SWIM-H2020 EFS-EG-2 "Drought and Water Scarcity risk management"

Task 5 – Capacity building on methods of water conservation end efficiency supporting water demand management

Selected Case Studies on water conservation and efficiency in buildings

SWIM and Horizon 2020 Support Mechanism

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Version	Document Title	Author	Review and Clearance
0	Selected Case Studies on water conservation and efficiency in buildings	Maggie Kossida, SWIM-H2020 SM NKE	Suza Taha, SWIM-H202 SM key water expert

1. CASE STUDY 1: HOTEL INSTALLS WATER-EFFICIENT SANITARY FIXTURES

Location:	Holiday Inn Hotel, San Antonio International Airport, Texas, USA
Aim:	Water saving in the hotel guestroom bathrooms
Technology/ practice:	retrofitting 397 hotel guestroom bathrooms with water saving fixtures (high-efficiency toilets, faucet aerators, and showerheads)
Water saving:	7 million gallons of water per year (~ 26,500 m3/yr).
Energy saving:	much of the water saved is hot water, thus the hotel also saves energy. Estimated electrical energy savings 330,000 kWh/y.
Economic benefits:	approximately $35,000 saved each year in water and sewer bills from reducing the water use, and an additional $33,000 per year in energy savings. i.e. Total = $68,000 per year
Investment cost:	the utility spent approximately $100,000
Payback period:	less than 2 years
Miscellaneous:	The hotel has also reported that it no longer receives calls for maintenance of the new fixtures or fittings, compared to the 1-2 calls received each day in the past.

Fixture/Fitting Replaced	Original Efficiency	Retrofit Efficiency	Number of Units Replaced
Toilets	3.5 gallons per flush (gpf)	1.1 gpf	297
Toilets	5.0 gpf	1.1 gpf	100
Faucet Aerators	2.2 gpm	1.5 gpm	397
Showerheads	2.5 gpm	1.75 gpm	397

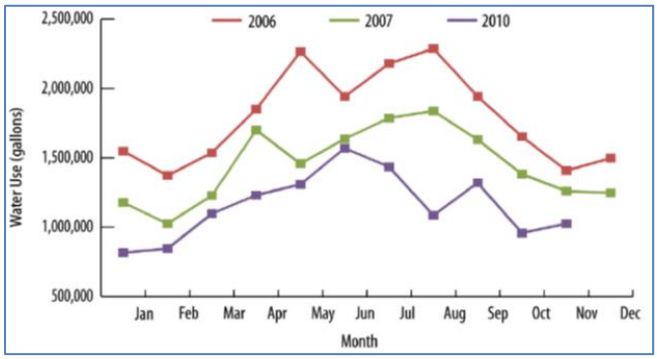

Figure 1-1: Evolution of the water use per month

2. CASE STUDY 2: OFFICE COMPLEX REDUCES OUTDOOR WATER USE

Location:	Granite Park office complex in Plano, Texas, USA – 35,000 m2 in size
Aim:	Reduce outdoor water use
Technology/ practice:	Following an irrigation audit, the irrigation efficiency was improved by: ✓ installing weather-based irrigation controller (which analyzes local weather data and landscape conditions to program watering schedules based on plants' needs) ✓ installing rain sensor and freeze sensor (to prevent watering at unnecessary times) ✓ replacing broken sprinkler heads; ✓ positioning sprinkler heads to ensure adequate coverage Installing pressure regulating nozzles to increase the uniformity of water applied
Water saving:	12.5 million gallons in 2009 (~47,300 m3/yr)
Energy saving:	
Economic benefits:	$47,000 in 2009
Investment cost:	~ $66,000

Payback period:	Less than 1.5 years
Miscellaneous:	

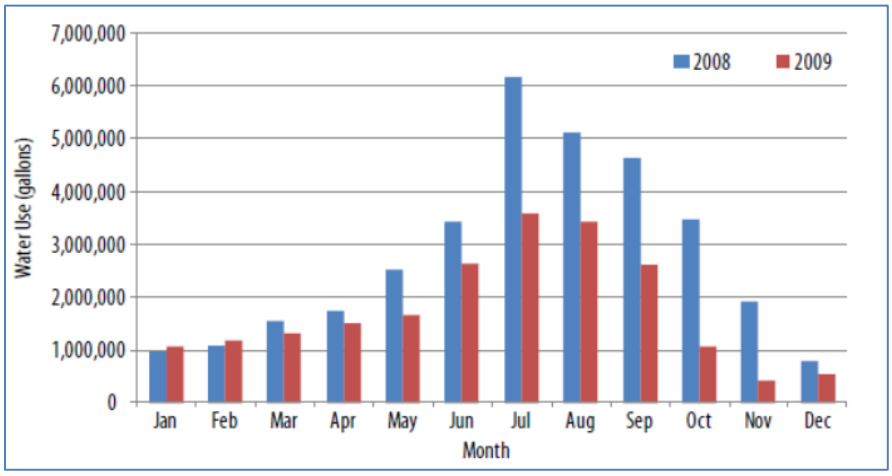

Figure 1-2: Evolution of the water use per month for the years 2008 and 2009

3. CASE STUDY 3: GREYWATER RECYCLING AND REUSE IN HOTEL, DEAD SEA, JORDAN

Location:	Dead Sea, Jordan
Aim:	Conservation of water, address water scarcity and drought
Technology/ practice:	Old system: ✓ During peak season the hotel had to hire private water suppliers to fill the hotel‘s water tank up to 10 times/day ✓ Public water supply is available at a significantly lower price, but it cannot meet the needs of this four-star hotel
Water saving:	Potential of recycled water: Approximately 80% of the wastewater generated daily by each hotel room of the facility takes the form of grey water. The system can recycle 15 m3/day, collected from showers and bathroom sinks, thus 60% of water consumed for toilet flushing in the hotel can be saved.

Energy saving:	
Economic benefits:	20.000€ per year savings
Investment cost:	
Payback period:	
Miscellaneous:	

Table 1-1: Summary results of greywater recycling at the hotel

Saving potential	17% of the total water consumption in the hotel
Investment in the greywater system	US $ 80,000
Approaches used	High quility greywater treatment and reuse
Key success factors	Investment costs can be minimised if integrated in early planning

Figure 1-3: The Dead Sea Spa Hotel (left); The greywater recycling system (right)

4. CASE STUDY 4: LIFE CYCLE COST SAVINGS OF A 350-TON COOLING TOWER

Location:	
Aim:	Cooling Tower Water Saving
Technology/ practice:	✓ Installation of controls that automate blowdown and chemical feed based on conductivity or flow rate ✓ Maximize cycles of concentration based on local water quality conditions. ✓ Installation of a flow meter on the makeup water line ✓ Installation of an overflow alarm to prevent overflow in case of makeup water valve failure, and efficient drift eliminators
Water saving:	Savings expected for a 350-ton CT: 1,289,764 gallons over 15 years as a result of decreasing bleed through increased cycles of concentration from 3.5 to 4.9. Reduction of bleed has the added benefit of decreasing chemical use Associated chemical savings: ~ 500 kgr of chemicals, or $2,150 over the life of the ct.
Energy saving:	Annual embedded energy savings of 858 kWh, or 12,868 kWh over the lifetime of the CT
Economic benefits:	Expected $7,540 in net savings over 15 years (saving $11,165 minus $3,624 cost) from the water saved Expected savings of $2,150 over the life of the ct from the associated chemical savings
Investment cost:	
Payback period:	
Miscellaneous:	

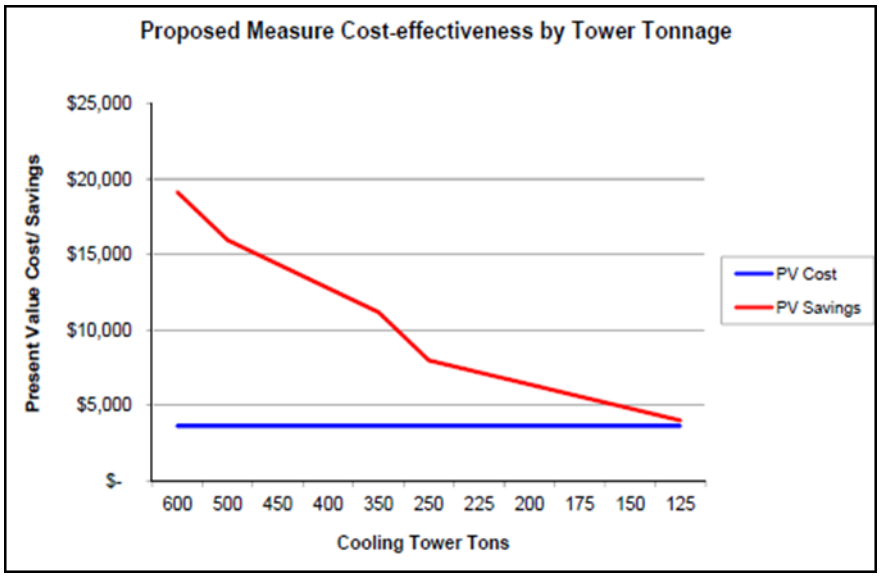

Figure 1-4: Present value cost/ savings for different cooling towers

5. CASE STUDY 5: USE OF ONSITE ALTERNATIVE WATER SOURCES IN UNIVERSITY

Location:	University of Texas at Austin, USA
Aim:	Use of on-site alternative water resources to serve the non-potable water needs
Technology/ practice:	Features: 400-acre campus, 1.6 million m2 of building space, serves approximately 51,000 students and 24,000 faculty/staff. The campus includes administrative offices, academic lecture buildings, dormitories, research laboratories, cafeterias, museums, libraries, athletic venues, and industrial facilities Practice: recovering and reusing water from onsite alternative sources to serve non-potable water needs (for cooling tower make-up water and lawn irrigation). Retrofits include: ✓ single-pass cooling water ✓ foundation groundwater

	✓ using air handler condensate ✓ Rainwater harvesting
Water saving:	Reduced potable water use >33%. More than 6 million m3 of water saved in total since the program began in the 1980s. In the early 1980s: 3.8 million m3 of potable water per year. In 2010: 2.5 million m3 (despite a 70% increase in overall building square footage).
Energy saving:	
Economic benefits:	Saving of $7.5 million in water and sewer costs
Investment cost:	
Payback period:	
Miscellaneous:	

6. CASE STUDY 6: RWH IN A COMMERCIAL BUILDING IN PORTUGAL

Location:	Commercial building, Dolce Vita Braga, N. Portugal
Aim:	Economic analysis of a RWH system based on 3 scenarios of potential water use of the RW: ✓ Scenario 1 – for pavement washing (62,000 m2) and garden irrigation (14,000 m2) ✓ Scenario 2 – for 50% toilet flush and garden irrigation ✓ Scenario 3 – for toilet flush and 5 % garden irrigation
Technology/ practice:	Intervention area:159.971m2, rainwater collection area: 36,870 m2, occupants: 34,500 people
Water saving:	The results indicate that RWH scenarios proposed are cost-efficient ✓ Scenario 1: 18% water savings ✓ Scenario 2: 23% water savings ✓ Scenario 3: 20% water savings

Energy saving:	
Economic benefits:	reduction in the annual water bill from local water authorities
Investment cost:	Total cost, including cost of underground storage tank and its fixtures, the alternative water supply net, the pump, and installation costs): Scenario 1 = 92,120 € ; Scenario 2 = 240,843 € ; Scenario 3 = 180,051 €
Payback period:	
Miscellaneous:	

Figure 1-5: Dolce Vita Braga (Source: http://www.dolcevita.pt)

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