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Water Efficiency Performance Standards and Indicators

(MOE Benchmarking Survey)

In conjunction with the CWWA

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What does it mean?

- Everyone has likely heard the terms –

“comparing apples to apples”

and

“comparing apples and oranges”.

Sounds easy, but…

- Not all apples are the same
- Sometimes it is difficult to compare apples to apples
- Some apples are good for eating, some for cooking, others are good only for throwing (people that do this are called ‘bad apples’)
- We need better delineation
  - Many different varieties of apples
- There can be significant confusion if we are all not talking about the same thing

Benchmarking Water Demands

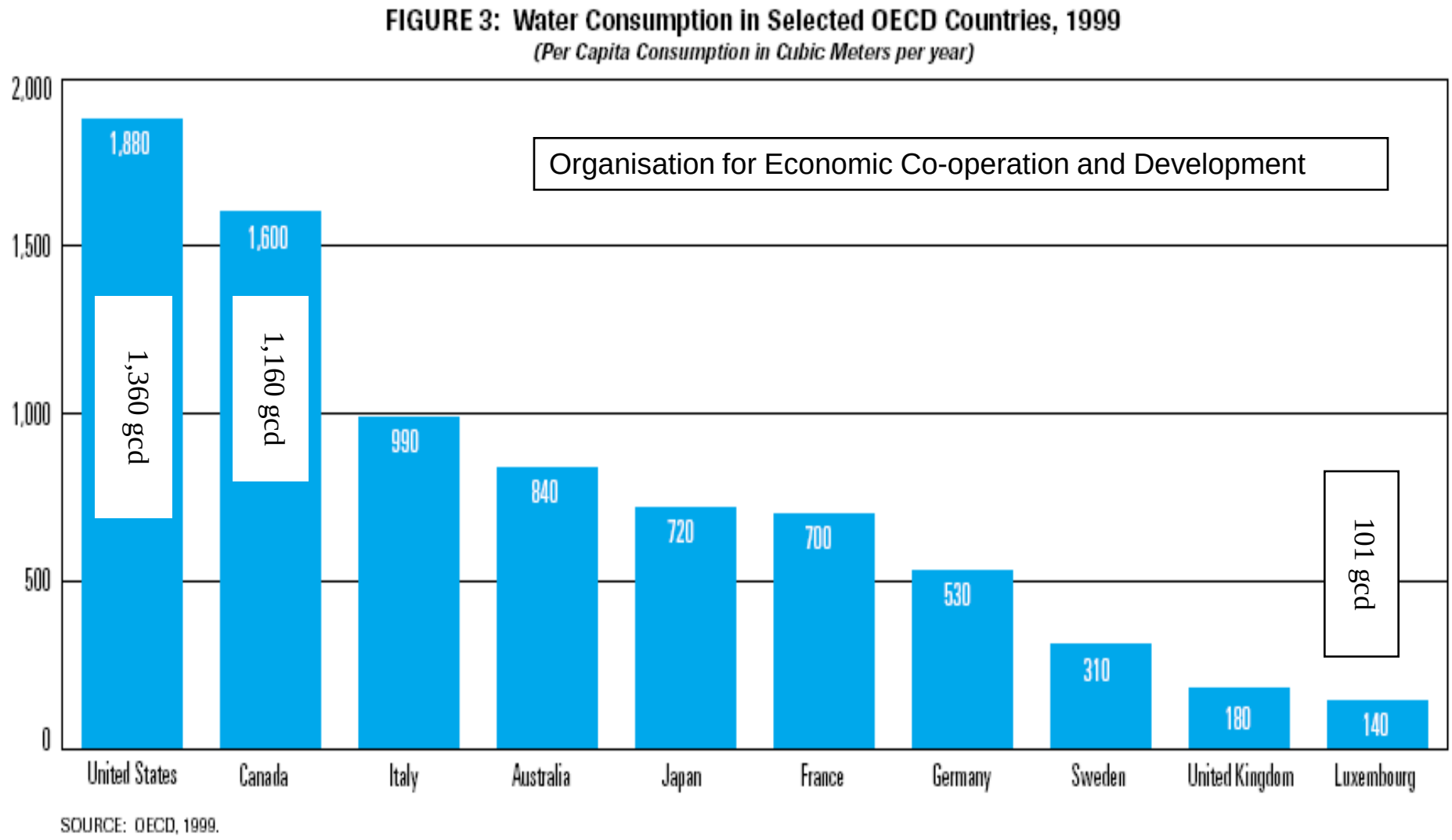
- Definition*:* Typically when organizations evaluate various aspects of their processes in relation to best practice, usually within their own sector.
- We determine how efficient a process or product is by comparing it to a similar process or product that is known to be efficient.
- Relative efficiency
- Rating can change as new technology is developed

Consider…

- 25 years ago a 3.5-G toilet was considered “efficient”
  - 3.5-G models are called ‘water saver’ toilets
- When 1.6-G models were introduced they needed a new name
  - Utra-Low Flush (ULF) toilet
- When 1.28-G models introduced…
  - High-Efficiency Toilet (HET)
- Now 0.8-G models are available
  - Super-Duper Double Cosmic Wow Toilet (SDDCWT)

- For example: the organization EarthCare Canada says a “regular” toilet flushes with 16-20 litres (4.2 – 5.3 gallons)
  - What is a “regular” toilet?
  - Statements like this can be misleading because they don’t accurately define to what they are referring.

How do we fair?



So – we're in bad shape…

- A 2003 Canada West report (On Tap, Urban Water Issues in Canada, Discussion Paper) references a claim (Boyd, 2001) that Canada's overall water demand increased by a whopping **25.7%** since 1980.
  - Sounds bad, however, the population increased by 29.4% - so ??????
- Avg. residential water demands are decreasing in North America as new homes are built with efficient fixtures and appliances, and existing homes are retrofitted.

So, what is the demand?

- In 2000, ~ 408,000 MGD withdrawn in U.S. = 1,255 gcd
- When power plant cooling is removed = 655 gcd
- When crop irrigation is removed = 234 gcd
- Residential & commercial uses = 145 gcd
- Residential = 115 gcd (more irrigation in southern U.S.)*
- Indoor residential use = 70 gcd (similar to Canada)
- Typical new homes = 53 gcd (similar to Canada)
- Homes w/ efficient clothes washers, showers, toilets, and faucets = 40 gcd (similar to Canada)

- **Potential without behavioral modification ~ 32 gcd**

All valid, all gcd

- Like the ‘apples to apples’ comparison
  - Delicious, Granny Smith, Crab, etc.
- All demands use same units (gcd)
- But, there are different types of apples
- And there are different types of gcd data
- Unless we are very specific, we run the risk of being very wrong!

What type of “apple” are we looking for?

- No recognized ‘standard’ efficiency indicators -
  - some based on total water withdrawals,
  - some based on total water produced,
  - some based on total water billed,
  - some include industrial, commercial, and institutional demands, etc.
- It is extremely difficult to compare efficiency of one municipality to another or, depending on indicator, from one year to another in same municipality.
- When we say “Municipality A is more efficient than Municipality B” – what do we *really* mean?

First, what we don't mean -

- Likely don't mean efficiency in ICI sector
- We shouldn't mean efficiency of the entire customer base
  - Want to appear more efficient? Kick all of the industry out of town.
- Likely, we are referring to the residential sector only, but…

Residential Sector - either delineate or its “still just apples”

- Town A has a high percentage of multi-residential apartments
- Town B is virtually all single-family homes
- Town C is a retirement community
- Town D has a stagnant population and old housing stock
- Town E is rapidly growing with a large percentage of new homes, etc.

Demand Reductions

- The same problems arise when defining demand reduction targets.
- Municipal Goal – 10% reduction in 10 years
  - 10% of What?
  - Of current total annual production?
  - Of current average annual day demand?
  - Of projected demands?
  - Of residential demands?
  - Of new home demand?
  - Indoor demands? (can’t predict weather)

Consider simple case - Residential

- Town has pop. of 100,000 and avg. indoor demand of 66 gcd
- Town mandated to double in size in 20 years
- New homes have demands of 54 Lcd (even without efficient washers, HETs, etc.)
- Demand in 20 yrs w/o ANY action = 60 gcd
- Yea! We have a 10% reduction.

Or, looked at it another way…

- Town has avg. indoor demand of 66 gcd
- New homes have demands of 54 gcd (even without efficient washers, HETs, etc.)
- Town claims 20% savings, how?
  - they have reduced demands in new homes by 20% vs. existing homes

CWWA Municipal Survey

- CWWA sent a survey to all of its member municipalities asking questions such as:

  Are the performance indicators that you currently use:

  1. always accurately calculated based on complete data
  2. calculated where possible based on available data
  3. estimated based on available data and assumptions
  4. more of an educated guess

  What implementation issues have you encountered?

  1. difficulty getting accurate data
  2. difficulty getting support or buy-in from others
  3. difficulty comparing results from year to year
  4. difficulty comparing results with results from other jurisdictions

A sampling of Survey Responses

- Municipal goal: 10% reduction of Average Day Irrigation Demand – no formal date assigned to achieve target, however 10% reduction has already been achieved and surpassed.
  - Avg. indoor residential demand = 189 Lcd (50 gcd)
  - Calculate where possible based on available data
  - Difficulty getting accurate data
  - Track demands on a season to season basis

A sampling of Survey Responses

- Municipal goal: 20% total reduction by 2025 (converted to a volume).
  - Avg. SF residential demand = 232 Lcd (61 gcd)
  - Calculate where possible based on available data
  - Difficulty getting accurate data
  - Difficulty comparing results with other jurisdictions
  - Track demands on a season to season, customer sector, and system-wide basis

A sampling of Survey Responses

- Municipal goal: 15% reduction in total water usage below year 2000 water demand levels by 2015
  - Avg. residential demand = 335 Lcd (88 gcd)
  - Always accurately calculate based on complete data
  - Don’t track demands

A sampling of Survey Responses

- Municipality goal: none
  - Customer sector demands = not calculated
  - Always accurately calculated based on complete data
  - Track demands on a system-wide basis
  - Lawn watering bylaw is only measure

A sampling of Survey Responses

- Municipal goal: none
  - Customer sector demands = not calculated
  - Use educated guesses
  - difficulty getting support or buy-in from others
  - difficulty comparing results from year to year
  - Track average day and peak day demands
  - Implement watering restrictions (don’t track)

A sampling of Survey Responses

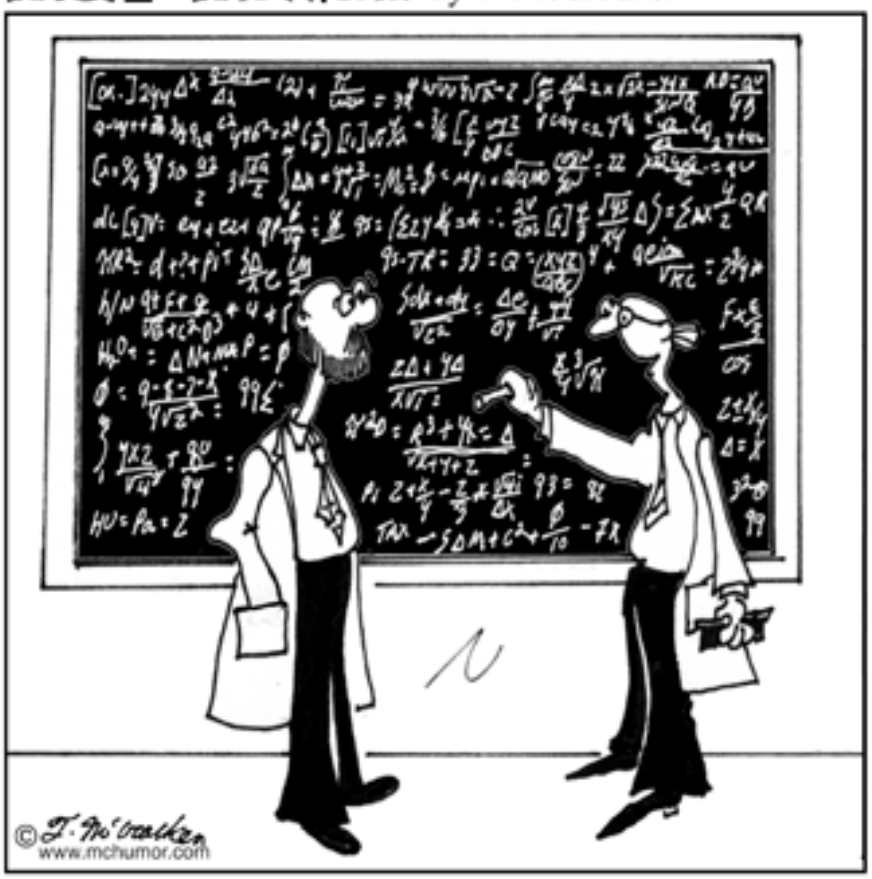
- Municipal goal: none
  - Avg. residential demand = 160 Lcd (42 gcd)
  - Avg. indoor (winter) res. demand = 170 Lcd (45 gcd)
  - Avg. summer residential demand = 130 Lcd (34 gcd)
  - Calculate where possible based on available data
  - No difficulty getting accurate data
  - Totally un-metered community
  - Odd/even watering restrictions – don't track

A sampling of Survey Responses

- Municipal goal: 15% reduction in avg. annual per capita demand by 2020
  - Avg. residential demand = 371 Lcd (98 gcd)
  - Avg. SF residential demand = 407 Lcd (108 gcd)
  - Avg. MF residential demand = 469 Lcd (124 gcd)
  - calculated based on plant production versus utility billing information
  - No difficulty getting accurate data
  - No difficulty comparing results with other jurisdictions

CWWA Survey

- Analyzing surveys took more effort than expected.
- Even with what we thought were clear, precise questions – results are a little murky



"There's really no need for confusion.
Part 95 of section 33 of article Q
in the formula quite clearly states ... "

What do we really want to compare?

- Industrial demands
  - Not generally. Each municipality has its own unique blend of ICI customers. Next to impossible to compare “apples to apples”
- Gross demands (total production / population)
  - Not generally, because gross demands include system water losses, un-metered municipal uses, ICI demands, etc.

Con’t

- Avg. residential demands
  - Better than nothing, but includes outdoor demands and both single- and multi-family demands.
  - Municipalities in hot climates would appear less efficient because of more irrigation.
  - Municipalities with a high percentage of MF dwellings would also appear more efficient

Con’t

- You really need to compare “each type of apple” separately -
  - Indoor demands of new SF homes (fitted with code-compliant fixtures) to indoor demands of other new SF homes
  - Older SF homes to older SF homes
  - MF to MF
  - Seniors’ homes to seniors’ homes
  - Etc.

We need to be on the same page

- Municipality planning new subdivision of 500 homes, or 1,500 persons
- Base savings on -
  - Average gross demand of 132 gcd
  - Average residential demand of 60 gcd
  - Avg. indoor residential demand of 54 gcd
  - Peak day demand of 80 gcd
  - Avg. demand of other new homes of 40 gcd
  - Avg. demand of pilot project homes of 32 gcd

Err on the side of caution

- Most engineers and planners err on the side of caution (better too much than not enough)
- But, being too conservative leads to over-building infrastructure (expensive, wasteful) and to potential water quality problems (make everyone as efficient as possible then waste the water by flushing the mains)

Benchmarking

- We need to have practical benchmarks to allow us to identify where there is room for improvement, where we should focus efforts
- In all likelihood, the most important benchmarks will be related to indoor residential demands (gcd) and, separately, irrigation demands (normalized on an area basis and considering the local climate)
- For example -

Potential Indoor SF Benchmarks: Lcd

Water Use	Pre-1996*	Retrofitted	New Home	Potential	Ultimate
Toilet	18.5	7.9	7.9	6.3	4.0
Clothes Washer	15.0	9.0	9.0	6.9	6.9
Shower	11.6	9.2	9.2	9.2	8.5
Faucet	10.9	10.4	10.4	10.4	8.3
other dom.	1.6	1.6	1.6	1.6	1.6
Bath	1.2	1.2	1.2	1.2	1.2
Dishwasher	1.0	1.0	1.0	1.0	1.0
Total	59.8	40.3	40.3	36.6	31.4

*Aquacraft REUS

- Mix of existing toilets, 1.6-G, HETs, 0.8-G
- Mix of existing washers, front-load, lower Water Factor (6.0)
- Mix of existing showers, 2 gpm, 2 gpm w/ hot water recirc.
- Mix of existing faucets, 2.2 gpm, 0.5 gpm w/ hot water recirc.

What's next

- The next step is to consider municipal survey data collected by CWWA
- Possibly get information from USA and other countries as comparison
- Identify various types of "apples" (demand benchmarks) that are helpful to municipalities and water agencies to advance water efficiency.

Thank you…

Contact…

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