a move towards sustainability. Moreover, more technology will emerge in respond to a real market demand. The issue to consider is more that of how old regulations preclude the use of new technologies. Australia needs to ensure that regulations do not impede progress.

d. **Research:** There could be more structured research at all levels, from the arcane area of sustainability concepts, through to the techniques for delivering more sustainable development on the ground. While the existing CRC structure ensures some excellent research is carried out on water-related topics, sustainability is not a core goal for any of them. The CSIRO Urban Water Unit has addressed the question of urban water systems in some ground-breaking work, but the Unit, like others within CSIRO, has to rely on commercial commissions to fund much of its work. An increase in national funding in this direction would be positive.

ADDRESSING QUESTIONS POSED IN THE SUSTAINABLE CITIES 2025 DISCUSSION PAPER

On p6 of the Discussion Paper, under the heading of *Establish an integrated sustainable water and stormwater management system addressing capture, consumption, treatment and re-use opportunities,* there are six questions posed. We respond to them as follows:

- *Should cities of the future be looking to develop more localised small scale systems of urban water management?* – Yes, they should, but there is no single scale which will be apt for all circumstances. The local context will always dictate a unique approach and more work is needed to establish just how to find the optimum. Modeling systems developed by CSIRO have provided some useful tools to start on this question.
- *What scale of residential water management systems is most efficient and sustainable?* As above, there is no single answer, but indications are that the optimum may fall between 2,000 and 10,000 people. The optimum will be different for each local situation anyway, so it must be individually examined.
- *How do we transform existing developed city areas into more sustainable water management systems?* This is the $64 question! The high cost and relative longevity of urban water infrastructure militate against rapid change. It would be most effective to integrate paradigm changes with necessary refurbishments of older infrastructure, rather than intervening on recently installed systems. In some cases, new, more sustainable technology may be able to be inserted into existing pipelines, for example, but that has to be tested. In all likelihood, adopting the principles of least cost planning would enable alternatives to be evaluated so that maximum benefits are extracted (for sustainability) at lowest cost. If utilities are empowered to offer alternative service models, they will have an incentive to pursue retrofits which might otherwise not be economically sustainable. As mentioned above, conservation and efficiency can deliver very cost-effective sustainability gains in this area, given the correct mix of education, pricing and regulation.

- *How do we encourage areas to abandon existing wastewater systems, which may discharge to the ocean or to other waterways, in favour of alternative wastewater treatment methods?* As suggested above, systems in need of upgrade or refurbishment are the best candidates for major change. Alternative models for utility services; opportunities for the private sector; regulatory incentives (eg lighter fees and lower licence hurdles); and capital subsidies can all help. It is also necessary to note that discharging to a waterway or to the ocean is not intrinsically less sustainable than other options – a site-specific analysis of costs and impacts will reveal which direction is most desirable. For example, ocean conditions off Sydney mean that the current practice of discharging partially purified effluent into deep waters is not causing measurable ecosystem deterioration, while Adelaide, Brisbane and Perth have all had to use different methods, owing to their more fragile local ecosystems and less amenable geography. In inland Australia, there are many situations where discharging appropriately purified wastewater may be of more benefit to river health than other forms of recycling. Again, local conditions will always dictate the best outcome.
- *What incentives or market based instruments might be appropriate for residential and commercial enterprises to encourage responsible water consumption and reuse?* Full metering is an essential (a few communities around Australia are still not fully served by water meters!); two-part tariffs are now almost universally applied and are important; water pricing at levels high enough to discourage wastage; rebates on water-efficient or water conserving appliances and products; provision of recycled water, fit-for-purpose and priced attractively (ie slightly below the price of drinking water); use of mandatory efficiency standards and labelling, can all assist.
- *Are more standards and guidelines needed for new development to minimise waste and storm water and to maximise capture and reuse opportunities?* This is a challenging area, as some well-intentioned standards or guidelines can have unintended consequences, or can lead to higher costs with minimal benefits. An example of this is the requirement in many areas for new developments or alterations to include large stormwater retention tanks – this proved to be very expensive and did not lead to significant environmental improvements. Generally, ensuring some flexibility and ensuring consistency among regulations is more important than specific guidelines. Although it is possible for more sustainable systems to be cost-effectively included in developments, that outcome can only be achieved through careful and intelligent design and a good understanding of detailed implementation. Contractors, plumbers and householders all need to be well informed, so education and training must go hand in hand with new standards and regulations.

The Australian Water Association Limited
ABN 78 096 035 773

PO Box 388, Artarmon NSW 1570
Tel (02) 9413-1288
Fax (02) 9413-1047
http://www.awa.asn.au

Contact: Chris Davis, CEO
Direct line (02) 9495-9909/0411-532-504
Email cdavis@awa.asn.au