

Submission to the:

**Standing Committee on the Environment, Communications,
Information Technology and the Arts**

Urban Water Use and Management in Australia

By

The Water Services Association of Australia (WSAA)

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Executive Summary

The Water Services Association of Australia (WSAA) was formed in 1995 to represent the Australian urban water industry. Its 21 members provide water and wastewater services to 13 million Australians and many of the country's largest commercial and industrial companies.

THE WATER RESOURCE

While Australia is the second driest continent in the world, this general statement is misleading. The message fails to convey a realistic picture of the diversity of water availability within the country; from some of the most arid regions of the world to some very wet regions – such as the North coast of Australia and Tasmania. Furthermore, it is important to remember that Australia's population is concentrated within 100 km of the Australian coast – far from the arid centre.

The generalisation of Australia as a dry continent also fails to convey the other crucial dimension of Australia's water resource – its extreme variability – Australia is truly a land of floods and droughts. As a result urban water supplies are very dependent on large reservoirs of water. Melbourne and Sydney both rely on large surface water catchments and reservoirs to provide water supplies during recurring droughts. Perth, Newcastle and Geelong have a mixture of surface and groundwater reservoirs. Alice Springs relies on groundwater. Adelaide is dependent on the river Murray for its water. The bottom line is that the manner in which each region has addressed its water security arrangements is specific to its unique regional circumstances.

THE USE OF WATER & DEMAND MANAGEMENT

Contrary to common perceptions, Australian cities are not the greatest users of water in the nation. Agriculture uses 70% of all water used. Australian households account for 8%. Manufacturing and mining each account for 3%. Gas and electricity industries together use 6% of all water used. In supplying water to 13 million people, WSAA members account for less than 10% of all water used in Australia.

For the Australian urban water industry, the 1950s, 1960s and 1970s were periods of high growth in water consumption. This growth in water consumption was accompanied by the construction of large reservoirs and water harvesting schemes.

The severe drought of the late 1970s in Western Australia and that of 1982/83 in the Eastern States stimulated substantial reforms in the Australian urban water industry. The introduction of consumption based pricing in Perth in 1978

and in Newcastle in 1982 were the beginning and pricing reforms subsequently progressed to other parts of the industry. “Free water” allowances were progressively phased out. Pricing changes were accompanied by a range of other measures including technical changes (such as the introduction of dual flush toilets), appliance water efficiency labelling and public education campaigns. The reform process was subsequently consolidated by the COAG water reforms from 1994 to date. For major urban regions the key aspects of the reforms are now universally in place.

The key measures introduced to curb urban demand for water were the introduction of consumption based pricing and full cost recovery. The introduction of consumption based pricing was followed by progressively increasing the reliance on the consumption part of the two part tariff. Without doubt, demand management by the Australian urban water industry has been very successful. The combination of pricing, technological change and education campaigns have slashed growth in urban water use (see table below).

Changes in Water Use

	Total Water Used 1970 to 1980	Total Water Used 1980 to 1990	Total Water Used 1990 to 2000	Water Used Per Capita 1970 to 1980	Water Used Per Capita 1980 to 1990	Water Used Per Capita 1990 to 2000
Sydney	+30%	-6%	+2%	+15%	-16%	-7%
Melbourne	+50%	+13%	-1%	+38%	-6%	-12%
Newcastle	+37%	-16%	-2%	+27%	-23%	-14%

This substantial reduction in the level of urban water consumption on a per capita basis has accommodated significant increases in urban population while deferring major supply augmentations during the last 20 years.

WATER SERVICES AND THE ENVIRONMENT

The urban water industry is not fixed on a mindset of continual augmentation of the existing water supply systems. The industry understands the importance of the urban water lifecycle; that is the provision of water supply, sewerage services and the management of stormwater runoff. The industry has invested in developing an understanding of this lifecycle. Good management of urban stormwater and treatment of sewage effluent is essential to the protection of urban waterways and coastal waters. Reliable scientific evidence on the ecology of these waters is essential to the development of cost effective management strategies.

The urban water industry has invested significantly in recent years to improve the environmental impact of wastewater. Between 1987/88 and 1999/2000 capital investment in sewage treatment and reticulation in Sydney, Melbourne,

Brisbane, Perth, Adelaide and Newcastle amounted to \$9.4 billion (in 2000/01 dollars). As a result of these investments wastewater quality has improved significantly and it was important to reassess the industry's priorities regarding the urban water lifecycle. The funding provided by Melbourne Water for the Port Phillip Bay Environmental Study, the Water Corporation in Western Australia for the Perth Long Term Ocean Outlet Monitoring Program and Brisbane City Council/Gold Coast City Council and their water businesses for the South East Queensland Regional Water Quality Management Strategy are three examples of such involvement. The investment in environmental studies provided vital information to ensure major investments will achieve the desired environmental outcomes in a cost effective manner.

Environmental concerns are also focussing on the need for increased environmental flows. It is important to realise that any increase in environmental flows necessarily leads to a decrease in drought security, the need for investment in water efficiency or the need to augment water harvesting to maintain existing drought security standards.

THE FUTURE

Water Sensitive Urban Design

The urban water industry faces a number of objectives. These objectives include:

- the provision of water and wastewater services which meet the needs of the community (including health and environmental),
- increased efficiency of water utilisation,
- the reduction of the potential downstream environmental impact of the industry's services,
- ensuring that the industry's activities are cost effective, and
- ensuring that the community is well informed regarding the choices it faces.

A number of WSAA members have participated in significant urban projects designed to improve the efficiency of water supply, stormwater and wastewater systems while achieving the objectives noted above. These water sensitive urban designs target both the way in which the utility provides its services and the manner in which the household uses water. The objective of water sensitive urban designs is to improve in a cost effective manner the efficiency of water use and the downstream environmental impact of the urban water lifecycle. Sydney Water's Rouse Hill double reticulation project, Brisbane Water's Integrated Water Management Study and Melbourne Water's participation in the Lynbrook estate to the South East of Melbourne are all examples of the way forward in developing innovative water sensitive

designs which are cost effective. These projects and the WSAA members' active participation demonstrate the industry's commitment to finding innovative solutions to water sensitive urban designs.

In seeking innovative urban designs, all water utilities, developers, local government, health authorities, environmental regulators etc have a role to play to ensure that stormwater, wastewater and water supply are developed in ways that sensibly take the environment into consideration. WSAA intends to act as an industry forum to stimulate innovation in this important area.

Demand & Population Growth

Past successes in urban water demand management are no cause for complacency. Population projections by the Australian Bureau of Statistics point to significant increases in Australia's population. Again, it is important to recognise that these projections suggest very different growth rates for different regions. For example, the projections suggest very substantial increases in Darwin, Brisbane and Perth. Substantial increases are also expected in Sydney and, to a lesser degree, in Melbourne. Adelaide's population is expected to remain unchanged while Hobart's is expected to decline. In absolute terms, the populations of Sydney, Melbourne, Brisbane and Perth are projected to increase by almost 5 million by 2051.

Continued attention to demand management will assist in keeping increases in water consumption below the projected increases in population. However, demand management initiatives to date have substantially improved water efficiency without significant impact on either lifestyle or water systems. Further reductions in demand, without substantial technological change, are likely to be incremental or require significant changes to either lifestyles or water systems. These changes are not without cost.

CONCLUSIONS

Statements such as "Australia is a dry continent" are misleading since they miss the key feature of the nation – the great regional diversity and its highly variable rainfall. To understand the different regional considerations facing the urban water industry one must take into account:

- Differences in specific water resource availability,
- Differences in population projections, and
- Specific opportunities for urban designs.

All these considerations indicate that more effective urban water solutions are likely to be found at the regional level rather than at a national level.

The last twenty years period has seen the implementation of successful programs of urban water demand management in delivering reductions in the growth of total water consumption and absolute decreases in per capita water consumption. The success of these programs has generally resulted in the avoidance of augmentation of water supplies while accommodating large increases in urban population.

In addition, the urban water industry has in recent years undertaken substantial investments in improving the quality of wastewater to the point where it is now clear that stormwater quality is emerging as a higher priority for the environment.

The urban water industry has made substantial achievements in progressing a reform agenda which has included the universal introduction of user pays pricing, full cost recovery and other structural changes which have made the industry more efficient (operationally and in its use of water), accountable and responsive to change. It is now timely to begin to think about the next round of reforms. WSAA and its members are prepared to take the lead in assessing new water sensitive urban designs which meet the community's needs in a cost effective manner while achieving desirable environmental objectives. WSAA plans to provide a forum for stakeholders to discuss water sensitive urban designs and options for trial subdivisions. The performance of such projects should be rigorously evaluated to provide feedback for further developments.

It is important, however, to note that while demand management is, and will remain, important; there are practical limits to what it can accomplish given community expectations and lifestyles. Accordingly, the development of water allocation policy should recognise the specific regional circumstances, having regard to water availability and projected population increases. Such considerations should not exclude the potential for future urban water supply augmentation.

INTRODUCTION

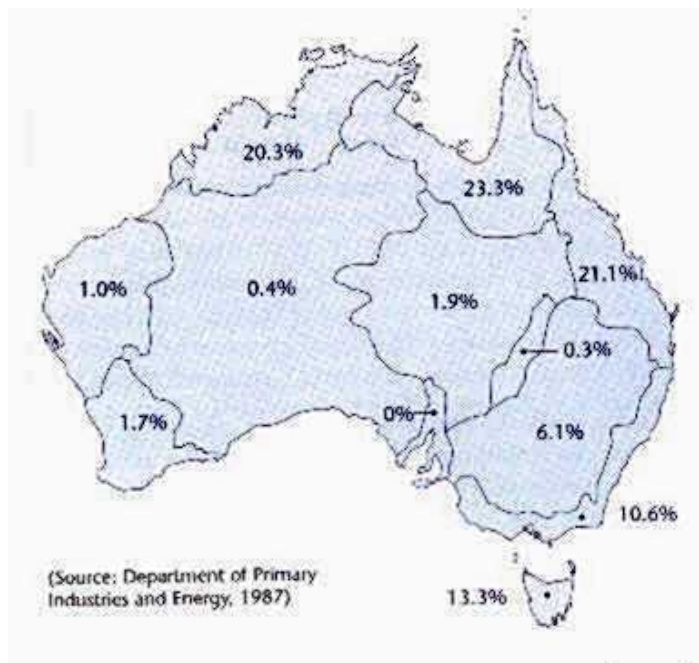
The Water Services Association of Australia (WSAA) is the peak body of the Australian urban water industry. WSAA's 21 members provide water and sewerage services to approximately 13 million Australians and many of the country's largest industrial and commercial enterprises.

WSAA was formed in 1995 to provide a forum for debate on issues of importance to the urban water industry and to provide a focal point for communicating the industry's views. As such, WSAA welcomes this opportunity to present the urban water industry's views to the Senate Inquiry into Australia's Urban Water Demand Management. WSAA is aware that a number of its members are making their own submissions to the Inquiry and, for this reason, will avoid addressing specific comments regarding demand management in the various urban centres.

THE WATER RESOURCE

Water is vital to human survival and lifestyle. It is not surprising, therefore, that the Australian community should consider that protection of water resources should be given a high priority. This importance is further strengthened by the knowledge that Australia is the second driest continent in the world. This statement, however, is misleading since Australia is a continent of great diversity within which one can find some very wet regions (eg the North, the North East coast and Tasmania) as well as some of world's most arid and inhospitable areas. Fig 1 below shows the distribution of

Fig 1 Distribution of Surface Runoff in Australia¹



¹ Reproduced from "Water and the Australian Economy", April 1999.

surface runoff in Australia. The Figure illustrates the great diversity within Australia in terms of surface water availability. Human settlement has, accordingly, concentrated in coastal areas where water availability was greater.

The development of inland Australia involving human settlement and agriculture (grazing of sheep and cattle) only became possible with the technology to drill for groundwater. Groundwater is used in large areas of Northern, western and central Australia.

Another key feature – and probably the most important - of Australia's water resource is the high variability of rainfall. Australia's rainfall is not only seasonal but extremely irregular compared to other continents. Available estimates of the coefficients of variation of rainfall and runoff suggest that they are 2 to 4 times those of North America and Europe. Due to the highly irregular precipitation, urban regions relying on surface water have had to invest in large surface water catchments and reservoirs to provide water supplies during recurring droughts.

The result has been very specific outcomes for different urban regions. For example, both Melbourne and Sydney rely on large water catchments. Perth, Newcastle and Geelong have a mixture of surface and groundwater reservoirs. Alice Springs relies on groundwater and its drinking water source is 20,000 years old. Adelaide, on the other hand, is dependent on the river Murray for its water. The key point being that each urban region has addressed its water security arrangements in a unique and specific manner according to its individual circumstances.

The final point that should be made in respect of Australia's water resources is regarding the possibility and potential impact of climatic change. There are considerable concerns regarding the potential effects of climatic change on the pattern of Australia's rainfall. Generally speaking, the predictions in the event of such climatic changes eventuating are for more rain in the Northern part of Australia and for less rain in the Southern regions. However, it is important to stress that the high variability of Australia's rainfall has made it impossible to discern any underlying trend changes. The only exception is the South West region of Western Australia, where hydrologists have shifted from relying on 100 year record of water yields to the experience of the most recent 20 years.

THE USE OF WATER & DEMAND MANAGEMENT

Water is essential to the environment. Mankind, while part of the environment, has developed and significantly changed the environment to bring prosperity and improve both the quality of human life and its lifespan. This progress,

however, has been accompanied by significant impact on the environment. Agriculture increased food production and allowed substantial increases in population. Other technological advances brought industrialisation. These in turn led to additional demands for arable land, bigger cities with significant impact on the environment. The challenge for the future is to strike a balance between the continuing demands for improvements in living standards and the need to safeguard the environment – including our waterways.

Since fresh water is used by industry and households it is important that as a community we should consider the way in which this crucial natural resource is used. As a society we have a responsibility to use this resource in a sustainable manner. The first step, therefore, is to consider how much water is used and by whom?

According to the Australian Bureau of Statistics², the dominant consumer of water in Australia is the agricultural sector, accounting for 70 per cent of water consumed. Mining and manufacturing activities each account for a mere 3 per cent of water consumption. The gas and electricity industries account for a further 6 per cent. The water and sewerage industries account for 8 per cent. Other service industries account for 2 per cent and the household sector for the remaining 8 per cent.

The second issue to consider is the trend in water usage. The important point here is the growth in demand by the dominant consumer. While it is difficult to estimate with accuracy a longer term trend of water usage by agriculture, CSIRO estimates that between 1984 and 1997 the water consumption by this sector of the economy increased by more than 5,000 GL. That increase in water consumption is more than 2 ½ times the level of water consumed by Australian households in 1996/97 (the most recent year for which comparable statistics for water used by the different sectors are available).

It is also important to note that broadacre farming (this section covers livestock, pasture and grain) uses more than one half of the water used by the entire agricultural sector. Broadacre farming and rice growing have the lowest production value per water used ratios of all other agricultural industries (\$290/ML and \$190/ML respectively). And yet, broadacre farming alone increased its net water consumption between 1993-94 and 1996-97 by around 3,000 GL. Vegetables, sugar, fruit and grapes increased their water consumption only marginally during the same period. And yet these agricultural industries have much higher production values per water used: vegetables \$1760/ML, fruit \$1460/ML, grapes \$615/ML and sugar \$420/ML. Mining, manufacturing, gas/electricity and the water/sewerage/drainage industries have much higher production values per water used than any

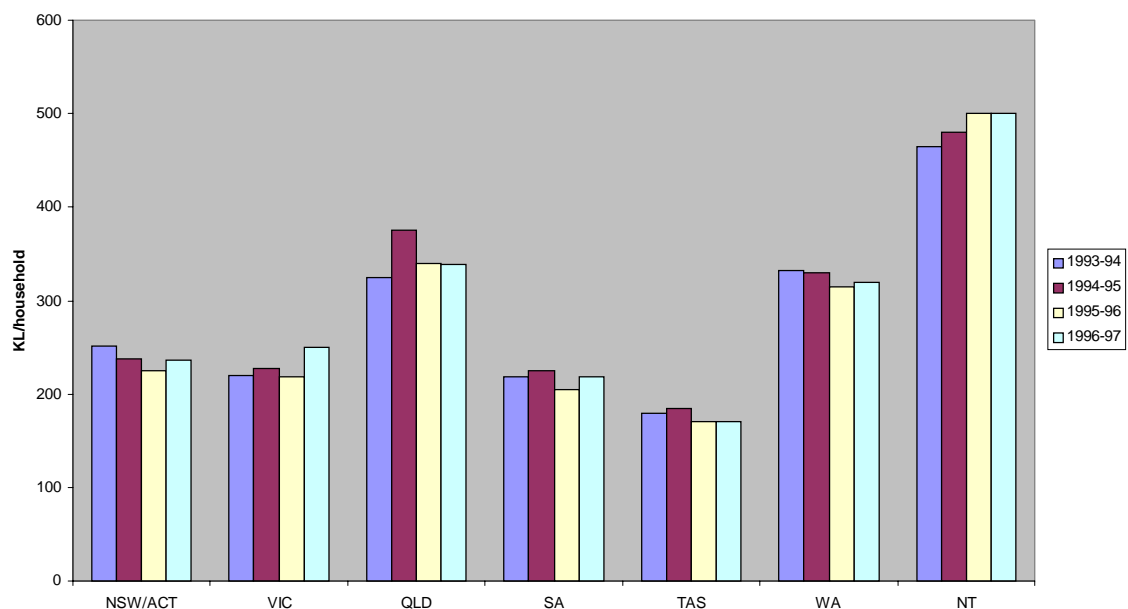
² Australian Bureau of Statistics, Water Account for Australia 1993-94 to 1996-97, Cat. No. 4610.0.

agricultural industry – ranging from \$87,400/ML for manufacturing to \$2,300/ML for the water/sewerage/drainage industries.

The bottom line in water utilisation, therefore, is that the key issue for water demand management is not associated with urban water but rather with rural water (since this is beyond the scope of this Inquiry, this submission will not dwell on this further).

Australian households account for 8 per cent of water used. The amount of water used varies substantially in the different States and Territories. Fig 2 illustrates the differences in water used in the various States and Territories.

Fig 2 HOUSEHOLD WATER USE



Water consumption is provided on a per household basis for ease of comparability. The data show that water consumption per household is higher than average in Queensland, Western Australia and the Northern Territory. Given the warmer climate in these States and Territory, this result is not surprising.

To understand urban water use and demand management one must take a longer term perspective than a four year period. The 1950s, 1960s and 1970s were periods of high growth in water consumption for Australia's urban regions. This substantial growth in water consumption led to the construction of large reservoirs and water harvesting schemes to provide water supply to urban regions during periods of drought.

A series of severe droughts, however, proved to be the turning point for the urban water industry. In Western Australia several drought years in the mid to late 1970s brought on the imposition of severe restrictions and, in 1978, the

introduction of consumption based pricing. On the East coast of Australia the severe drought of 1982/83 stimulated substantial reforms that were subsequently progressed throughout the Australian water industry.

Demand management for the urban water industry spans a number of conservation measures including consumption based pricing, the introduction of dual flush toilets, public education campaigns and labelling schemes for water efficiency of appliances. The impact of demand management by the urban water industry on water consumption has been substantial. Appendix 1 outlines the trends in water consumption over the last few decades for four Australian cities: Sydney, Melbourne, Perth and Newcastle. The various trends show that:

- Growth in urban water use has been substantially reduced. Indeed, in Sydney and Newcastle water consumption in 2000 is below the peaks experienced in the early 1980s;
- Water used on a per capita basis has been drastically reduced in urban regions.

The table below summarises the growth rates of urban water consumption for the three of those cities.

Changes in Water Use

	Total Water Used 1970 to 1980	Total Water Used 1980 to 1990	Total Water Used 1990 to 2000	Water Used Per Capita 1970 to 1980	Water Used Per Capita 1980 to 1990	Water Used Per Capita 1990 to 2000
Sydney	+30%	-6%	+2%	+15%	-16%	-7%
Melbourne	+50%	+13%	-1%	+38%	-6%	-12%
Newcastle	+37%	-16%	-2%	+27%	-23%	-14%

The timing of the drought and the earlier introduction of demand management in Western Australia require a longer term perspective. Between 1960 and 1970 per capita water consumption increased by 76% in Perth (1960 coincided with a severe drought). Water consumption on a per capita basis peaked in Perth at just over 230KL in the mid 1970s. Between 1970 and 1980, however, per capita water consumption was slashed by 27%. Since the middle of the 1980s per capita water consumption has stabilised and has ranged between 165 to 185 in recent years.

Generally speaking, the success of urban water demand management in reducing per capita water consumption has accommodated substantial increases in urban population while deferring major supply augmentations during the last 20 years.

Water Uses by Households

In considering the use of water by Australian households, it is important to recognise its various uses. Residential use of water ranges from washing (personal and items like clothes and dishes), cooking, toilet flushing, lifestyle (eg swimming pools) and watering gardens.

The latest Australian urban residential water use study was undertaken in Perth in 2000. The study estimated the composition of the various uses of water by households. Similar analyses have been undertaken for other Australian capital cities. However, to the extent that these various analyses were undertaken earlier than the Perth study and in different years³, direct comparison is difficult due to the higher uptake of more water efficient sanitary fittings and appliances (from dual flush toilets to dishwashers and washing machines) in more recent years.

Fig 3 below suggests that in Perth more than half of the water is used outside the house. While the actual proportion of external water use is higher in Perth than, say, in Melbourne or Sydney, the external water use for Australian urban households is much higher than that of their European counterparts. Fig 4 shows the composition of residential water use in the UK. The chart indicates that in the UK external urban water use, at only 3% of total residential consumption, is almost negligible compared to Perth. The situation regarding external water use by households in other developed countries in Europe would be similar to the UK. Whereas Australia's urban development is similar to that of urban sprawls in the USA. With that kind of development comes significant water use to maintain suburban gardens and other outdoor water uses.

³ See Appendix 2.1 of WSAA, "Wise Water Management, A Demand Management Manual for Water Utilities" for such comparisons."

Fig 3 RESIDENTIAL WATER USE -PERTH

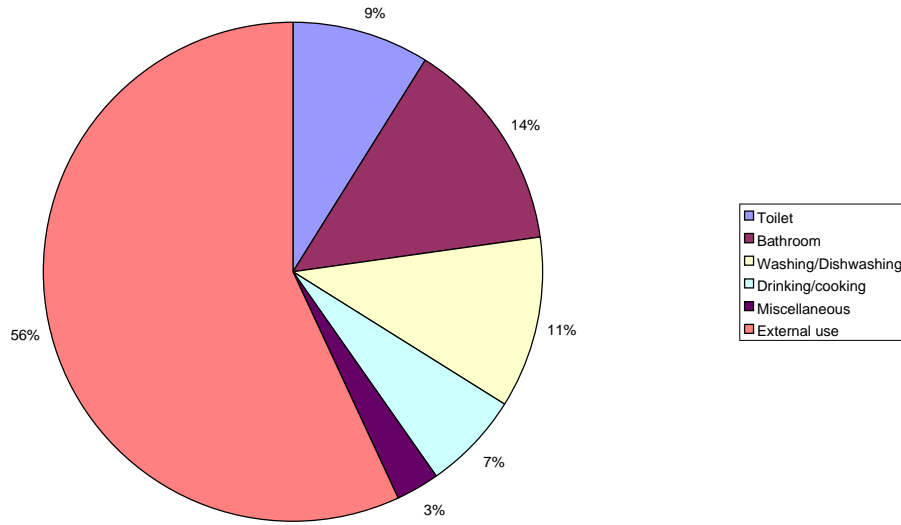
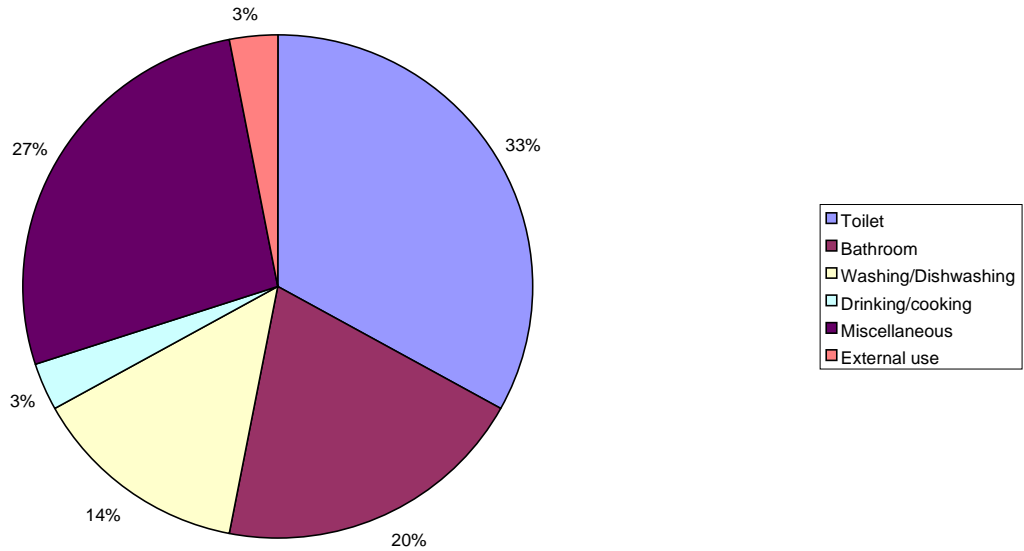


Fig 4 RESIDENTIAL WATER USE - UK



Indoor water consumption is determined by household behaviour and the water efficiency of household appliances and sanitary/plumbing fittings. Taking toilet flushing as the first category in residential water consumption, Australia compares quite favourably with other advanced countries. The dual flush toilet was introduced in Australia in the mid 1980s. The table below includes a comparison of the flushing capacities of toilets in various countries.

Toilet Flushing

England & Wales	9.5 l/flush
Finland	6 l/flush
France	9 l/flush
Germany	9 l/flush
Australia	3-6 l/flush (ave. 4l/flush)

The second category in residential water consumption is the bathroom and comparisons here are more difficult. While the water efficiency of fittings is important, the principal drivers here are household behaviour in terms of preference for say bath compared to shower and washing frequency. For example, in the UK the bathroom only accounts for 20% of residential water consumption. In Switzerland and Finland, water consumption in the bathroom is around 30%, roughly comparable to Australia's, once outdoor consumption is removed.

The third category of residential water consumption is washing and dishwashing. Australian washing machines are predominantly top loaders whereas front loading machines are the norm in Europe. Generally speaking, front loading machines are significantly more water efficient – they are also substantially more expensive to manufacture.

Dishwashers

England & Wales	35 l/cycle
Finland	25 l/cycle
France	24 l/cycle
Germany	27-47 l/cycle
Australia	17-33 l/cycle

The table above shows a comparison of the water efficiency of dishwashers available in various countries. The efficiency of dishwashers available in Australia is similar to those of the other countries. Appendix 2 of this submission contains charts which illustrate the increasing water efficiency of washing machines and dishwashers manufactured over time. As newer appliances are installed, the water efficiency of the household tends to improve – regardless of the reason for purchasing the new appliance.

The proportion of other residential uses of water (drinking, cooking and miscellaneous) is small and unlikely to be impacted by the water efficiency of any product. Accordingly, it will not be discussed further in this submission.

Outdoor use of water by Australian household is significant and an integral part of Australia's lifestyle. Residential gardens are common. This common feature of Australian urban development makes Australian households heavy users of water. Increased affluence has added to this aspect of residential water consumption by increased incidence of private swimming pools and the introduction of automatic garden watering systems – the latter with the potential to also increase peak usage. There are, however, offsetting trends. For example, increased use of outdoor paving and a shift towards inner city living. Around 5% of the populations of Melbourne and Sydney now live within a very small radius of their respective CBDs and the trend seems set to continue. This inner city lifestyle is associated with negligible outdoor residential water consumption. The trend is also taking place in other major Australian cities.

The Domestic Water Use Study⁴ highlights the impact of growth in affluence in terms of appliance ownership for the city of Perth. The study notes that between 1981 and 1998 the proportion of households with installed automatic reticulation watering systems for gardens and lawns had increased from 5% to 41%. In the same time period the proportion of households with inground pools had increased from 11% to 21%. The proportion of households with dishwashers had increased from 13% to 29% and those with automatic washing machines had gone up from 64% to 93%. On the positive side, from the perspective of water demand management, the proportion of households with dual flush toilets had increased from 1% to 65%.

The problem with outdoor water usage is that it is not amenable to easy general fixes for water efficiency. The answers lie in garden designs, paving rather than lawns, appropriate plants, responsible watering, urban planning, swimming pool covers etc. The solutions in this area are mostly individual.

⁴“Domestic Water Use Study” by Peter Coghlan and Chris Higgs, Infrastructure Planning Branch, Water Corporation

The only obvious broad tool for management is to ensure consumers pay for the water they use.

Demand Management

The water supply and demand circumstances in the various Australian urban centres are very different. The prospects for population growth – and hence demand for water – are also very different. This suggests, therefore, that the need for a uniform demand management solution across Australia does not exist.

Nevertheless, demand management of this precious resource remains important and urban water service providers have been active in this area over the years and have developed various strategies with some success. Indeed, WSAA has produced a demand management manual for water service providers called *Wise Water Management* (a copy is attached to this submission). The manual provides guidance on developing a cost effective demand management plan while reducing the adverse urban impact on the environment.

The tools available for advancing a demand management strategy include: pricing, reduce unaccounted water, efficient water use, public campaigns/customer communications, retrofitting and water reuse. These will be discussed briefly in turn.

Pricing

Pricing has been the cornerstone of demand management. The urban water industry has moved from property based charges to the introduction of consumption based pricing – essentially a fixed charge and a consumption component. “Free water” allowances were progressively phased out. It must be stressed, however, that the reliance of the fixed charge versus the consumption component of the two part tariff varies with different service providers. However, a common feature of the pricing reform has been the increasing reliance on the consumption component of the two part tariff over time.

To illustrate the point made above, the table below shows the impact of the pricing in place in the cities: Sydney, Melbourne and Newcastle. The table shows the fixed and consumption charges and the total water bill for a

domestic property which used 250 KL of water⁵ during the years 1980, 1990 and 2000.

Domestic Water Bill for 250 KL p.a. (\$)

	Sydney	Sydney	Sydney	Melb.	Melb.	Melb.	N.castle	N.castle	N.castle
	Fixed	Consumption	Total	Fixed	Consumption	Total	Fixed	Consumption	Total
1980	101	0	101	79	0	79	128	0	128
1990	93	38	131	124	17	141	76	170	246
2000	76	228	304	54	176	230	25	231	256

The table illustrates the increasing reliance on the consumption part of the two part tariff and the progressive lowering of the fixed part component. It must be noted that all amounts are in dollars of the day.

The only other issue which must be flagged is price elasticity – that is the expected decrease in water consumption from a given price increase. Various studies have attempted to estimate this relationship and have concluded that it is inelastic – that is a given percentage price increase will result in a somewhat smaller percentage decrease in water consumed. It must be emphasised that these findings are in respect of short run impacts and mostly about the overall use of water. This finding should come as no surprise given the capital costs associated with drastically changing an household's water consumption. In the long run, however, this is not the case and, as with most products and services, water demand can be expected to be more elastic. It must also be stressed that the various household uses of water would have different price elasticities and, in particular, that indoor water use would be more inelastic than outdoor use.

Unaccounted water

There are water losses from any water supply system. Some are inevitable, some are beyond the control of the water service provider. Others, however, are within the control of the service provider and require monitoring and remedial action.

⁵ 250 KL is approximately the average annual volume of water consumed per residential property in 2000 for all WSAA members. The actual volumes consumed in Sydney, Melbourne and Newcastle are lower.

Unaccounted Water % of Water Supply

Denmark	4 to 16
Finland	15
France	30
Germany	8.8
Hungary	30 to 40
Italy	15
Spain	24 to 34
Australia	12

The table above includes a comparison of Australia's average performance compared to other European countries. The UK does not report unaccounted water in a comparable manner to other European countries. The statistic used by the UK is 243 l/property/day and the comparable figure for Australia is 142 l/property/day.

While Australia compares quite favourably with overseas experience, the Australian industry has adopted a number of initiatives to continue to improve its performance. At the same time it is important to stress that there are limits to the extent to which it is economically justified to seek improvements given the price of water. Increases in the price of water will extend those limits.

The Australian urban water industry has been active in this area. WSAA has adapted the International Water Associations (IWA) methodology of evaluating the performance of water suppliers with regards to Non-Revenue Water and Water Losses. Software has been developed to suit Australian conditions. This information is essential for improving the rational assessment of the effectiveness of water demand management in Australia. Current comparisons of Unaccounted for Water in percentage terms are now considered inappropriate as technical and financial performance indicators of the management efficiency of water supply systems represent a more rational and structured approach. WSAA has distributed the software and user manual to its members and it is available to non members for a small charge.

Efficient water use

The urban water industry has been an enthusiastic promoter of efficient water use. The Standards Association of Australia, together with the Australian Water Resources Council – the precursor to WSAA - launched the Water Conservation Rating and Labelling Scheme. This Scheme is an efficiency

rating scheme similar to the energy rating scheme and provides ratings for dishwashers, washing machines, water taps, shower heads, toilet suites and urinals. It is the intention to expand the water efficiency rating scheme to include irrigation systems, evaporative coolers and flow controllers.

The current Water Conservation Rating scheme is based on a 3 A with:

- A - an acceptable level of water efficiency,
- AA - high level of water efficiency,
- AAA - excellent water efficiency.

WSAA hosts information regarding the ratings of various products on its website (either via www.wsaa.asn.au or directly at ratings.wsaa.asn.au). Although manufacturers that have applied for the rating are able to label their products accordingly.

With the introduction of products that are even more water efficient than those which were previously available, WSAA has now changed the scheme from a 3 A to a 5 A rating scheme. All the existing product ratings are still based on the 3 A rating scheme but evaluations are being undertaken to rate products to the new rating.

The scheme is voluntary. Manufacturers and importers of such products are not obliged to have their products rated or labelled. Consumers are also free to make their own decisions.

Another approach taken in this area was the decision regarding the installation of dual flush toilets. This decision, taken in the mid 1980s, ensured that any new toilets installed were significantly more efficient in their use of water (see above for comparisons to overseas performance).

Promotion of water efficiency in gardens, lawn watering and other outdoor uses is more difficult. However, water service providers have undertaken programs in this area through demonstrations of water efficient gardens (eg Xeriscape in the ACT) and the provision of information regarding efficient garden and lawn watering practices.

Public campaigns/Customer information

The urban water industry has made extensive use of public campaigns over the years. The focus of such campaigns has been varied; from specific focus on periodic water restrictions to general conservation (eg the Victorian “3 Buckets”). In addition to such public campaigns, the provision of water

consumption information in water bills allows the customers to view trends in their water usage (and understand its implications for charges).

There is no doubt that properly targeted public campaigns can have beneficial impacts on water usage and are an important change agent for other reforms.

Retrofitting

The use of incentives to encourage retrofitting of existing sanitary and plumbing fittings has been implemented by some water service providers. Such incentives have included subsidies for the installation of shower heads, rainwater tanks, water efficiency ratings of houses with recommendations for improvements.

These programs can be effective in achieving reductions in water usage. They are, however, by their nature expensive and their overall resource efficiency needs to be considered.

Water reuse

Water reuse is an issue for stormwater and wastewater, including greywater (water flows from shower, bath, basin, sink, washing machine and dishwasher but not from toilets). Water reuse, while conceptually attractive, should be considered with all other options for sustainability having regard to cost effectiveness, health considerations, environmental implications and community acceptance issues.

While stormwater appears to be a cheap source for water reuse, its storage and quality provide significant difficulties. These difficulties are often compounded by institutional fragmentation over responsibility with associated problems for its management. On the other hand, public acceptability regarding its reuse is higher than in respect of wastewater. The issues here are how to manage stormwater and its quality in older systems which were designed to remove stormwater quickly from urban development and the implementation of innovative stormwater solutions in new urban developments.

Effluent reuse is a more sensitive issue with the community. Generally speaking, the community considers that wastewater reuse is suitable for irrigation and industrial use. Dual reticulation systems as part of new urban infrastructure have been tried (eg Sydney's Rouse Hill). Such systems are expensive and community acceptance remains an issue.

WSAAfacts publishes figures regarding wastewater reuse (excluding amounts of treated water returned to waterways) and waste water biosolids reuse.

Fig. 5 WASTEWATER REUSE

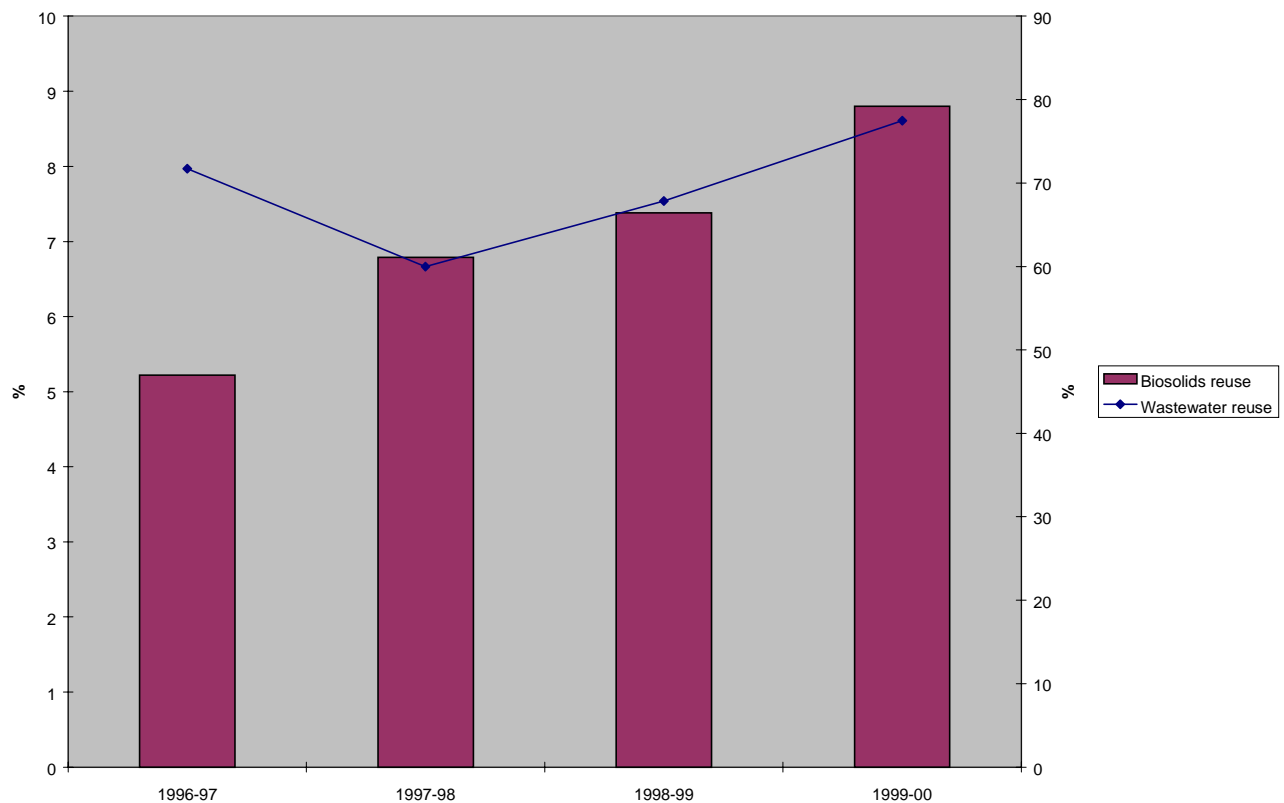


Fig 5 above shows a continuing increase in the proportion of wastewater being reused for alternate consumption, albeit at relatively low levels. Reuse of biosolids from wastewater is, however, much higher.

While it is technically possible to produce potable water from wastewater, the efficiency and community acceptance of such solutions are questionable. Indeed, the only city where a potable recirculation system is in operation is Windhoek in South Africa. Similar capabilities do exist in the USA but public acceptance remains a problem.

Reuse of greywater is an alternative that has been investigated. The predecessor to WSAA, the Urban Water Research Association of Australia produced two reports dealing with domestic greywater reuse, overseas practices and their applicability to Australia (copies of the reports are attached to this submission). Greywater reuse offers potentially significant savings by using it for garden and lawn watering. There are however problems associated with human health, plant damage, contamination of soil, possible

pollution of waterways through runoffs as well as odour/aesthetics issues and possible groundwater contamination.

Other greywater reuse schemes envisage its use for toilet flushing. Obviously the potential for water savings are smaller and there are associated health issues.

The bottom line is that while there is some scope for additional reuse and the industry is continuing to experiment with innovative solutions, there are no simple formulae or fixes.

WATER SERVICES AND THE ENVIRONMENT

The urban water industry is not fixed on a mindset of continual augmentation of the existing water supply systems. The industry understands the importance of the urban water lifecycle; that is the provision of water supply, sewerage services and the management of stormwater runoff. The industry has invested in developing an understanding of this lifecycle. Good management of urban stormwater and treatment of sewage effluent is essential to the protection of urban waterways and coastal waters. Reliable scientific evidence on the ecology of these waters is essential to the development of cost effective management strategies.

The urban water industry has invested significantly in recent years to improve the environmental impact of wastewater. Between 1987/88 and 1999/2000 capital investment in sewage treatment and reticulation in Sydney, Melbourne, Brisbane, Adelaide and Newcastle amounted to \$9.4 billion (in 2000/01 dollars). As a result of these investments wastewater quality has improved significantly and it was important to reassess the industry's priorities regarding the urban water lifecycle. The funding provided by Melbourne Water for the Port Phillip Bay Environmental Study, the Water Corporation in Western Australia for the Perth Long Term Ocean Outlet Monitoring Program and Brisbane City Council/Gold Coast City Council and their water businesses for the South East Queensland Regional Water Quality Management Strategy are three examples of such involvement. The investment in environmental studies provided vital information to ensure major investments will achieve the desired environmental outcomes in a cost effective manner.

Many of the findings of the above studies formed the basis of the recommendations of the WSAA submission to the Senate inquiry into Marine Pollution. The recommendations of the submission were:

Understanding the ecology of local Coastal Waters

1. That goals for managing discharges of treated sewage effluent, urban stormwater and agricultural runoff to coastal waters be based on the desired environmental outcome, developed progressively by ongoing monitoring and ecological study of the local waters;
2. That ecological models of priority coastal waters be developed describing ecosystem behaviour allowing goals, and management strategies to be based on the ecology;

Audit of the Whole Urban Water Lifecycle

3. That audits of the whole urban water lifecycle identifying the movement of water, the sources and destinations of sediment, nutrients, metals etc be conducted as the basis for preparing comprehensive catchment wide strategies, and assessing management initiatives to improve water management;
4. That reform of water and wastewater pricing policies continue;
5. That innovation in new, more sustainable and cost effective forms of urban development, and water using appliances be encouraged by a vigorous program of research and development;

Assignment of Accountability for Quality of Runoff

6. That accountability for the quality of urban stormwater and agricultural runoff be clearly assigned to a “commission” for each major catchment by applying the principles of the Murray Darling Basin integrated catchment initiative;

(the accountability for treated sewage effluent is already clearly assigned).

7. That comprehensive catchment wide strategies involving the whole urban water lifecycle be developed by the “commission” based on the most cost effective and sustainable means of achieving the defined environmental goals;

Mobilise Community Support to Clean up Urban Stormwater

8. That the experiences of the Landcare Movement be used to develop an “Urban Water Care” movement to clean up urban stormwater by reducing

the load of sediment, floating rubbish, grass cuttings, plastic and household chemicals.

THE FUTURE

Water Sensitive Urban Design

A number of WSAA members have participated in significant water sensitive urban design projects. Sydney Water's Rouse Hill double reticulation project, Brisbane Water's Integrated Water Management Study and Melbourne Water's participation in the Lynbrook estate to the South East of Melbourne are all examples of the way forward in developing innovative water sensitive designs which are cost effective. These projects and the WSAA members' active participation demonstrate the industry's commitment to finding innovative solutions to water sensitive urban designs.

In seeking innovative urban designs, all stakeholders, including the community, the urban water industry and regulators, have a role to play to ensure that stormwater, wastewater and water supply are developed in ways that sensibly take the environment into consideration. WSAA intends to act as an industry forum to stimulate innovation in this important area.

Demand & Population Growth

Past successes in urban water demand management are no cause for complacency. While urban water consumption per capita has been relatively static in recent years (except in cities in which consumption based pricing has been introduced only recently), population increases bring pressure for increased urban water consumption. The Australian Bureau of Statistics has issued projections⁶ for populations for Australia's capital cities. Australia's population is projected to grow from 19 million people in 1999 to between 24 million and 28 million in 2051 under various assumptions including net fertility rates and immigration intakes.

The key issue in the population projections is that the impact of the growth is not expected to be even across Australian cities. The table below illustrates the extreme variation in expected population changes in Australia's major cities.

⁶ Australian Bureau of Statistics, Population Projections Australia 1999-2101, Cat. No. 3222.0

The average of the three projections for Sydney suggests something in the order of a 45% increase in population for Sydney between 2000 and 2051. For Melbourne the average of the three projections only suggests a 29% increase during the same period. Brisbane's projected population increase is an average of 81%. The average projection for Perth is 62%. The expectation for Adelaide's population is to remain at the same level. The projections for Canberra vary from a significant increase to a substantial decrease and with an average increase of 20% over the period. Hobart's population is projected to, at best, remain at the existing level or to decrease to almost half its existing size. In percentage terms, the greatest increase in population is projected for Darwin, whose size is on average expected to more than double between 2000 and 2051.

Population	2000	2051 Ser I	2051 Ser II	2051 Ser III
Sydney	4.1 M	6.2 M	5.9 M	5.7 M
Melbourne	3.5 M	4.5 M	4.4 M	4.6 M
Brisbane	1.6 M	3.3 M	2.9 M	2.5 M
Perth	1.4 M	2.6 M	2.2 M	2.0 M
Adelaide	1.1 M	1.0 M	1.1 M	1.2 M
Canberra	0.31 M	0.49 M	0.37 M	0.25 M
Hobart	0.19 M	0.19 M	0.15 M	0.10 M
Darwin	0.09 M	0.24 M	0.19 M	0.12 M

While Darwin has the fastest growth rate in population projections, the most significant increases in absolute terms are expected in the larger cities. Taking the ABS Series II projections, Sydney's population is projected to increase by 1.8 million between 2000 and 2051, Brisbane's by 1.3 million, and Melbourne and Perth by 900,000 and 800,000 respectively.

The bottom line is that the ABS is projecting increases totalling 4.8 million people spread across Sydney, Melbourne, Brisbane and Perth over the next 50 years.

Continued attention to demand management will assist in keeping increases in water consumption below the projected increases in population. However, demand management initiatives to date have substantially improved water efficiency without significant impact on either lifestyle or water systems. Further reductions in demand, without substantial technological change, are likely to be incremental or require significant changes to either lifestyles or water systems. These changes are not without cost.

CONCLUSIONS

Statements such as “Australia is a dry continent” are misleading since they miss the key feature of the nation – the great regional diversity and its highly variable rainfall. To understand the different regional considerations facing the urban water industry one must take into account:

- Differences in specific water resource availability,
- Differences in population projections, and
- Specific opportunities for urban designs.

All these considerations indicate that more effective urban water solutions are likely to be found at the regional level rather than at a national level.

The last twenty years period has seen the implementation of successful programs of urban water demand management in delivering reductions in the growth of total water consumption and absolute decreases in per capita water consumption. The success of these programs has generally resulted in the avoidance of augmentation of water supplies while accommodating large increases in urban population.

In addition, the urban water industry has in recent years undertaken substantial investments in improving the quality of wastewater to the point where it is now clear that stormwater quality is emerging as a higher priority for the environment.

The urban water industry has made substantial achievements in progressing a reform agenda which has included the universal introduction of user pays pricing, full cost recovery and other structural changes which have made the industry more efficient (operationally and in its use of water), accountable and responsive to change. It is now timely to begin to think about the next round of reforms. WSAA and its members are prepared to take the lead in assessing new water sensitive urban designs which meet the community’s needs in a cost effective manner while achieving desirable environmental objectives. WSAA plans to provide a forum for stakeholders to discuss water sensitive urban designs and options for trial subdivisions. The performance of such projects should be rigorously evaluated to provide feedback for further developments.

It is important, however, to note that while demand management is, and will remain, important; there are practical limits to what it can accomplish given community expectations and lifestyles. Accordingly, the development of water allocation policy should recognise the specific regional circumstances, having regard to water availability and projected population increases. Such considerations should not exclude the potential for future urban water supply augmentation.

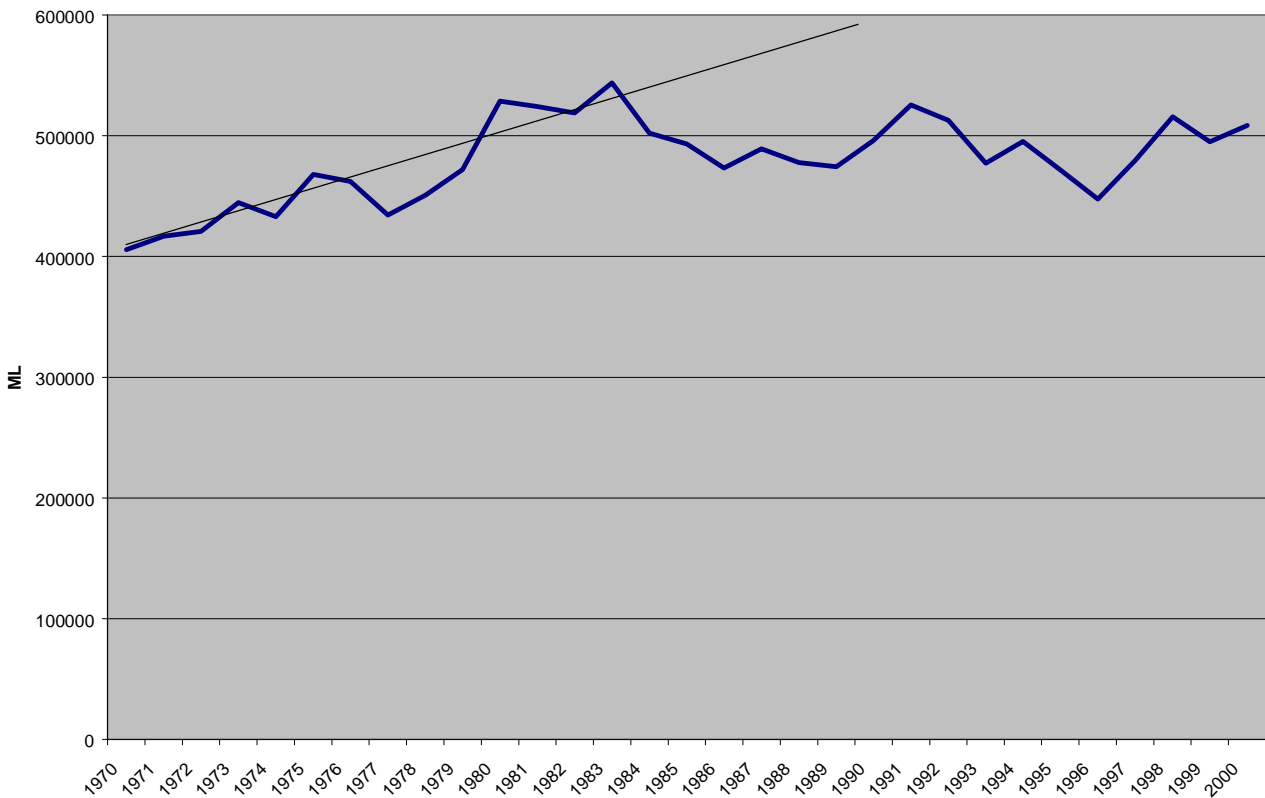
Water Consumption in Australia's Capital Cities

Water consumption in Australian cities has responded to demand management measures. This appendix outlines the history of the last thirty years for total water consumed and water consumed per capita for three Australian cities: Sydney, Melbourne and Newcastle. The Appendix also includes the history of water consumption for Perth over the last forty years.

Taking Sydney first, Figure A1.1 shows the history of total water used from 1970 to 2000. The chart clearly shows an upwards trend to the early 1980s.

From the mid 1980s to 2000, however, the total amount of water used by Sydney has fallen relative to the previous peaks despite the city's population

Fig A1.1 SYDNEY WATER USE



increasing by almost 1 million people.

The gains in water consumption on a per capita basis have been even more impressive. Figure A1.2 shows the water consumption history on a per capita basis since 1970.

Fig A1.2 SYDNEY WATER USE PER CAPITA

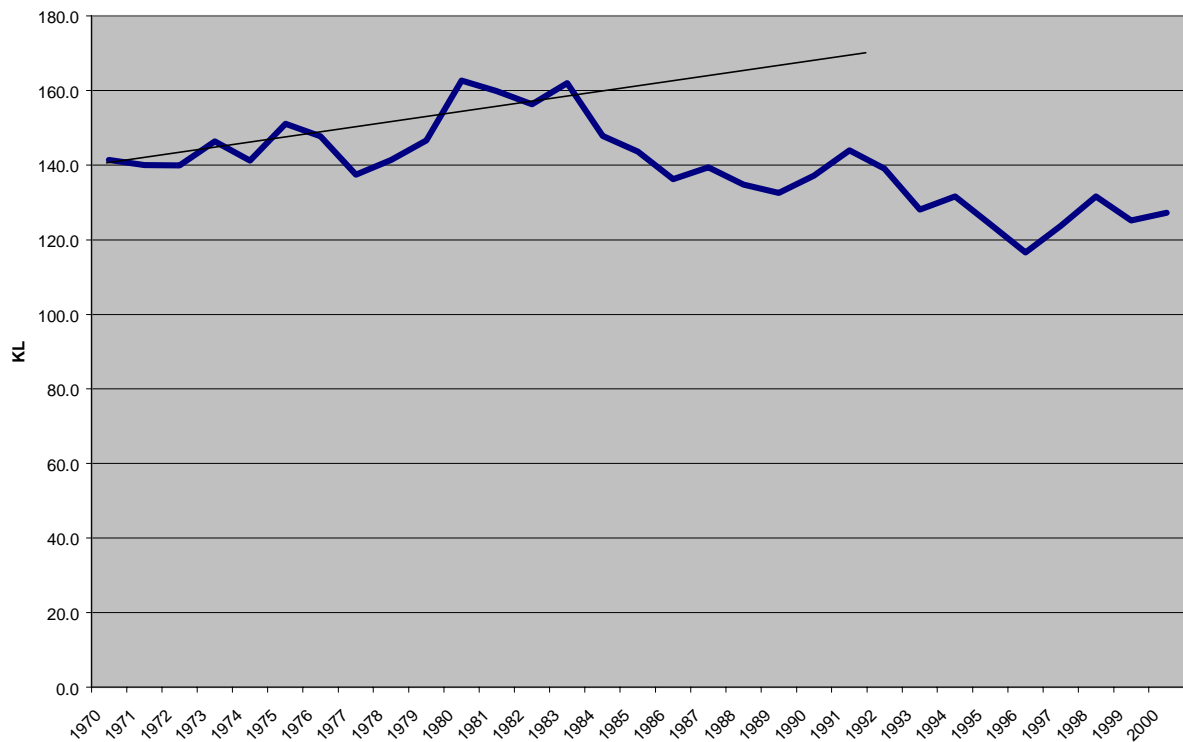
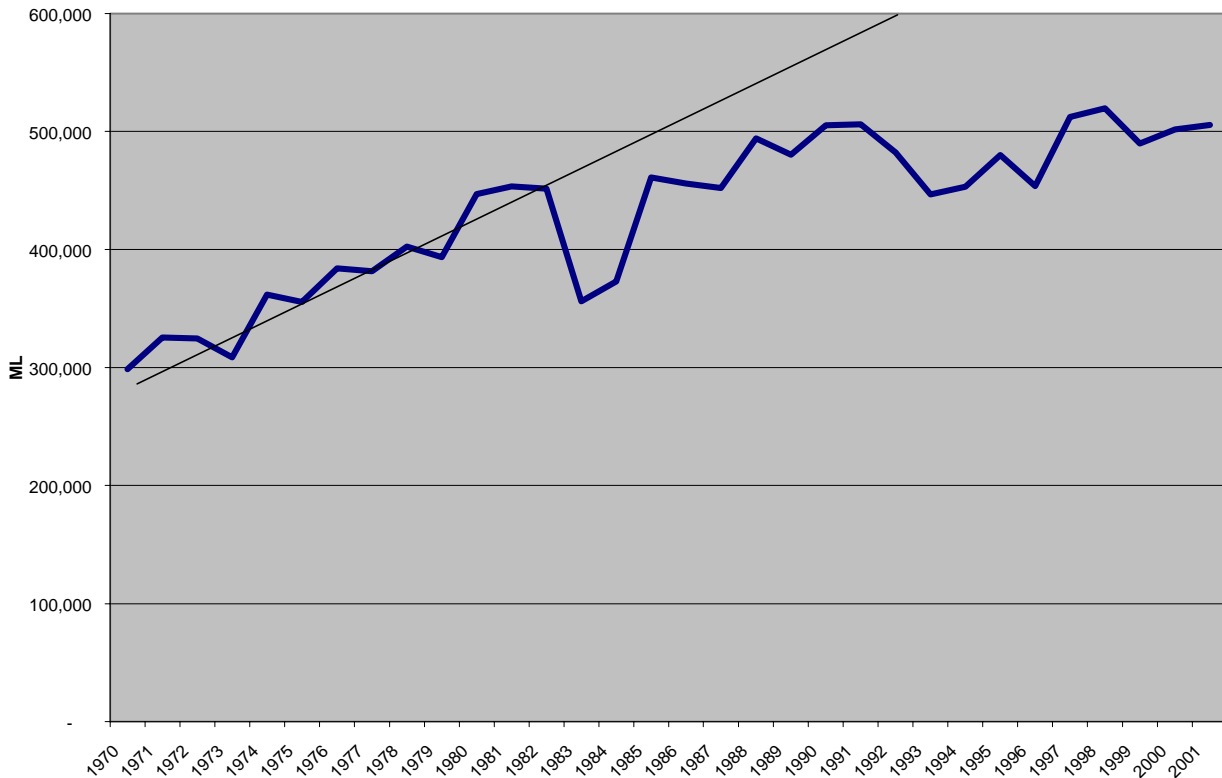


Figure A1.2 shows a rising trend until the early 1980s from 140 KL per capita to over 160 KL per capita. In more recent times per capita water consumption has ranged around the 120 to 130 KL band.

The trend in water consumption for Melbourne was an increase from 300,000 ML in 1970 to over 450,000 ML by the early 1980s. Demand management in Melbourne began with public education campaigns in 1982, followed by the introduction of dual flush toilets in 1984 and the consumption based pricing starting in 1986. The drought of 1982/83 also resulted in the imposition of temporary restrictions on water consumption – the last time they were introduced in Melbourne. The result was an immediate reduction in the rate of growth. Growth in total water consumption in Melbourne has since resumed and in more recent times has exceeded 500,000 ML in some years. However, as Figure A1.3 illustrates the recent upward trend is lower than that experienced in the earlier period and total water consumption is substantially lower than the consumption levels that would have eventuated had earlier trends continued unabated – particularly since Melbourne’s population increased by almost 1 million people between the early 1980s to 2000.

Again, the impact of demand management is more marked if one considers the trend history of water consumption on a per capita basis. Figure A1.4

Fig A1.3 MELBOURNE WATER USE

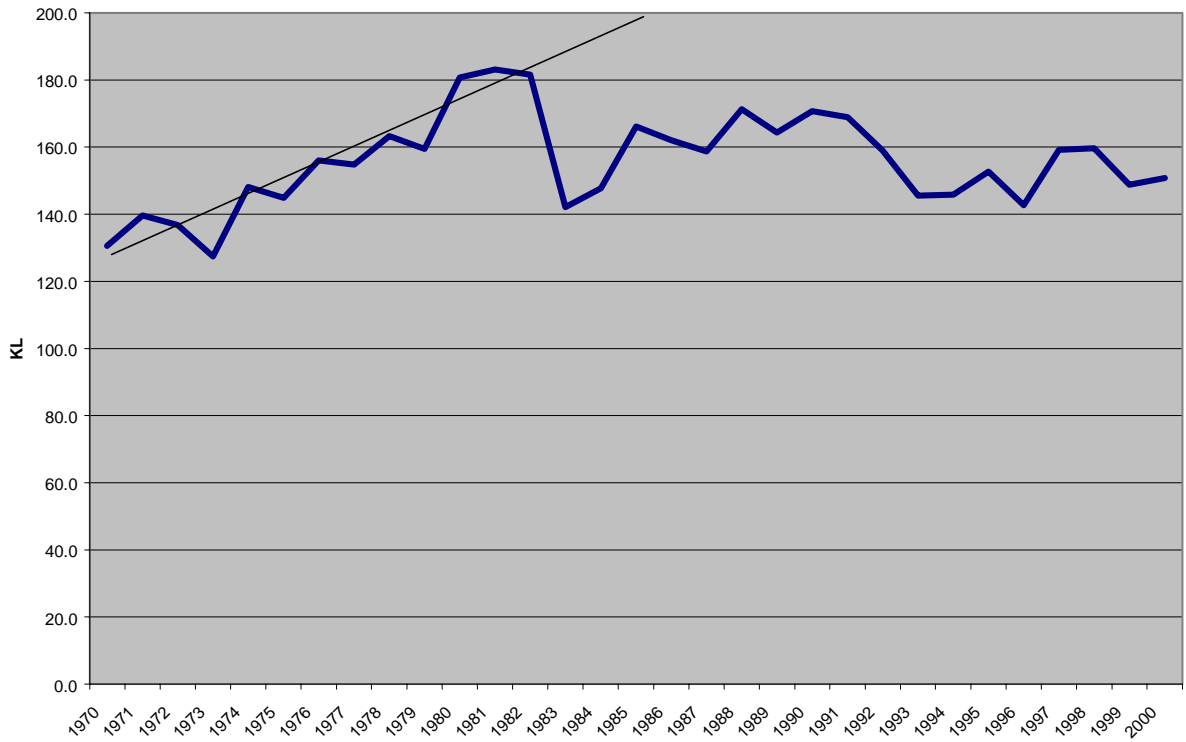


below shows that in the early 1970s water consumption on a per capita basis ranged between 130 and 140 KL before increasing to over 180 KL per capita in the early 1980s. In more recent years per capita consumption has ranged between 150 and 160 KL.

The history of water consumption for Newcastle shows that between 1970 and 1982 total water consumption in Newcastle rose from below 70,000 ML to above 90,000 ML. The introduction of consumption based pricing in 1982 and the progressive reduction of the fixed charge and increasing reliance on the variable part of the two part pricing tariff has slashed total water consumption and kept it below 77,000 ML despite Newcastle’s population increasing from 390,000 people in 1982 to over 466,000 in 2000. Figure A1.5 below shows the history of total water consumption in Newcastle from 1970 to 2000.

Again, the impact of Hunter Water’s demand management is more profound when viewed in terms of water used on a per capita basis. Figure A1.6

Fig A1.4 MELBOURNE WATER USE PER CAPITA



below shows water consumption on a per capita basis at just below 200 KL per person in the early 1970s rising to 250 by 1980. The demand management measures introduced since then have continued to slash per capita water consumption to a band around 160 to 165 KL.

NEWCASTLE WATER USE

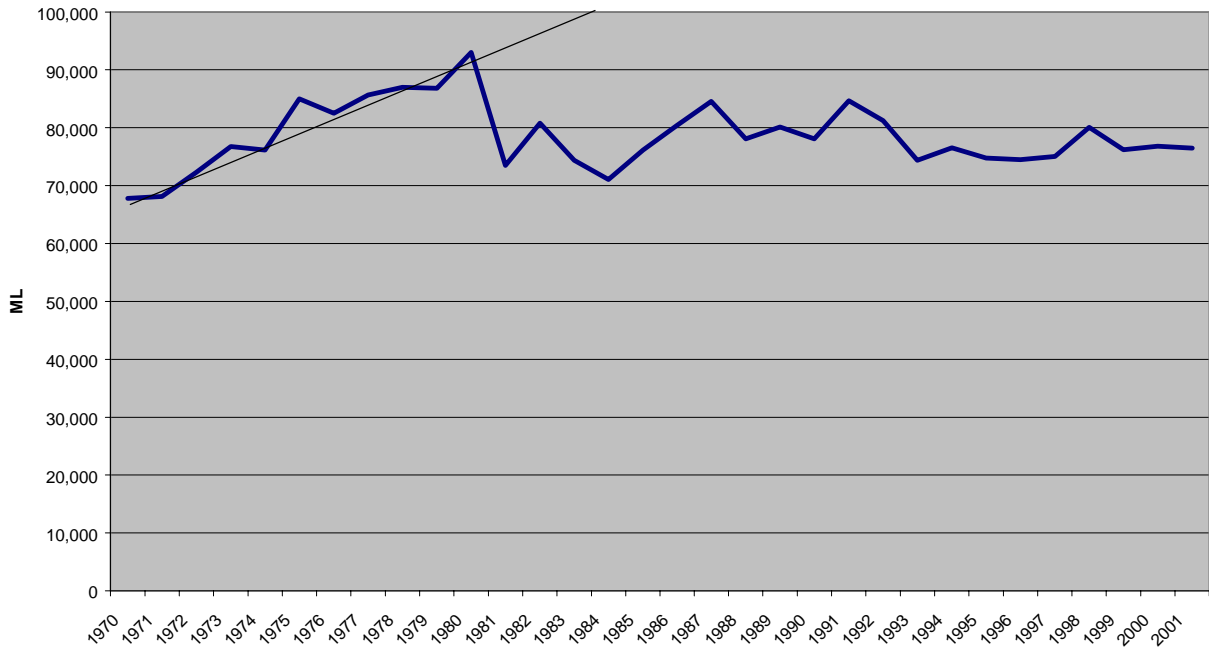
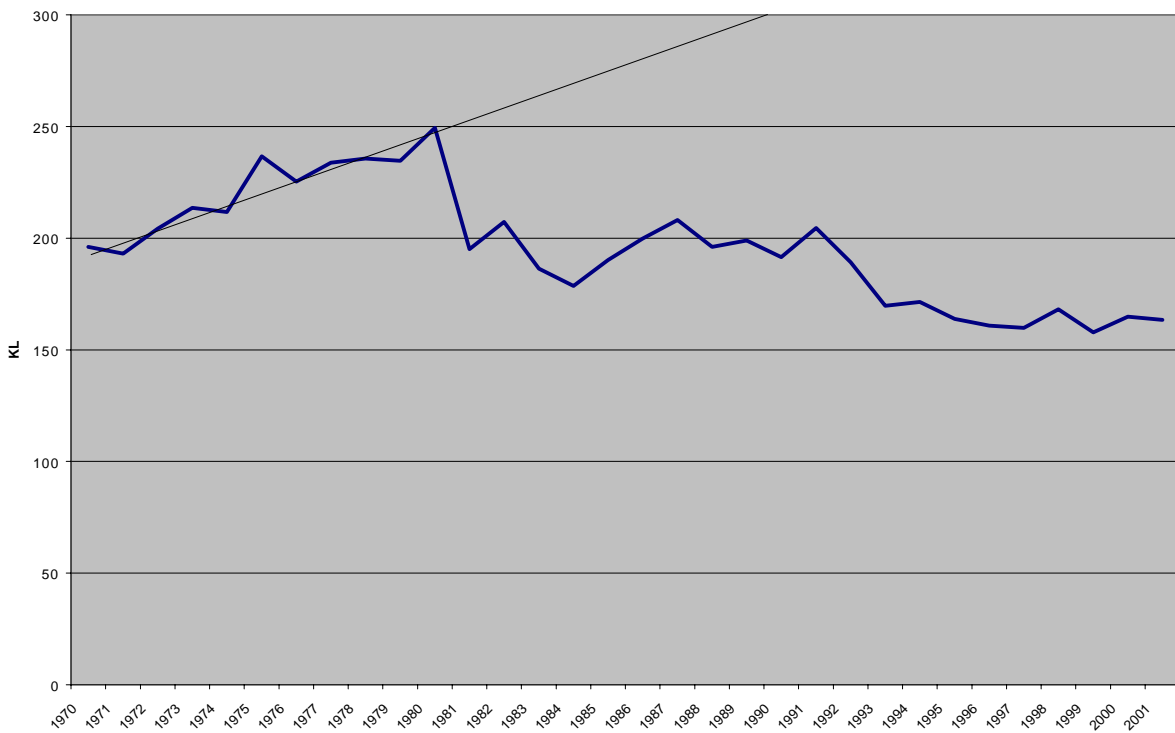
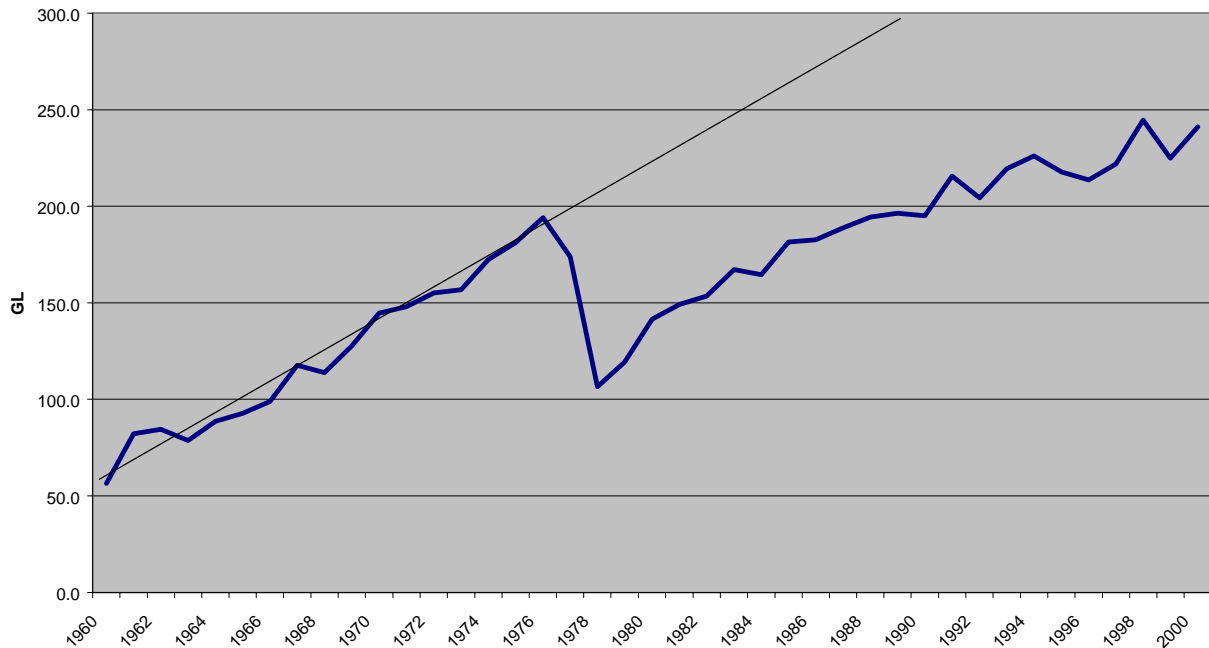


Fig A1.6 NEWCASTLE WATER USE PER CAPITA



The experience with demand water management for Perth also reflects strong growth in total water consumption and per capita consumption prior to the introduction of demand management. During the mid to late 1970s severe droughts brought on restrictions and the introduction of consumption based pricing (this included a free water allowance that was phased out by 1995). Figure A1.7 shows the history of Perth's water consumption from 1960 onwards (an earlier starting point was chosen due to the earlier introduction of consumption based pricing in Perth).

Fig A1.7 PERTH WATER USE



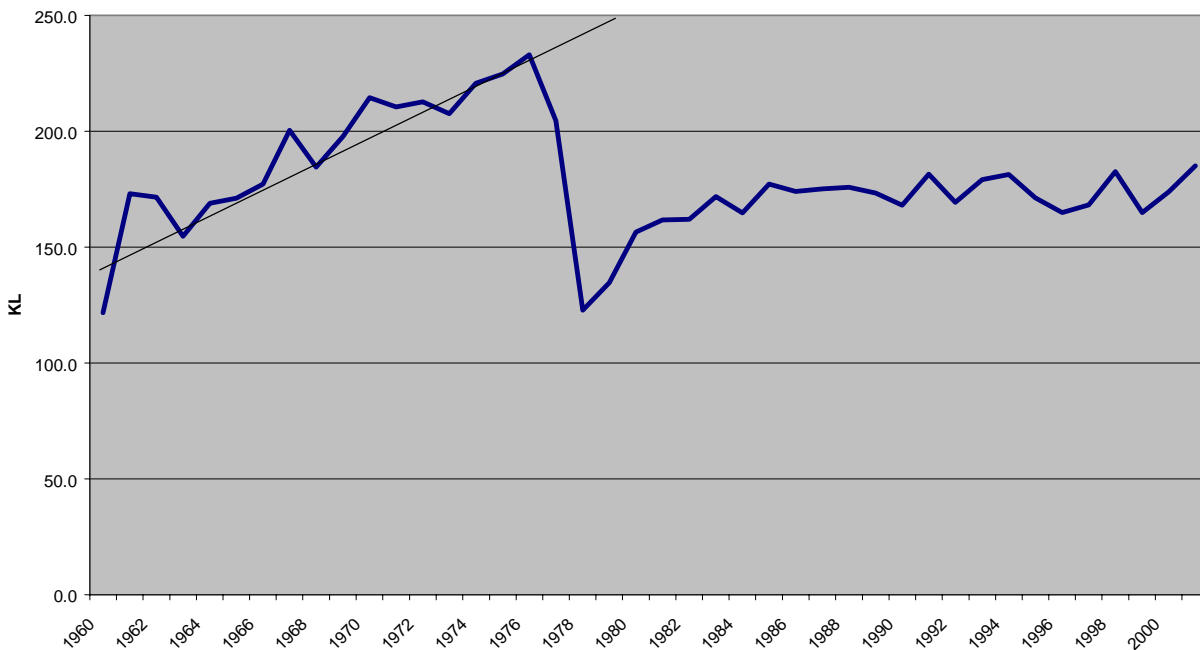
Perth's water consumption in 1960, at 57 GL, was atypical with consumption closer to 80 GL being closer to the norm of the period. High population growth and increasing per capita consumption pushed total consumption to a peak of 194 GL by 1976. Drought restrictions and the introduction of consumption based pricing combined to slash total water consumption to 107 GL in 1978. Pressure from population growth⁷, a drier climate than earlier periods and a partial rebound from per capita consumption led to a return to growth in total water consumption – however, Perth's water consumption did not reach 194 GL (the previous peak) until 1988. By 2000 Perth's water consumption has reached 241 GL.

The impact of Perth's water demand management is clearer when one considers per capita water consumption. Figure A1.8 below shows the history of per capita consumption from 1960 to 2001.

⁷ Perth's population growth at 3% p.a. is significantly higher than the national average.

As for total consumption, per capita water consumption in Perth increased quite strongly until the mid 1970s reaching a peak of 230 KL. The imposition of drought restrictions and the introduction of consumption based pricing slashed per capita consumption. While per capita water consumption recovered somewhat by the 1985 it had stabilised around a band of 165 to 185 KL.

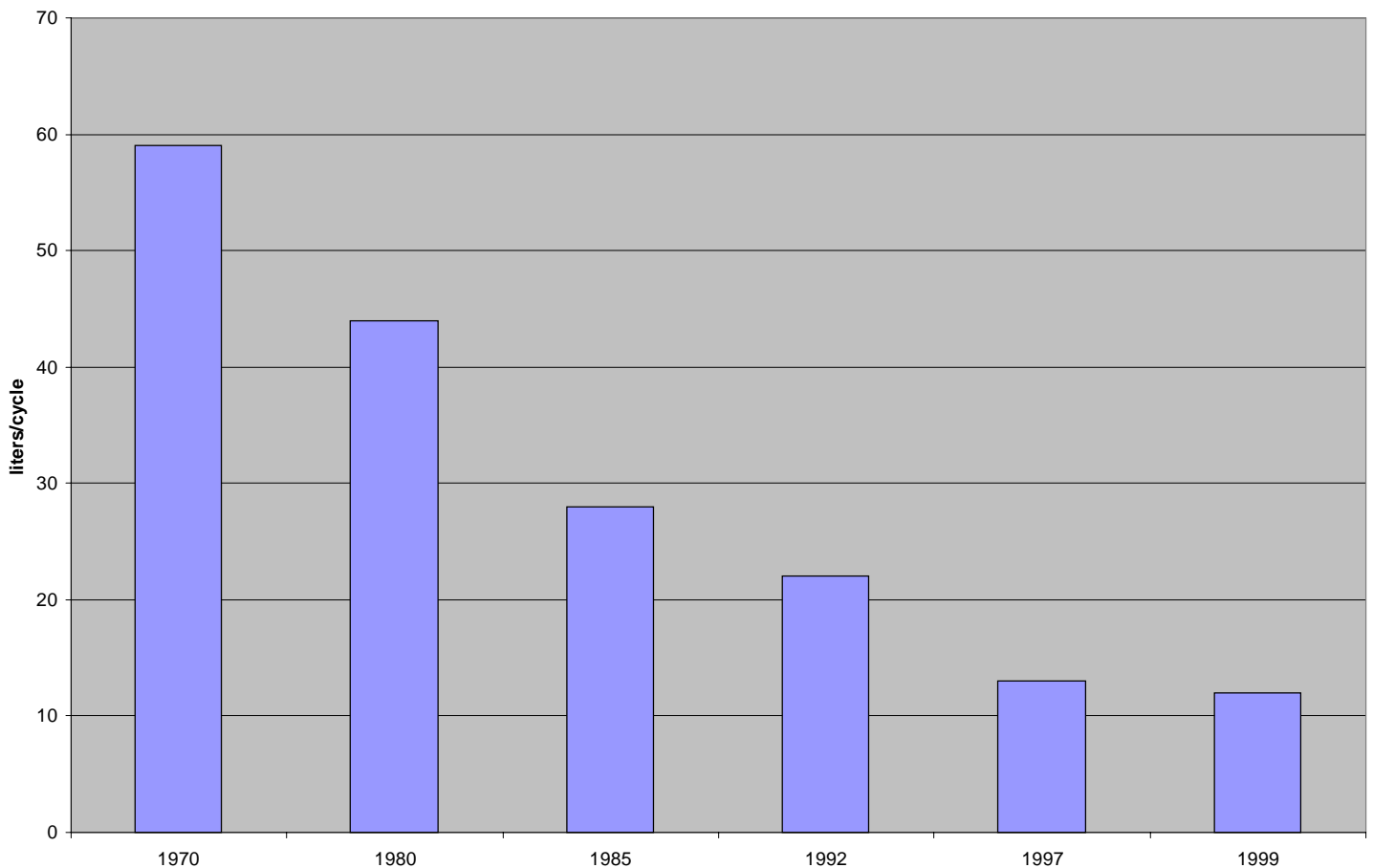
Fig A1.8 PERTH WATER USE PER CAPITA



Appliances – Water Efficiency

It is important to note that newer appliances are generally more energy and water efficient than the older models they replace – regardless of whether the particular purchaser is seeking these efficiencies. The charts below show the water efficiencies available from dishwasher and washing machines manufactured in different years. The information comes from the Environment Issue Report No 19, *Sustainable Water Use In Europe*, from the European Environment Agency.

Fig A 2.1.D Dishwasher Efficiency



It is not clear from the report how the tests deriving the actual efficiency data were carried out. However, the extent of improvement over the period appears to be representative of similar appliances available in Australia. Particular caution is required in considering the absolute levels of efficiencies regarding washing machines as in Fig A2.2 since front loading machines, predominantly used in Europe, are significantly more water efficient than top loading machines (and considerably more expensive).

Fig A2.2 Water Efficiency of Washing Machines

