Best Practices in Domestic Water Demand Management

March, 2009

by Danya Bryx, Gidon Bromberg
Best Practices in Domestic Water Demand Management

Effective demand management is now the focus of leading water policy worldwide. This is in recognition not only of the detrimental environmental impacts of increasing water diversions, but also of the cost involved in large-scale projects such as desalination, dams and conduits. Leading policy-makers are now turning their attention to improving efficiency before increasing supplies. In 2007 the Commission of European Communities stated that one of the key water policy challenges facing the EU was “giving priority to water savings and water efficiency measures over any other alternatives, [which should be considered] as a last resort”\(^1\).

A variety of mechanisms are being implemented to achieve effective demand management, and these can be split into five broad categories – education & public awareness, water restrictions; sustainable building design; and pricing. This paper details best-practice initiatives in other water-scarce regions, within these four categories, with a view to highlighting reforms that need to be adopted in the region.

1. **Education & Public Awareness Campaigns**

   1.1 Education and public awareness are an integral aspect of demand management because of the potential to alter behavior on a mass-scale to save water. The best practice initiatives are those able to engage the public as stakeholders and partners in the project of saving water. This is often achieved by setting concrete city-wide targets that the public aim for together, and enabling individuals to measure their personal consumption against the collective target.

   1.2 Zaragoza in Spain faced severe water shortages and chose to implement a demand management program before taking further measures to increase water supplies. The city municipality, responding to pressure from civil society groups, initially set a target of saving 1 million m\(^3\) of domestic water in 1 year - 1996. Zaragoza now saves 1.6 million m\(^3\) per year compared to 1995 despite significant population growth.\(^2\) Whilst Zaragoza implemented a subsidy scheme as well, its initiative focused on changing behavior, appropriate pricing (considered below) and upgrading the leaky pipe system.\(^3\) Public awareness campaigning in Zaragoza aimed at broad public engagement in all sectors to gain commitment to the ‘Water Saving City’ theme.

   - Phase 1 'Inspirational Phase' - set the initial collective challenge and involved schools, businesses and households in initiatives to achieve it by informing users about water-saving technology and encouraging serious behavioral changes. Almost 70% of educational institutions in the city participated in the project.

   - Phase 2 – Set a goal of creating '50 good Practices in Technology and Uses in gardens and parks, buildings of public and industrial use'. For example cooling systems using recycled water, changing commercial cleaning routines in the shopping centre, improving pipe/leak maintenance in schools, water-recycling at carwashes, environmental education in schools, change in practices & technology upgrade at a corn processing plant and a paper mill.

   - Phase 3 – The City Council drew up a municipal order to save water, publishing detailed guides and self-assessment 'Ecoaudits' aimed at different sectors. These were distributed widely to the hospitality sector, industry, schools and homes to assist users in assessing and managing consumption efficiently. A publication was also collated of the best practices from Phase 2 and then widely distributed to encourage other users to follow suit.\(^4\)

   Zaragoza reduced its domestic consumption from 113L in 1996 to 96L per person per day in 2007, the lowest in Spain\(^5\).

   - In Australia the State of Victoria’s demand management projects have resulted in significant reductions in domestic consumption over the last decade. The reductions achieved exceed the targets set by the

---

3 Ibid.
4 Ibid.
government in 2004, when a goal of reducing domestic consumption from 423L per person per day to 360L by 2010 was set. Over the summer of 2007-8 Melburnians used 180L of water per person per day, representing a 57% reduction from 2004 State-wide levels. The government set a further target of saving 500 million m³ per annum via demand management, for a breakdown please see Figure 1 below. Public awareness and education are one of four integral demand management strategies adopted - also including water restrictions, waterwise urban development, and a rebate & subsidy scheme. The government's widespread public education campaign was initiated to achieve behavioral change in the domestic sector. The campaign is based on setting targets for per capita per day consumption and publicizing the severity of water shortages.

- Water saving billboards are in place in major centres that are continually updated with the percent capacity of local city or town water stores.
- TV, radio and newspaper advertisements do the same and encourage water saving measures.
- A 'Target 155' marketing campaign was launched to encourage urban users to aim for 155L per person per day, it included information kits with 4 minute hourglass shower timers posted to every home in Melbourne.
- Schoolchildren are educated about taking short showers, turning off the tap whilst brushing teeth and other everyday savings, they are also encouraged to take responsibility at home for monitoring consumption.
- Water bills detail the household consumption level compared to both neighborhood averages and government targets.
- Mandatory water efficiency labeling was introduced for appliances such as washing machines and dishwashers, requiring manufacturers or retailers to disclose the efficiency of their products according to a uniform '5-star' system. This has enabled consumers to make waterwise purchases.

**Figure 1 – Projected Water Savings 'Wedges' via Demand Management in the State of Victoria, Australia.**


1.4 In California predictions that 2009 may be the worst drought year on record prompted the Governor to set a

---


target of reducing domestic demand by 20% by the year 2020. A public education program is identified as key to meeting this target.\(^9\)

1.5 Cyprus has identified public education as integral to success of its demand management policy. Schools have been targeted with water-saving education programs initiated by some municipalities in conjunction with civil society organizations.

1.6 Arizona provides detailed information to residents about water-saving behavior at home, including drought-tolerant landscaping guides and the benefits of removing lawns.\(^10\)

2. Water Restrictions

2.1 Domestic water restrictions are commonplace in areas affected by drought worldwide. Some are enforced by State law and others managed by town water authorities or municipal governments at by-law. Leading domestic water restriction policies now involve permanent water saving rules to conserve water resources even when there is no immediate drought. Water restrictions tend to focus on garden watering, municipal parks, hosing pavements and carwashing.

2.2 The State of Victoria in Australia has adopted permanent water saving rules that are in place regardless of drought. These restrict hours for garden watering, require permits to fill new pools, ban hosing of paved areas and require industrial and commercial users that consume more than 10,000m\(^3\) per annum of potable water from an urban supply to develop a reduction plan.\(^11\) Victoria also has 4 stages of further restrictions that may apply depending on the severity of water shortages. These are aimed at gardens, sports grounds, car washing and swimming pools. Currently the State’s largest city, Melbourne, is at Stage 3a water restrictions as follows -

- Gardens may only be watered 2 days per week, manually, between the hours of 6am – 8am in order to reduce evaporation loss. Sprinkler systems are altogether banned but automatic dripper systems may be used between midnight – 2.00am.\(^12\)
- Municipal governments must prioritize and restrict watering of sports grounds to 1 out of 4, and must reduce the quantity used on those sports grounds by 25%.
- Commercial car washes may be utilized only if they use less than 70L of water per car. This has resulted in a proliferation of commercial carwash outlets that install onsite water recycling technology. Residents are not permitted to handwash their cars except for windows, mirrors and lights.
- New pools and spas of any capacity may not be filled and permission must be sought before filling an existing pool or spa.

2.3 Stage 4 Restrictions (the most severe) involve -

- Watering altogether banned for residential, commercial and public gardens, as well as sports grounds.
- Hosing of paving, concrete and other hard surfaces banned except for construction purposes, emergencies, or where there is a health or safety hazard.
- Washing vehicles banned except for health and safety reasons, in which case the windows and lights must be washed and rinsed by means of a bucket. Commercial car washes which utilise onsite recycling and do not draw any water from the grid may be used.
- Residential or commercial pools and spas cannot be filled, added to or replaced without prior written approval. Can be topped up by bucket only.

---


\(^12\) To ensure enforceability houses are allocated specific days of the week on which they may water according to their street number. Houses with elderly residents are given extended hours.
• Emergency procedures exist giving local water authorities the power to implement further measures, including supply rations, with the written approval of the Water Minister.

A breach results in a warning, and persistent offenders can be fined up to AU$1130 (approx NIS3000) for the first offence and AU$2260 (approx NIS6000) for offences thereafter, with an additional fine of AU$226 (approx NIS600) per day that the offence continues. Water supply restrictions may also be imposed.13

2.4 Cyprus has banned washing of cars and pavements with hoses, and implemented supply rationing.14

2.5 Albuquerque, New Mexico has imposed fines for anyone who allows water to drain off their property onto a public road or neighboring property, as well as for restaurants who serve water to customers without being requested to do so. Fines increase exponentially for continued violations, ensuring businesses cannot simply factor the fines into their balance sheets.15

2.6 The City of Los Angeles has implemented, among others, the following restrictions:
• Banned hosing of paved areas
• Banned allowing water leaks to go unrepaired

Los Angeles has pioneered enforcement with a team of 'Drought Busters' employed by the municipality to patrol the streets issuing warnings and fines, as well as educating citizens about saving water.16

2.7 In Las Vegas municipal by-laws deal with water restrictions, delegating authority to the Las Vegas Valley Water District for implementation. Currently Las Vegas is under 'Drought Alert', which is the second of three restriction stages that can be implemented depending on the severity of water shortages. Drought Alert includes the following restrictions -
• Garden Watering -
  o Drip irrigation may be used at any time of the day but must not exceed a frequency of 1 day per week in Winter and 3 days per week in Spring and Autumn.
• New Lawns -
  o No new lawns permitted in front yards
  o New lawns permitted in back & side yards only at 50% of surface area.
  o Non-residential users must apply for an exemption to install any lawn.

Fines and supply cutoffs may be imposed for 'water waste' - the term used to refer to a breach of restrictions.17 Las Vegas does not pre-determine the measures in place for 'Drought Alarm' – the most severe stage of restrictions – these are left to the discretion of the municipality.

3. Waterwise Building Design

3.1 Waterwise building design and urban development is imperative to meet long-term demand management targets. Currently many outstanding design features, such as greywater recycling and waterless toilets, are being implemented by architects and developers on a voluntary basis. Some countries have now mandated waterwise development through amended building codes. Rebate and subsidy schemes also form an integral part of leading waterwise building design policies by encouraging improvements in the existing housing stock. Rebate schemes cover a wide variety of water-efficient features, including greywater recycling, retrofits to efficient showerheads, faucets and appliances, and converting water-intensive gardens to xeriscapes. The best schemes generally involve substantial water savings with a relatively small State investment.

15 Albuquerque Benadillo County Water Utility Authority, How We Enforce Water Waste, avail. at www.abcwua.org/content/view/232/430/
3.2 The UK introduced a new building code entitled the ‘Code for Sustainable Homes’ in 2006. Essentially the Code mandates energy and water efficiency measures via a point system. It details how the savings made through installation of particular devices is to be calculated, and the minimum scores required for building approval. The code rates all water-using fixtures and appliances, as well as greywater recycling and rainwater harvesting systems. It therefore gives flexibility to builders and architects to implement a mix of efficiency measures as they see fit. Environmental NGOs in the UK have applauded the regulations, but are calling for them to extend to renovations and for an equivalent effort to be placed on improving efficiency in the existing housing stock. For an excerpt of the water-efficiency sections of the UK Code please see Appendix 2.

3.3 The City of Los Angeles has mandated that new hot water systems must use recirculation (i.e., redirect the coldwater in the pipes back to the hot water tank), and banned single-pass cooling systems. Various designs of hot water recirculators are now on the market. Some involve installation of a 3rd return pipe and are most suitable for new buildings, others involve a thermostat, valve and bleed system that is simple and inexpensive to retrofit to existing hotwater systems.

3.4 In Victoria an aspirational target was set of 25% water savings in all-new urban developments, however the government refrained from mandating specific methods to be implemented by developers, and acknowledged further work is needed to both achieve and assess compliance with the target. The government could easily mandate some mechanisms already being voluntarily adopted by best-practice developers, akin to technology standards legally required for industrial pollution treatment. Examples of best practice in urban development in Victoria are:

- installation of a 3rd pipe system to recycle greywater for toilet flushing and watering parks & gardens;
- installation of 5-star rated appliances;
- water efficient landscaping including propagating drought resistant plants;
- rainwater tanks connected to toilets;

---

19 Wildlife and CountrySide Link, Blueprint for Water, 2007 Reportcard: Progress on 10 Steps to Sustainable Water
• and the reuse of storm water.  

3.5 Waterless toilets are being adopted in ecological building designs in Scandinavia and Northern Europe, resulting in water-savings of up to 40%.  

There are 3 categories of waterless toilets that are used in the urban environment. The first involves immediate diversion of waste to an onsite composting unit via a pipe, and therefore requires a reasonable amount of space to house the composting unit directly below the bathroom. The second involves immediate diversion of waste to a ventilated pit. The third involves manual removal of small bins and emptying to a compost location, this may be done communally for several households. Some designs of the latter involve a rotation unit so that several bins may be filled and begin the composting process before they require manual handling. The first and second options are used frequently in roadside public toilets, holiday homes and ecological building designs in Scandinavia and other countries. The third option is marketed as suitable for apartments. However, there are notable examples of high-density residential buildings designed utilizing the first option, such as the Gerbers Housing project in Sweden. The composting units, however, require emptying to a central secondary-compost location offsite.  

A municipality in Norway has implemented centralized collection and secondary composting of waste from waterless toilets. A local farmer collects the waste and treats it in a purpose built composting unit that produces a hygienized soil-like end product. However, this is in a semi-rural community.  

A UNESCO building in The Hague is pioneering centralized collection of waste from its waterless toilets, however at present there is no composting process involved in the project. Several buildings and urban development projects in Germany are now using vacuum toilets that use just 15% of the water of conventional toilets, but can still make use of existing sewage infrastructure.  

3.6 High-rise residential buildings designed to conserve water are being developed in the US. An example is the Solaire, the first green high rise in New York. The building has an onsite wastewater recycling system, operated by a private water firm to supply "water for flushing toilets, filling the cooling tower, and irrigating the rooftop garden. [The building] conserves up to nine million gallons of water each year and consumes 35% less overall energy than a traditional high rise." The Solaire is best-practice in terms of high-density urban efficiency and its design features therefore form an excellent model for Israel.  

3.7 Arizona introduced a rebate scheme for greywater recycling installations alongside a permit system to manage health risks. A permit validates small-scale domestic grey water installations that comply with a set of criteria aimed at managing potential health risks (see Appendix 1). As long as all criteria are met, the greywater system is permitted and no notification to the department is required nor is any fee payable. This is widely regarded as best-practice greywater law because it is effective and simple regulation that
minimizes bureaucracy and is therefore the least prohibitive\(^{29}\). Rebates apply to compliant residential systems and are allocated retrospectively, covering the lesser of 25% of the installation costs or US$1000\(^{30}\).

3.8 In Cyprus water scarcity forced government action in demand management, particularly in the domestic sector. Whilst Cyprus faces a severe water crisis it has implemented some effective initiatives, most significantly its greywater recycling subsidy scheme. Subsidies provide €1700 (\(^{31}\) representing 75% of the price of installation, and the scheme is estimated to have reduced domestic consumption by 35-40%. The Cyprus initiative involves decentralized greywater treatment onsite at residential premises for use in the toilet and garden. State investment in greywater recycling in Cyprus was found to be 4 times cheaper than supplying the equivalent amount of drinking water.\(^{31}\) Cyprus also provides a €170 subsidy for hot water recirculators\(^{32}\). Total spending on demand management (excluding blackwater/effluent recycling) was found to be just 2% of the Water Development Department's total budget in 2006.\(^{33}\)

3.9 The rebate program in place in Las Vegas targets lawncover and promotes xeriscaping, as well as encourages use of carwash outlets that have onsite water-recycling. It includes the following:

- Rebates of US$1.50 per square foot of lawn converted to 'xeriscape' (a term for gardens that do not require irrigation)
- Free water efficiency retrofit kits, including kitchen faucet fixture; 2 bathroom sink aerators; water flow testing bag; leak detection tablets; thread-seal tape; and a water-efficient shower head.\(^{34}\)

3.10 In Victoria & Queensland, Australia, rebates and subsidies are part of the States’ demand management strategies. The schemes provide the following rebates:

- AU$500 (approx ¥1290) for greywater system installations that comply with regulations
- AU$150-$1,500 (₪390-4000) for rainwater tank dependent on capacity
- AU$200 (₪540) for a water efficient washing machine
- AU$150 (₪390) for rainwater tank to toilet connection where installed by licensed plumber
- AU$50 (₪130) for efficient dual-flush toilets (at most 9/4.5L flush)
- AU$50 Water conservation audit conducted by a licensed plumber
- AU$150 (₪390) Hot water re-circulator (redirects cold water in pipes back to hotwater tank)
- $10-20 (₪25-50) for showerheads where the device uses 9L or less per minute.
- Free exchanges to water-efficient showerheads.\(^{35}\)
The rebate scheme is on track to meet its target of saving 1152ML per annum (1.152 million m\(^3\)), with a total investment of approx US$7million over 7 yrs from 2004-10. As at April 2006 uptake of water-efficient technologies through the rebate scheme was estimated to be saving 615 ML per annum, with a State investment of AU$5.497 million (approx NIS14,177,422) in the rebate scheme for the Melbourne metropolitan area.\(^{37}\)

4. Pricing

4.1 Appropriate pricing forms a key aspect of effective demand management. Best-practice domestic water pricing balances three key principles – cost recovery, incentive for efficiency, and equity.

4.2 The EU established its major water policy in 2000 – the EU Water Framework Directive. Legislative details are largely left up to each State, and different aspects variously fall within the jurisdiction of municipal, provincial and State governments. One of the major policy goals is to achieve water pricing by 2010 that recovers ‘true cost’ for all users (domestic, industrial and agricultural). Price should also provide an incentive for efficient use. True cost includes treatment, infrastructure, delivery, resource and environmental costs. Environmental costs reflect damage to ecosystems caused by extraction, whilst resource costs cause price increases, as water is depleted and opportunities for use are forgone by other users.\(^{37}\)

4.3 Under the Framework Directive, by December 2009 a management plan is to be produced for each river basin that provides, amongst other details, the legal controls in place to meet pricing obligations. In 2004 an EU taskforce delivered a fact-sheet to guide member States in calculating environmental and resource costs. The fact-sheet does not standardize a mandatory method to be used for calculation, but gives direction. It states that it is equally valid to calculate environmental cost either in terms of pricing the loss of ecosystem value, or as the cost of preventative action to stop such deterioration. There remains relative inexperience in valuating environmental costs and a wide variety of approaches are advocated, even within the EU taskforce itself.\(^{38}\)


The pricing scheme in place in Zaragoza is recognized as best practice in terms of meeting the principles of equity, efficiency incentive and economic cost recovery. Water tariffs in Zaragoza apply to both supply and wastewater, and both include a nominal flat base rate plus a tiered variable rate. The base rate is 3.80€/month (approx 20NIS) including both supply and wastewater. The tiered variable rate attaches to metered consumption in 3 levels. “Level 1 has a budget price to allow adequate access for all. Level 2 has a price equivalent to the cost of production. Level 3 has a ‘penalty’ price to discourage wastage and encourage conservation”.

- Level 1 0.333€ (1.74NIS) combined water/wastewater per m³ for the first 6m³ per month;
- Level 2 0.799€ (4.19NIS) per m³ for the next 12.5m³ per month;
- Level 3 1.6€ (8.38NIS) applies per m³ above 18.5m³ per month.

Acknowledging that meters apply per household not per person, the rates are set to provide a fair tariff for a household of up to 6 persons. Whilst this means that people in smaller households can consume more before being penalized, the tariffs nevertheless achieve a balance between equity and cost recovery whilst providing incentive for efficient use. Pricing in Zaragoza does not yet account for environmental or resource costs.

Research from the US suggests best practice should price water at the basin scale in two tiers – a subsidized tier to cater for subsistence, and a true cost tier for discretionary use that factors in specific environmental and resource costs.

Many municipalities in Germany have implemented water pricing to meet full cost recovery for infrastructure, delivery and treatment, and in theory pricing in Germany is supposed to meet the full cost recovery principle including resource and environment costs. Germany has the second lowest domestic consumption levels in Western Europe after Belgium. Within Germany price variations demonstrate a clear relationship between consumption levels and pricing (see Figure 2 below). Germany has commissioned studies to undertake environmental valuations and determine the most cost-effective ways to effectively incorporate these into water pricing across all sectors.

Water pricing in Brussels, Belgium is tiered as follows -
- Vital: 0 – 15m³ per year per person at €0.80 (₪4.18)
- Social: 15 – 30m³ per year per person at €1.39 (₪7.27)
- Normal: 30 - 60m³ per year per person at €2.06 (₪10.79)
- Comfort: above 60 m³ per year per person at €3.06 (₪16.02)

Plus a fixed charge of €0.43/m³ for municipal sanitation services and €0.3602/m³ for regional sanitation services.

Water pricing in Limassol, Cyprus is tiered as follows -
- 0.25 -10m³ per month per household - €0.21 (approx ₪1)
- 10 - 20m³ per month per household - €0.37 (₪2)
- 20 - 30m³ per month per household - €0.72 (₪3.80)
- above 30m³ month per household – €4.14 (₪21.80)

40 Ibid.
41 Ibid.
Plus a fixed €0.38 (₪2) per m$^3$ for sewage services, and a flat maintenance charge of €3.10 (₪16.30) per month.\textsuperscript{47} Cyprus has reached estimates of environment and resource costs, stating that currently the country is at 62.1\% true cost recovery.\textsuperscript{48} To view a chart comparing Cyprus water pricing with the Middle East please see Figure 3 below.

\textbf{Figure 2: Coherence between water price and water use in Germany}


Figure 3: Comparing Water Price and Consumption in the Middle East

**Recommendations**

1. Set a target for per person per day water consumption.

2. Implement public education schemes aimed at altering domestic water consumption patterns – involve schools, business, television, newspapers, billboards & public mailouts including self-assessment water audit kits.

3. Implement a rebate and/or subsidy scheme to encourage water-efficiency retrofits and installations, including for lowflow showerheads, vacuum toilets, greywater recycling & rainwater harvesting.

4. Improve publicity and enforcement of domestic water restrictions.

5. Increase fines for breach of domestic water restrictions and implement a system so as fines increase exponentially for repeat offences.

6. Legalize and regulate domestic greywater installations to manage health risks in the simplest and least prohibitive manner possible (for model rules see Appendix 1).

7. Introduce mandatory water efficiency design in all new buildings and renovations. Building/renovation approval should be premised on water efficiency targets calculated via a standardized code. A detailed point system, where each design feature and device accumulates set points, enables flexibility in the building sector whilst guaranteeing savings.

8. Introduce mandatory water efficient urban planning, including the use of urban runoff.


10. Price domestic water at tiers where a set quantity to meet needs is subsidized, consumption above that threshold is priced at true cost (incorporating environment and resource costs), and gross overconsumption is priced at penalty rates.

**Conclusion**

Whilst agriculture is a significant user of water in the region and at the forefront of current water debates, considerable savings could be made in the domestic sector, which has been surprisingly absent from the region's water agenda. Many mistakenly accept that quantities of domestic water consumption are relatively fixed. International experience has shown that dramatic savings can be made in the domestic sector with a relatively small State investment. Savings in the domestic sector could well provide much-needed environmental flows to the region's dyeing river systems.
Appendix 1 – Arizona Residential Greywater Permit

R18-9-711. Type 1 Reclaimed Water General Permit for Gray Water

A. A Type 1 Reclaimed Water General Permit allows private residential direct reuse of gray water for a flow of less than 400 gallons per day if all the following conditions are met:
   1. Human contact with gray water and soil irrigated by gray water is avoided;
   2. Gray water originating from the residence is used and contained within the property boundary for household gardening, composting, lawn watering, or landscape irrigation;
   3. Surface application of gray water is not used for irrigation of food plants, except for citrus and nut trees;
   4. The gray water does not contain hazardous chemicals derived from activities such as cleaning car parts, washing greasy or oily rags, or disposing of waste solutions from home photo labs or similar hobbyist or home occupational activities;
   5. The application of gray water is managed to minimize standing water on the surface;
   6. The gray water system is constructed so that if blockage, plugging, or backup of the system occurs, gray water can be directed into the sewage collection system or on-site wastewater treatment and disposal system, as applicable. The gray water system may include a means of filtration to reduce plugging and extend system lifetime;
   7. Any gray water storage tank is covered to restrict access and to eliminate habitat for mosquitoes or other vectors;
   8. The gray water system is sited outside of a floodway;
   9. The gray water system is operated to maintain a minimum vertical separation distance of at least five feet from the point of gray water application to the top of the seasonally high groundwater table;
   10. For residences using an on-site wastewater treatment facility for black water treatment and disposal, the use of a gray water system does not change the design, capacity, or reserve area requirements for the on-site wastewater treatment facility at the residence, and ensures that the facility can handle the combined black water and gray water flow if the gray water system fails or is not fully used;
   11. Any pressure piping used in a gray water system that may be susceptible to cross connection with a potable water system clearly indicates that the piping does not carry potable water;
   12. Gray water applied by surface irrigation does not contain water used to wash diapers or similarly soiled or infectious garments unless the gray water is disinfected before irrigation; and
   13. Surface irrigation by gray water is only by flood or drip irrigation.

B. Prohibitions. The following are prohibited:
   1. Gray water use for purposes other than irrigation, and
   2. Spray irrigation.

C. Towns, cities, or counties may further limit the use of gray water described in this Section by rule or ordinance.

Historical Note
New Section adopted by final rulemaking at 7 A.A.R. 758, effective January 16, 2001 (Supp. 01-1).
References

Albuquerque Benadillo County Water Utility Authority, How We Enforce Water Waste, available at www.abcwua.org/content/view/232/430/


Mayor of Los Angeles, Mayor Villaraigosa Cracks Down on Excessive Water Use, available at http://mayor.lacity.org/villaraigosaplan/EnergyandEnvironment/GreenestAndCleanestBigCity/LACITY_004843.htm


Shirley-Smith, C., & Ors, Sustainability of Water Management in Zaragoza City, Water and Environment Journal, 22 (2008)


Water Act 1989 (Vic, Australia)


## Comparative Table – Score for Israel

<table>
<thead>
<tr>
<th>Measures</th>
<th>Best Practices</th>
<th>Reference</th>
<th>Current Israel</th>
<th>Score (1 - 5)</th>
</tr>
</thead>
</table>
| **Education & Public Awareness**| **Set concrete collective targets**  
Saragossa, Spain - save 1 million m³ in one year  
Victoria, Australia - Target 155L per person per day  
Ability to measure personal consumption against a collective target  
Meters per household  
Bills detail household consumption as against target (Victoria)  
Self-assessment eco-audit kits (Zaragoza & Victoria)  
Engaging stakeholders through targeted programs  
School education programs (Zaragoza & Victoria)  
Encourage business to take leadership by adopting best-practice (Zaragoza)  
Households –  
mailout eco-audit kits (Zaragoza & Victoria)  
mailout 2 minute shower times (Victoria)  
Consistent publicity of water situation & restrictions across media –  
billboards, tv, radio, & print (Victoria)                                                                 | 1.2 & 1.3 | Recommends that public save 10% by minor behavioral change.  
No concrete target.  
Bills provide some water-saving tips.  
High percent individual metering.  
No programs to engage stakeholders.  
No efficiency self-assessment kits or public mailouts.  
Some publicity of water shortages via tv, print & billboards - “Israel Drying Up” campaign. | **2**       |
| **Water Restrictions**          | **6. Permanent ban on hosing paved areas, cars & buildings (Cyprus, Los Angeles, Victoria, Israel)**  
7. Ban watering residential, commercial and public parks & gardens (Victoria, Israel)  
8. Fines for allowing leaks to go unrepaired – (Los Angeles)  
9. Pools & spas cannot be filled without permission (Victoria)  
10. No new lawns (Las Vegas)  
11. Support for alternatives  
• domestic greywater recycling regulated simply (Arizona)  
• domestic greywater recycling subsidized to 75% (Cyprus)  
• domestic rainwater harvesting heavily subsidized (Australia)  
• Xeriscape rebates ($1.50 per sqft lawn converted) (Las Vegas)  
12. Enforcement  
1. ‘Water Busters’ patrol educating citizens & fining offenders (LA)  
2. Public mailouts & media advertisements detail restrictions (Victoria)  
3. Initial fine of approx NIS3000, increasing to 6000 for further offences (Victoria)  
4. Fines increase exponentially for additional offences (Albuquerque, New Mexico)                                                                 | 2.2       | Banned watering residential, commercial & public parks & gardens, but poorly enforced.  
Banned hosing cars and paved areas but not enforced.  
No support for alternatives & some illegal -  
• greywater recycling banned  
• no subsidies.  
Only 15 water authority employees dedicated to enforcement as of November 2008 for the whole country. | **1**       |
<table>
<thead>
<tr>
<th>Measures</th>
<th>Best Practices</th>
<th>Reference</th>
<th>Current Israel</th>
<th>Score (1 - 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Waterwise Building Design</strong></td>
<td>2. Mandatory water-efficiency benchmarks to gain building permit, implemented via a standardized point system (UK Code)</td>
<td>3.2</td>
<td>Mandatory water-efficient faucets &amp; showerheads in public buildings only.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3. Mandatory installation of hotwater recirculation systems (LA)</td>
<td>3.3</td>
<td>Installation of efficient fixtures &amp; dual-flush toilets to show leadership in public buildings (2003).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Mandatory water efficiency labeling for appliances (Victoria, Australia)</td>
<td>1.3</td>
<td>No subsidy schemes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Use of waterless toilets</td>
<td>3.5</td>
<td>No state-sponsored pilot programs for waterwise urban developments.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.4 Urban (vacuum 15% wateruse) (Germany)</td>
<td></td>
<td>Waterless toilets in nature reserves &amp; at concerts.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.5 Suburban (Type 2) (Scandinavia)</td>
<td></td>
<td>Domestic greywater recycling banned under health regulations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.6 Rural (Type 1) (Scandinavia)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Free water efficiency retrofit kits – showerheads, faucets, flow-control valves (Las Vegas)</td>
<td>3.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Simple regulation of domestic greywater systems (Arizona, USA)</td>
<td>3.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Greywater recycling systems subsidized to 75% (Cyprus)</td>
<td>3.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. Rainwater tanks heavily subsidized (Victoria, Australia)</td>
<td>3.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10. 3&quot; pipe systems connect sinks and showers to toilet and garden irrigation (Victoria)</td>
<td>3.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11. Highrise buildings contain onsite greywater treatment for reuse throughout the building (Solaire, New York)</td>
<td>3.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12. Urban development projects designed to capture and make use of stormwater (Victoria, Germany)</td>
<td>3.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13. Subsidies for rainwater tank to toilet connections (Victoria)</td>
<td>3.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pricing</strong></td>
<td>3. Tiered - penalty rates apply to high consumption levels (approx ₪23.80 per m³ at highest tier - Limassol, Cyprus)</td>
<td>4.4</td>
<td>Tiered – moderately high marginal cost (₪7,858 at highest tier)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>4. Calculating and incorporating environment &amp; resource costs (under research &amp; progressive implementation in EU since 2000)</td>
<td>4.2 – 4.5</td>
<td>No move toward calculating environment or resource costs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Full metering</td>
<td></td>
<td>High percent individual metering</td>
<td></td>
</tr>
</tbody>
</table>