Submission to the:

House Environment Committee to examine the Future Sustainability of Australian Cities

By

The Water Services Association of Australia (WSAA)

November 2003

Executive Summary

The Water Services Association of Australia (WSAA) was formed in 1995 to represent the Australian urban water industry. Its 28 members currently provide water and wastewater services to 16 million Australian and New Zealanders and many of the country's largest commercial and industrial companies.

This submission addresses item 3 in the discussion paper which is

"to establish an integrated sustainable water and stormwater management system addressing capture, consumption, treatment and re-use opportunities".

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 generally 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. Sydney, Melbourne, Brisbane, the Gold Coast and Canberra 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

Australian households account for 8% of overall water use. Manufacturing and mining each account for 3%. Gas and electricity industries together use 6% of all water used with the remaining 70% being used by agriculture.

However, 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 these 1994 reforms are now universally in place.

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.

THE FUTURE

While the measures described above have been very successful in reducing demand, continued population growth in our major cities and possible climate change exacerbating resource limitations, will require further work be done to reduce demand on water resources and where necessary augment existing systems. Possible options are outlined below.

Demand Management Programs

When evaluating options for reducing demand on resources, demand management programs are usually a first choice due to their cost effectiveness and ability to influence the whole urban system.

Sydney Water's demand management and water efficient appliance retrofitting program has resulted in reductions in water use by 20.9KL per household or approximately 10% of household water use. This has been accompanied by reduced sewer flows, energy costs and greenhouse emissions.

Further demand management activities will require active intervention to the market to improve information to customers on water efficiency of appliances. For this reason WSAA is actively supporting the initiative by the States and Federal Government for mandatory efficiency labelling of water using appliances.

Similarly WSAA is working with a number of sectorial groups to establish a "Smart Water Mark" scheme to label appliances that save water but cannot be covered under the mandatory scheme (eg trigger hoses).

WSAA's estimates of overall possible savings due to demand management are between 15% and 20%. These savings can however be applied to all existing residential developments.

The other major alternative to addressing demand is Water Sensitive Urban Development.

Water Sensitive Urban Development (WSUD)

Water Sensitive Urban Development takes into account the whole water cycle from an urban perspective and attempts to maintain services and make best use of available resources, while minimising environmental impacts. At the present time its implementation is limited to new developments or major infill developments.

Current examples include Sydney Water's Rouse Hill dual reticulation project, and the Sydney Olympic Park Authority, Homebush Bay Water Sensitive Urban Development. These sites have now been in operation for some years and are providing valuable lessons to the industry.

It is important to recognise that these sites were developed as "pioneering sites" to demonstrate that these designs can operate at a practical level. There are few examples in the world of developments of this type at the scale used in Sydney and where recycled water is used inside a home. Australia can legitimately be seen to lead the world in this area.

These two pioneering sites were constructed and operate at considerably higher cost and a significantly altered risk profile than traditional supply systems. However the water savings demonstrated are very significant at approximately 30% at Rouse Hill and now over 60% at Homebush Bay.

Because of these potential water savings, planning for further WSUD projects are well advanced at Pimpama – Coomera (Gold Coast) Epping North (Melbourne), Mawson Lakes (Adelaide), Roachdale (Brisbane) and Edmondson Park (Sydney).

Key issues with these types of developments are costs, potential health risks and the effective management of those risks. Similarly because these developments are very new, there are a range of technical, financial and institutional issues to resolve.

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.

Supply Augmentation

Because population growth and changing demographics may exceed the ability of demand management programs and WSUD to contain overall water supply growth in our major cities, it is important to recognise supply augmentation may be required. This could be in the form of mandatory requirements for rainwater tanks, however alternatives include the use of seawater desalination and more effective use of available water resources via improved allocation policies.

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 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.

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 demand management programs and water sensitive urban developments 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 development 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. Additionally Water Sensitive Urban Development must be proven at large scale and costs must be shown to be competitive with alternatives.

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. It should be noted that the cost of desalination of seawater has significantly reduced over the past decade and can now be considered as a legitimate future supply option.

Achieving sustainable water use for our growing cities will require a mix of options including demand management, water sensitive urban development and supply augmentation.

INTRODUCTION

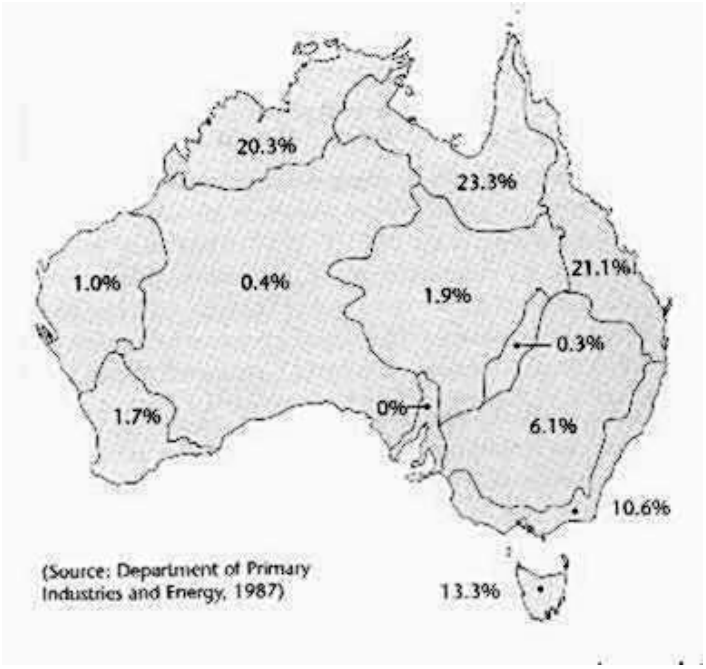
The Water Services Association of Australia (WSAA) is the peak body of the Australian urban water industry. WSAA's 28 members provide water and sewerage services to approximately 16 million Australians and New Zealanders and many of the country's largest industrial and commercial enterprises.

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 House Environment Committee examining the Future Sustainability of Australian Cities.

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 Australia[1]



[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, Sydney, Brisbane and Melbourne 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 form 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 Statistics[2], 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 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).

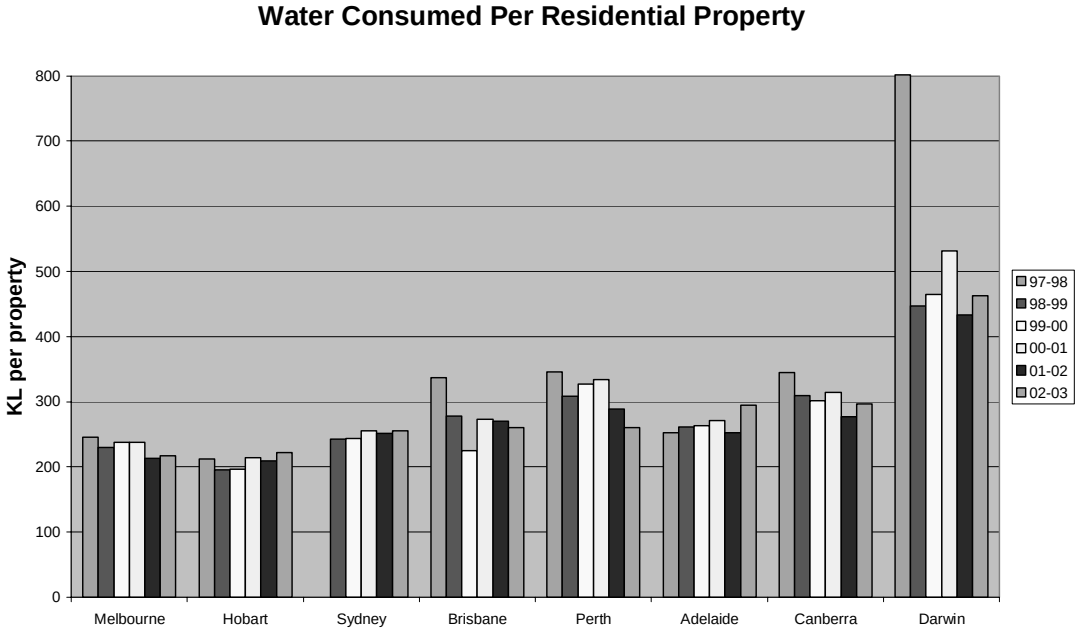
It is also important to note that broadacre farming (this section covers livestock, pasture and grain) uses more than one half of the water used by the entire agricultural sector. Broadacre farming and rice growing have the lowest production value per water used ratios of all other agricultural industries ($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 cities. Water consumption is provided on a per residential property basis for ease of comparability.

To understand urban water use and demand management one must take a longer term perspective then 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 dropped to approximately 150 KL per capita in 2003.

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 years[3], 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

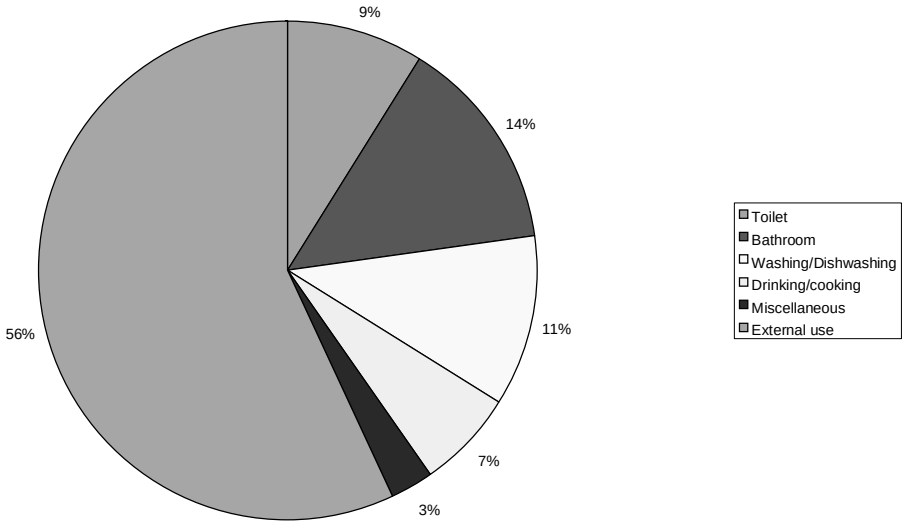
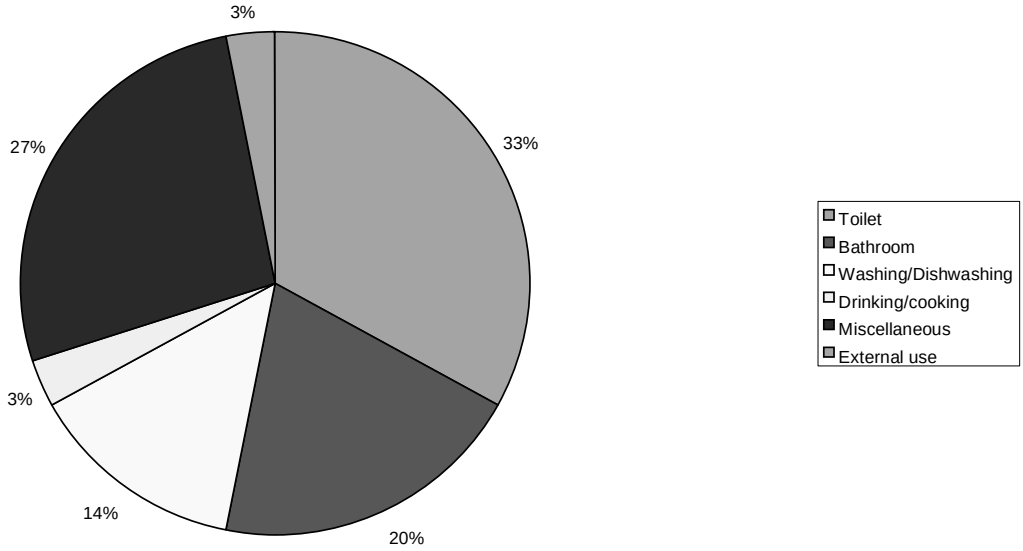


Fig 4 RESIDENTIAL WATER USE - UK



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 (80% of market) whereas front loading machines are the norm in Europe. Generally speaking, front loading machines are significantly more water efficient.

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 can improve. However in the absence of consumer information on appliance water use the rate of introduction of these more efficient appliances may be slowed.

The efficiency of washing machines is an area where further improvements can clearly be made. The Perth Domestic Water Use study showed that for single residential dwellings front loading washing machines consumed 27 litres per person day compared to top loaders which consumed 43 litres per person per day. However currently relatively inefficient top loaders dominate the market.

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 Perth Domestic Water Use Study[4] also 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%.

"Domestic Water Use Study" by Peter Coghlan and Chris Higgs, Infrastructure Planning Branch, Water Corporation[4]

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. 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.* 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 and retrofitting. 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 water[5] 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.

WSAA is currently conducting a major project to determine the optimum pricing structure to encourage demand management.

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.

The current Water Conservation Rating scheme is based on a 5A with 5A's the most water efficient. 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).

The scheme is voluntary as WSAA has no powers to mandate any labelling. Manufacturers and importers of such products are not obliged to have their products rated or labelled. Accordingly a number of water inefficient appliances are currently on the market and unlabelled. The consequence is that consumers are not fully informed about the efficiency of appliances.

The Federal and State Governments are now developing a mandatory labelling scheme based on the foundations of the WSAA voluntary scheme to ensure all key water using appliances are labelled.

WSAA strongly supports the development of this mandatory water efficiency labelling scheme.

WSAA is also working with a number of industry associations to develop a "smart water mark" labelling scheme for appliances which are beneficial in reducing water use, but where flows cannot be measured (eg trigger hoses).

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). Their penetration into the market has significantly reduced water use in the toilet.

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.

Again, WSAA is working with garden and irrigation industry associations to determine what options are available to reduce water use in the garden.

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.

The most extensive program currently underway is Sydney Water’s retrofitting program. As at 2003, over 200,000 houses had been inspected and where necessary retrofitted with water saving shower roses, tap flow regulators, cistern flush arrestors and repairs minor leaks.

The service costs customers on $22, substantially less than the recommended retail cost of $130. The program has demonstrated water savings of 20.9 KL per household or some 10% of residential household water use.

THE FUTURE

While the measures described previously have been very successful in reducing demand, continued population growth in our major cities, combined with resource limitations and possible climate change require further work be done to reduce demand on water resources.

Demand Management Programs

When evaluating options for reducing demand on resources, demand management programs are usually a first choice due to their cost

effectiveness. As indicated above Sydney Water's demand management and water efficient appliance retrofitting program has resulted in reductions in water use by 20.9KL per household or approximately 10% of household water use. This has been accompanied by reduced sewer flows, energy costs and greenhouse emissions.

Further demand management activities will require active intervention to the market to inform customers of water efficiency – such as the States and Federal Governments initiative for mandatory efficiency labelling of water using appliances.

WSAA's estimates of overall possible savings due to demand management are between 15% and 20%. These savings can however be applied to all existing residential developments.

The other major alternative Water Sensitive Urban Development.

Water Sensitive Urban Development (WSUD)

Water Sensitive Urban Development takes into account the whole water cycle from an urban perspective and attempts to maintain services and make best use of available resources, while minimising environmental impacts. At the present time its implementation is limited to new developments or major infill developments.

Current examples include Sydney Water's Rouse Hill dual reticulation project, and the Sydney Olympic Park Authority Homebush Bay Water Sensitive Urban Development. These sites have now been in operation for some years and are providing valuable lessons to the industry.

The pioneering Rouse Hill development currently covers some 12,000 lots which are provide with potable water via one pipeline and high quality recycled water to gardens and toilets via a second pipeline. The development occurred to assess whether wastewater flows to a sensitive waterway could be reduced. Reduction in potable water demand was not the principal consideration. Because public health is a critical issue in an urban environment, recycled water is of very high quality and a conservative design was undertaken due to the pioneering nature of the project. Costs have therefore been very high.

Some of the lessons learnt from Rouse Hill include the issue of the price of the recycled water, the need to control the quality of the recycled water and the need for continued auditing to detect cross connections.

Potable water savings from the Rouse project are currently 30% below a conventional system. However, overall water use is higher than neighbouring suburbs due to low charges for recycled water.

The Homebush Bay site was developed as a “demonstration site” for the Sydney Olympics. Unlike Rouse, the development collects stormwater as well as recycled wastewater for supply back to toilets and gardens in some 4,000 households. Key learnings from this development are the importance of water storages to balance seasonal demand (wastewater flow is constant and stormwater flow intermittent, while overall water use is seasonal), the importance of materials concentration in the recycling process (particularly salt) and the need for continuous monitoring control systems. Potable water savings are now over 60% compared to a traditional development, a remarkable achievement.

It is important to recognise that these sites were developed as “pioneering sites” to demonstrate that these designs can operate at a practical level. There are few examples in the world of developments of this type at the scale used in Sydney and where recycled water is used inside a home. Australia can legitimately be seen to lead the world in this area.

These two pioneering sites were constructed and operate at considerably higher cost and a significantly altered risk profile than traditional supply systems. Public health must continue to be protected. However as indicated, the water savings demonstrated are very significant at approximately 30% at Rouse Hill and now over 60% at Homebush Bay.

Because of these potential water savings, planning for further WSUD projects well advanced at Pimpama – Coomera (Gold Coast) Epping North (Melbourne), Mawson Lakes (Adelaide), Roachdale (Brisbane) and Edmondson Park (Sydney).

Extensive documentation is publicly available on the Pimpama – Coomera Water Futures Development undertaken by Gold Coast City Council and Gold Coast Water. This project is an excellent example of possible approaches to Water Sensitive Urban Development. The full urban water cycle is assessed and options evaluated using a multi-criteria analytical approach taking into account cost, environment issues and social issues. The Master Plan Options Summary is attached and provides a good overview of the approach taken.

A key issue with these types of developments are potential health risks and the effective management of those risks. Similarly because these

developments are very new, there are many technical, financial and institutional issues to resolve.

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.

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.

Appendix 1

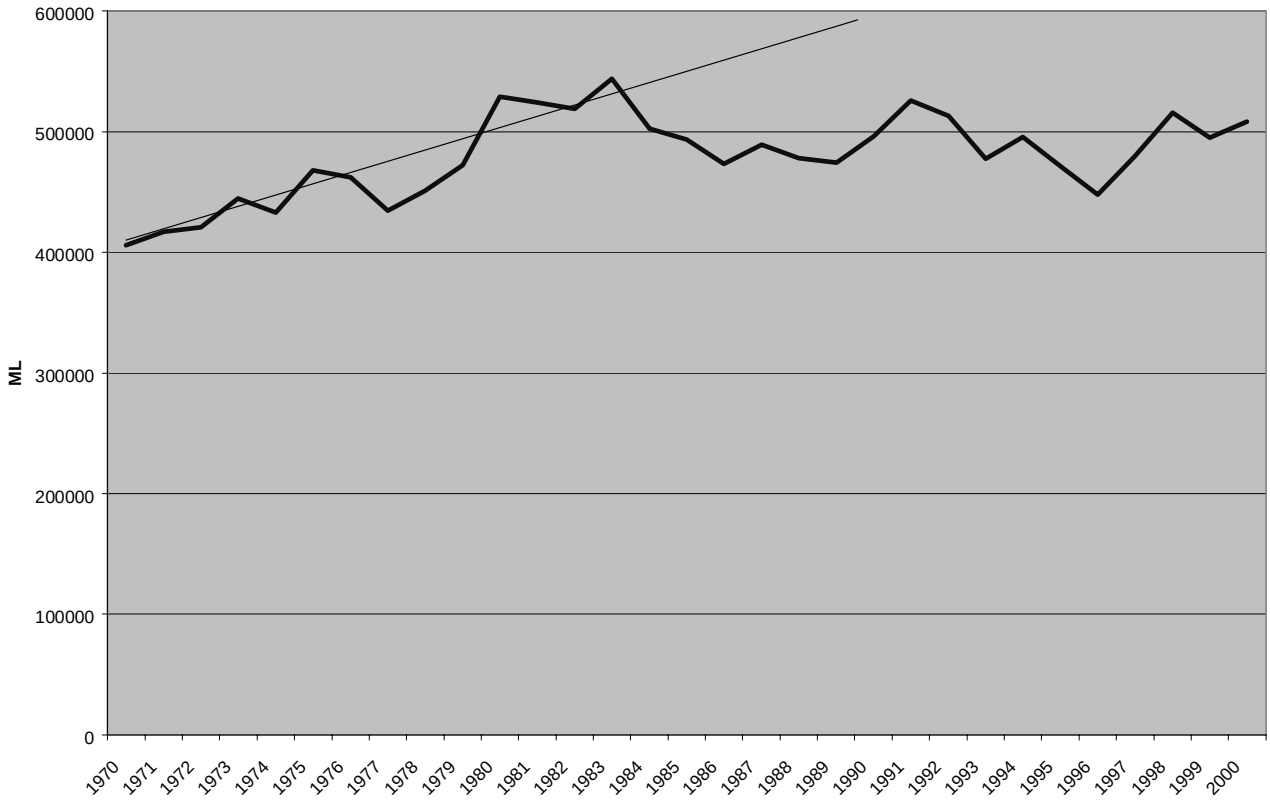
Water Consumption in Australia's Capital Cities

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

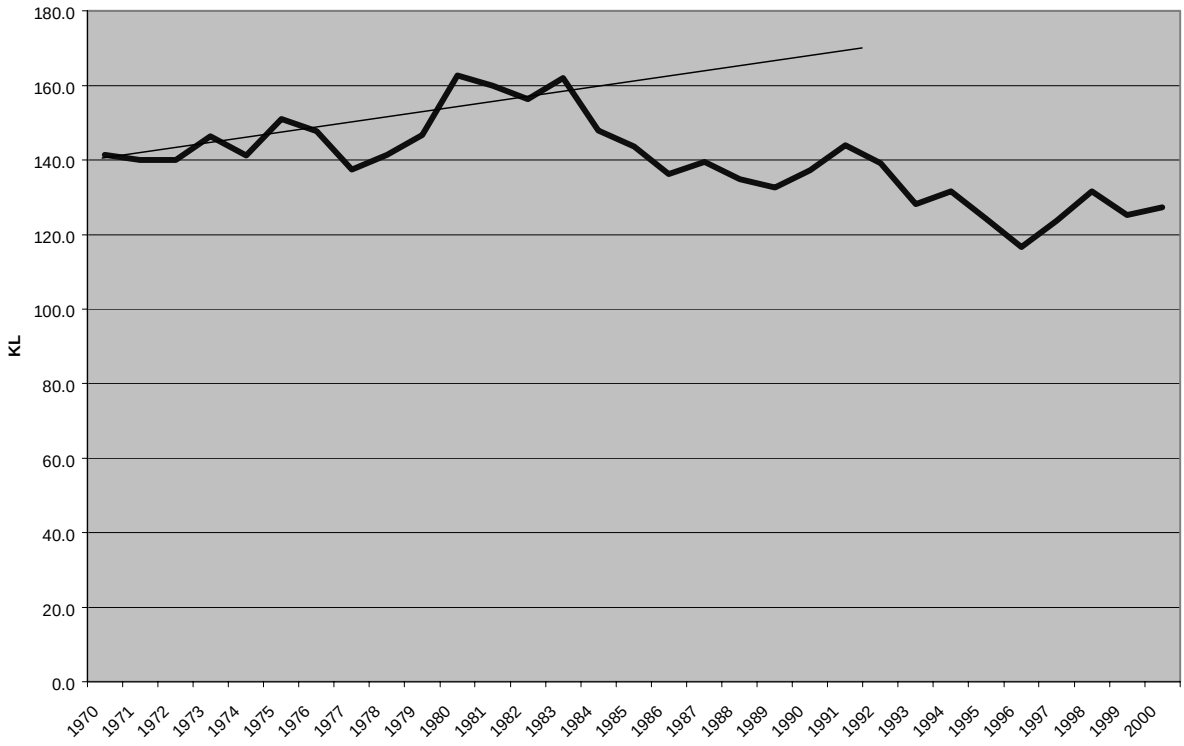
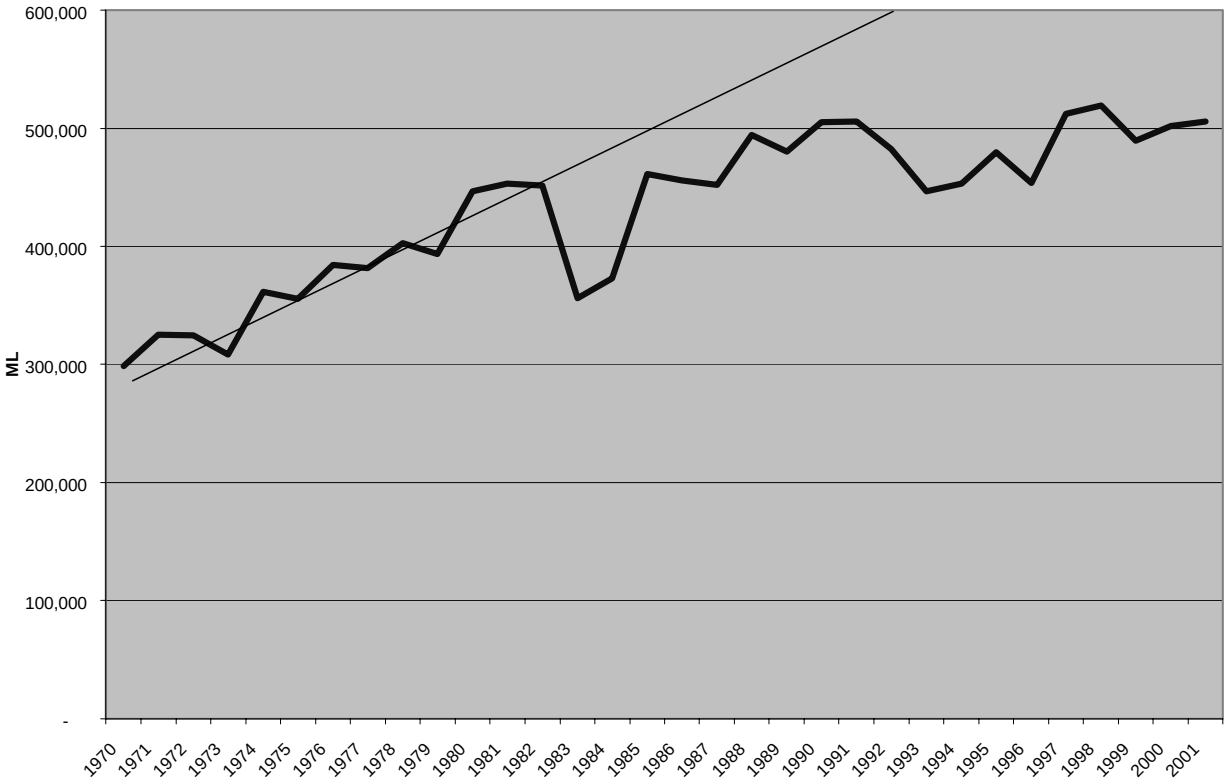


Figure A1.2 shows a rising trend until the early 1980s from 140 KL per capita to over 160 KL per capita. In more recent times per capita water consumption has ranged around the 120 to 130 KL band.

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

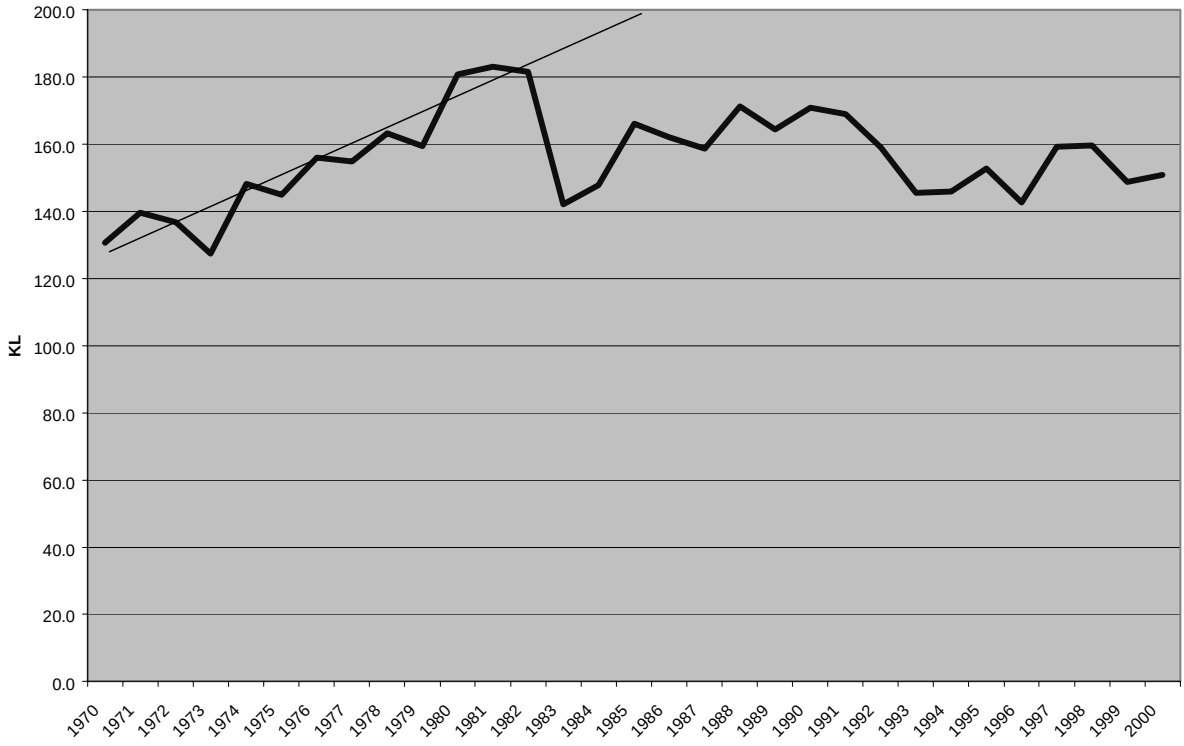


below shows that in the early 1970s water consumption on a per capita basis ranged between 130 and 140 KL before increasing to over 180 KL per capita in the early 1980s. In more recent years per capita consumption has ranged between 150 and 160 KL.

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

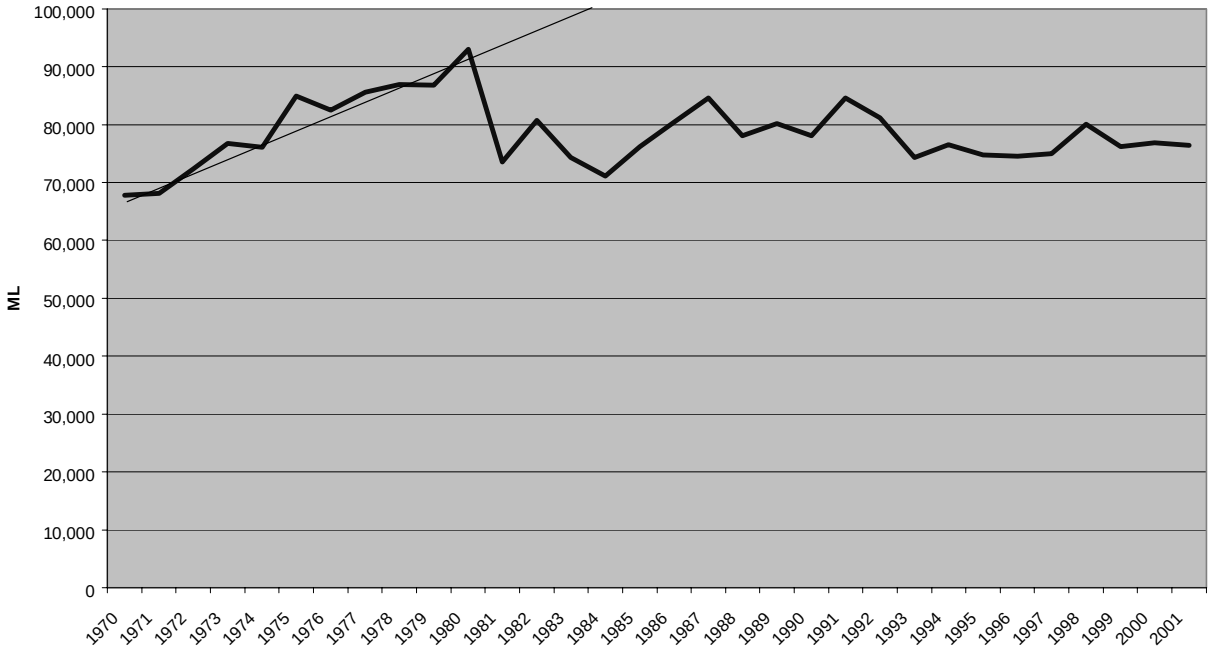
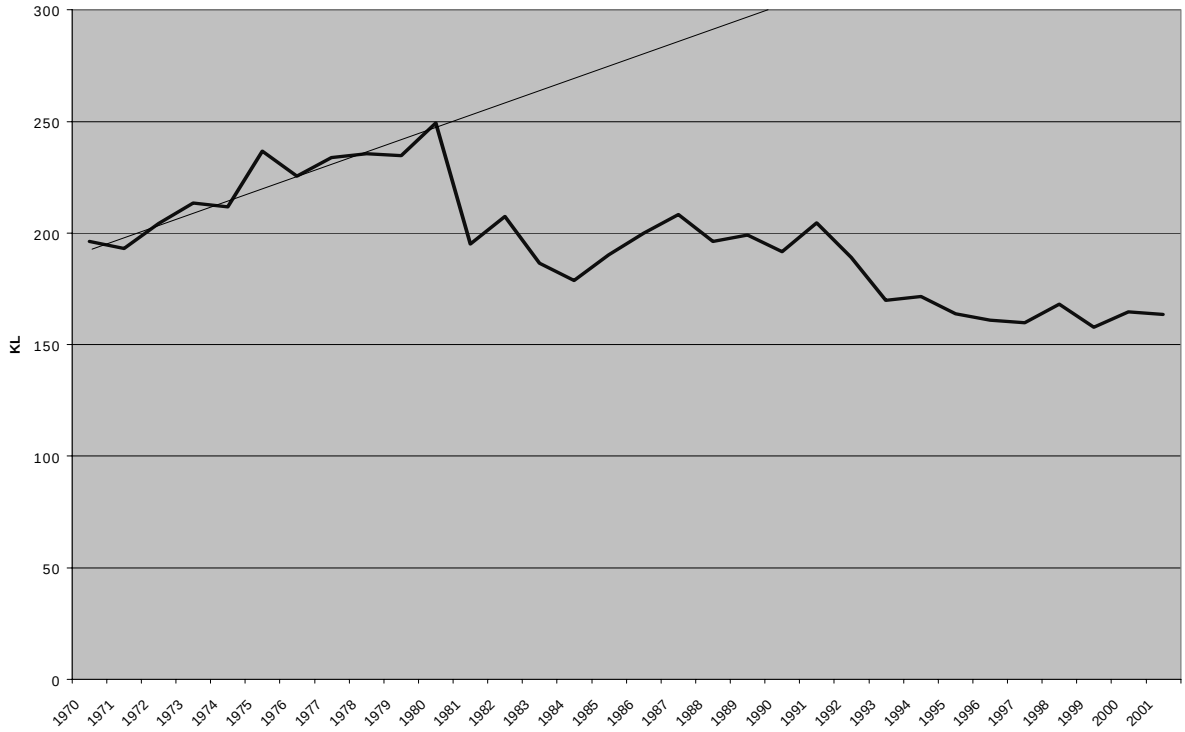
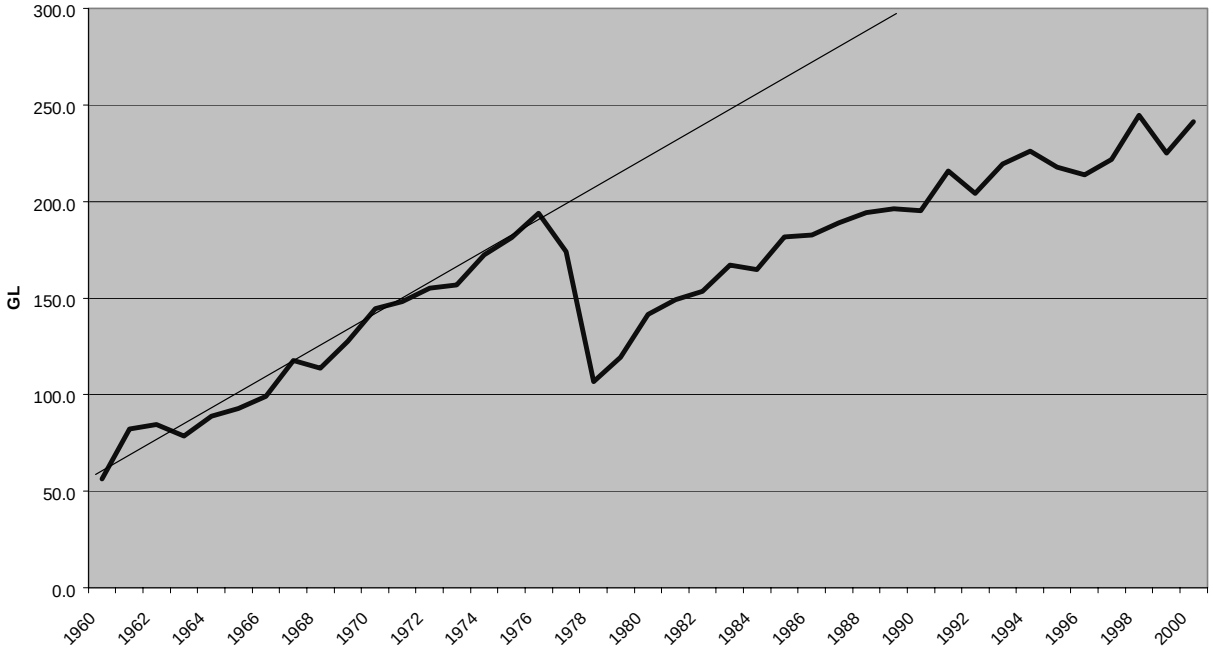


Fig A1.6 NEWCASTLE WATER USE PER CAPITA



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



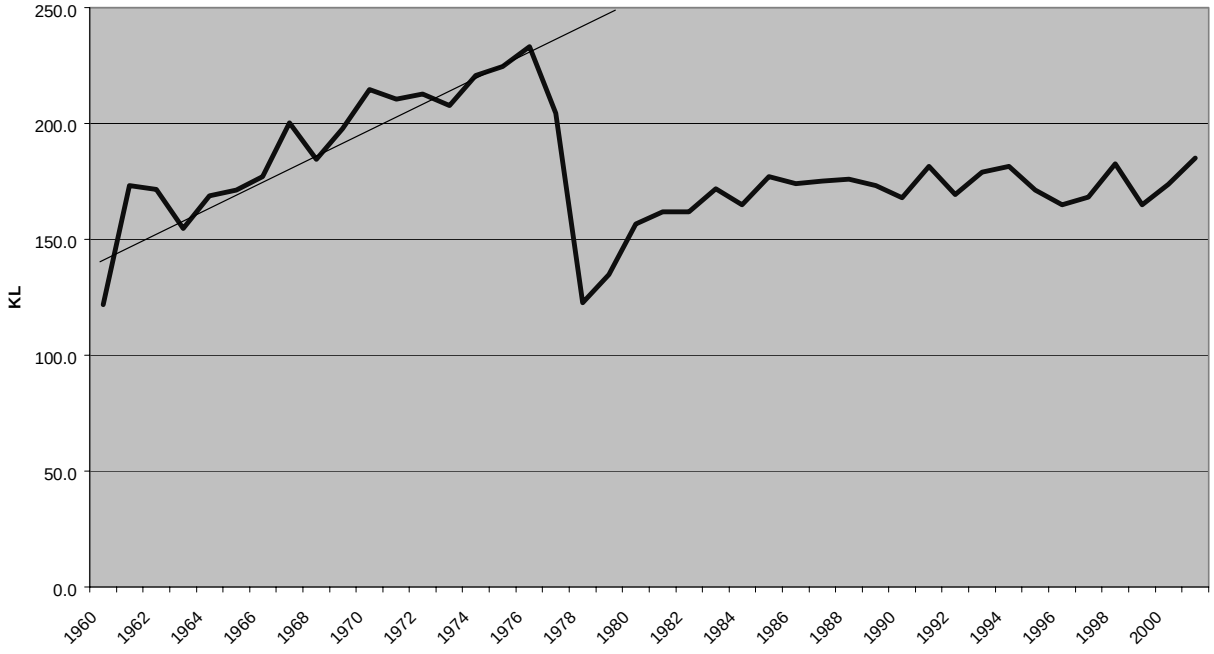
Perth's water consumption in 1960, at 57 GL, was atypical with consumption closer to 80 GL being closer to the norm of the period. High population growth and increasing per capita consumption pushed total consumption to a peak of 194 GL by 1976. Drought restrictions and the introduction of consumption based pricing combined to slash total water consumption to 107 GL in 1978. Pressure from population growth[6], 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.

[6] 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

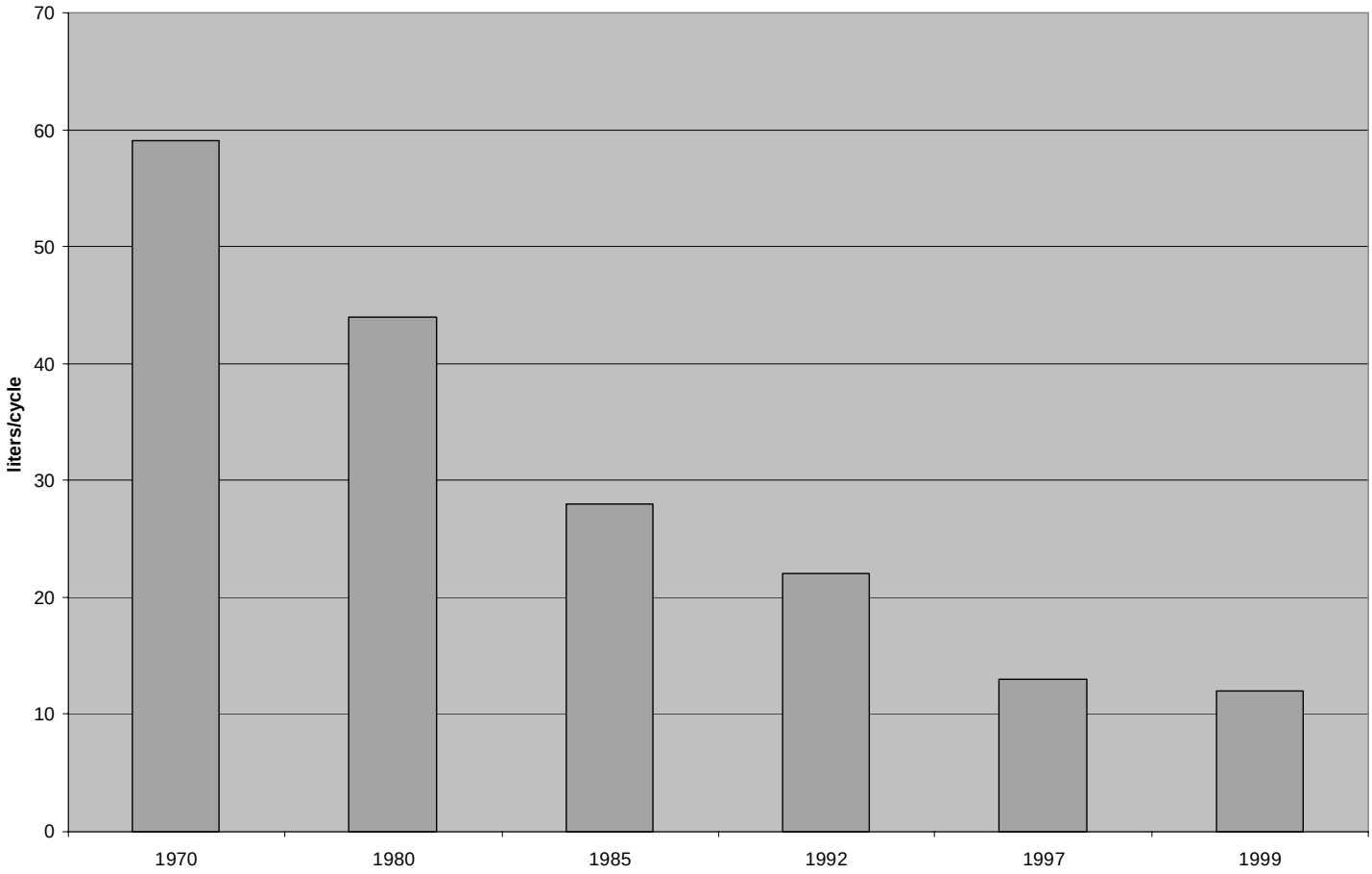


1. Appendix 2

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 A2.1 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 M achines