

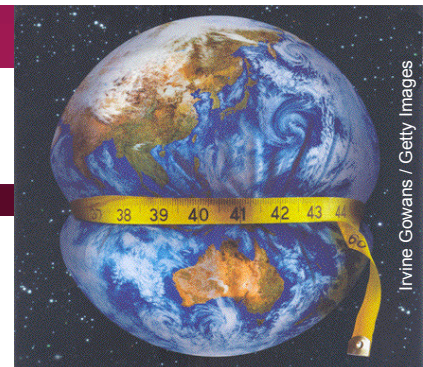
Restorative Water Systems

making a new paradigm real



Take home messages

- > From Sydney to Sri Lanka, it's time for the next generation:



restorative water systems

And

- > Distributed systems are part of the answer
- > Maximising synergies with other cycles (eg energy, nutrients) is also part of the answer
- > Talking about poo and wee in polite company is OK

Acknowledgements and a Disclaimer

Ideas developed through many projects, field trips, discussions with insightful colleagues. Particular thanks to

- > Project sponsors: SHFA, Frasers, USEPA, WERF, YVW, Melbourne Water, World Vision Australia, WaterAid Australia
- > At home: ISF colleagues and students
- > And away: Valerie Nelson, Jerry Stonebridge, Richard Pinkham, Jan Olof Drangert, Petter Jensen, Marco Schmidt

**Responsibility rests with me.
Especially for the (toilet) humour.**

Alternative titles....

**Not for the faint-hearted:
a closer look at Victoria's real underbelly**



**Making money by going
through the motions**

I'm a self-confessed sewer-side gal

Quiz: Round 1

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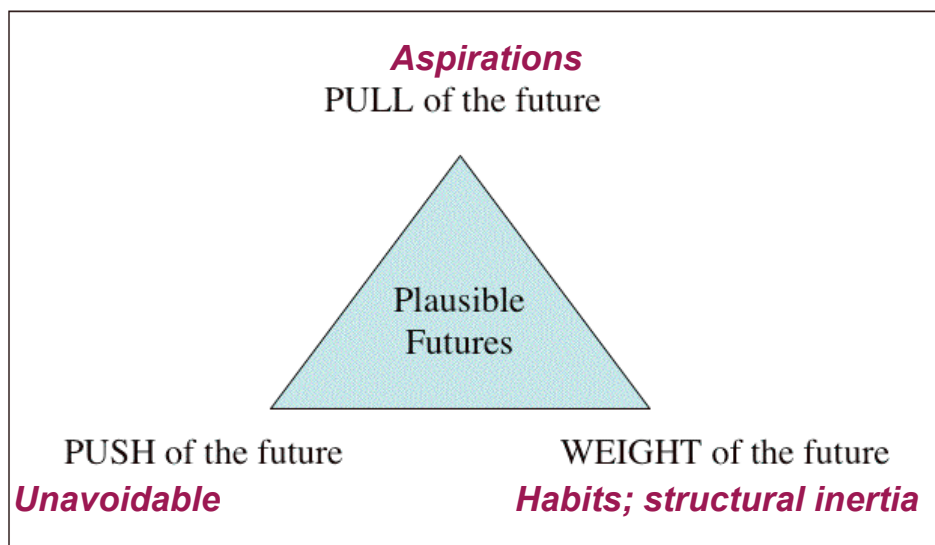
How many euphemisms do Aussies have for 'number 2s'?

And how much (kg per person) do we produce each year?



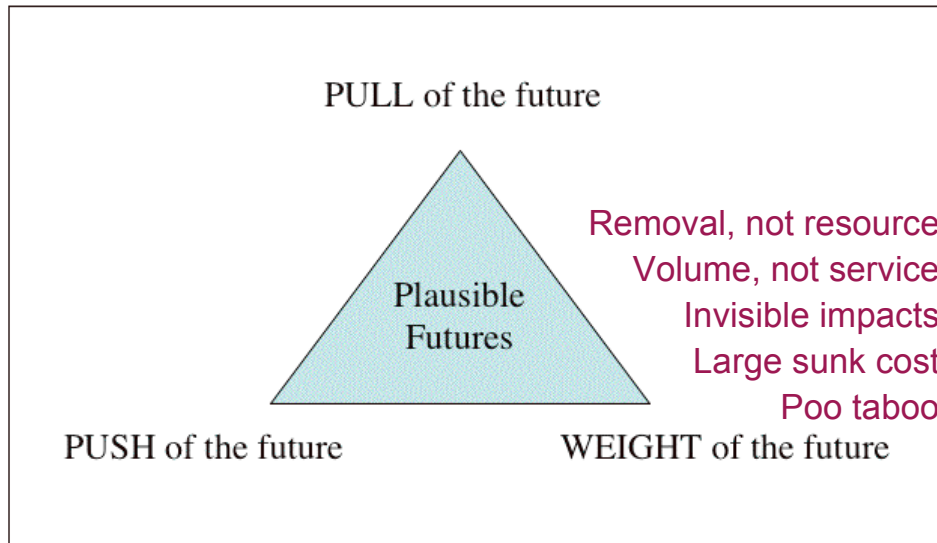
Restorative water systems: a plausible future?

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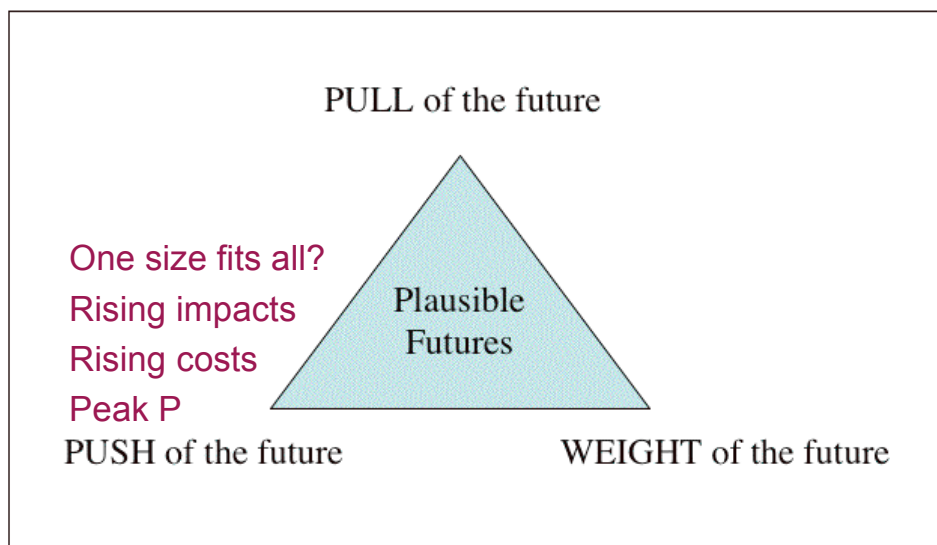
Restorative water systems: the inertia

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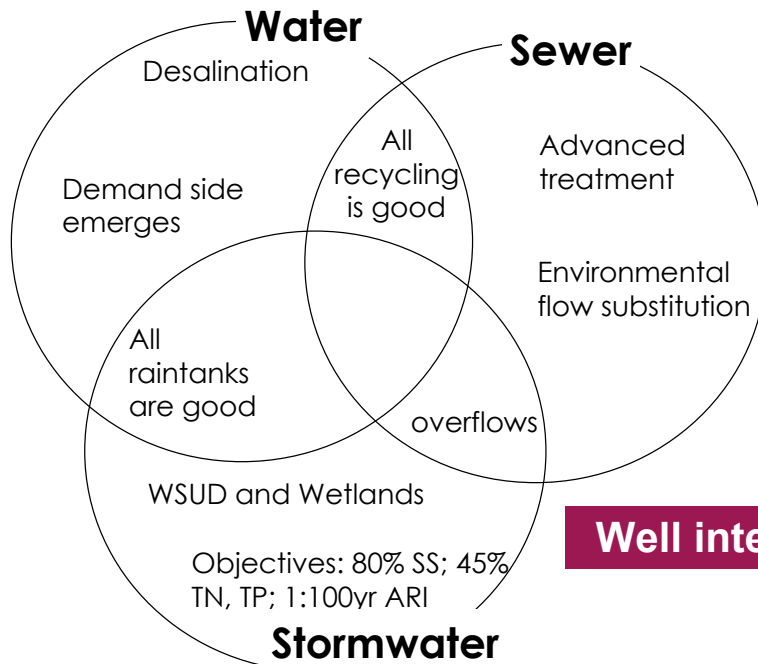
Restorative water systems: the inevitabilities

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Current water cycle thinking mostly takes a one size fits all approach

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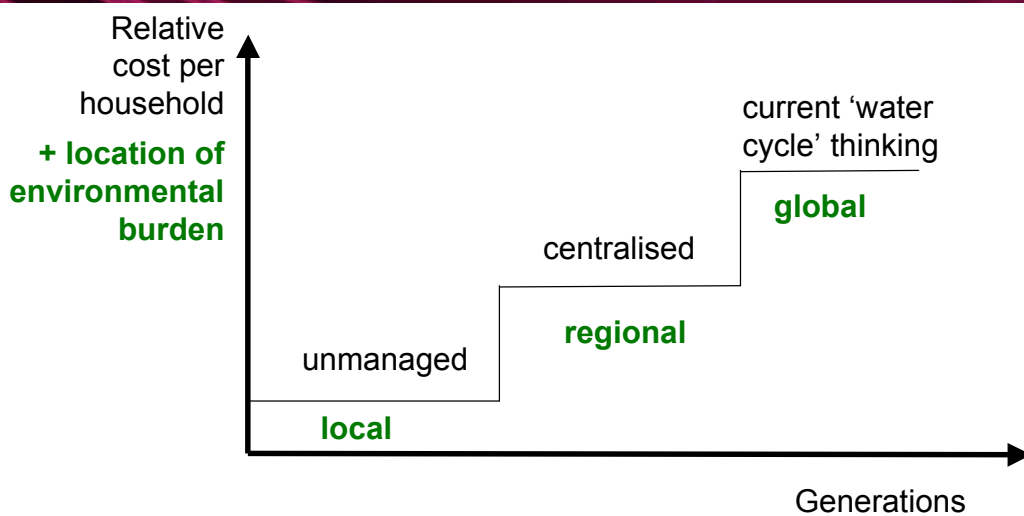


Well intentioned, and ...

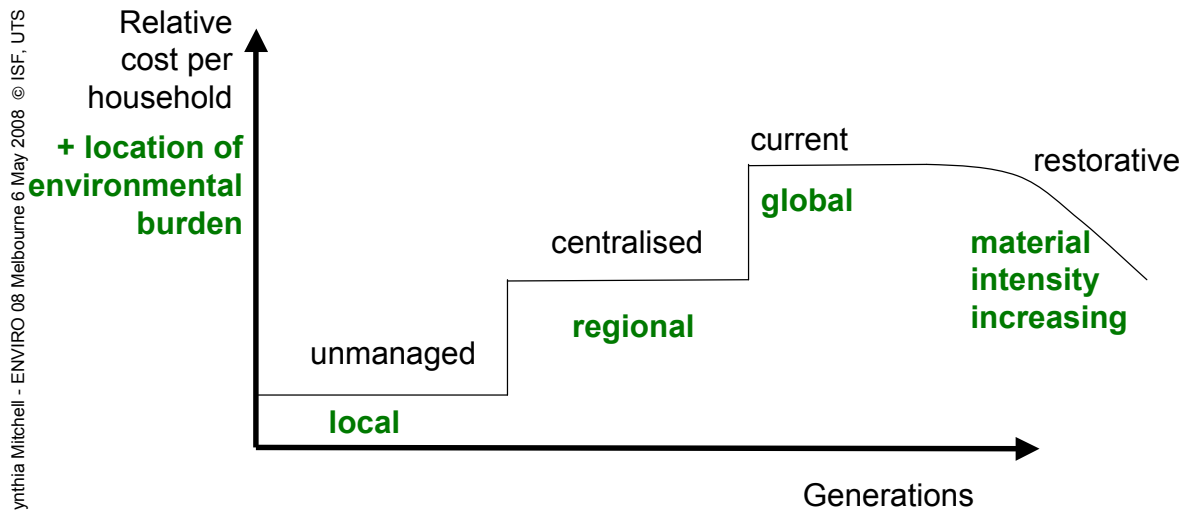


With each generation, cost per household increases and environmental burden shifts

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With each generation, cost per household increases and environmental burden shifts



Need cleverer solutions that tunnel through the cost barrier and reduce overall ecological impacts

You've heard of peak oil - meet peak P

- > P (phosphorus) is essential for *all* life
- > 90% of P demand is for food production
- > key to food production, and therefore growth of society
- > Projected \uparrow 50% by 2025, \uparrow 100% by 2050
- > Non-renewable! No substitute!
- > At current rates, reserves depleted in 50-100yrs
- > Global reserves skewed (China, Morocco, USA)

Guess what is a highly concentrated P source ?



Quiz: Round 2

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How many euphemisms do Aussies have for doing #1s?

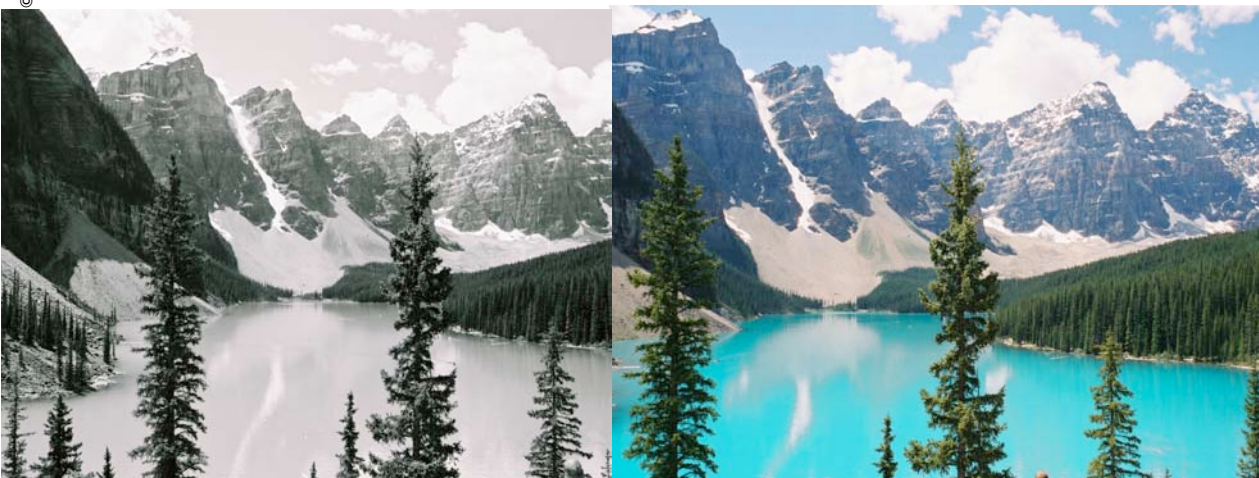
And how much (litres per person) do we produce in a year?



“We can't solve problems by using the same kind of thinking we used when we created them.”

Albert Einstein

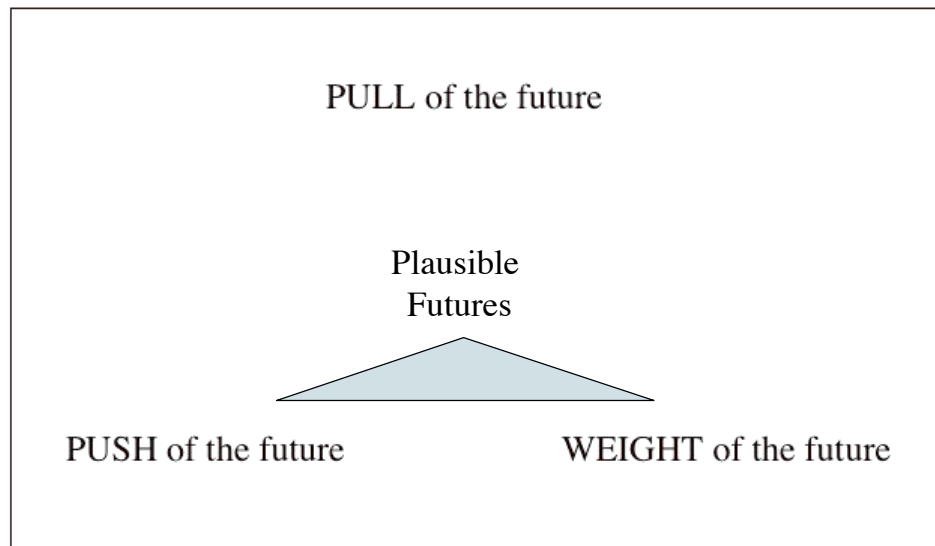
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Keynote Presentat

Without a big picture, we run the risk of selling ourselves short

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Sohail Inayatullah (2005) *Questioning the Future: Methods and Tools for Organisational and Societal Transformation*.



Interface: a visionary, restorative organisation

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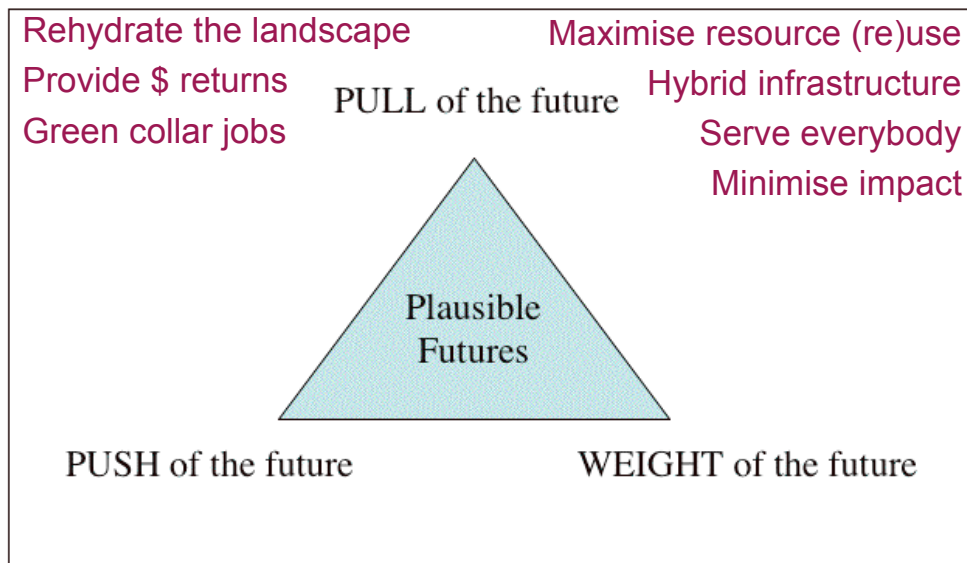
Mission

To be the first company that, by its deeds, shows the entire industrial world what sustainability is in all its dimensions: people, process, product, place and profits - by 2020 - and in doing so we will become restorative through the power of influence.

- > Eliminate waste
- > Benign emissions
- > Renewable energy
- > Closing the loop
- > Resource-efficient transport
- > Sensitizing stakeholders
- > Redesign commerce

So, what might restorative mean for water systems and water businesses?

Restorative water systems: the aspirations ... imagining a different future



Calls for this kind of future are increasing

Baltimore Charter: signed by 50 internationally leading researchers, public officials, and private business people in March last year; in use now to secure funds from Capitol Hill

We commit to implementing more sustainable water systems by expanding uses and opening new markets for small-scale treatment processes, advancing research on micro-biological and macro-ecological scales, inventing new technologies based on nature's lessons, creating new management and financial institutions, reforming government policies and regulations, and elevating water literacy in the public.

**Requires a trans-disciplinary approach:
innovation across roles and disciplines
... thinking green, not just counting green**



Implementing new ideas means significant institutional and socio-cultural changes

- > New regulations e.g. WHO
- > New risks and responses e.g. distributed systems
- > New institutional arrangements e.g. service teams
- > New decision-making processes e.g. deliberative
- > New interpretations of personal responsibility e.g. behaviours
- > New pricing and payment structures e.g. feed-in tariffs
- > New markets e.g. nutrients

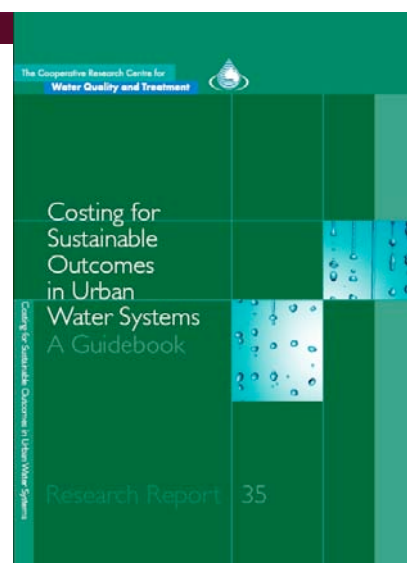
peebay

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And it requires new ways of thinking about costing

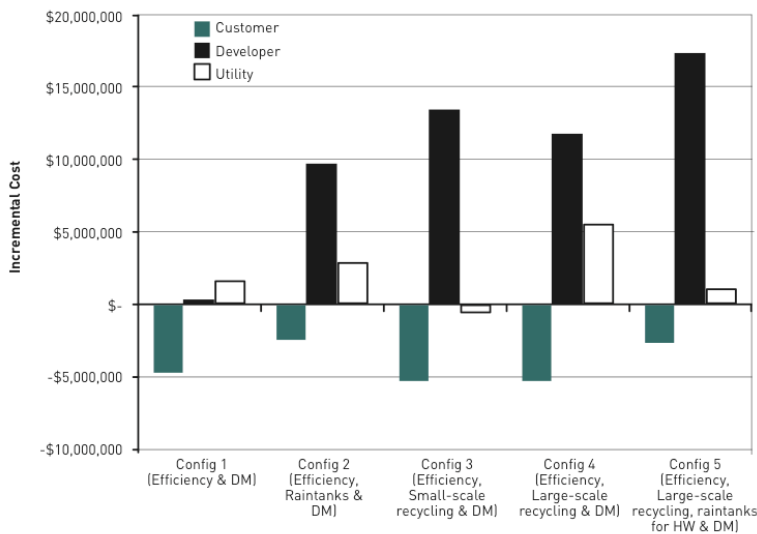
- > Specify cost perspective(s)
- > Take a service approach (not the kilolitres provided).
- > Take a systems approach: boundaries, linkages
- > Account for time value of money
- > Assess on the basis of net cost (benefit): specify the base case, account for avoided costs relative to base case
- > Identify further, non-monetisable impacts (externalities, limits, qualitative comparisons)
- > Acknowledge and deal with uncertainty and precision



Guidebook structure enables 'finding out'

Being explicit about different cost perspectives opens up new negotiation processes

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Principles enable systematic inclusion and assessment of different systems

Distributed systems: an integral part of a restorative approach

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- > Water is heavy!
- > C is useful.
- > Nutrients are essential.
- > Meet demand incrementally.
- > Qualitatively different risk profiles.
- > Variety of business models.
- > New services and products provide new revenue streams.

The goal: Hybrid infrastructure with drastically improved material intensity



Diverse opportunities in water-energy nexus



Water: reduce volume and distance

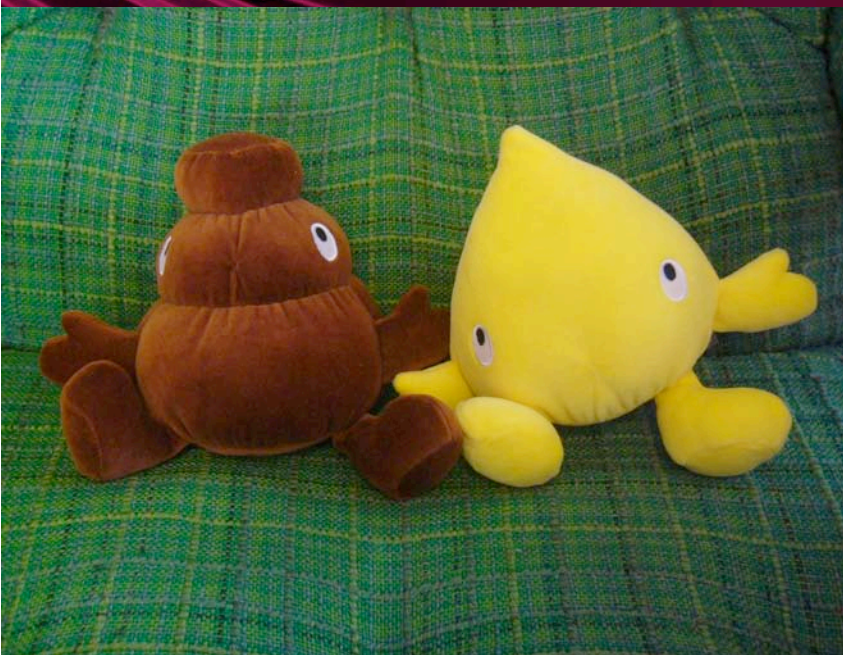
Wastewater: flip from remove problem to reuse resource

Stormwater: rehydrate landscape, reduce building heat loads, new heating/cooling technologies, shift radiation patterns

The challenge: how best to maximise the synergies?



Quiz: Round 3



What are the names of these fluffy toys?

And for a bonus point, what is their nationality?

Principles for the design of new infill developments are the starting point

Principle 1: Create a development that is at least sustainable, ideally restorative

Principle 2: Focus on quality of service provision rather than quantity of supply

Principle 3: Adopt a 'systems' approach

Principle 4: Build in flexibility, adaptability and resilience

Principle 5: Maximise cost-effectiveness

Principle 6: Facilitate community engagement with sustainability issues

Need principles to guide outcome AND process

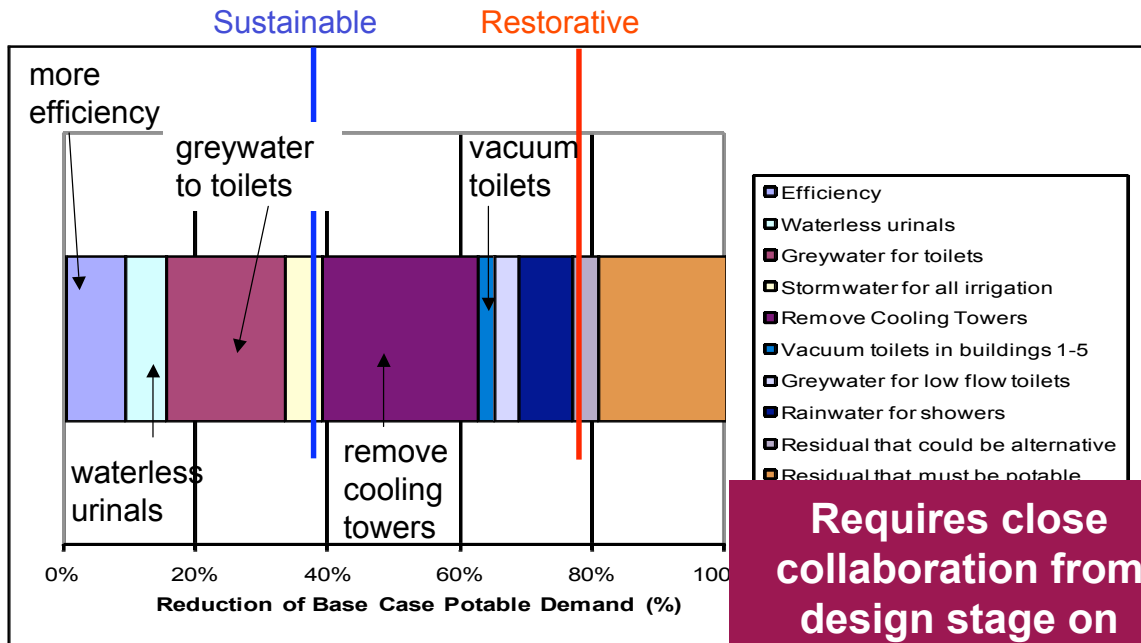
Translate principles to quantifiable targets to drive sustainable and restorative outcomes

	Sustainable	Restorative
Energy	<ul style="list-style-type: none"> > 60-80% reduction in GHGE > equivalent to 60% BASIX or 5 Star + 40% additional reductions 	<ul style="list-style-type: none"> > GHGE targets beyond stabilisation
Water	<ul style="list-style-type: none"> > 40% - 60% reduction in overall water use > 100% beneficial reuse of biosolids > maintain potential to retrofit horizon technologies > 3% effective impervious area 	<ul style="list-style-type: none"> > 60% - 80% reduction in overall water use > supply all efficient non-potable end-uses with non-potable water, recover nutrients, beneficial reuse of phosphorous > complete recycling of all organics into energy production > 60% green roofs and facades

Energy targets are defined already - we need more practice to get it right for water

Extraordinary volume reductions are possible through new technologies and designs

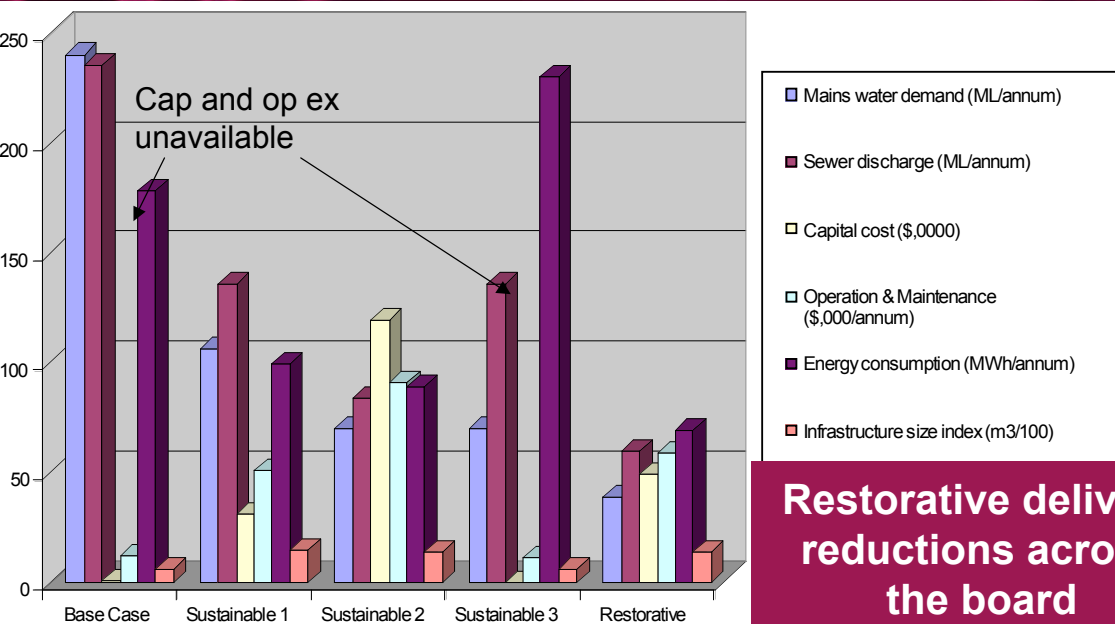
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Requires close collaboration from design stage on

A holistic approach uncovers tradeoffs

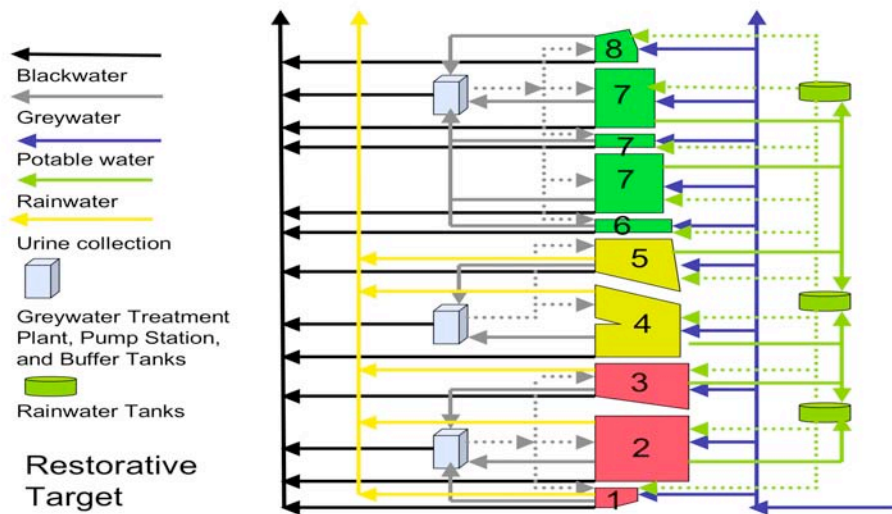
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Restorative delivers reductions across the board

Restorative targets increase complexity, require new technologies, and bring new challenges

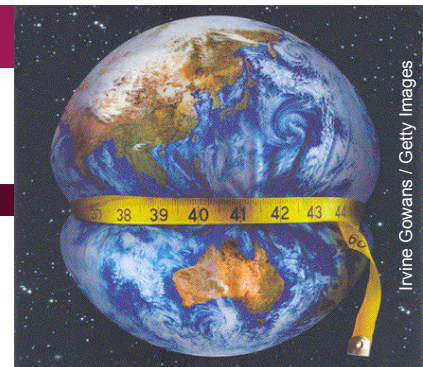
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We need to be brave enough to learn by doing

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restorative water systems

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Trivia answers



1. #2 euphemisms? I found 35
2. 50 kg faeces per person per yr
3. #1 euphemisms? I found 30
4. 500L urine per person per yr
5. The characters are 'poo' (Bajs) and 'pee' (Kiss) (really!)
6. They're Swedish

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'There is no use trying,' said Alice; 'one can't believe in impossible things.'

'I dare say you haven't had much practice,' said the Queen. 'When I was your age, I always did it for half an hour a day. Why, sometimes I've believed as many as six impossible things before breakfast.'

*Lewis Carroll,
Alice in Wonderland*



A solar-powered tree ?

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