WATER TRANSFORMED:

SUSTAINABLE WATER SOLUTIONS FOR CLIMATE CHANGE ADAPTATION

MODULE B: ADAPTING TO CHANGES IN WATER AVAILABILITY - INDUSTRIAL & COMMERCIAL SECTORS

This online textbook provides free access to a comprehensive education and training package that brings together the knowledge of how countries, specifically Australia, can adapt to climate change. This resource has been developed formally as part of the Federal Government's Department of Climate Change's Climate Change Adaptation Professional Skills program.

CHAPTER 4: IDENTIFYING AND IMPLEMENTING WATER EFFICIENCY & RECYCLING OPPORTUNITIES BY SERVICE SECTOR

LECTURE 4.1: TOURISM – WATER SAVINGS IN HOTELS & HOSPITALITY

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Adapting to Changes in Water Availability - Industrial & Commercial Sectors

Lecture 4.1: Tourism – Water Savings in Hotels & Hospitality

Educational Aim

This lecture aims to overview key areas of water usage in the tourism industry, focusing on hotels and hospitality (including restaurants). The lecture highlights opportunities to cost effectively reduce water consumption without compromising the quality of service to customers, including a number of case studies and links to best practice examples.

Learning Points:

1. Tourism is a fast-growing industry in Australia, with steadily increasing domestic and international markets playing key roles in the industry's economic performance. However the tourism industry will be affected by climate change, through unpredictable weather patterns including drought, flooding, and coral bleaching. Further, discerning travellers and holiday makers are becoming increasingly aware of environmental impacts, and are starting to look for more responsible products, services and experiences that are cost competitive. Indeed, studies conducted in the US in the mid 1990s found that 75 per cent of hotel customers identified themselves as environmentally minded consumers, while 54 per cent responded that they wanted to stay in hotels that are proactively reducing their carbon footprints.[1]
2. The tourism industry has a unique responsibility to both contribute to lessening the potential future impacts on the environment, as well as adapting to changing environmental conditions, such as reduced water availability and changing eco-systems. As Tourism Australia acknowledges on its website, *'Like anyone who operates a business, tourism operations have an environmental and social impact. As such we have an obligation as an industry to minimise the impact of our product. Everyone in our industry has a responsibility to ensure our industry remains sustainable for future generations.'*[2]
3. With rising electricity and water prices, along with influences such as the global financial crisis, addressing environmental impacts, including reducing water consumption, may prove to play a key role for future viability in the industry. Within the tourism industry, hotels and associated hospitality (i.e. companies within the food services, recreation, and entertainment sectors) represent a large portion of the industry-wide opportunities to reduce water consumption, and hence form the focus of this lecture. Numerous operators in Australia and around the world are now exploring water saving measures which can be learned from, some of which are listed at the end of this lecture.

[1] Feiertag, H. (1994) 'Boost sales with environment-driven strategy', *Hotel & Motel Management*, vol 209, no 2, p8, cited in Kirk, D. (1995) 'Environmental Management in Hotels', *International Journal of Contemporary Hospitality Management*, Vol 7, no 6, pp3-8.
[2] Tourism Australia (undated) 'Sustainability Toolkit and Resources', http://www.tourism.australia.com/AboutUs.asp?lang=EN&sub=0303&al=2926, accessed 10 October 2009.

4. Certification schemes, such as Ecotourism Australia's *Eco Certification Program*[3] and EC3's *Green Globe,*[4] provide a means to enable the competitive differentiation and market positioning for those actively seeking to reduce resource consumption and environmental pressures, such as through energy, water and waste management (see checklist references at the end of this lecture). In particular, industry leaders are demonstrating that it is possible to cost-effectively achieve significant water savings in hotels and associated hospitality. For example in hotels, opportunities exist in major water using areas such as guest rooms, kitchens, laundries, cooling towers, public toilets, garden irrigation and in swimming pools.[5] In the associated food service businesses and sports clubs, significant water savings can also be achieved in cleaning, food preparation, amenities, washing and irrigation. Of the areas in a typical hotel, guest rooms are where the most water is used, with typical shower usage accounting for around half of the total water used, with, toilets accounting for around 25 per cent, basins 9 per cent and cleaning uses the remaining 10 per cent. In re restaurants, about half of the water used is in kitchen areas with further 35 per cent used in the toilets/rest-rooms.

5. While hotels can spend in the order of AUD$200,000 or more for water and trade waste services each year extensive experience in the Australian hotel industry shows that water consumption can be reduced by an average of 20-40 per cent without compromising guest comfort.[6] For a larger hotel, savings of AUD$25,000-AUD$60,000 can be realised each year just from reducing water consumption.[7] However these achievements need to be underpinned by a process involving key personnel who influence decision making processes and who understand water saving opportunities, to develop a range of strategies and policies. This may include senior managers, facilities managers, maintenance staff, general staff, human resource staff (to help with training and knowledge sharing) and may also include an environmental team or external consultants.[8]

6. A key early step in addressing water consumption is undertaking a water audit, which will help management understand where and how much water is being used, and identify opportunities for reducing consumption. Water audits usually pay for themselves not just through the water savings they identify but also through identifying leaks in the system. For example in an average large hotel in Australia (e.g. 260 rooms) which would use about 28.8 ML per year (300 L/ room /day), leaking taps are usually responsible for 5 per cent of a hotel's water usage – around 1.4 ML or $140,000.[9]

[3] Ecotourism Australia (undated) 'Eco Certification Program', www.ecotourism.org.au/eco_certification.asp, accessed 25 October 2009.
[4] EC3 (undated) 'Green Globe Company Program', www.ec3global.com/products-programs/green-globe/Default.aspx#, accessed 10 October 2009.
[5] Sustainability Victoria and the City of Melbourne (2007) 'WaterWise Hotel', www.smartwater.com.au/downloadDocs/WaterWiseHotelKit.pdf, accessed 21 June 2009.
[6] Sydney Water (2001) 'Hotels', Australia, http://www.sydneywater.com.au/Publications/FactSheets/SavingWaterHotels.pdf, accessed 25 August 2009.
[7] The Natural Edge Project (2008) *Sustainable Water Factsheet*, Tourism Australia, www.tourism.australia.com/content/About%20Us/sustainable_tourism/fact%20_sheets/TACA4047_Water%20Fact%20Sheet.pdf, accessed 21 June 2009.
[8] Sustainability Victoria and the City of Melbourne (2007) 'WaterWise Hotel', www.smartwater.com.au/downloadDocs/WaterWiseHotelKit.pdf, accessed 21 June 2009.
[9] The Natural Edge Project (2008) *Sustainable Water Factsheet*, Tourism Australia, www.tourism.australia.com/content/About%20Us/sustainable_tourism/fact%20_sheets/TACA4047_Water%20Fact%20Sheet.pdf, accessed 21 June 2009.

7. Water savings can be captured in hotels in a number of areas, including The following areas for water saving opportunities in hotels and in associated hospitality. The following learning points highlight water saving opportunities for hotels and associated hospitality in order from largest savings.

   - *Bathrooms and Restrooms - Showers, Taps and Toilets:* Water efficient shower flow rates of less than 9 L/min, which offer similar levels of water pressure and comfort are only used in approximately 20 per cent of Australian hotels, with some hotels are averaging shower flow rates of up to two-thirds higher than is needed. Similarly, the average hotel tap flow rate is about 85 per cent higher than is necessary.[10] Toilets are big water users also, replacing the commonly found 11 litre single flush toilets with dual flushing toilets using 6 and 3 litres on the full and half flushes respectively have been shown to save approximately $185 per year for each toilet replaced.[11]

   - *Heating, Ventilation and Air-Conditioning (HVAC):* In addition to consuming electricity, cooling towers (which provide conditioned air to the rest of the building) can use anywhere between 10 and 25 per cent of a hotel's total water consumption. This can be significantly reduced or eliminated all together by using water efficient or hybrid wet/dry cooling systems, and by sourcing alternative input water sources, such as rainwater, recycled water or stormwater (see Lecture 4.2).[12]

   - *Laundry Services – Washing Machines and Rinse Water:* Most commercial washing machines can be retrofitted with a tank to capture and store rinse water for reuse, cutting water usage by up to 30 per cent. Continuous-batch washing machines are also available which use 70 per cent less water than regular washer-extractor washing machines, while also cutting labour costs. Alternatively, front-loading washer-extractor machines use 60 per cent less water than top-loading machines, and can be stacked to save space.

   - *Landscaping and Pools:* Designing drought resistant landscapes and gardens can save water, in addition to grouping plants with similar water needs together to simplify the watering regime, watering less frequently but more heavily to promote deep root growth, not mowing the grass too short and leaving clipped grass behind, and using mulch around plants. Watering in the early morning or evening can also achieve the same results with 25 per cent less water.

   – *Kitchens and Catering:* A significant percentage of water can be saved in the kitchen by purchasing water efficient cooking equipment and appliances. According to the US EPA, energy efficient steam cookers consume approximately 8L of water per hour, compared to 100 - 140L on standard models. Significant water savings can be achieved with waterless woks. For example in a medium sized Asian restaurant, the average daily water use of a conventional wok stove is between 5,500 – 8,000 litres per day. As less than 10 per cent is required for cleaning and food preparation, there is the potential to save 5,000 litres per day per wok stove, totalling 1,800 kL per year, and achieving savings of up to $4,500 per year.[13]

[10] Sustainability Victoria and the City of Melbourne (2007) 'WaterWise Hotel', www.smartwater.com.au/downloadDocs/WaterWiseHotelKit.pdf, accessed 21 June 2009.
[11] Sydney Water (2001) 'Save Water, Money & the Environment', Sydney Water, Australia.
[12] Sustainability Victoria and the City of Melbourne (2007) 'WaterWise Hotel', www.smartwater.com.au/downloadDocs/WaterWiseHotelKit.pdf, accessed 21 June 2009.
[13] Sydney Water (2009) *Waterless Woks: Factsheet,* http://www.sydneywater.com.au/Publications/FactSheets/Wok_stove_fact_sheet.pdf accessed 25 August 2009.

Brief Background Information

Identifying Opportunities for Water savings

The tourism industry has historically been a significant water end-user. For example, the average consumption of water per room is around 300 litres. Hence, a medium to large hotel can use over 80,000 litres each day, or the equivalent of nearly 30 Olympic sized swimming pools each year. To supply this water, hotels can pay in excess of $200,000 each year for water and trade waste services, before taking into account the additional costs of water heating or the supply of chemicals for cooling towers.[14] As a fast-growing sector in Australia,[15] the tourism industry is made up of a range of business types, including resorts, hotels, attractions, clubs, restaurants and cafes and event facilities. Typically most businesses in this sector employ less than 20 persons, making water management the responsibility of many small operators as well as the fewer, more visible large operators.[16] Within the tourism industry, hotels and associated hospitality providers (i.e. companies within the food services, recreation, and entertainment sectors) have begun to capitalise on the availability of better technology and practices to make significant savings to both their water consumption and profit margins, while benefiting from the opportunity to market their business as 'green' and 'sustainable'. For example, the Hyatt Regency Sanctuary Cove resort reduced water use from 1996 to 2000, from 140 ML to 54 ML, saving $85,000.[17] Furthermore, the Chief Engineer of the Hotel Inter-Continental Sydney reflects that they are, *'proud to have saved over 30 per cent from its original water consumption, making the hotel more efficient, saving money and most importantly, making a positive contribution to the environment.'*[18] However, as the industry continues to grow it will face a range of new threats related to climate change and serious steps will need to be taken if the industry is to significantly reduce its water usage. This lecture focuses on hotels, however many of the water saving techniques listed are applicable across the tourism and hospitality industry.

Tackling large water saving measures requires senior management support to address organisational and technical issues that may arise. The good news is that by reducing water consumption in buildings and operations, businesses can save money and increase profit margins, while also taking advantage of marketing opportunities to present themselves as a water efficient business. As stated by Bill Healey, Australian Hotels Association Director for National Affairs, *'When it comes to sustainability and corporate social responsibility, we are moving from a position where hotels are at a competitive advantage if they do this to a position where it is a competitive disadvantage if they don't.'* [19] Water efficiency audits in the Australian hotel industry show that water consumption can be reduced by an average of 20 per cent without compromising guest comfort.[20] Further, hotels can spend up to AUD $200,000 or more for water and trade waste services each year, not including electricity costs for heating water. Hence, larger hotels could save in the order of AUD$25,000-$50,000 each year from reducing water usage. There are additional benefits to saving water, through avoided costs. For example, conserving water also has the benefit of reducing water charges, trade waste charges and energy costs for heating the water. Hence whilst the cost of purchasing 1000 litres (1kL) of water for a Brisbane food service business may be around $1.13 per kL, the true cost of purchase, use of water and disposal of water wastes is a lot more due to heating

[14] Sydney Water (2001) 'Hotels', Australia.
[15] SaveWater (undated) 'Case Studies', www.savewater.com.au/how-to-save-water/in-business/hospitality/case-studies, accessed 2 August 2009.
[16] Australian Government (2007) *Environmental Scan: Overview of the Hospitality Industry*, Australian Government.
[17] SaveWater (undated) 'Case Studies', www.savewater.com.au/how-to-save-water/in-business/hospitality/case-studies, accessed 2 August 2009.
[18] Sydney Water (2009) *Every Drop Counts Business Program,* Sydney Water, p2.
[19] Brace, M. (2007) 'The Lapse of Luxury', *ECOS Magazine*, Issue 136, May 2007, pp14-17.
[20] Tourism Australia (2008) *Sustainable Water Factsheet*, Tourism Australia, Developed by The Natural Edge Project.

and water waste charges. The University of Queensland's UNEP Cleaner Production centre's work shows that the total cost for an average food and hospitality business for the purchase, heating and disposal of a kilolitre of water is 10 times the actual water supply costs of water, at around $10.33 per kilolitre, comprising water supply ($1.13/kL), heating (using an electric heater, to 60^{o}C costs $8.37/kL) and trade waste disposal costs ($0.83/kL).

A formal 'water committee' may be an effective way to coordinate and lead water management programs, including personnel who influence decision making processes and understand the operation nature of the hotel, such as senior managers and facilities manager. This committee may also include those who understand how water is used in the hotel, and the particular uses and performances required. This might include facilities managers, maintenance staff, and general employees. Human resource staff can also assist with developing training programmes. In some cases, external consultants might be hired to provide specialist advice.[21] However before embarking on a water saving programme, it is necessary to understand how water is being used, and where, as each hotel or hospitality provider will be unique in its services and water consumption patterns. A water audit for the hotel can be as simple as using water bills to understand how much water is received (such as from mains water, rainwater and greywater reuse), when it is used (i.e. by month or smaller intervals depending on the tracking), and how it is discharged, such as through flows to the sewers, stormwater runoffs and additional losses from outside irrigation. To obtain more detailed information, an organisation might be fitted out for sub-metering (for example by building, or by floor of a building) to provide a better understanding of where the water is being used, and highlight where the greatest opportunities for savings might be found. Other considerations include use of alternative sources of water (i.e. rainwater and grey water), and how many of each type of water fixture are installed, as well as the number of each type of water using equipment and appliance.

The results of such an audit might produce data similar to those in Figure 4.1.1 below, which are based on the audits of many hotels. The data shows that major areas of water usage for hotels occurs in guest rooms, kitchens, laundries (if these are present), cooling towers (if present), public toilets, irrigation and swimming pools.[22]

Figure 4.1.1 Major Areas of Water Usage – Hotels

Source: Sydney Water (2001)[23]

Implementing Water Saving Measures

[21] Sustainability Victoria and the City of Melbourne (2007) 'WaterWise Hotel', www.smartwater.com.au/downloadDocs/WaterWiseHotelKit.pdf, accessed 21 June 2009.
[22] Sustainability Victoria and the City of Melbourne (2007) 'WaterWise Hotel', www.smartwater.com.au/downloadDocs/WaterWiseHotelKit.pdf, accessed 21 June 2009.
[23] Sydney Water (2001) *Save Water, Money & the Environment - Hotels,* Australia,

Once the main water using areas have been identified, a prioritised water management program can begin. There are many water efficiency measures which can be made with minimal investment or time. Others may require a greater investment, however by comparing the capital cost with the savings over time, these are likely to still be worthwhile investments. A number of key opportunities are discussed in the following paragraphs including installing water efficient showerheads and flow aerators in bathrooms, dual flush toilets and sensor operated urinals, maintaining cooling towers and limiting their bleed-off rates, using water efficient practices and equipment in the laundry, and water efficient landscaping and irrigation techniques. As mentioned below, the increased availability and acceptance of reclaimed water and rainwater also presents attractive opportunities to reduce potable water consumption and to make significant cost savings.

Bathrooms and Restrooms - Showers, Taps and Toilets

As summarised in Sydney Water's guide to water saving in hotels,[24] the majority of water (40-56 per cent) is typically used in guest rooms. Of this, around 56 per cent of the water is in the shower, with the toilet accounting for a further 25 percent, the basin 9 percent and cleaning 10 percent. A large portion of this water can be saved without compromising guest comfort, through the use of water efficient showerheads, dual flush toilets and aerators on taps. Table 4.1.1 shows the typical water savings which these measures can save, and shows how investing in water efficiency can provide a return on investment after as little as three years. Water savings can also be achieved through low-cost measures such as modifying the ball valve in toilet systems to reduce the flush volume, maintaining and replacing valves and ballcocks to ensure that cisterns aren't leaking, and replacing tap washers to stop leaks.[25]

Table 4.1.1 Typical Water Savings per Guest Room of a Hotel

Component	Best Practice	Existing Usage	Saving per room		Supply & Installation Cost	Description	Payback Period (years)
			kL/ year	$/ year			
Showers	9 L/min (AAA Rated)	15 L/min	28	$100	$50-$120	New showerhead, plus option of flow control	0.5-2
Toilet	6/3 dual flush	11 L	17	$30	$400	New pan and cistern	>5
Basin	6 L/min	12 L/min	5.3	1$5	$20-$40	Flow control in spout or in taps	1.3-2.6
Cleaning	-	-	3.7	$10	0	Typical saving	0
		Total:	54	$155	$470-$560	-	2.9-3.5

Source: Adapted from Sydney Water, 2001[26]

Public amenities are another significant source of water consumption, for example using between 12 and 16 per cent of a hotel's total water usage. For urinals, an existing system can be made more water efficient by adjusting the fill level in the cistern to reduce the amount of water released with each flush, or by adjusting the solenoid valve operation or a movement sensor's programming to adjust the flushing regime, optimising both the frequency and flush volume to maintain an odour free environment with minimal water use. If the urinals are being replaced, then waterless urinals have been shown to save thousands of litres of water each year depending on usage. Otherwise, water

[24] Sydney Water (2001) *Save Water, Money & the Environment - Hotels,* Australia,
[25] Sustainability Victoria and the City of Melbourne (2007) 'WaterWise Hotel', www.smartwater.com.au/downloadDocs/WaterWiseHotelKit.pdf, accessed 21 June 2009.
[26] Sydney Water (2001) *Save Water, Money & the Environment - Hotels,* Australia,

efficient models can reduce water usage, as can sensor operator urinals as opposed to cyclic flushing cisterns. However, these systems can be notoriously inefficient, particularly if not maintained. For example, one Sydney large hotel found that their door-activated sensor system was causing the 12 urinals in the public amenities to waste an estimated 6.2 ML per year, or nearly 17,000 L every day. By implementing additional automation controls on the urinals, they saved AUD$12,000 each year.[27] As with guest rooms, fitting flow aerators on hand basin taps and installing dual flush water efficient toilets can more than halve their water usage.[28]

Heating, Ventilation and Air-Conditioning (HVAC) - Cooling Towers:

The majority of hotels now use cooling towers as part of their air-conditioning systems, which take advantage of the cooling effect of evaporating water to remove heat from water as it circulates through the HVAC chillers. In addition to consuming electricity such cooling towers can use anywhere between 10 and 25 per cent of a hotel's total water consumption. Water is lost due to evaporation and also due to the water misting and drifting away. Depending on the local climate and maintenance of these systems, they can waste more than the water wasted from all of the toilets, hand basins and showers combined. Further, due to evaporation, the remaining water tends to become concentrated in minerals and salts which can cause corrosion of equipment. Some systems accommodate this by circulating water through once, and others bleed a certain portion of the water continually and replace it with 'make-up' water. The use of acid treatment controllers and filters, and correct maintenance of the bleed off system by an experienced operator can ensure optimal water efficiency while still protecting the HVAC equipment. Installing a conductivity controller and pH controller can also directly measure the concentration of salts and minerals in the water to make sure it's only discharged as needed.[29] Installing a conductivity controller can cost less than AUD$1,500 for an average sized cooling tower, and return savings of over $800 a year.[30] There are many other technical innovations which can reduce the amount of water used by the cooling tower, however these will have a minimal impact if not coupled with adequate education and training for the maintenance crew and operators. Some buildings use rain water, or mine sewers, for water for their cooling towers as an alternative to mains water, as outlined in Lecture 2.4.

Laundry Services – Washing Machines and Rinse Water:

Laundries can be big water users in many hotels, and for those without internal laundries, their laundering contractors can be responsible for considerable water use on their behalf. One of the simplest ways to reduce water consumption in the laundry can be through educating guests to minimise their requirements for fresh towels and linen. This requires virtually no investment, and can more than halve washing requirements. Making sure that rooms have adequate space for hanging towels so that they will dry between uses, and a note to guests encouraging their collaboration in water saving efforts can ensure greater success with this method.[31] Within the laundry, many existing washing machines can be retrofitted with a tank which can store rinsing water from load, to use for the pre-rinse of the next load, and this can reduce consumption by as much as 30 per cent. Continuous-batch washing machines are also available which use 70 per cent less water than

[27] Sydney Water (2001) 'Save Water, Money & the Environment', Australia,
[28] Sustainability Victoria and the City of Melbourne (2007) 'WaterWise Hotel', www.smartwater.com.au/downloadDocs/WaterWiseHotelKit.pdf, accessed 21 June 2009; Sydney Water (2001) *Save Water, Money & the Environment - Hotels,* Au`stralia, www.sydneywater.com.au/Publications/FactSheets/SavingWaterHotels.pdf#Page=1, accessed 21 June 2009.
[29] US Dept of Energy (2009) *Best Management Practice: Cooling Tower Management,* Energy Efficiency and Renewable Energy, www1.eere.energy.gov/femp/program/waterefficiency_bmp10.html, accessed 21 August 2009.
[30] US Alliance for Water Efficiency (2009) 'Hotels and Motels Introduction', Chicago, www.allianceforwaterefficiency.org/hotels_and_motels.aspx, accessed 21 August 2009.
[31] Alliance for Water Efficiency (2009) 'Hotels and Motels Introduction', Chicago, www.allianceforwaterefficiency.org/hotels_and_motels.aspx, accessed 21 August 2009.

regular washer-extractor washing machines, while also cutting labour costs. If new machines are being purchased, then water efficiency models are now available which use significantly less water than older versions. For example, a AAA rated front loading machine will use up to 60 per cent less water than a standard top loader, and is also quieter and can be stacked to save space. Operational changes in the laundry can also minimise water, such as by only washing full loads, and switching off the steam supply to equipment when not in use.[32]

Landscaping:

Many facilities incorporate golf courses and landscaped gardens which can require vast amounts of irrigation. There are many ways to minimise water consumption in landscaping by as much as 30-50 per cent, which can also reduce the maintenance workload. These include:

- Installing a water meter on automated systems which can alert staff to leaks or problems in the system before they become apparent in plant health.
- Selecting drought resistant plants, grasses and organising gardens to clump plants together which have similar watering needs, can minimise water usage and allow for a simpler and more efficient watering schedule. Many native plants are well suited to minimal watering, and are more likely to attract birdlife. Mowing more frequently but removing less of the leaf will encourage the grass to develop deeper roots and minimise the amount that it dries out. Leaving the clippings on the lawn can also help to retain moisture when the weather is particularly dry.
- Mulching garden beds to reduce evaporation by up to 70 per cent, and also to keep weeds at bay while aerating the soil. Adding water crystals can improve the landscaped gardens' capacity to hold water and minimise runoff.
- Installing a drip irrigation system to ensure that plants receive water where they need it most – in their roots – and which can allow for electronic controllers to be set to automatically water the gardens. These can also be fitted with rain or moisture sensors which will switch off the system when it's not needed, and allow for watering zones, to allow for the different watering needs of various plants. Drip irrigators also enable grey water, or recycled water, to be used in gardens, and reduces water loss from evaporation and drift.
- If sprinklers are being used, their nozzles should be inspected to make sure they're not clogged, and they should be placed to make sure their water isn't going to a road or footpath. Evaporation and drift can be reduced by avoiding watering when there are higher winds, and watering early in the morning or in the evening can reduce the amount of water needed by around 25 per cent.
- Using alternative sources of water for irrigation such as rainwater, recycled water, filter backwash water from a pool, cooling tower effluent, or grey water from the hotel itself.

[32] Sustainability Victoria and the City of Melbourne (2007) 'WaterWise Hotel', www.smartwater.com.au/downloadDocs/WaterWiseHotelKit.pdf, accessed 21 June 2009.

Pools:

Pools can also be responsible for consuming vast quantities of water, however with good maintenance and attention, this can be kept to a minimum. Evaporation can be limited by using a pool cover if the pool is not in use, and will also save energy in heated pools and reduce the need for chemicals. Insulated covers for spa pools and swimming pools reduce evaporation and can save 200 litres per day for larger pools in hot climates.[33] Losses due to splashing can also be reduced by lowering the water level slightly, and drainage barriers around the pool can collect overflows and splashes and direct them back to the pool. Monitoring the filter back-wash schedule can provide opportunities for reducing this amount without compromising its effectiveness, while filtered backwash water can be used to water lawns and gardens to reduce irrigation demands. Some filters actually don't need to be backwashed at all - cleaning a filter by hand can be more effective and save water. Installing and regularly checking and check-meter on the inlet to the pool can alert maintenance staff if the pool has a leak or is using an excessive amount of water. Properly maintaining the levels of chemicals in the pool also reduces the need to drain the pool or dilute its water in the event of too little, or too much chemical. If the pool has a water feature such as a fountain or waterfall, turning this off when guests are not around (for example using a motion-sensor) can save water by reducing aeration and evaporation. Similarly, lowering the temperature of heated pools and spas will minimise evaporation while also saving on energy.[34]

Kitchens and Catering:

In kitchens water is consumed in many areas from washing food during preparation, to thawing food and cleaning dishes. As Barry Haughton, a well-respected UK chef points out, there is significant potential to save water in the kitchen as until recently few chefs have often been simply unaware that their practices are wasting water, '*In almost all restaurants in the developed world, chefs cook vegetables until they are almost done and then stop them cooking using running water or ice. Then they refresh them with boiling water when they're ready to serve. But there's no awareness at all that this wastes lots of energy and water - commodities that are becoming increasingly precious. For years, I've taken my veg out of the pan about 50 seconds before they're done - they carry on cooking and are ready when they get to the table. It's really simple'*.[35] The largest consumers of water are usually the commercial dishwashers and Pre-Rinse Spray Valves (PRSVs) as discussed in the following bullet points.[36]

- *Commercial Dishwashers:* The amount of energy used by commercial dishwashers is closely related to the amount of water used, so demands for greater energy efficiency have resulted in manufacturers developing significantly more water-efficient models. According to the US Alliance for Water Efficiency, '*In the late 1990s, NSF International (the listing agency for such machines) showed that the most efficient dishwashers used 4.56 litres of water per rack. Today, machines are available at well below 3.8 litres per rack'.*[37] The US Alliance for Water Efficiency also

[33] Scenic Rim Regional Council (undated) 'Water Conservation', Queensland, Australia, www.scenicrim.qld.gov.au/environment/waterConservation.shtml, accessed 25 August 2009.
[34] Sustainability Victoria and the City of Melbourne (2007) 'WaterWise Hotel', www.smartwater.com.au/downloadDocs/WaterWiseHotelKit.pdf, accessed 21 June 2009; Alliance for Water Efficiency (2009) 'Swimming Pool and Spa Introduction', Chicago, www.allianceforwaterefficiency.org/Swimming_Pool_and_Spa_Introduction.aspx, accessed 21 June 2009.
[35] Cookson, R. (2006) 'The Eco-Eatery', *The Independent*, 18 May 2006, www.independent.co.uk/environment/green-living/the-eco-eatery-478687.html, accessed 4 May 2009.
[36] US Alliance for Water Efficiency (undated) 'Commercial Food Service Introduction', Chicago, www.allianceforwaterefficiency.org/Commercial_Food_Service_Introduction.aspx, accessed 21 August 2009.
[37] US Alliance for Water Efficiency (undated) 'Commercial Food Service Introduction', Chicago, www.allianceforwaterefficiency.org/Commercial_Food_Service_Introduction.aspx, accessed 21 August 2009.

provides an excel spreadsheet showing that commercial models are achieving 1.9-2.0 litres of water per rack.[38]

- *Commercial Pre-Rinse Spray Valves (PRSVs):* A pre-rinse spray valve uses a blast of water to rinse off large food particles from plates before loading them into a dishwasher, typically consuming about 30 per cent of all water used in the kitchen. Standard-flow spray valves which flow at 11 L/min or more can be replaced with valves that use 6.0 L/min or less, with replacement spray valves costing less than US$50 each with a useful life averaging about five years.[39] These efficient units can save the average small to medium food service operator as much as 570 litres of hot water per day and US$1,000 throughout the course of a year, which has electricity saving implications as well. These low-flow units can also improve the washing process, where the smaller nozzle openings result in higher water velocity and more effective spray patterns than the standard flow spray valves.

- *Connectionless/Boilerless Food Steamers:* Steaming food is a major part of cooking in any commercial restaurant. There are now commercially available boilerless food steamers. The US Food Service Technology Centre (FSTC) have undertaken studies compare their performance. The study confirmed that the relatively new boilerless food steamers yield significant water use reductions through the elimination of condensate-cooling water.[40] These new steamers are also more energy efficient and for this reason some US energy utilities offer rebates for their purchase. Boilerless steamers are recognised by the US EPA in their Energy Star qualified commercial products.

- *Commercial Ice-Makers:* There is significant variation in water and energy usage amongst commercial ice-makers. There are two main types of commercial ice makers: air and water-cooled machines. Water cooled ice-making machines can use ten times the amount of water which an air-cooled machine would. In a day, this can amount to 600 litres of water just for cooling, or more than half of the total water used by the machine.[41] Studies show that air-cooled machines are also the best choice for energy efficiency, making their operation overall more economical (see Lecture 4.2).[42]

- *Sinks and Basins:* Flow control regulators or tap aerators fitted to existing tapware, or new water saving fixtures and fittings, such as AAA-rated tapware and pre-wash spray rinse units, can half water usage and save money as the below table shows.[43]

[38] US Alliance for Water Efficiency (2006) 'Commercial Dishwashers - Water Use and Specifications', Chicago, www.allianceforwaterefficiency.org/Commercial_Food_Service_Introduction.aspx, accessed 22 August 2009.
[39] Alliance for Water Efficiency (2009) 'Hotels and Motels Introduction', Chicago, www.allianceforwaterefficiency.org/hotels_and_motels.aspx, accessed 21 August 2009.
[40] Karas, A., Kong, V. and Fisher, D. (2005) *Evaluating the Water Savings Potential of Commercial 'Connectionless' Food Steamers*. Fisher Nickel Inc., www.allianceforwaterefficiency.org/Commercial_Food_Service_Introduction.aspx, accessed 21 August 2009.
[41] Sustainability Victoria and the City of Melbourne (2007) 'WaterWise Hotel', www.smartwater.com.au/downloadDocs/WaterWiseHotelKit.pdf, accessed 21 June 2009.
[42] Fisher-Nickel Inc. (2007) *A Field Study to Characterize Water and Energy Use of Commercial Ice Machines and Quantify Saving Potential*, www.allianceforwaterefficiency.org/Commercial_Food_Service_Introduction.aspx, accessed 15 August 2009; Ferstrom, G. (2004) *Analysis of Standards Options For Commercial Packaged Refrigerators, Freezers, Refrigerator-Freezers and Ice Makers*, www.allianceforwaterefficiency.org/Commercial_Food_Service_Introduction.aspx, accessed 15 August 2009; FSTC (2004) 'Ice Maker Efficiency Comparison', www.allianceforwaterefficiency.org/Commercial_Food_Service_Introduction.aspx, accessed 15 August 2009; CEE (2006) *Commercial Ice-Cube Machine Specifications,* www.allianceforwaterefficiency.org/Commercial_Food_Service_Introduction.aspx, accessed 15 August 2009; Koeller and Company (2008) *PBMP - Commercial Ice Machines,* www.allianceforwaterefficiency.org/Commercial_Food_Service_Introduction.aspx, accessed 15 October 2009.
[43] Ethic Communities Council of NSW Inc. (undated) *Save Water and Save Money in Asian Restaurant Kitchens*, www.eccnsw.org.au/htm/assets/pdf/SavingWater_English.pdf, accessed 25 August 2009.

Table 4.1.2: Typical water and cost savings for best practice measures in restaurants

Component	Best Practice	Existing Use	Saving per fixture		Purchase Installation cost ($)	Payback period (yrs)
			kL/year	$/Year		
Sinks	12 L/min	25 L/min	40	122	40	0.4
Basins	6 L/min	12 L/min	6-9	17-26	40	1.5-2.3

Source: Ethnic Communities Council of NSW [44]

- *Behaviour Change:* Water can also be saved through simple behaviour changes such as sweeping or mopping floors instead of hosing them down with water, and by using full loads in the kitchen washing machines and operating dishwashers on the economy cycle. Further, microwaves can be used to thaw food or frozen food can be placed in a refrigerator to thaw overnight, rather than using running water to thaw. [45]

Reducing Reliance on Mains Water - Alternative Water Options

Reclaimed Water (Grey Water): Making use of reclaimed water is an increasingly popular way to reduce the volume and therefore cost of potable (mains) water. There are many opportunities for using reclaimed water in hotels depending on the local and state government legislation for water reuse, including for irrigating gardens and golf courses, in cooling towers and for toilet flushing and urinals. As it can be very expensive to retrofit an existing hotel with pipes to supply reclaimed water, such options are important to consider during the design and construction phase of new buildings, or potentially as a part of other large renovations, where the cost is estimated to add less than 15 per cent to the total cost of the plumbing system.

Rain Water and Storm Water: Another way to reduce potable water use is to collect and store rainwater (i.e. through above or below ground rainwater tanks), or stormwater (i.e. through retention basins or underground reservoirs) to then irrigate the hotel grounds or use for activities such as toilet flushing, outdoor cleaning and laundry services. In addition to being a very visible sign of the hotel's dedication to water sustainability, rainwater and stormwater reuse has several advantages including reducing the costs of purchasing potable water, mitigating the risk of flooding on the hotel grounds, reducing the load on the frequently overtaxed stormwater system, and reducing the amount of runoff of pollutants from the hotel grounds such as fertilisers, herbicides, pesticides and automobile fluids.

Case Studies – Inter-Continental (Sydney) and the Sofitel (Brisbane)

The following examples show how it is possible to make large financial savings through water efficiency, while still providing first class service to hotel guests.

- The Inter-Continental has been internationally recognised as a leading 'green hotel' and is often used as a case study for best practice, being one of the first establishments to take water efficiency seriously in 1987, and has found many ways to reduce their water consumption. From the initial step of installing water restrictors in bathrooms, restrictors have since been installed in the kitchens, sensors have been installed in urinals and a water reclamation unit has been

[44] Ethic Communities Council of NSW Inc. (undated) *Save Water and Save Money in Asian Restaurant Kitchens*, www.eccnsw.org.au/htm/assets/pdf/SavingWater_English.pdf, accessed 25 August 2009.
[45] Ethic Communities Council of NSW Inc. (undated) *Save Water and Save Money in Asian Restaurant Kitchens*, www.eccnsw.org.au/htm/assets/pdf/SavingWater_English.pdf, accessed 25 August 2009.

installed in the laundry. All together these initiatives have reduced the hotel's consumption by around 30 per cent. By installing water meters throughout the building, they have been able to monitor and charge each department for their water usage, ensuring the motivation for water efficiency is shared with all of the staff. Andy Goonesekera, the Chief Engineer, notes the pay back period has been longer for their hotel as so many systems had to be retrofitted. In contrast, newer hotels can incorporate water saving measures into design from the outset, resulting in more substantial savings with quicker pay back periods.

- Brisbane's Sofitel Hotel has also capitalised upon the business opportunity of water efficiency, saving almost $30,000 each year on potable water and trade waste charges, not including the associated savings in electricity for water heating and chemicals for the cooling tower. Their previous efficiency measures had reduced their yearly water consumption by almost 18 ML through a combination of many strategies, and the hotel is expecting to increase this to 27 ML with newer measures. Some water saving strategies at the Sofitel include recycling discharge water from the laundry's dry cleaning machine in the cooling tower system and installing controls in the cooling tower to optimise the bleed rate and filtering the cooling tower water to allow it to be used for longer. It collects and uses rainwater to top up the swimming pool and cooling tower The hotel also has also installed sub-meters throughout the hotel to measure water use and has a programme to inspect and fix leaks. ,

- The Regional Municipality of Waterloo, Ontario undertook a study in 2005 to measure water savings from PRSV retrofits in 10 commercial restaurants. The study showed that pre-rinse spray valves saved approximately 245 litres per valve per day. This unit savings level is approximately three times greater than the units savings related to toilet replacement programs. Total savings for the participant over the 5-year life of the valve is approximately US$1,500 when water, wastewater, and energy costs are included. The cost of each valve is approximately US$60.[46] A similar study in Calgary, Alberta, again measuring water savings at 10 installation locations found that 358 litres per valve per day could be saved a pre-rinse spray valve replacement program saved approximately. Total average savings over the 5-year life of the valve is estimated as US$1,400 - $1,800 when water, wastewater, and energy costs are included. The installed cost of each valve was around US$150 or less.[47]

[46] Veritec Consulting (2005) *Region of Waterloo Pre-Rinse Spray Valve Pilot Study*, Veritec Consulting Inc, www.allianceforwaterefficiency.org/Commercial_Food_Service_Introduction.aspx, accessed 21 August 2009.
[47] Veritec Consulting (2005) *Region of Waterloo Pre-Rinse Spray Valve Pilot Study*, Veritec Consulting Inc, www.allianceforwaterefficiency.org/Commercial_Food_Service_Introduction.aspx, accessed 21 August 2009.

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