

Cir
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My hypothesis today

- Water resource management has many parallels with Circular Economy
- Water management comparisons between Australia and India can be a good case study to identify better practices (and reflect Developed vs developing world commonalities and differences)
- Resource and waste management need to co-learn from the water management industry

Charity begins at home but should not end there!
(Thomas Fuller, 17th century)


The ever-changing canvas for water management

- Water security
- Water security + Energy and Food security
- Water security + Quality of life
- Water security + Climate change
- Water security + Hygiene
- ‘Sharing’ Water for rivers, nature, religious and cultural needs...



This ever-changing canvas for
water management

Is similar to
The challenges that motivate us towards
Circular economy

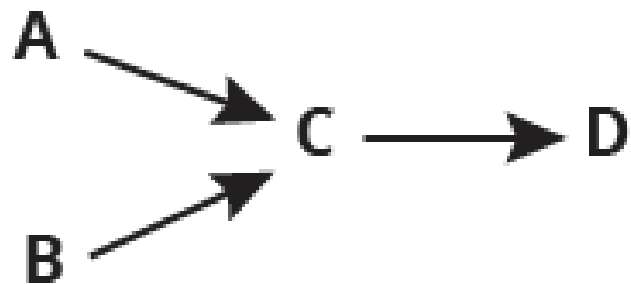


Different names for somewhat similar principles

- Integrated water resource management
- Integrated water management
- Integrated urban water management
- Integrated watershed management
- Integrated river basin management
- Water sensitive urban design
- Total water management
- Adaptive water management
- One Water

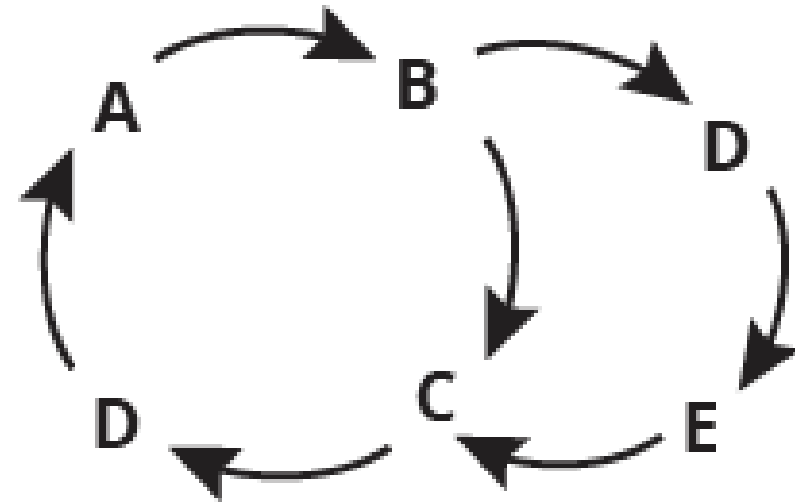
Event Oriented Thinking

Thinks in straight lines



Systems Thinking

Thinks in loop structure



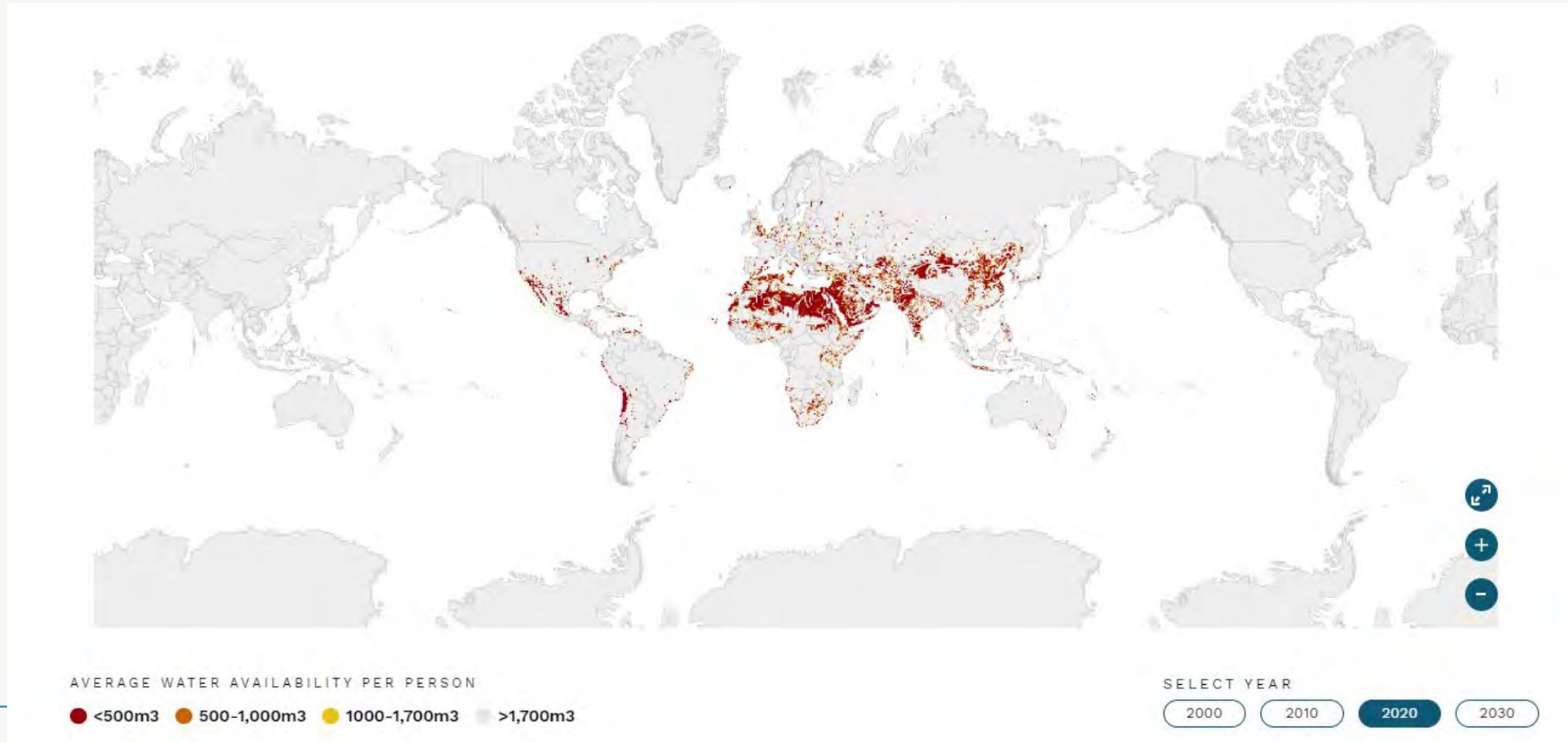
Demographic comparisons: Australia and India

- Area: India is about 2.4 times *smaller* than Australia
- Population: Only ~26 million people in Australia
- Population density: 3 people per sq.km. (India: 464 people per sq. km.)
- Median age: 38 years (India: 28 years; World: 30 years)
- Average precipitation in depth: 534 mm/year (India: 1083 mm/year)
- Water per 1000: 3.22 sq.km. (India: 0.268 sq.km.)

Comparing Australia and India....

- Urban population (% of total population): 86.24 % in Australia (India: 35%)
- Access to sanitation: 100% (India: 58%)
- Population aged more than 65 years: 14.7% (India: 5.7%)
- Population aged more than 80 years: 14.11% (India: 7.5%)
- Population growth rate: 1.2% (India: 1%)
- Net migration per million: 33,063 (India: -1855)

Per capita water availability map: Australia and India



It all begins with Water literacy

Gaps in understanding

LPCD

LPCD

The details of the domestic consumption are

a) Drinking	- 5 litres
b) Cooking	- 5 litres
c) Bathing	- 55 litres
d) Clothes washing	- 20 litres
e) Utensils washing	- 10 litres
f) House washing	- 10 litres
TOTAL	135 litres/day/capita



Residential RO systems have a waste: pure water ratio of 3 to 5 to 1 (average 4:1) and the actual ratio should depend on a number of factors including water quality ,pH, pressure and temperature.

Treating 'potable' water vs Wasting potable water ?

Washing cars ?

Environmental water ?

Draining and re-filling (intermediate supplies)!

We have not understood 'fit-for-purpose' water use



And are we OPEN about using alternative (re)sources?

Circular economy concepts
focus on
the reuse and regeneration
of materials or products

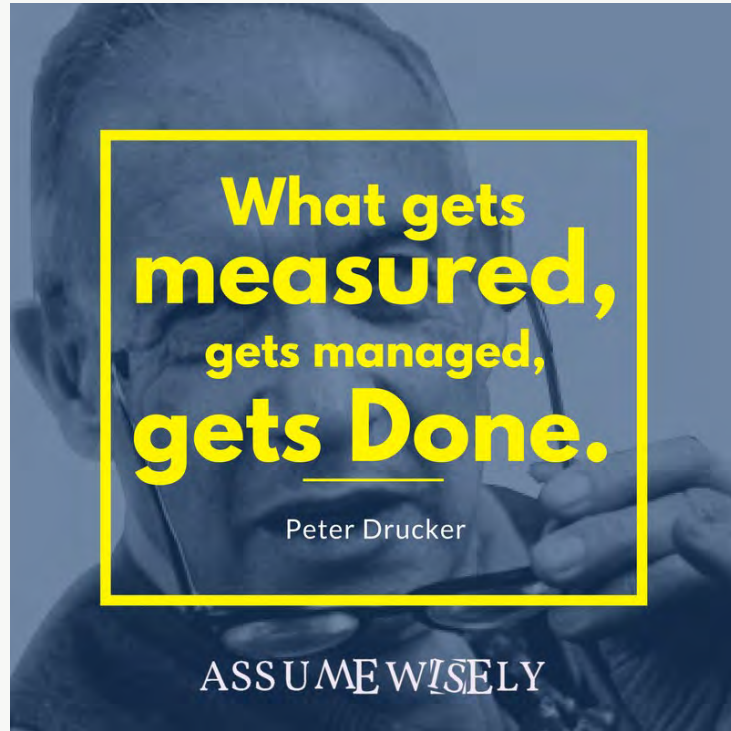
So fit for purpose is vital



What is **NOT** working for water
management!

And the same applies to our
resources, pollutants!!

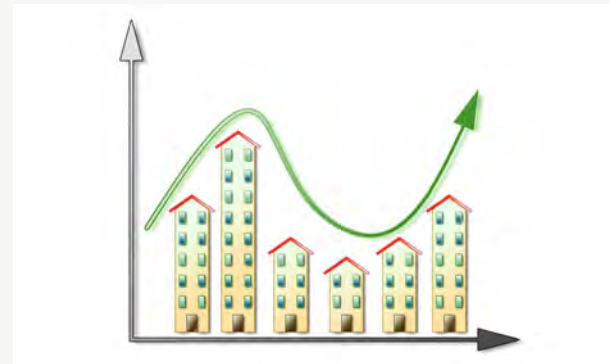
Illustrations of what is NOT working



**What gets measured,
gets managed,
gets Done.**

Peter Drucker

ASSUME WISELY



Water is still an almost FREE commodity

MUNICIPAL CORPORATION CHANDIGARH
WATER/ SEWERAGE CESS BILL-CUM-NOTICE

Water Reading From: 15/09/21 To: 15/01/22

	New Reading	Old Reading	Consumption in K.Ltr.	Tariff Type	MTR Status	Conn. Size	Period of Bill
Water	1584	1560	KL 24.01		Z	015	4.0
Water-2 (Lawn)							

Note: - THE NEW HIKED WATER TARIFF DEFERRED W. E. F 25.05.2021 to 31.03.2022

	Water-1	Water-2 (Lawn)
CY 1: 24	Current Water Charges	48
CY 2: 19	Maintenance Charges	60
CY 3: 22	Sewerage Cess (2)	14
CY 4: 27	Meter Rentals/Service Charges	
CY 5: 15	Challan of Misuse water	
CY 6: 54	Arrears	
	Garbage Charges	200
	Sundry Charges	
	Sundry Allowances	232
	Adjustment of Previous Bill	
	Total Amount	89
	Late Payment Surcharge	9

Amount Payable by Due Date Rs. 89

Total Late Payment Surcharge Rs. 9

Amount Payable After Due Date Rs. 98

0015648

Current charges + \$215.15

Total due \$215.15

Your snapshot

Average daily water use **216 litres**

Average daily cost **\$2.07**

Your water use

Average litres per day

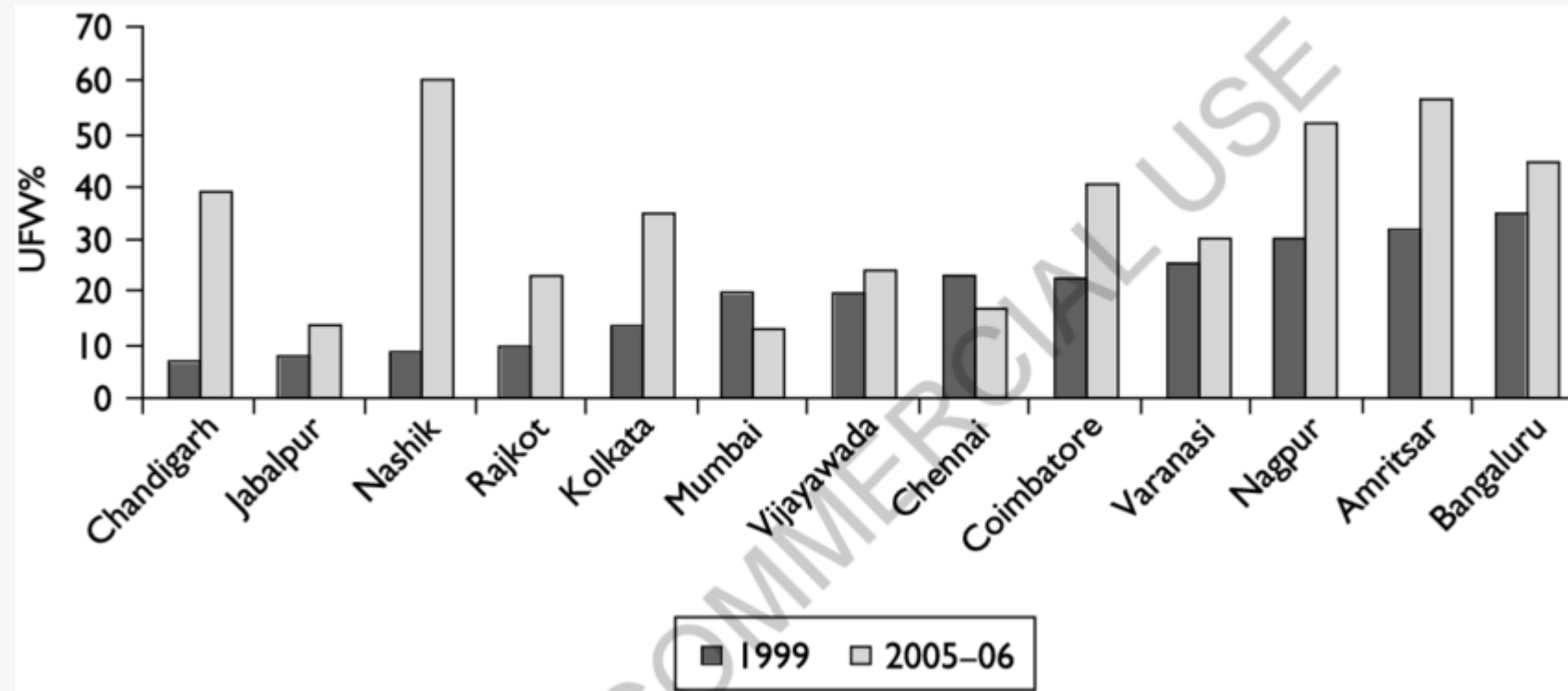
Dec 19 Mar 20 Jun 20 Sep 20 Dec 20

Step 1

Previous bills

Number of people in household	i	ii	iii	iiii	iiiii
Average daily use (litres) per person	216	108	72	54	43
Meeting Target 15%	x	✓	✓	✓	✓

Unaccounted for Water



Source: ADB (2007) and NIUA (2005a)

Water use efficiency has not been UNDERSTOOD

How much water can you save?



Panasonic NA-FS85G3WAU
8.5kg capacity



Whirlpool FSCR10420
8.5kg capacity

Water use: 170L/cycle

Water use: 42L/cycle



Choosing the Whirlpool front loader will save:
467,200L
of water over 10 years*

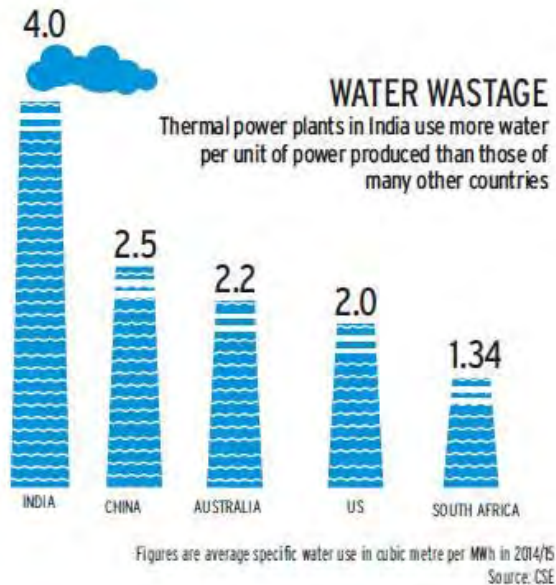
Our independent washing machine reviews compare more than 50 models from brands including LG, Miele, Bosch and Samsung.

*Water use over 10 years was calculated as one 'normal' load each day for 10 years.

CHOICE



SAME approach = Same trends across sectors



Country	Industrial water use (billion M ³)	Industrial productivity (million US \$)	Industrial water productivity (US \$ / cubic metre)
Argentina	2.6	77171.0	30.0
Brazil	9.9	231442.0	23.4
India	15.0	113041.0	7.5
Korea, Rep.	2.6	249268.0	95.6
Norway	1.4	47599.0	35.0
Sweden	0.8	74703.0	92.2
Thailand	1.3	64800.0	48.9
United Kingdom	0.7	330097.0	443.7

Source: World Bank, 2001

Ministry of Environment, Forest and Climate Change
Government of India



One World
One Sun
One Grid
INDIA
COP24 KATOWICE 2018

- Agriculture sector withdraws about 80% of all withdrawal
 - India has low water use efficiency compared to the developed countries.
 - The overall irrigation project efficiency in developed countries is 50 – 60% as compared to only 38% in India.

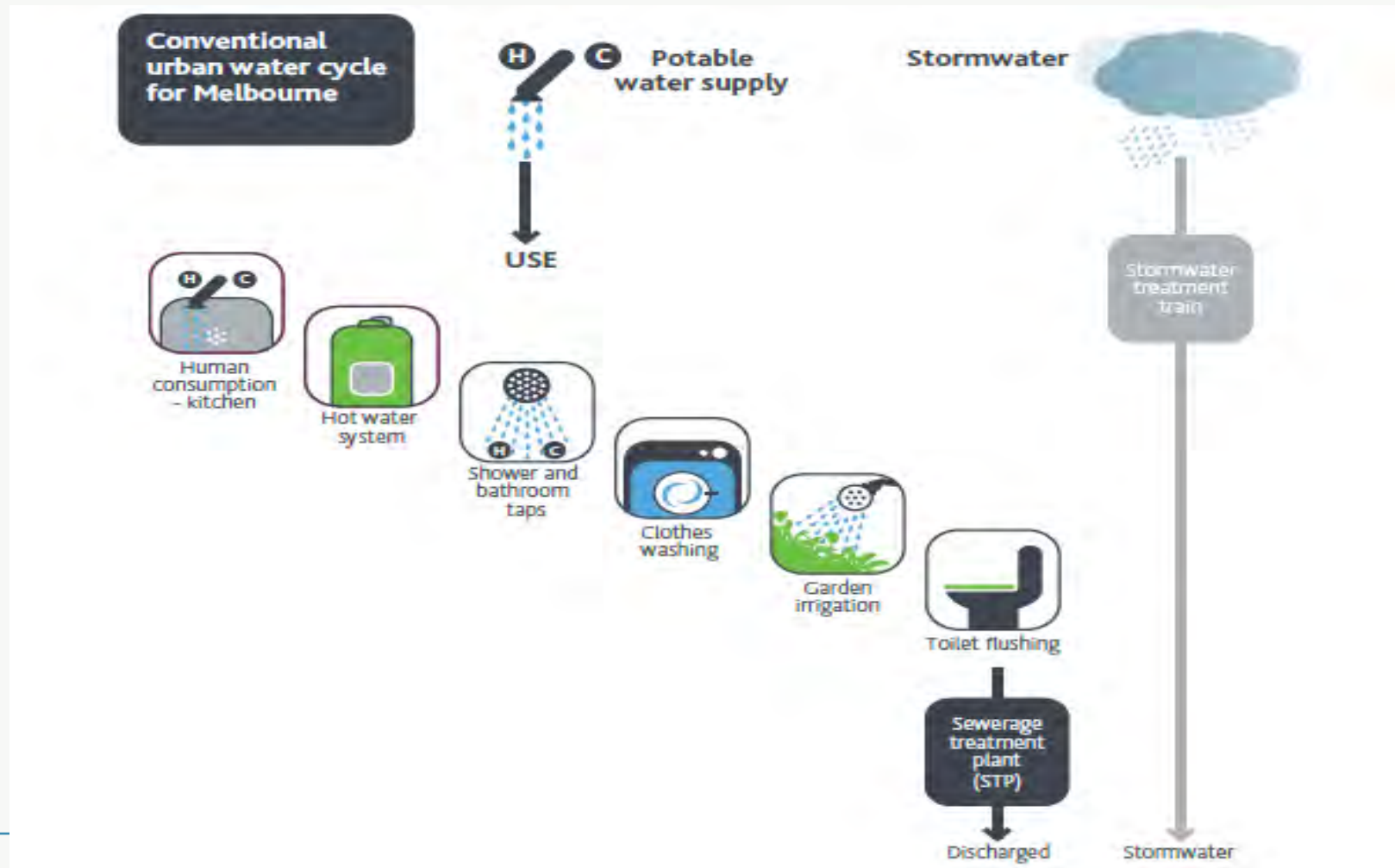


Circular economy concepts
focus on
efficiency of resource use

So need a logical \$ value



Conventional water cycle for urban households **will NOT work**



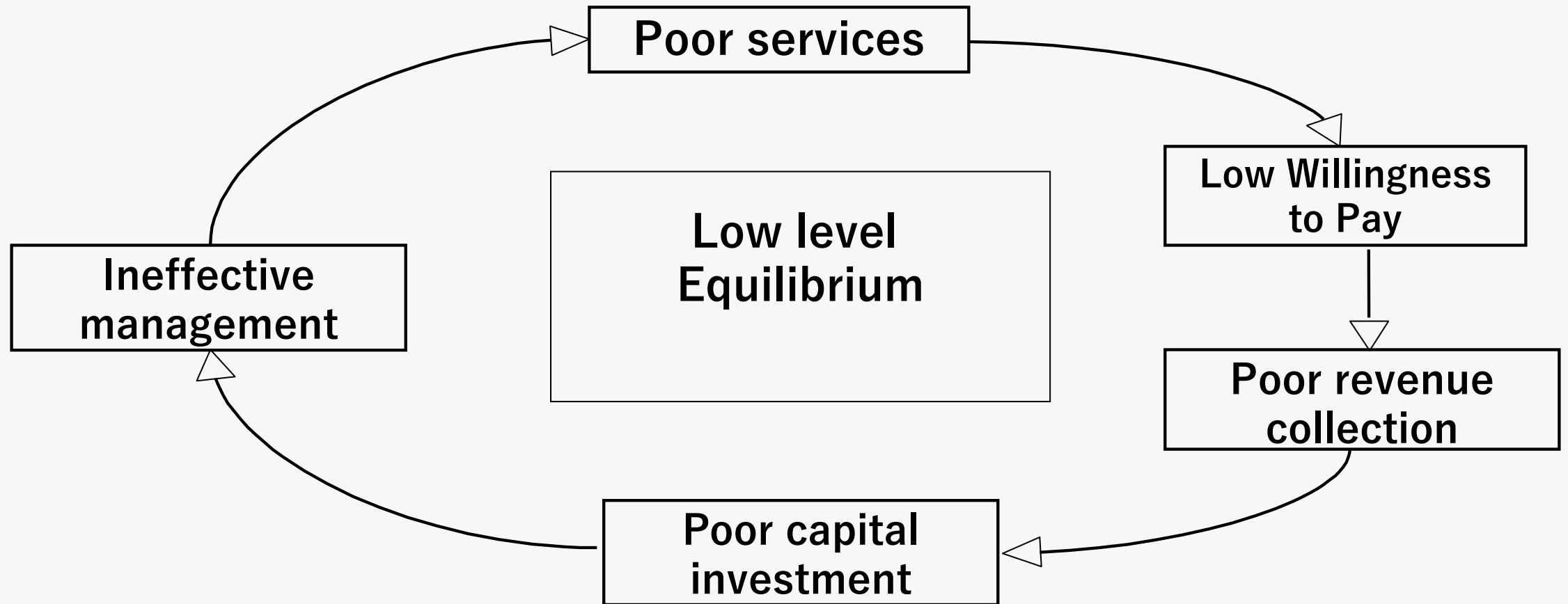
BUT we still do not clearly understand Energy rating/Energy efficiency

Energy Efficiency Label for Residential Buildings

“Energy Efficiency Label for Residential Buildings” launched by Hon’ble Minister of State (IC) for Power and Renewable during the conference of Ministers for Power, New & Renewable Energy of States & Union Territories held at Gurugram, Haryana on 26th February, 2019. The key objective of the programme is to make a transparent instrument over the energy performance of a home which will gradually lead to an effective model taken into consideration while deciding over the home prices in future. The objective of the labeling program is to make an energy performance of a home an instrument of comparison while deciding over the home prices in the future. It also aims to provide a benchmark to compare one house over the other on the energy efficiency standards to create a consumer-driven market transformation solution for energy efficiency in the housing sector.

This program is another step towards realizing the vision of an energy surplus India with 24*7 power to all. Proposed Labelling program will cover all types of residential buildings in India. All the envisaged objectives can be achieved through the proposed labeling mechanism by making it as a mandatory information required in any real estate transaction/leasing.

The current (vicious) Governance cycle won't help



Ownership and the blame game!

One person (group) is a culprit!

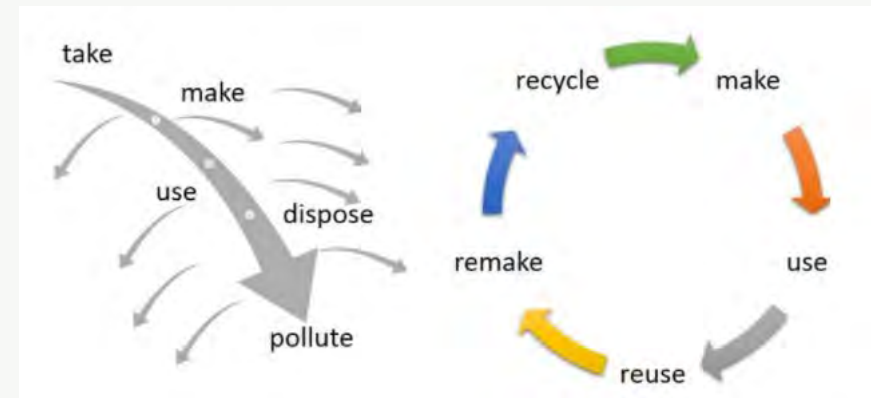
Problem to be solved by 1 person/1
Government/ 1 political party/ 1 industry
(consumer group)

Problem to be solved only by 1 set of
professionals!

Solving water managements problems using '1
hundred year' old approaches


One flat tariff rate !

One tariff rate for all consumers!






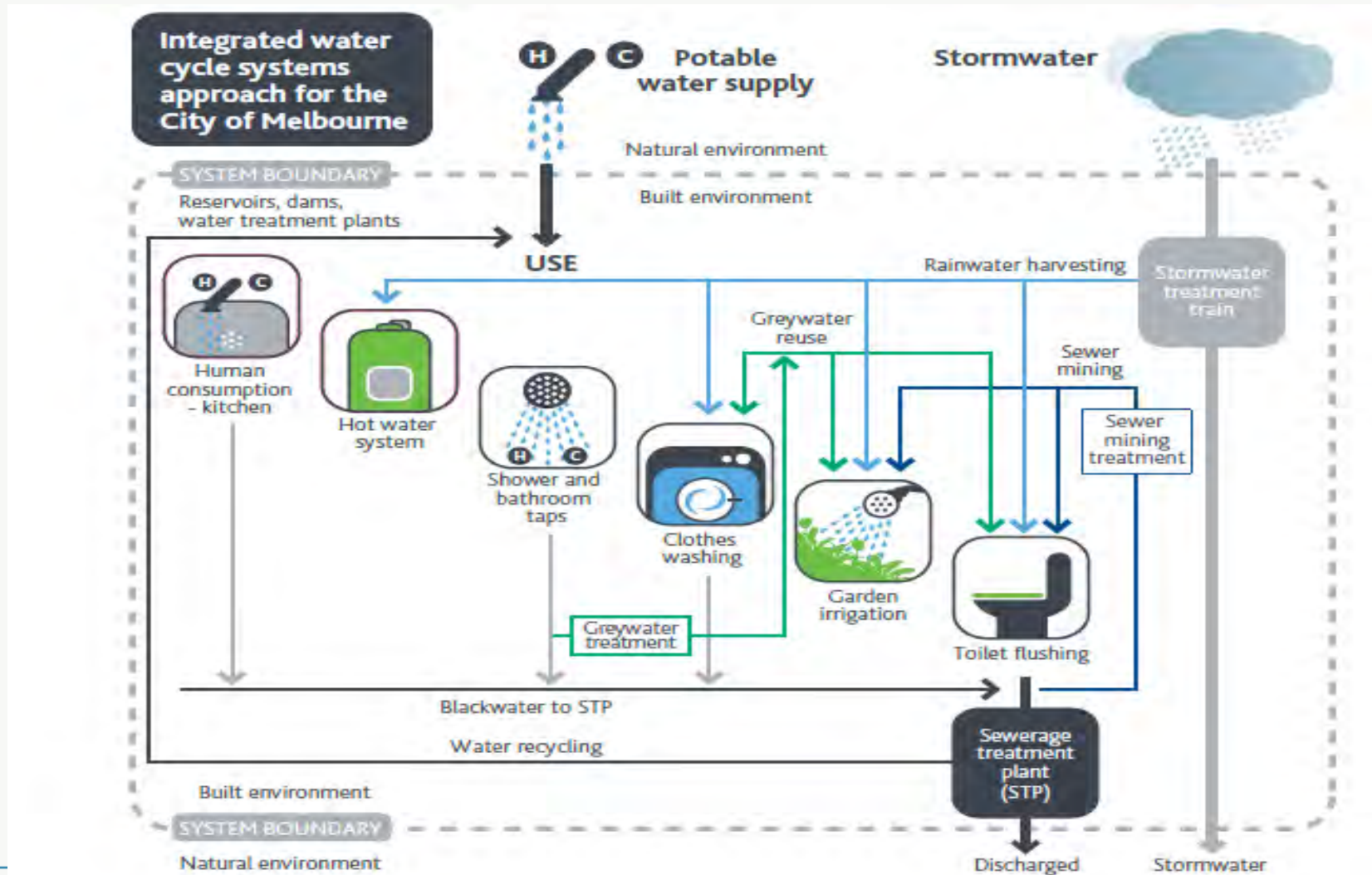
The way forward



Do we have a guidance manual that
leads us to **Circular Economy** at
different implementation levels?



Integrating water cycle- A systems approach



Are we able to (measure and) benchmark!



150



Are there established
networks that can help
share successful (and
failure) stories?

The Melbourne Cricket Ground case study

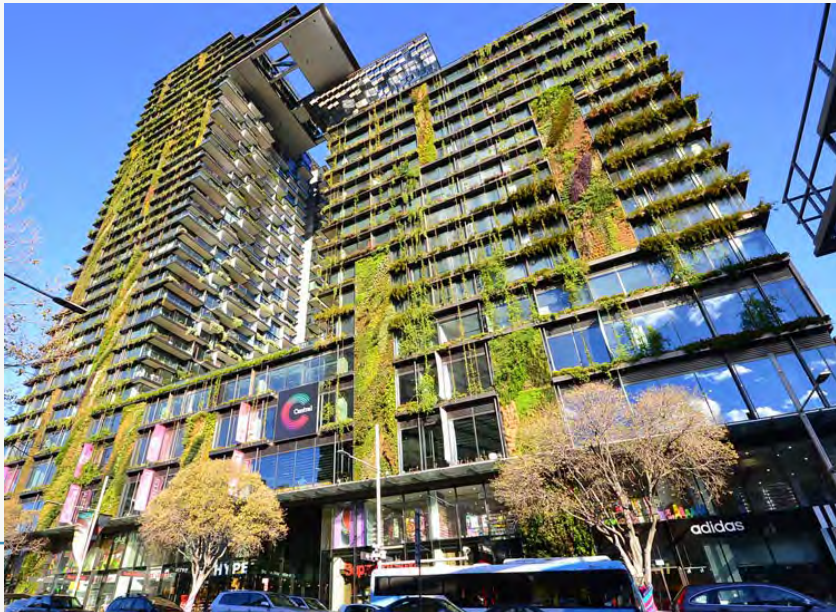


[Video link MCG](#)

- ❑ Victoria's largest underground water recycling facility
- ❑ Located in Yarra Park, directly outside the MCG.
- ❑ Funded by the MCC (\$18 million) and Victorian Government (\$6 million)
- ❑ Treats sewage from the local sewerage network to Class A recycled water standards
- ❑ More than 180 million litres of recycled water is produced each year
- ❑ Reduced the MCG's use of potable water by 50 per cent
- ❑ Treated water is primarily re-used as irrigation in Yarra Park, as well as for cleaning and toilet flushing at the MCG

Green roofs and walls

- Incorporate a growing medium (soil, a growing mat) and vegetation.
- Green walls can be external or internal and include green façades
- Improve the thermal performance of a building by providing thermal mass, insulation and shading.
- Green roofs and walls also provide other environmental benefits such as reducing stormwater runoff, decreasing urban heat island effects, and increasing biodiversity.



[Green buildings](#)

[Sydney Green roofs](#)

<https://www.yourhome.gov.au/materials/green-roofs-and-walls>

Wetlands and lakes

- Constructed surface wetland systems use enhanced sedimentation, fine filtration and biological uptake processes to remove pollutants from stormwater.
- Wetland systems provide flood protection when incorporated into retarding basins.
- Additionally, an open water body or pond at the downstream end of a wetland can provide water storage for reuse, such as irrigation.
- Provide habitat for wildlife and a focus for recreation, such as walking paths and resting areas
- Improve the aesthetics and form a central landscape feature

[Lakeside Pakenham](#)

[LaTrobe Wetlands](#)

Porous pavers

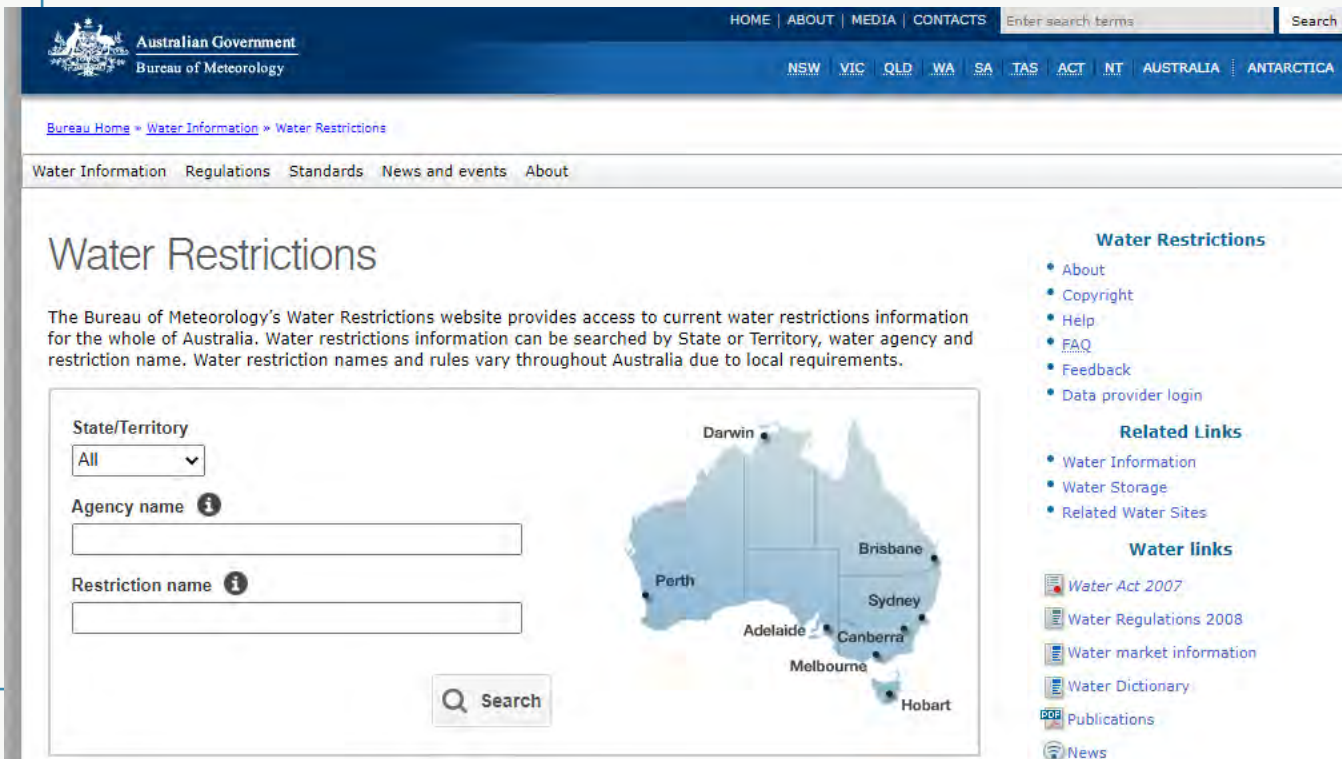


- Installing Porous pavements instead of traditional concrete pavements in our backyards and driveways reduces the amount of runoff by allowing water to soak through the surface and into the underlying soil.
- Installed just like traditional paving
- Can be asphalt, or modular pavers that are concrete, ceramic or plastic.
- Porous paving contains surface voids that are filled with sand or gravel that filter stormwater.
- They overlay a gravel retention trench that allows greater capacity to retain stormwater. During heavy rain, excess stormwater overflows to the street drainage systems when the trench becomes full.

Lessons from Water restrictions

Constraints placed on water use by a water agency, local council or State or Territory Australian Government.

They have become common practice throughout much of Australia to manage demands during periods of water scarcity. Water restriction names and rules vary throughout Australia due to local requirements.



Water Restrictions

The Bureau of Meteorology's Water Restrictions website provides access to current water restrictions information for the whole of Australia. Water restrictions information can be searched by State or Territory, water agency and restriction name. Water restriction names and rules vary throughout Australia due to local requirements.

State/Territory: All

Agency name:

Restriction name:

Water Restrictions

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- Help
- FAQ
- Feedback
- Data provider login

Related Links


- Water Information
- Water Storage
- Related Water Sites

Water links

- Water Act 2007
- Water Regulations 2008
- Water market information
- Water Dictionary
- Publications
- News

	Agency	Current Restriction
Sydney NSW	Sydney Water	Water Restrictions Level 1
Melbourne VIC	City West Water Yarra Valley Water South East Water	Permanent Water Saving Rules Permanent Water Saving Rules Permanent Water Saving Rules
Brisbane QLD	Queensland Urban Utilities	No restriction
Perth WA	Water Corporation	Area 3 watering days
Adelaide SA	SA Water	Water Wise Measures
Hobart TAS	TasWater	Stage 1
Canberra ACT	Icon Water	Permanent Water Conservation Measures
Darwin NT	Power and Water	No restrictions

Water products

 Australian Government
Bureau of Meteorology

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Water data Water status Water forecasts

Water information




Australian Water Outlook

We've expanded our hydrological services to enable the Australian community to better manage water resources and plan for potential hazards such as floods, drought, and fire. Visit the Australian Water Outlook [for](#) forecasts, hydrological projections and historic data on Australia's hydroclimate to support your climate, weather and water-sensitive decisions.


[» Australian Water Outlook](#)

1




Water data

- [Australian Water Data Service](#)
- [Climate Resilient Water Sources](#)
- [Design Rainfalls](#)
- [Geofabric](#)
- [Groundwater Information](#)
- [Hydrologic Reference Stations](#)
- [Murray-Darling Basin Water Information](#)
- [Water Market Information](#)
- [Water Data Online](#)



Water status

- [Australian Water Outlook](#)
- [Water Assessments](#)
- [National Water Account](#)
- [Urban National Performance Report](#)
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Water forecasts

- [Flood Knowledge Centre](#)
- [7-day Streamflow Forecasts](#)
- [Seasonal Streamflow Forecasts](#)

Related links

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- [Water Act 2007](#)
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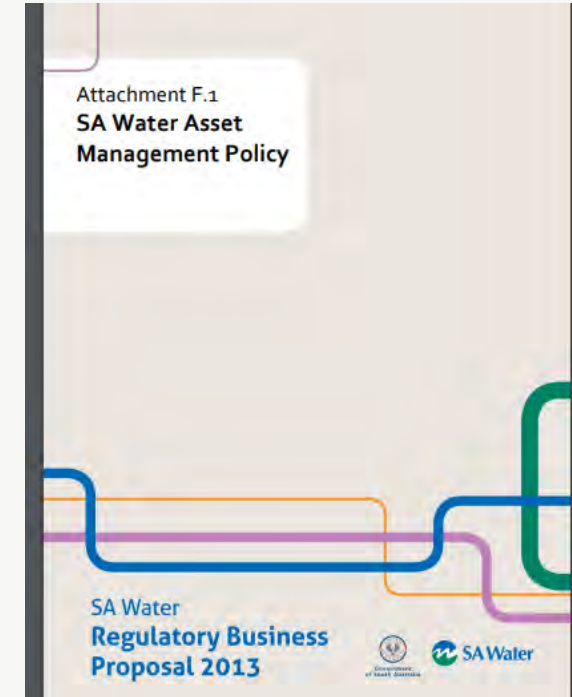
[Subscribe to e-news](#)

[Watch water videos](#)

[Download Water Storage App](#)

Asset Management in the Water industry

- Ageing infrastructure and a growing population are among the biggest challenges in the water sector
- Water corporations need to manage assets as effectively as possible to optimise performance.
- Asset Management and Optimisation Programs are aiming to look at performance optimisation methods and how to best manage assets across their entire life cycle - from strategic planning to disposal.

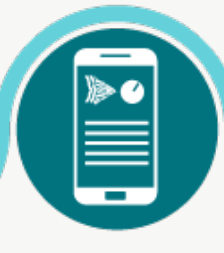


[Video Asset Management](#)

[Intelligent Water Network Asset Management](#)

Smart water metering

HOW DO SMART WATER METERS WORK?



The meter registers water use.

The meter transmits the data.

The data can be viewed by Council and you.

Any leaks can be identified quickly and repaired.

Water and money saved!

Controlling our GHG emissions



WATER SERVICES
ASSOCIATION OF AUSTRALIA

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Water utilities unite to cut emissions in Race to Zero

WSAA'S

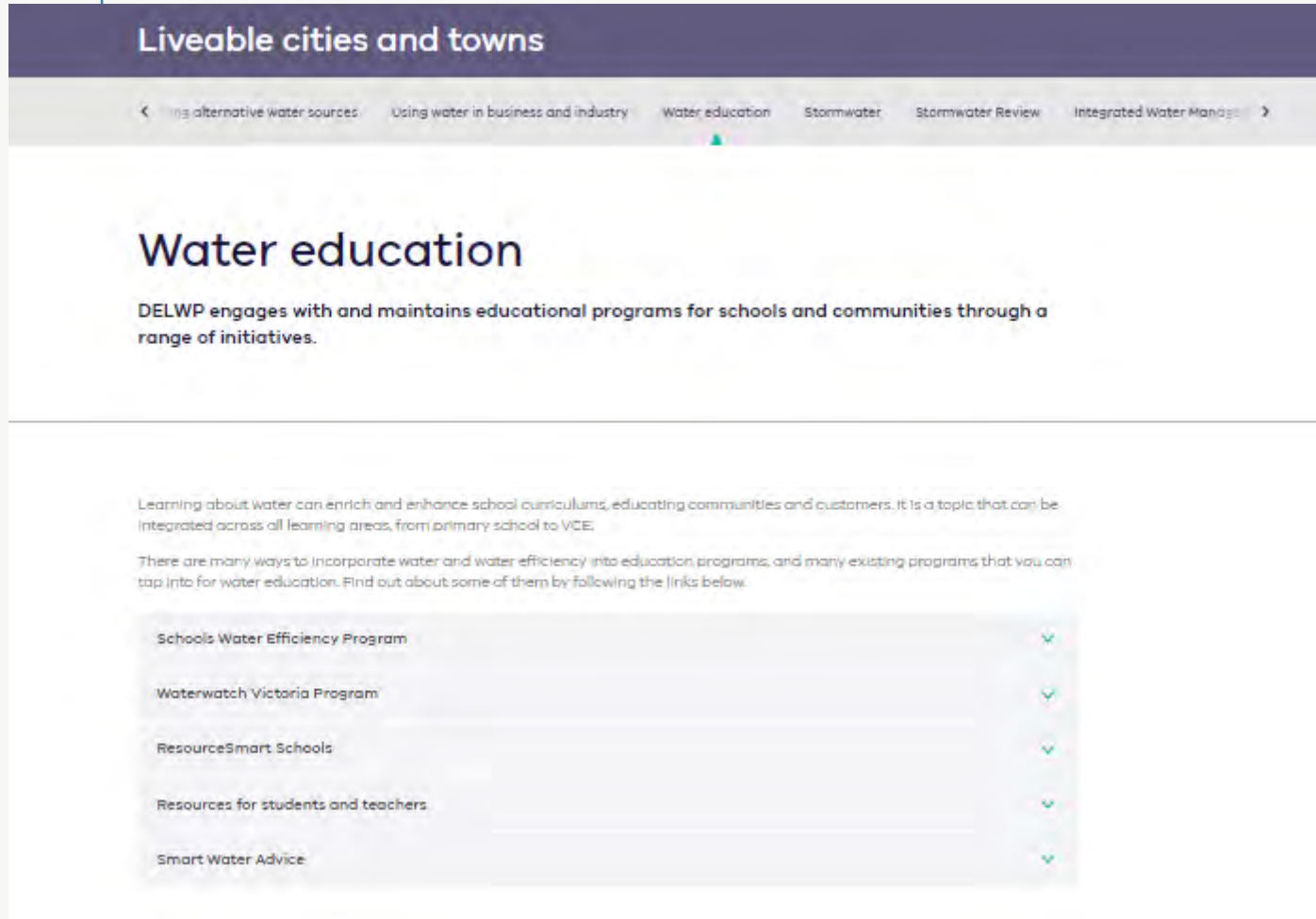
Some facts about the collective impact of the 14 Australian and New Zealand water utilities who have joined the Race To Zero:

- Serve over 18 million customers
- Total of 160,000 km of water and wastewater pipelines
- Total of 354 treatment plants
- Pledges to reach net zero by 2025 to 2050
- Total net emissions: 847,637tCO₂e*
- Total electricity use: 1,199,192 MWh*
- 175MW of existing solar assets
- 220MW of planned solar assets.

The 14 utilities are:

- Barwon Water
- Coliban Water
- Gippsland Water
- Goulburn Valley Water
- Icon Water
- Melbourne Water
- SA Water
- South East Water
- Southern Rural Water
- Sydney Water
- Unitywater
- Urban Utilities
- Watercare (New Zealand)
- Yarra Valley Water

Catch them young !

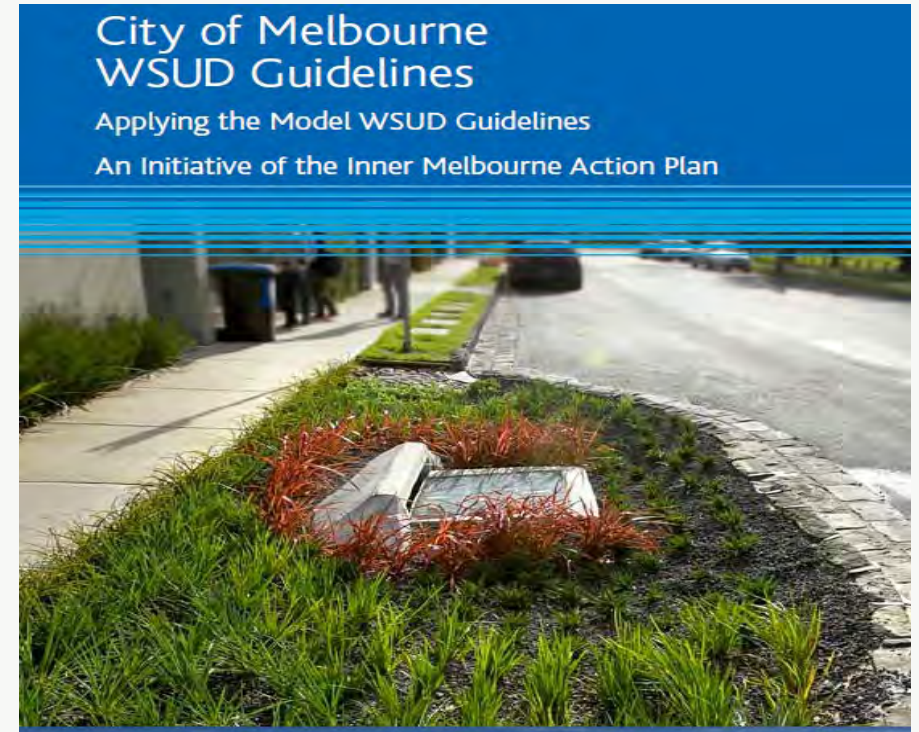


Integrated Water
Management courses in
Australian Universities

[Victorian Government Schools Program](#)

How can other management concepts and approaches complement CE?

Life cycle assessment
Life cycle costing
Management Information Systems (MIS)
Stakeholder engagement processes
Water footprints
Industrial ecology
Artificial intelligence
Smart water systems....



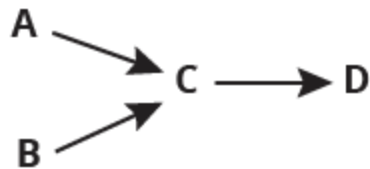
In summary, the key 'need' is-

Integration

Which evolves from concepts of Systems Thinking

Event Oriented Thinking

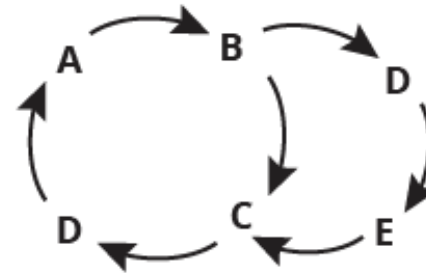
Thinks in straight lines



In event oriented thinking everything can be explained by causal chains of events. From this perspective the **root causes** are the events starting the chains of cause and effect, such as A and B.

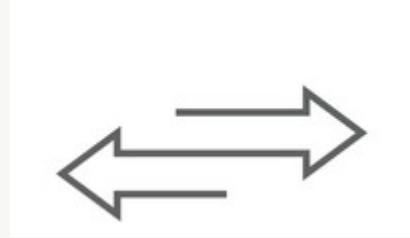
Systems Thinking

Thinks in loop structure



In systems thinking a system's behavior emerges from the structure of its feedback loops. **Root causes** are not individual nodes. They are the forces emerging from particular feedback loops.

These messages are



Equally applicable to all water uses/users

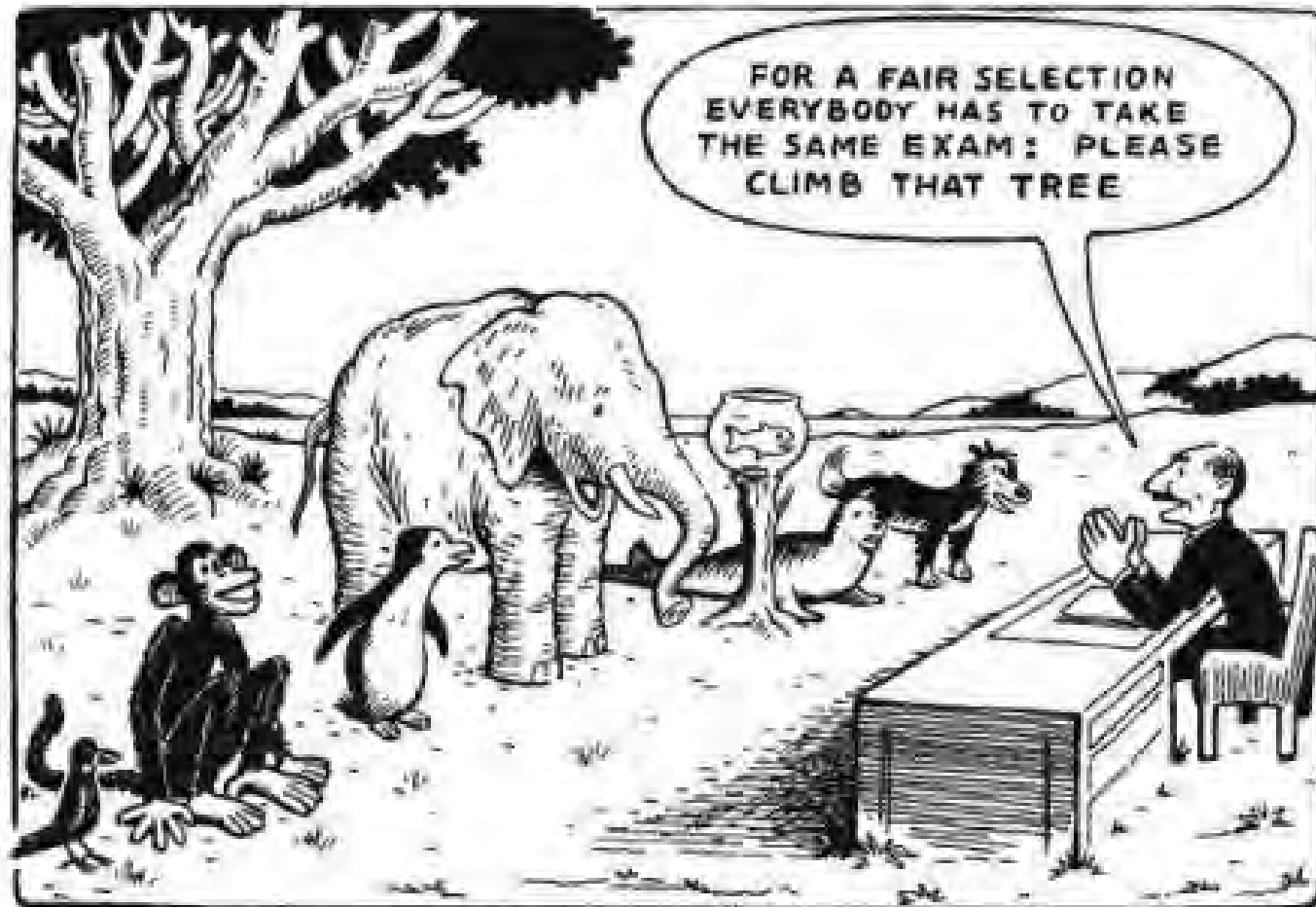
Equally applicable to all economies

Equally applicable to all natural resources

And hence pertinent for Circular economy

Co-learning

Because 1 Size does not fit all



We need
integration with
several ongoing
efforts to learn
from better
practices



For your time today
and the opportunity