

Water Use Practices in Buildings



Role of Energy and Water Resource Efficiency in Buildings

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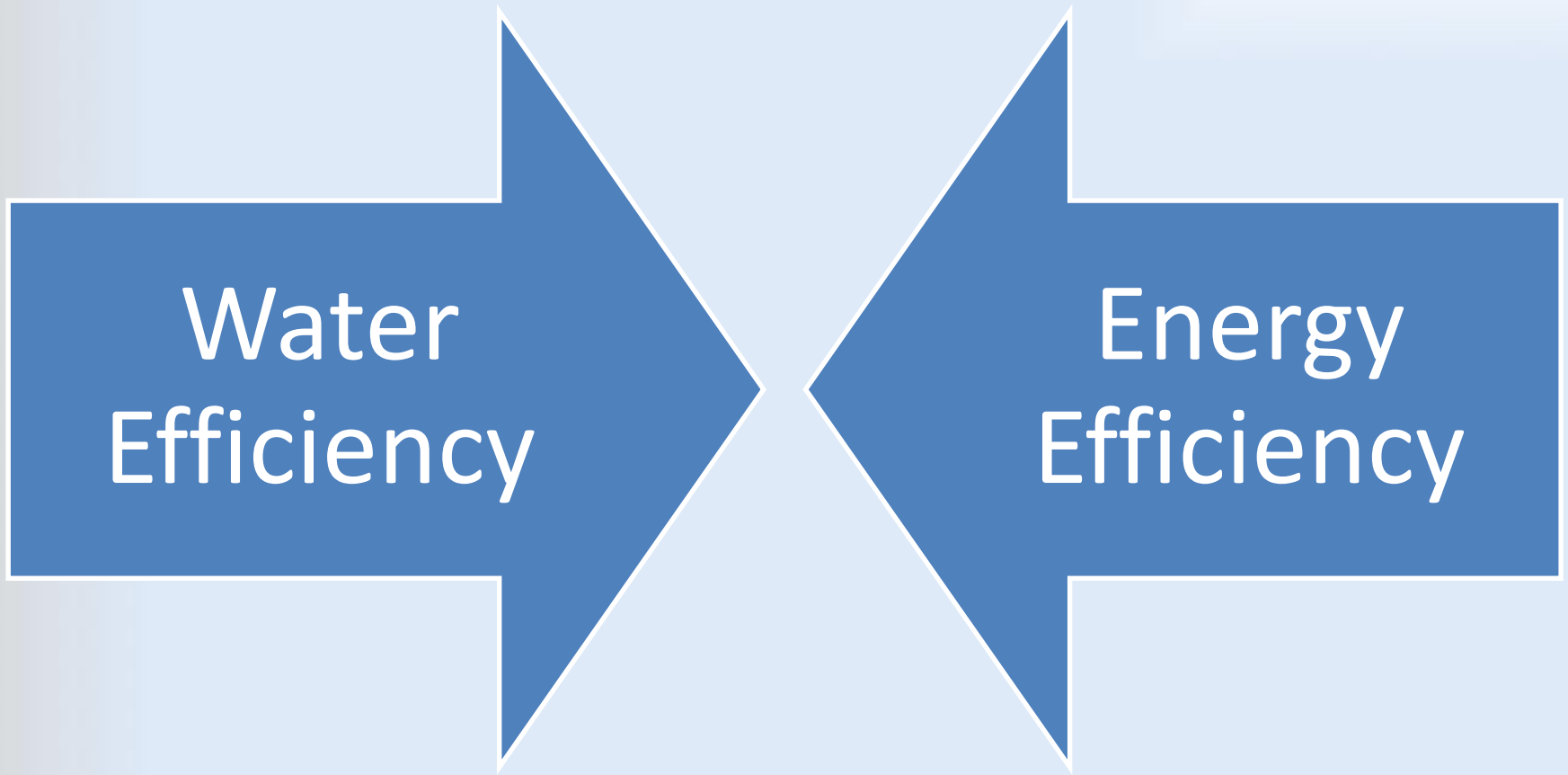
Blue is the New Green!!

Indian water use situation



- Water situation grim in Himalayan settlements
- Plains are depleting ground water
- Capacity to treat and re-use water is dismal
- Water bodies have disappeared or rendered dysfunctional
- Management of water sources is rarely an academic subject
- Water harvesting is yet to find mainstream feature in built environment

Common Goal and Objective



Water Efficiency = Energy Efficiency

Water + Energy = WatErnergy



- California Energy Commission: *19 percent of the state's electricity and 30 percent of the state's natural gas support the state's water and sewer systems.*
- Water and energy efficiency efforts needed

Water Requirement Reduction Causing Energy Saving



REDUCED WATER REQUIREMTN REFLECT THE REDUCED COST AND LESS CONSUMPTION OF ENERGY

✓ Total consumption 135l/p/d

✓ Nos of users $4 \times 135 = 540l$

For one month = 16200 l

✓ Energy consumption for pumping 1hr into 6 Rs per unit per 10min , one hr 6 units = $6 \times 6 = 36$ For one month = 1080

✓ Total consumption after effective reduction 96 l/p/d

✓ Nos of users $4 \times 96 = 384l$

For one month = 11520 l

✓ Energy consumption for pumping 40min into 6 Rs per unit per 10 min , 40 min ,4 units = $4 \times 6 = 24$ For one month = 720

Energy Saving = 33%

Water saving = 28%

17 Design Stage Analysis



Projects	LPCD Fresh Water Consumption	Overall Energy Consumption (KWHR/kl)	Energy Factor for Water Supply (KWHR/kl)	Energy Factor for Recycling (KWHR/kl)
Total Average of 11 Residential Projects	171.92	5.12	1.20	3.51
Total Average of 3 Hotel Projects	226.36	6.74	1.64	3.19
Total Average of 3 Office Projects	86.19	11.18	8.07	0.95

Water Efficient Plumbing Fixtures



- **Water efficiency labeling of plumbing products**
- American Water Works Association (AWWA) estimates possible **reduction up to 35% of per capita household** water use by way of installation of water efficient plumbing fixtures and plugging leaks in the systems.
- Home Water Use
 - Toilets 28% • Clothes Washers 21%
 - Showers 17% • Faucets 15% • Leaks 14%
 - Other 5%

Water efficiency labeling of plumbing products



- INTERNATIONAL INITIATIVES
 - Europe
 - Australia
 - East Asia



Water Efficient Initiatives - Europe	Type
Water supply (water fittings) Regulations : WC Suite Performance Specifications (UK); 1999	Mandatory
BMA Water Efficiency Labeling Scheme (UK); 2007	Voluntary
Waterwise Marque (UK); 2006	Voluntary
Enhanced Capital Allowance Scheme (UK); 2003	Tax rebate
Ordenanza de Gestion y Uso Eficiente del Agua en la Ciudad de Madrid (Spain); 2006; Local coverage in Madrid	Mandatory regulations
Decreto 202/1998 (Spain); 1998; Local coverage in Catalonia	Mandatory regulations
Distintivo de Grantia de Calidad Ambiental Catalan (Spain); 1994 ; Local coverage in Catalonia	Voluntary label
Ambientale al Regolamento dell Citta di Avigliana – Allegato Energetico (Italy); 2007 Local coverage in Avigliana	Voluntary label
Variante all’ Art.8 delle Norme Tecniche di Attuazione del P.R.G. (Italy); 1997 Local coverage in Urbino	Regulation
Regolamento Energetico Ambientale (Italy); 2008 Local coverage in Sassari	Regulation
Regulamento gerls dos sistemas publicos e predias de distribuicao de aguae de drenagem de aguas residuals (Portugal); 1998	Regulation
Certificacao de Efficnenncia Hidrica de Produtos (Portugal); 2008	Voluntary (E to A++ rating system)
Building Regulations (Ireland); 2008	Mandatory regulation
The Blue Angel (Germany); 1978	Voluntary label
The Nordic Eco-label (Nordic countries); 1989	Voluntary
The European Eco-label (Europe); 1993	Voluntary label

UK

Spain

Italy

Portugal



Water Efficient Initiatives- Australia & USA	Type
WELS (Australia); 2005	Mandatory 5 star rating system
Smart Approved WaterMark (Australia); 2004	Voluntary Label
The Car Wash Water Saver Rating Scheme (Australia); 2004	Voluntary Label (Rating System)
New Zealand WELS (New Zealand); 2009	Mandatory 5 star rating system
WaterSense (USA); 2006	Certification Mark
Energy Star (USA); 1992	Certification Mark, Voluntary Label



Water Efficient Initiative- East Asia	Type
WELS (Singapore); 2006	Mandatory / Voluntary Label (5-star rating system)
Singapore Green Labeling Scheme (Singapore); 1992	Voluntary (Accredited Tested products)
WELS (Hong Kong); 2009	Voluntary Label
Korea Green Label (Korea); 1992	Voluntary Label
Japan Eco Mark (Japan); 1989	Voluntary Label
Thailand Green Label (Thailand); 1994	Voluntary

Water Efficient Products–A Rating System









Objectives

- Provide credible information on water-efficient products and practices
- Raise awareness about the importance of water efficiency, recommend water-efficient products
- Aid consumers make an informed choice of products that conserve water.

Water closets



- European water closet with cistern or flush valve using not more than 6 litres per flush. 
- European water closet with dual flush cistern or flush valve using 6 litres for full flush and 3 litres for half flush. 
- High-efficiency European water closet using 5 litres single flush. 
- High-efficiency European water closet using less than 5 litres per flush. 
- Combination or Asian / Indian pan using 6 litres per flush; cistern or flush valve. 
- Combination or Asian / Indian pan using 6 litres per full flush and 3 litres for half flush; cistern or flush valve. 

Urinals



- With flushing device using 4 liters per flush. ★
- With flushing device using 3 liters per flush. ★★
- With flushing device using 2 liters per flush. ★★★

Showerheads



- With flow-rates of 9.5 lpm. ★
- With flow-rates of 7.5 lpm. ★★
- Flow-rates less than 7.5 lpm. ★★★

Faucets



- Non-metered faucets or faucets with aerators with flow-rates of 8lpm. ★
- Non-metered faucets or faucets with aerators with flow-rates of 5.7 lpm. ★★
- Non-metered faucets or faucets with aerators with flow-rates less than 5.7 lpm. ★★★
- **Public use faucets:**
- Metered faucets with or without aerators with flow-rates of 1 litre per cycle or non-metered faucets with flow-rate of 2 lpm. ★★
- Metered faucets with electronic actuator with flow-rates of 1 litre per cycle. ★★

Kitchen sinks



- Kitchen sink faucets or faucets with aerators with flow-rates of 8 lpm. ★
- Kitchen sink faucets or faucets with aerators with flow-rates of less than 8 lpm. ★★

Hand-held Bidet Spray



- With flow-rates of 8 lpm. ★
- With flow-rates of less than 8 lpm. ★★

Dish Washer



- With a Water Factor of 22 liters. ★
- With a Water Factor less than 22 liters. ★★

Water factor: the quantity of water used in liters per full machine wash and rinse cycle

Clothes washer



- With a Water Factor of 5 liters for private use and 8 liters for public use. ★
- With a Water Factor of less than 5 liters for private and less than 8 liters for public use. ★★

Water factor: quantity of water in liters used to wash each cubic meter volume of machine drum capacity

Impact on drainage design due to low water consumption



Ascertain dry drain performance in various climatic and low water availability situations

Poor performance may impact user interest

Could more efficient toilets cause sewer carriage or wastewater treatment problems?

Issues with high efficiency fixtures



- Dual flush toilets, however, require users to utilize conservation behavior
- **Research outcome 1:** Actual use ratio of **1:4** rather than the manufacturer prediction of **2:1** (**26.6%** low-volume vs. the prediction of **66.6%** low-volume);
- Adding signage increased the ratio slightly to **2:5** (**38.8%**)
- Commercial dual flush toilets should be chosen which make it simple for users to choose the correct behavior

Issues with high efficiency fixtures



- **Research outcome 1:** Ratio of small to large-volume flushes in a building with **permanent, educated occupants** was about 2:3.
- 31% study participants preferred to use foot to flush toilet
- Low volume use still not as prevalently utilized as predicted by manufacturer

Issues with high efficiency fixtures



- Push down for high volume and push up for low flow: Users choose push down being easiest option and common behavior to flush a toilet, pulling the handle up for a low-flush requires awareness and extra effort

Issues with high efficiency fixtures



- Concern of water conservation impact on drainline transport:
 - Building retrofits: Consider Pipe diameter, slope, length of horizontal runs, as well as presence of drainline defects
 - New designs: Decreasing pipe diameter, increasing slope, and shortening horizontal runs could increase the effectiveness of high-efficiency toilets to transport of solid waste

Issues with sensor-operated plumbing fixtures



- Water use monitored for 12 months, sensor valves installed in three phases: 1 faucets, 2 urinals, 3 toilets. Following each installation, monitoring for a 4 month period
- Average daily water demand of the washrooms increased by 30% after faucet replacement (654 gallons per day to 856)
- Average daily water demand of the washrooms after urinal and toilets valve replacement increased by 45% (856 gallons per day to 1,254)
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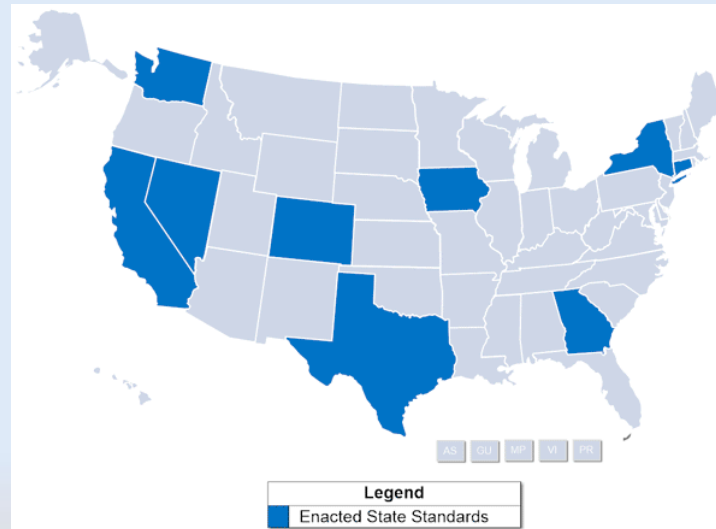
Water use study: Millennium Dome UK



- Water conservation studies evaluating water-efficient technologies and water reclamation
- Males are more likely to use urinals rather than dual flush half flush, no water saving advantage to installing dual flush WCs in male restrooms



Low-Flow Toilets Requirement in California For All Home Renovations -2017



Low Flow Plumbing Fixtures Mandatory in California starting 2017



- By 2017, the law requires all pre-1994 homes to be retrofitted with low-flow plumbing fixtures plus disclosure of noncomplying fixtures when owners sell, the idea of deadlines — 2017 for homes and 2019 for commercial buildings and apartments - POVERTY NO EXCUSE
- The water-conserving measure requires low-flow toilets, shower heads and interior faucets for single-family homes exceeding 20 years in age
- Starting Jan. 1, 2017 homes will not be able to get final approval for a variety of home improvements — from replacements of windows to a room addition — unless they have low-flow plumbing fixtures throughout their properties
- Under federal law enacted in 1992, low-flow toilets became standard, in 2009, the year the measure passed, proclaimed a state-wide emergency due to drought and asked Californians to cut their water use by 20 percent.

The Mandate



- Starting in January, those owners must replace noncomplying fixtures serving an area being renovated but only if the cost of the renovation exceeds \$150,000.
- They must retrofit the entire building if they make an addition exceeding 10 percent of the floor space.
- They must replace all inefficient fixtures in a room where they are making improvements.
- But there is no dollar exemption for homeowners.



- Toilets 1.6 gallons per flush
- Shower heads 2.5 gallons per minute
- interior faucets 2.2 gallon per minute

The Bill/Code/Mandate



SB407 Property transfers: plumbing fixtures replacement. (2009-2010)

An act to add Section 1102.155 to, and to add Article 1.4 (commencing with Section 1101.1) to Chapter 2 of Title 4 of Part 4 of Division 2 of, the Civil Code, relating to water conservation. [Approved by Governor October 11, 2009. Filed with Secretary of State October 11, 2009.]

“The bill would require, on and after January 1, 2017, that a seller or transferor of single-family residential real property, multifamily residential real property, or commercial real property disclose to a purchaser or transferee, in writing, specified requirements for replacing plumbing fixtures, and whether the real property includes noncompliant plumbing. The bill would require, on and after January 1, 2017, a seller of certain residential real property to make a specified disclosure in this regard.”

Conclusions



- Water treatment is not enough, Recycling is important
- Water specific energy use must be looked into
- Use of water efficient fixtures needs encouragement along with:
 - User awareness
 - Evidence based innovation
 - Design, installation and maintenance process review