Costing Urban Water Infrastructure

Institute of Public Works Engineering Australasia

30th of May 2014

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Overview

1. The case for collecting cost data
2. An approach to estimating urban water costs
3. Some sample results
4. Ideas on how to collect more data

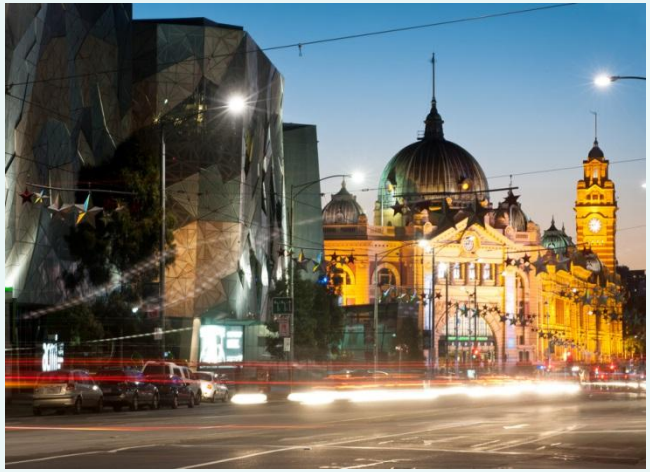
Costing data and statistics. Why the need?

Why do we estimate costs?

- Conceptual planning
- Options assessment
- Budget forecasting

What happens if we get it wrong?

- Redesign on-the-fly
- Funding shortfalls
- Sub-optimal outcomes
- Impacts on other projects



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Infrastructure Costing - The Problems

We know we get it wrong!

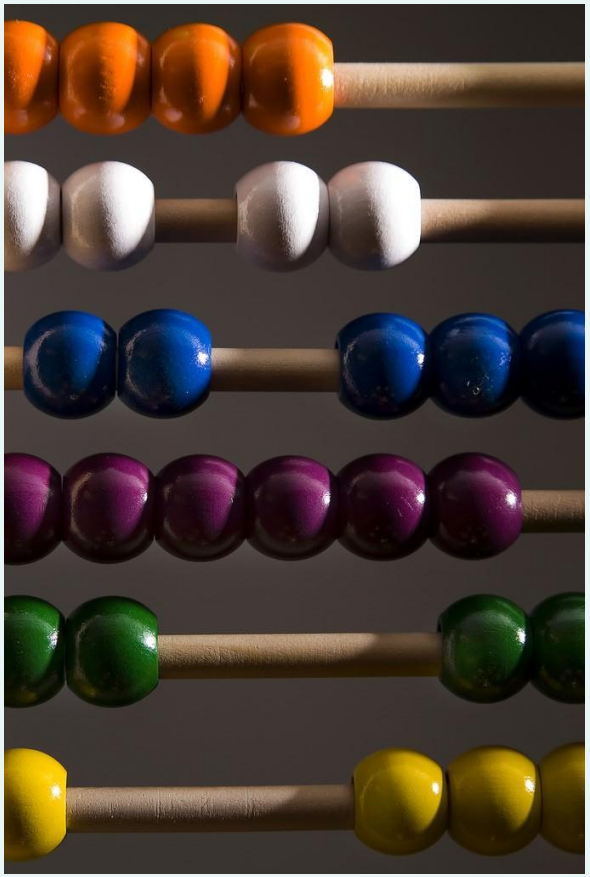
258 transport infrastructure projects

- 9 out of 10 underestimate cost.
- Cost underestimation has not decreased over the past 70 years.
- On average, costs are underestimated by 28%. (Flyvbjerg et al. 2002)

The “list of horror stories is endless”

- Scottish Parliament, where final costs were £431 million yet the original estimate was £40 million
- Remodelling of kitchens by American homeowners, who on average expected the job to cost $18,658, but it actually cost $38,769. (Kahneman 2011)

Melbourne Desalination Plant

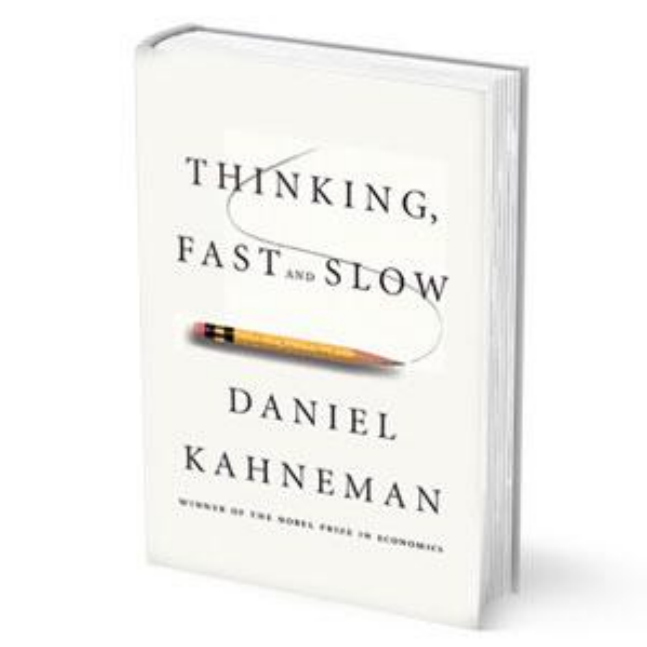


Infrastructure Costing – The problems

Why do we get it wrong?

- Rumsfeldian uncertainty?
- Technical errors (e.g. inadequate data)
- Optimism
- Self-interest & political reasons
- The most common reasons are political and self-interest:

"deception and lying in power struggles aimed at getting projects started and at making a profit appear to best explain why costs are highly and systematically underestimated" Flyvbjerg et al. (2002)



Solutions

- Adopt an *"outside view"*, see Kahneman (2011)

Infrastructure Costing – the problems

Conceptually easy

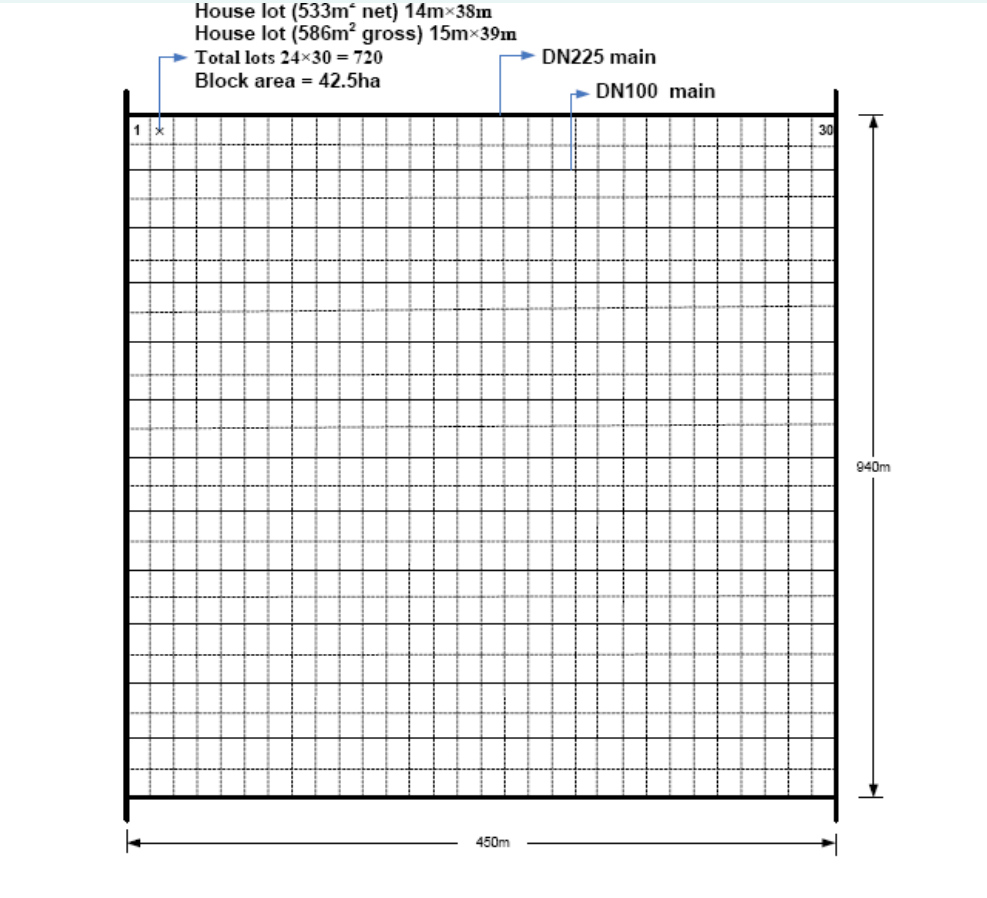
Practically difficult (time consuming)

- Data not publically available
- Data in different formats (pre-construction, post-construction, tied up with other costs)
- Information spatially and temporally variable
- Maybe we just find it all a bit boring?

Is it a good use of time and resources?

- Small projects?
- Large projects?
- The market will deliver lowest cost (but this doesn't help us at the planning stage)
- Centralised collection of data would be beneficial

Approach: Pipes



Method adapted from CSIRO – Ashok Sharma et al. 2005

Approach

Wetlands & Bioretention

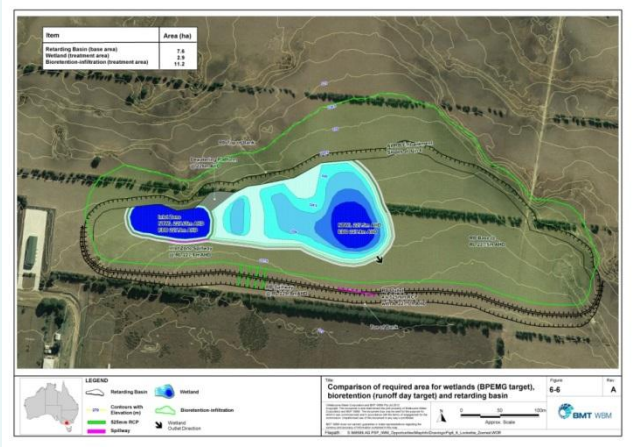
- Conceptual design using MUSIC
- Design curves from local guidelines
- Costs from local water authorities

Wastewater, Potable Water

- Connection costs for new dwellings
- Annual water charges
- Essential Services Commission
- Assumption: 70% of revenue for recovery of capital costs; 30% to operating costs

Stormwater Harvesting

- Conceptual design
- Water balance modelling
- Rawlinsons Construction Manual
- Previous similar studies / projects



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Approach

Plumbing

- Abel & Brown 2012
- Rawlinsons Construction Manual

Retarding Basins

- Conceptual design
- RORB

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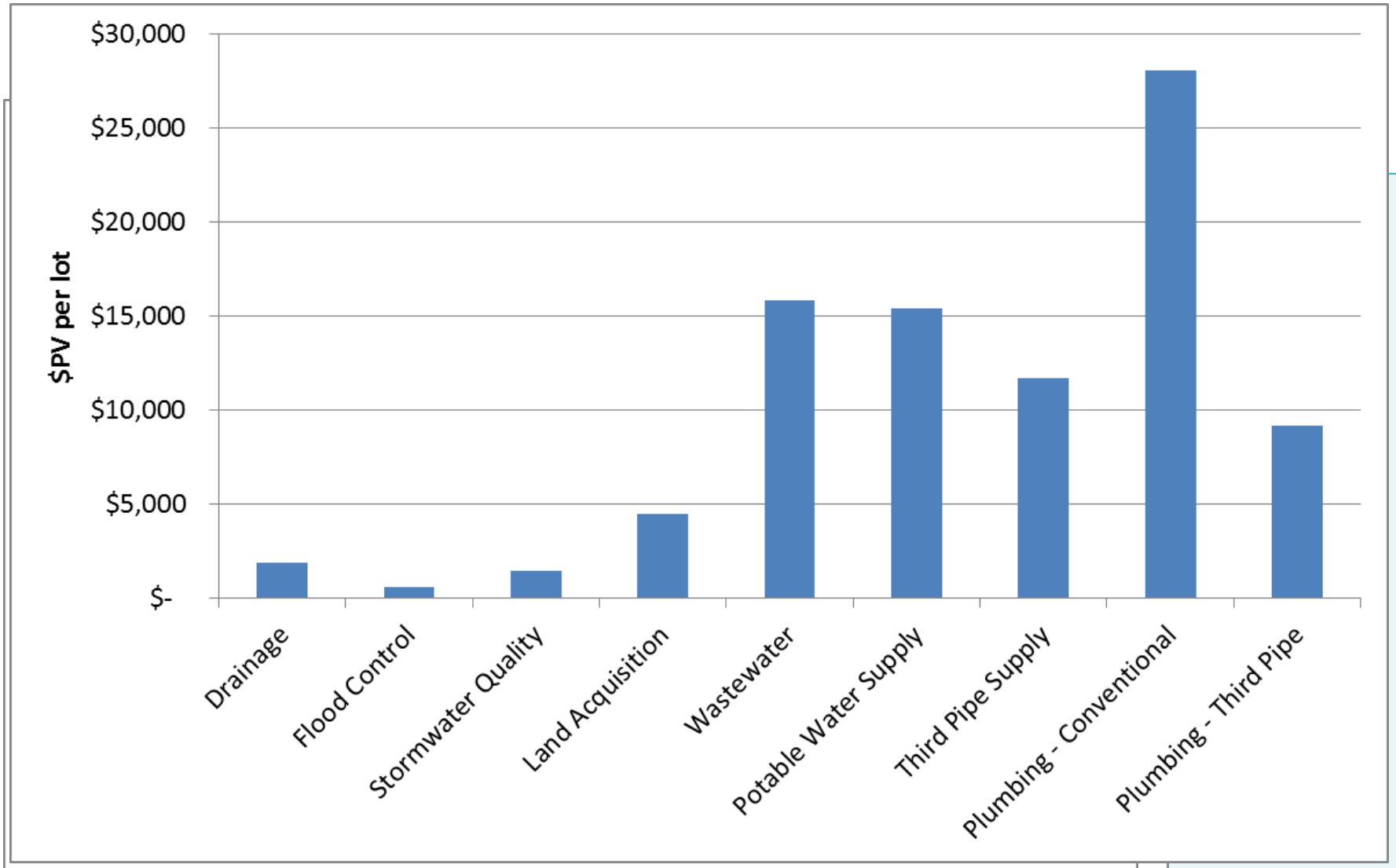
Results: Capital Costs

Element	Capital Cost Rate
Stormwater pipes	$1000 per residential dwelling
Sewer reticulation	$2400 per residential lot
Potable water reticulation	$4400 per residential lot
Third pipe reticulation	$2600 per residential lot
Wetlands	$6500 to $8500 per hectare of development area
Wastewater – bulk removal & treatment	$6700 to $8500 per residential lot

Results: Capital Costs

Element	Capital Cost Rate
Potable water – bulk supply & treatment	$4500 to $5500 per residential lot
Plumbing – stormwater	$5400 per dwelling
Plumbing – wastewater	$5200 per dwelling
Plumbing – potable water supply	$5200 per dwelling
Plumbing – third pipe supply	$5200 per dwelling
Retarding Basins	$3000 to $9000 per hectare of developed area



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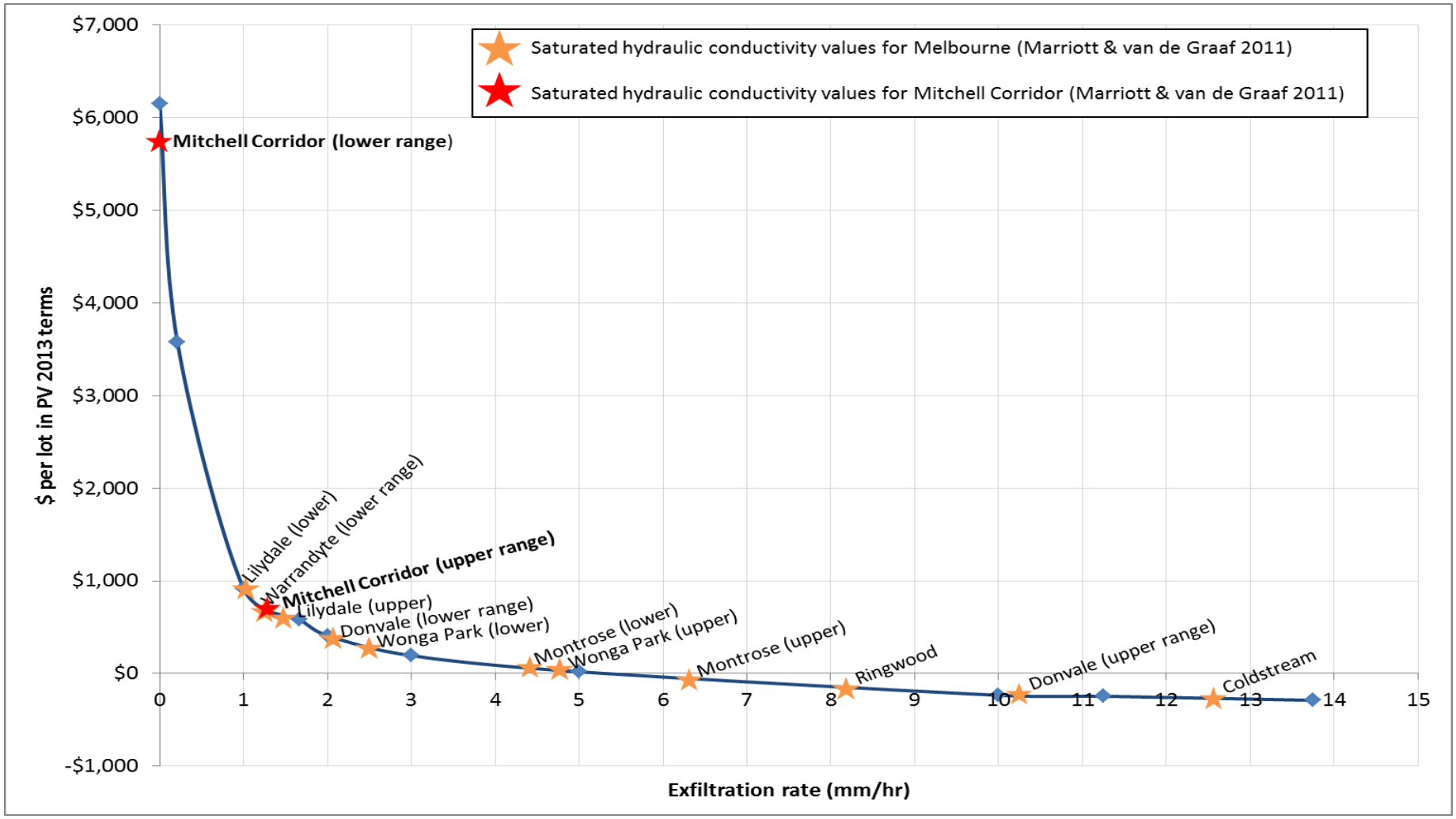
Results



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Solution

Adopt an “outside view”, see Kahneman (2011)

National Databases

- Water, Roads, Public Works
- Lead organisation?
  - CSIRO
  - ARRB
  - WSAA
  - Universities
  - IPWEA
  - IEA
- Key partners
  - Water authorities
  - Road authorities
  - Local government
- Commercially viable (e.g. Rawlinsons)

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Summary

Estimating costs is important

- Resource allocation
- Decision making
- Optimal planning outcomes

We estimate costs poorly

- Data are scarce
- We need an “outside view”

We need to collect more data

- Let’s work together
- Any volunteers to take the lead?

Urban water servicing in Melbourne’s Growth Areas

- $90,000 per lot in PV terms
- Stormwater infrastructure comprises 8% of total costs
- 15-20% of stormwater infrastructure costs are WSUD

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Thank you

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