Institute for Sustainable Futures

Tunnelling through the cost curve: seeking the safe operating space for humanity

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Institute for Sustainable Futures, UTS

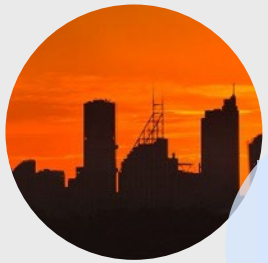
The Institute for Sustainable Futures at UTS has a mission to create change towards sustainable futures.

We partner with government, industry and community to address complex sustainability challenges through transdisciplinary research and learning.

- 120 research and professional staff
- 65 higher degree research students
- 45 Adjunct professors, fellows and visiting scholars
- 200+ projects per year
- $17m external income

HEALTHY ENVIRONMENTS

INTERNATIONAL DEVELOPMENT



BUSINESS, ECONOMIES & GOVERNANCE

FOUNDED 1997

ENERGY

WATER

RESOURCE STEWARDSHIP

Climate-KIC Australia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Sustainable
Futures

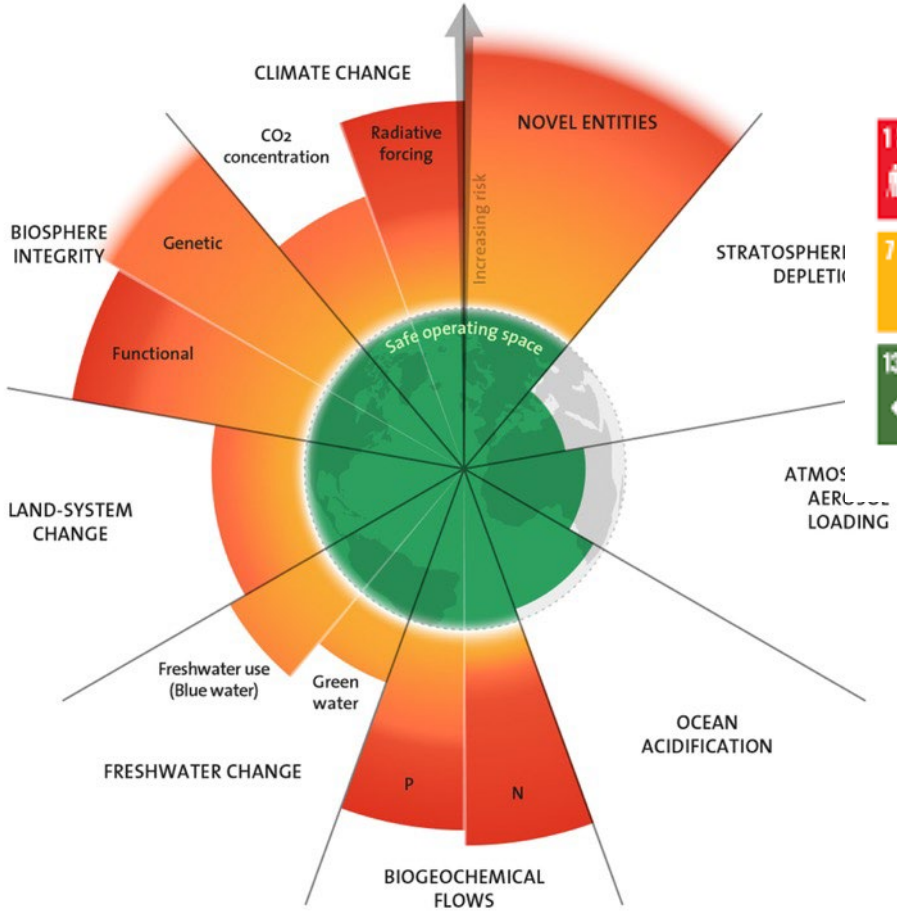
Introduction

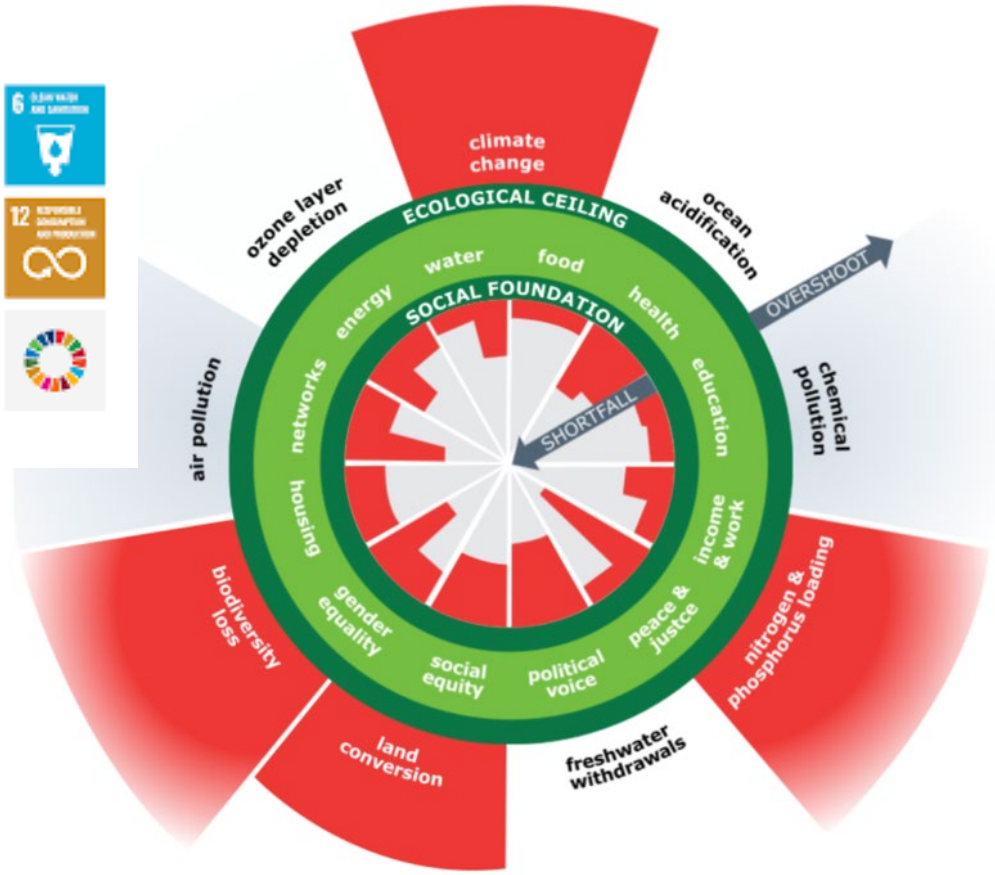
What I will discuss

- Creating change towards sustainable futures
- Seeking a safe operating space for humanity
- The approaches:
  - systems view
  - demand-side and functional unit
  - contingency, resilience, adaptation
- Instruments of change
- Case studies
- Concluding remarks - principles

Seeking a safe operating space for humanity

Repairing the damage and building a better world





https://www.stockholmresilience.org/research/planetary-boundaries.html

https://www.kateraworth.com/doughnut/#

Pathways to sustainable futures

How does our thinking need to change?

- Systems thinking
- Solution-multiplying solutions
- The functional unit and the demand-side
- Economics as if people and the planet mattered
- Contraction and convergence
- Tunnelling through the cost curve
- Deliberative democracy

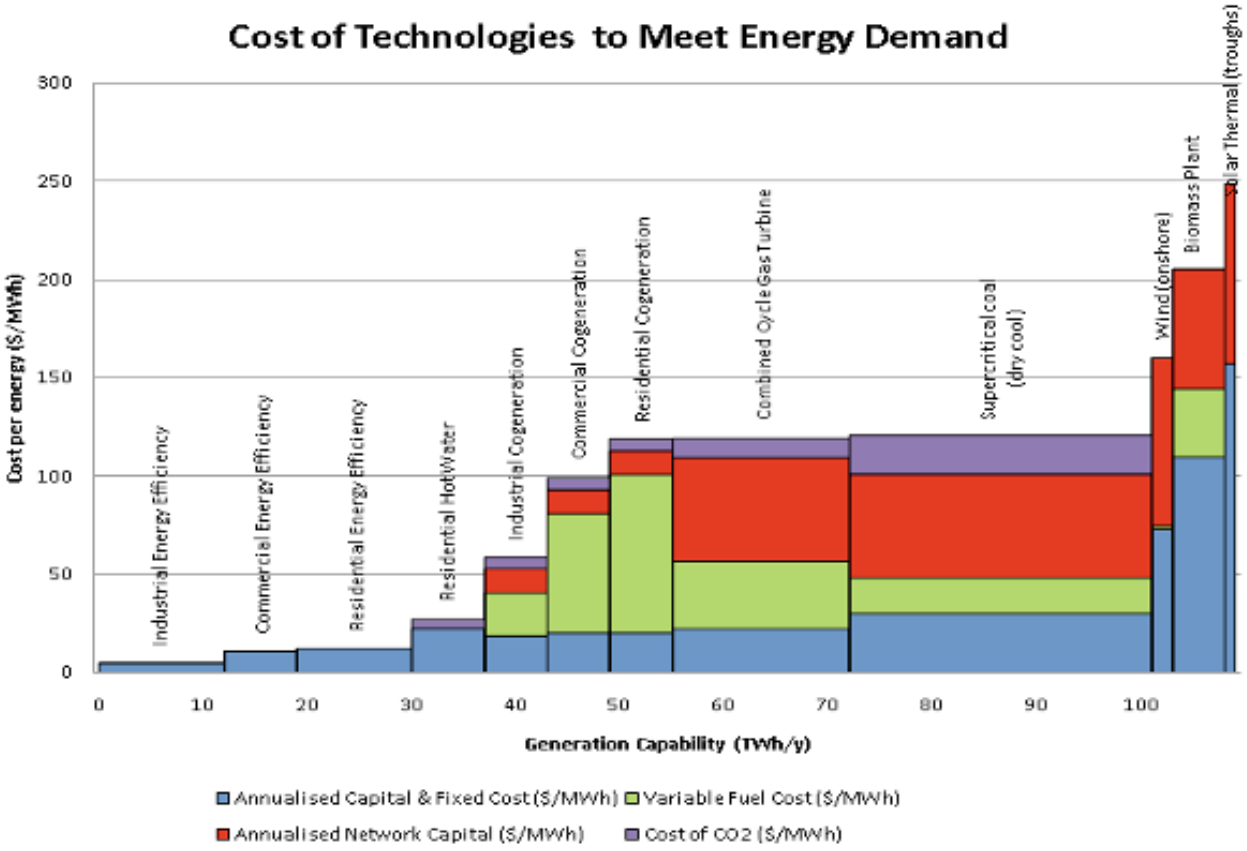
Instruments for change

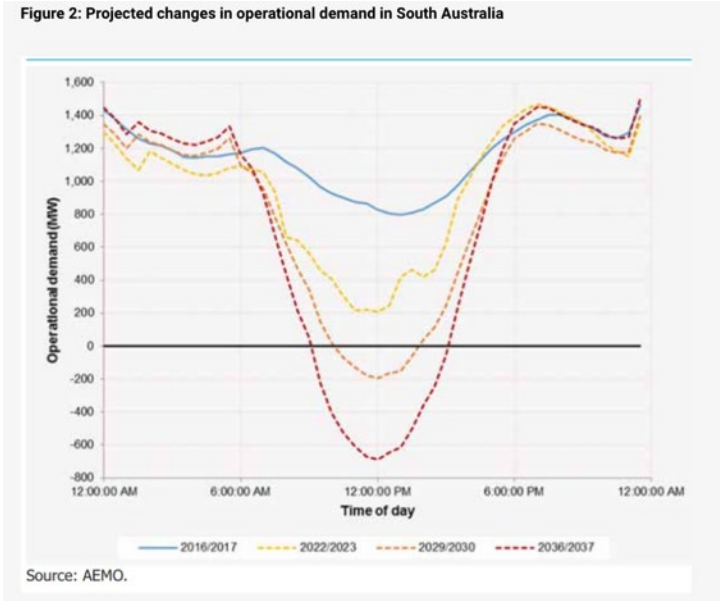
The policy palette

Dunstan et al (2011) “20 Policy Tools for Developing Distributed Energy”
see http://igrid.net.au/resources/index.html#project4

Case study: Energy

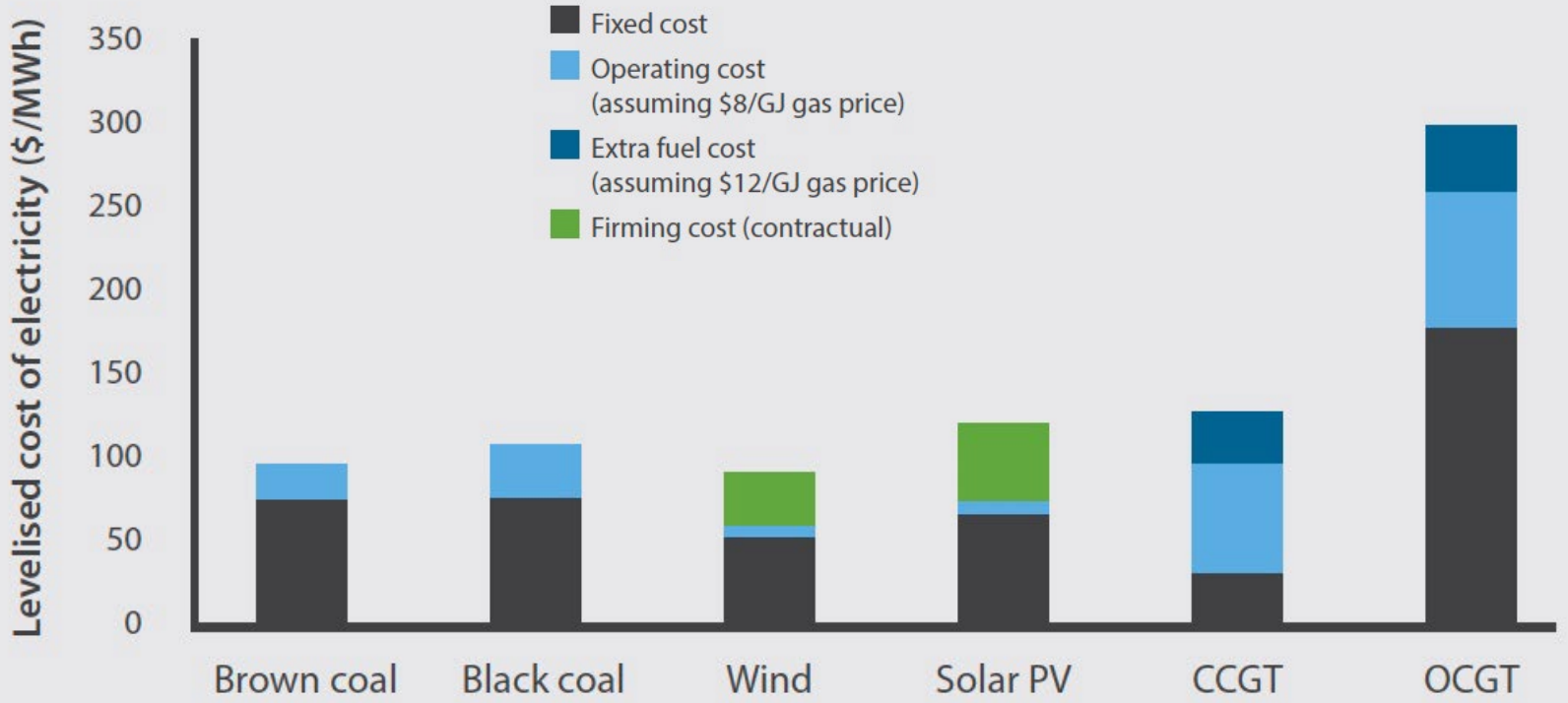
From least cost planning to ‘putting the duck to sleep’





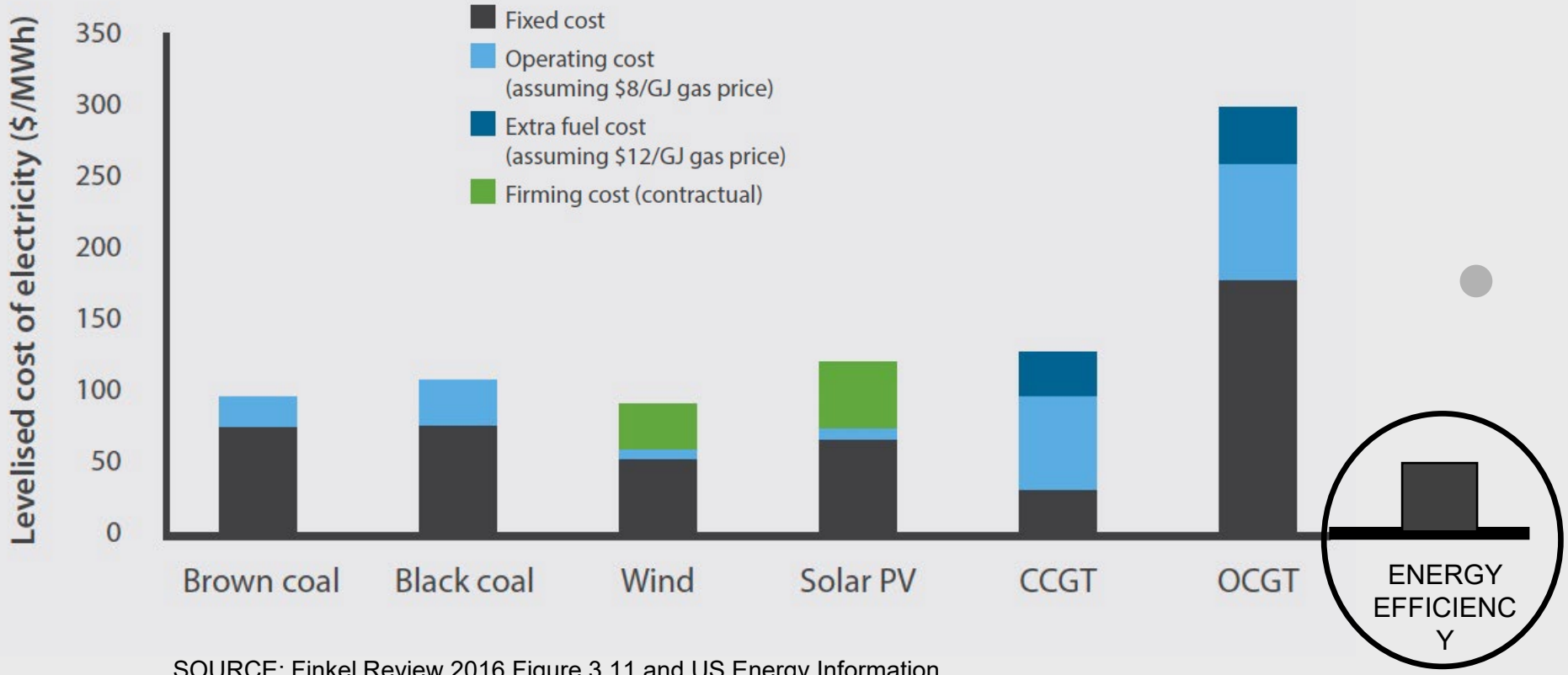
http://igrid.net.au/resources/index.html#project4

The lowest cost option



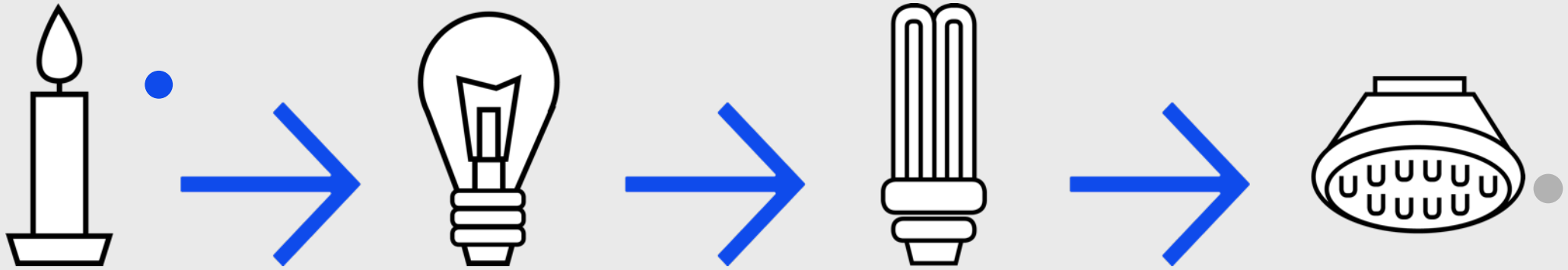
SOURCE: Finkel Review 2016 Figure 3.11

The lowest cost option



SOURCE: Finkel Review 2016 Figure 3.11 and US Energy Information Administration

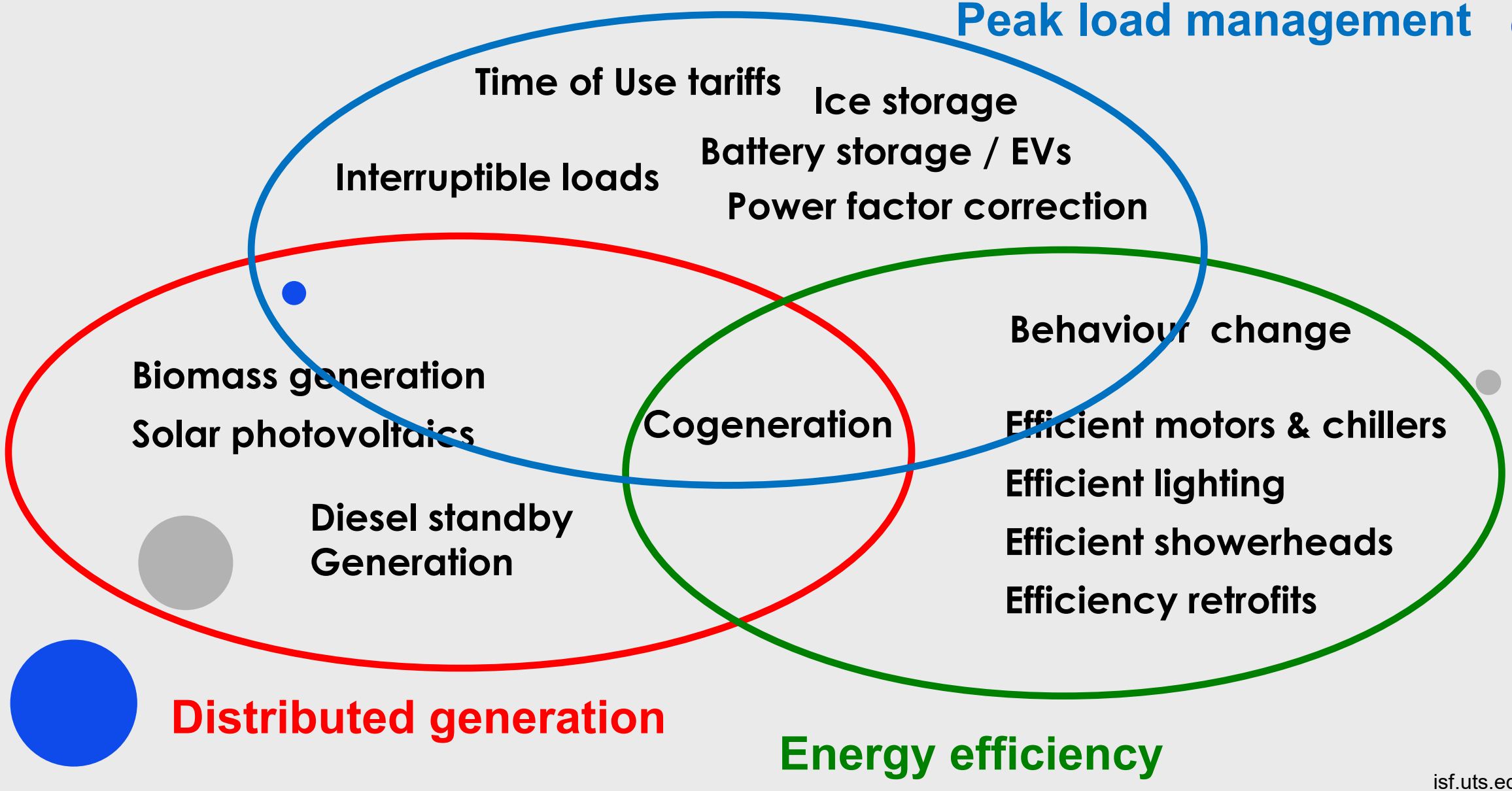
Lighting revolution (lumens/W)



0.3 10 70 ***100-200***

SOURCE: CSIRO Low Emission Technology Roadmap 2016

Decentralised energy:



ENERGY STORAGE

15 kWh
$5k

15 kWh
$15k

60 kWh
$60k

https://reneweconomy.com.au/this-is-the-future-how-my-ev-earned-100-in-two-hours-supporting-the-grid-in-heatwave/

STORAGE CAPACITY FOR THE RENEWABLE TRANSITION

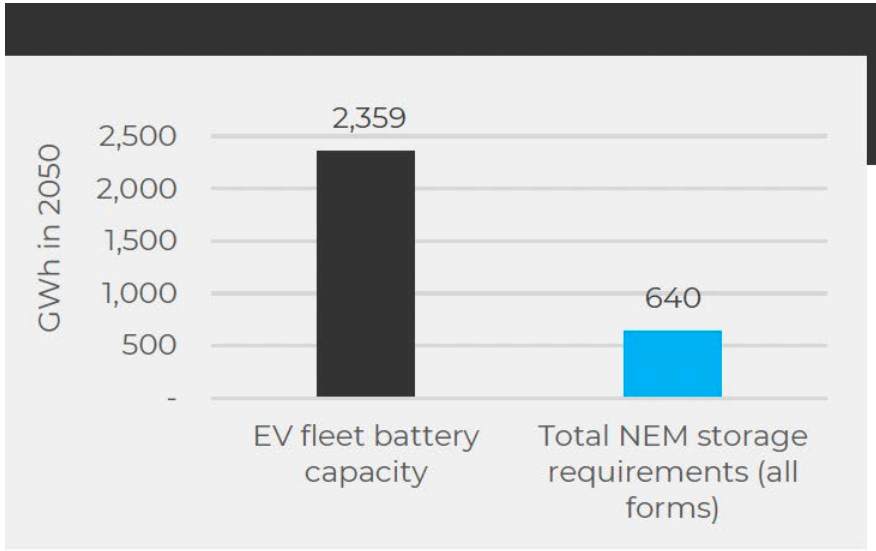


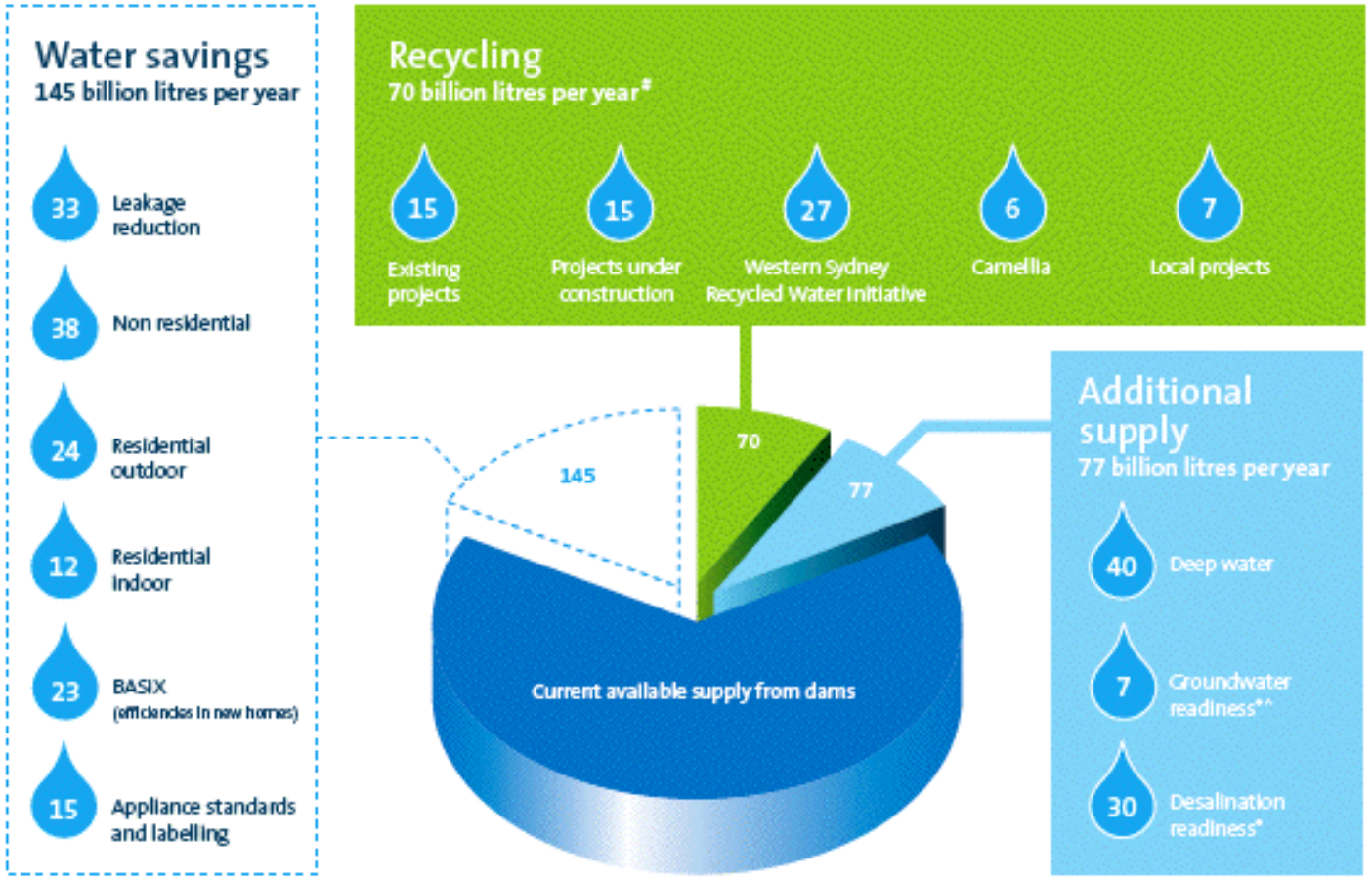
Figure 1: Estimated gross energy storage capacities in the NEM in 2050 (GWh)

Total NEM Storage requirements from AEMO 2022 ISP[1] See Appendix C for details about EV fleet battery assumptions. Figures do not represent estimated or likely resource availability.

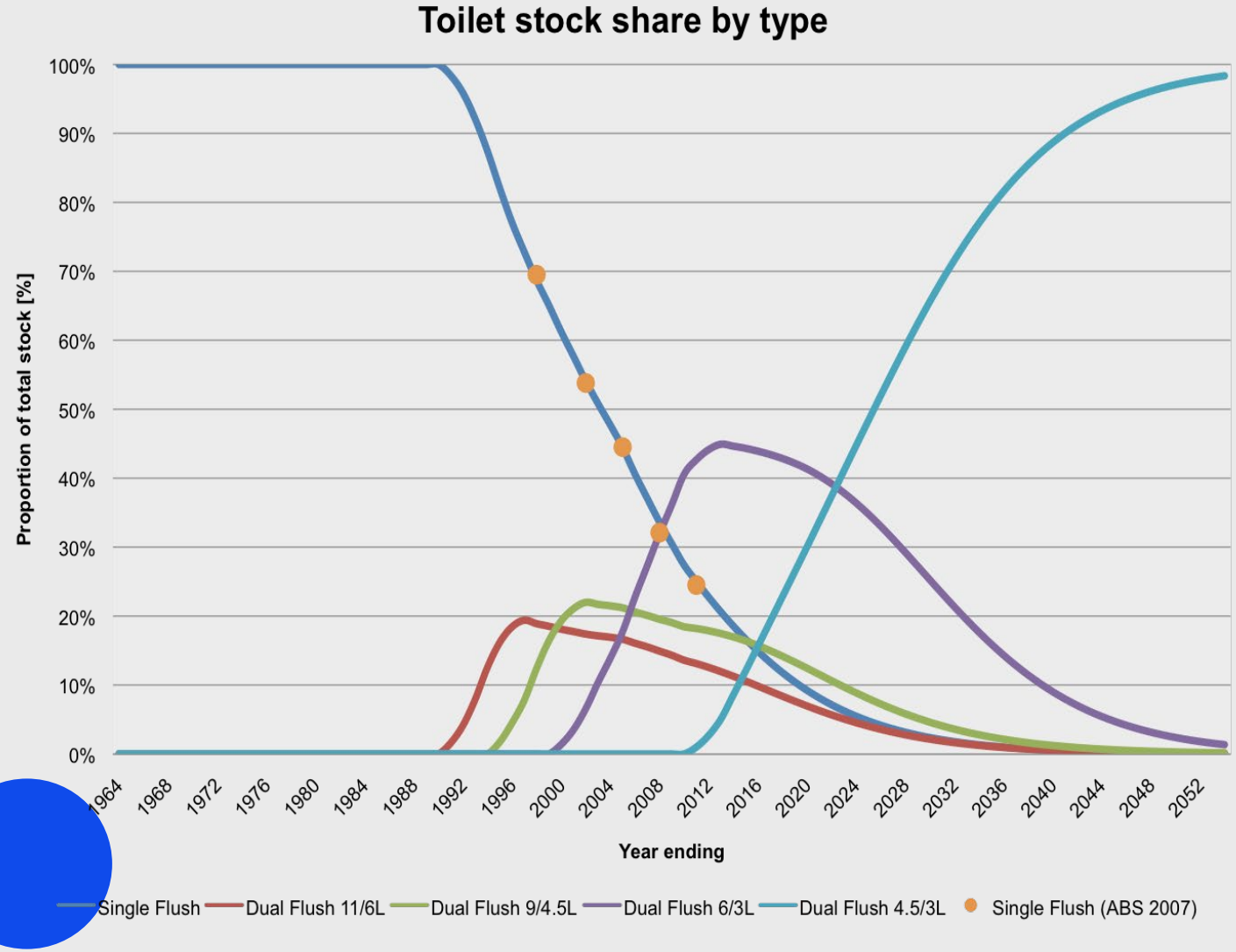
enX (2023) *V2X.au Summary Report – Opportunities and Challenges for Bidirectional Charging in Australia*
Report prepared for ARENA, 30 June 2023

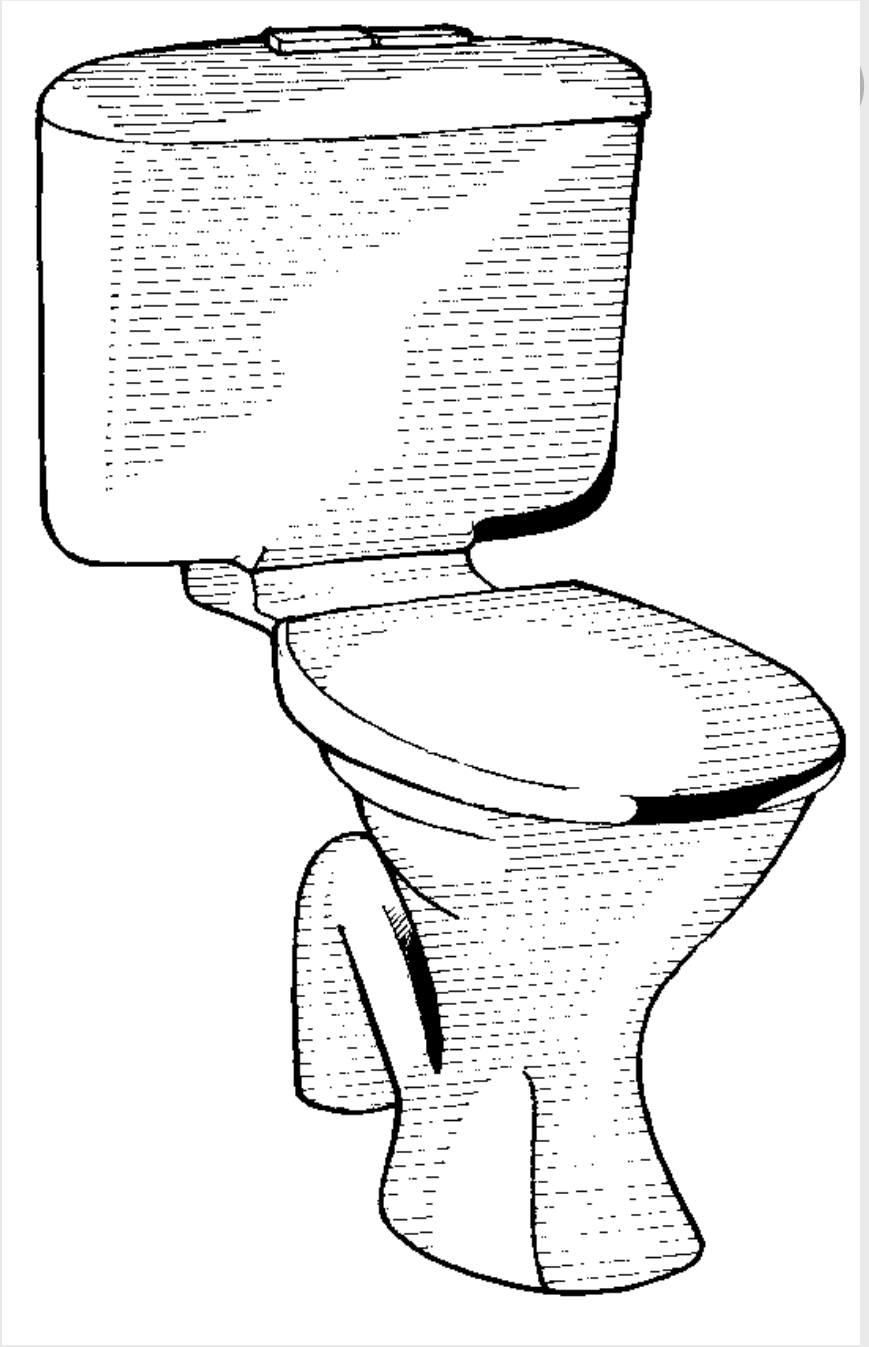
Case study: Water

What is the largest, quickest, cheapest source of new water?

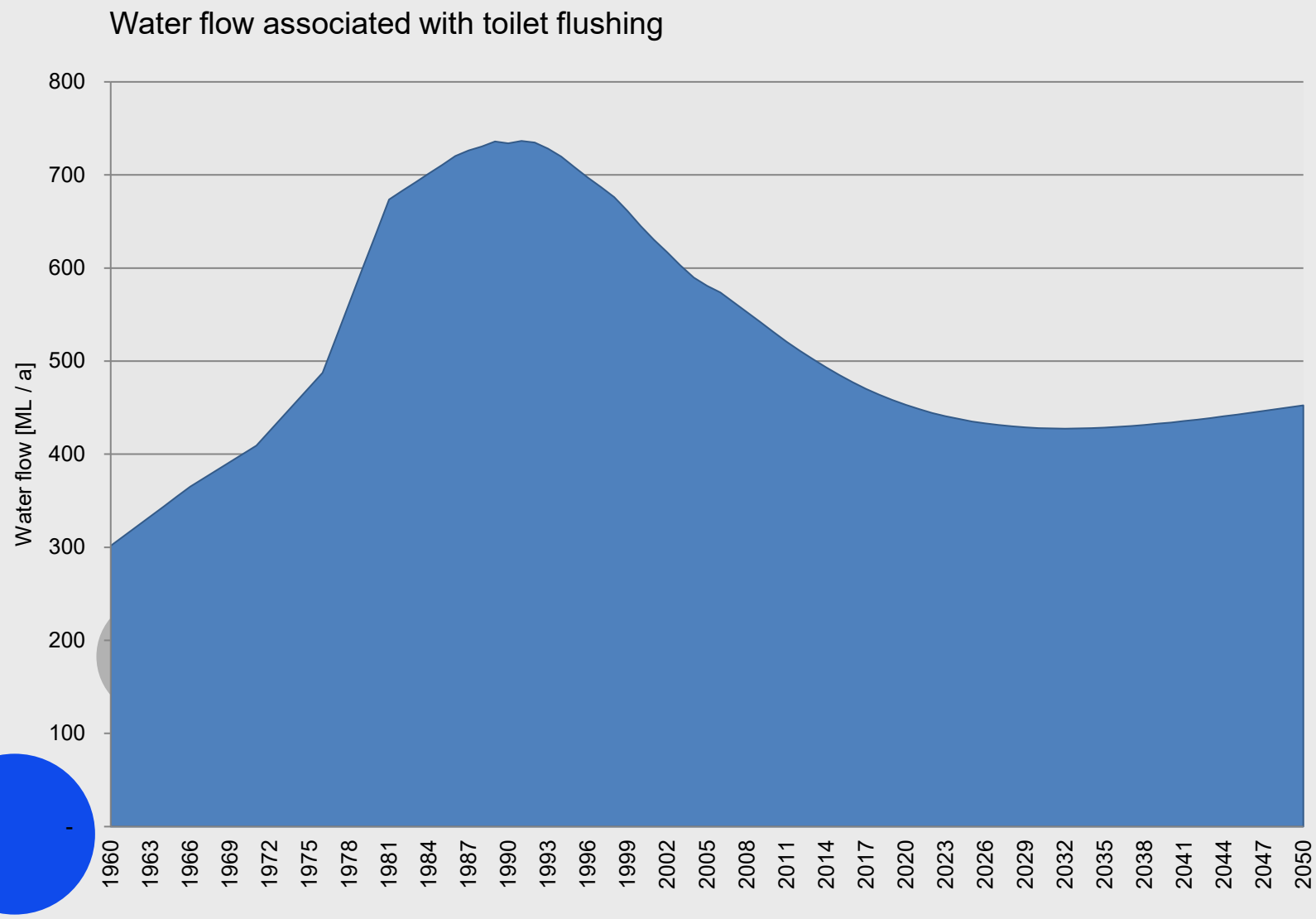


Stock models - toilets

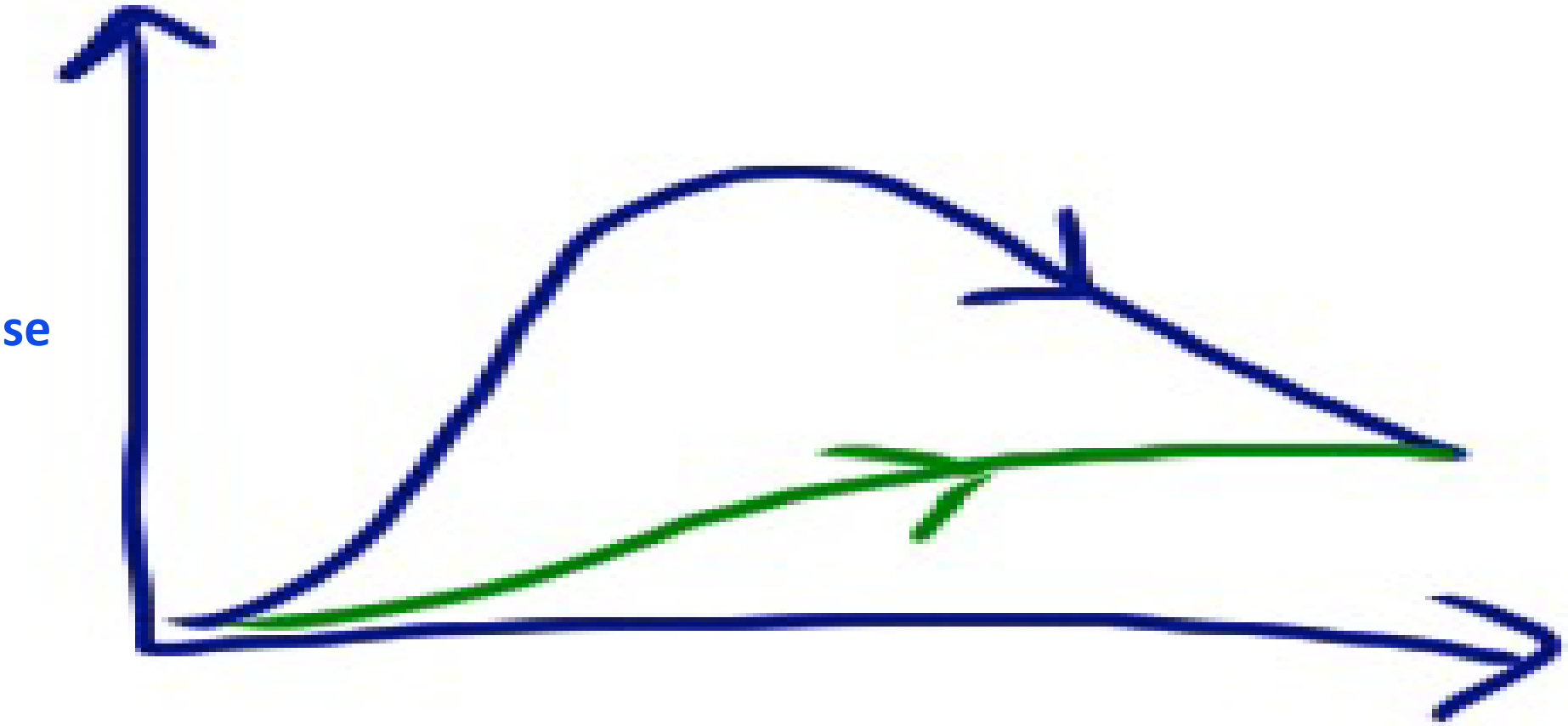




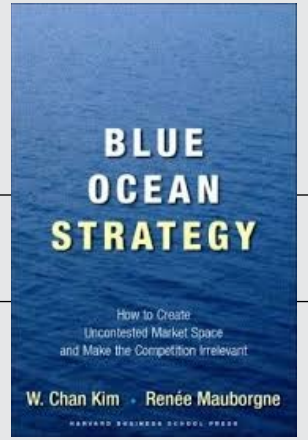
Toilet water flow



The Environmental Kuznets Curve - modified



Systems thinking



Utility

Customer's premises

Equipment and fixtures in customer's premises

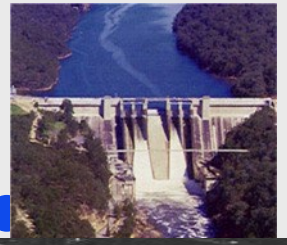
Practices and processes in customer's premises

Interconnection and feedback

LoRa™

Future proofing:
Four generations of water infrastructure

1 **Unmanaged**

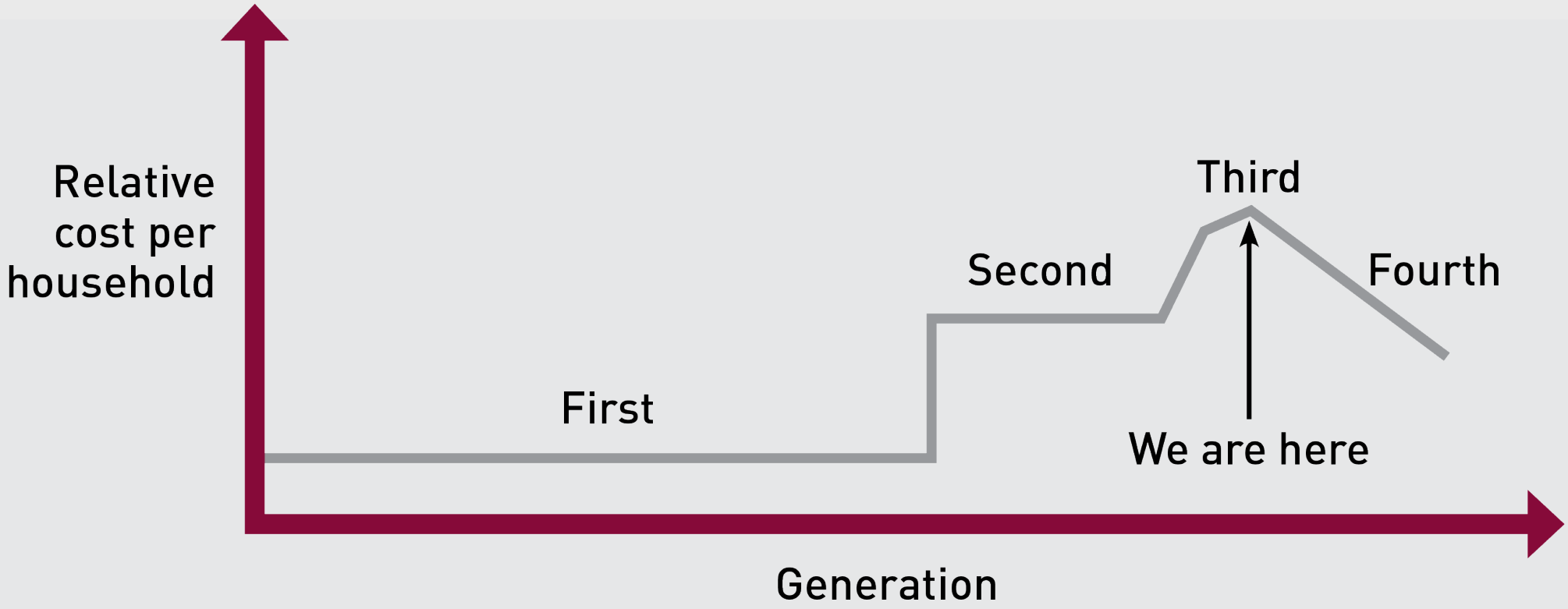


2 **Centralised**

3 **Transitional**
(neo-centralised)

4 Emerging…
(efficient, decentralised, integrated, fit for purpose)

The cost of each generation



Fourth generation in practice

Case study: Materials flow

‘An ounce of prevention is worth a pound of cure’

Urban metabolism: used container materials

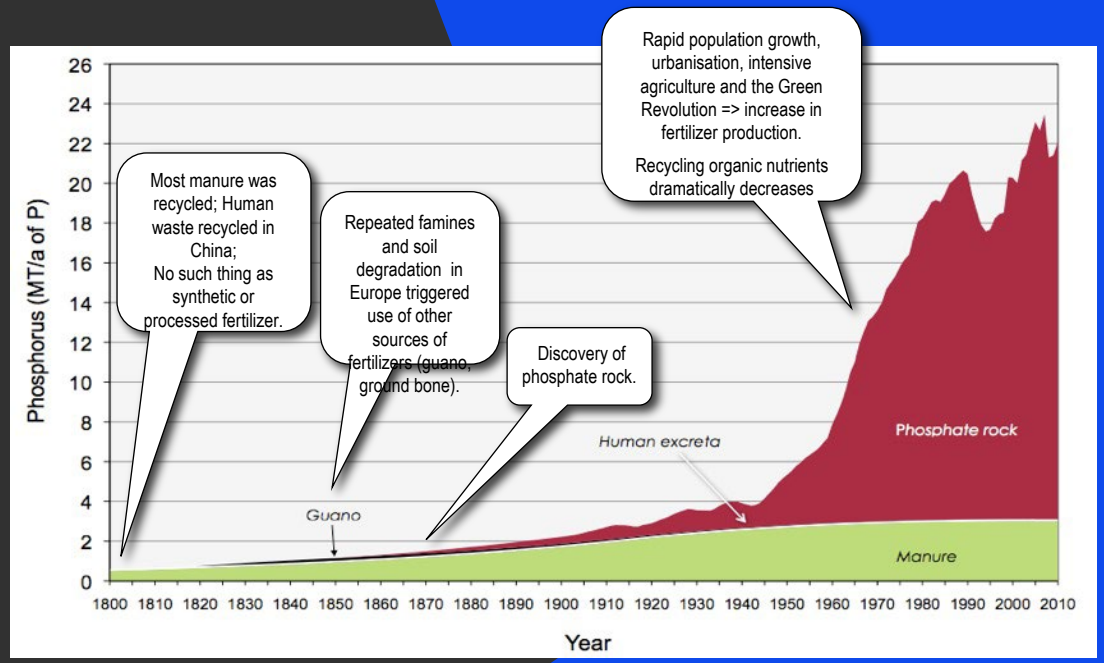
institute for sustainable futures

University of Technology, Sydney

Net financial costs and environmental benefits (Table 3.5-2)

Option	Net financial cost relative to current kerbside ($m/a)	Net environmental benefit relative to current kerbside ($m/a)
CDL intermediate 5¢	32	109
CDL point-of-sale 20¢	47	149

Phosphorus – a globally limiting resource

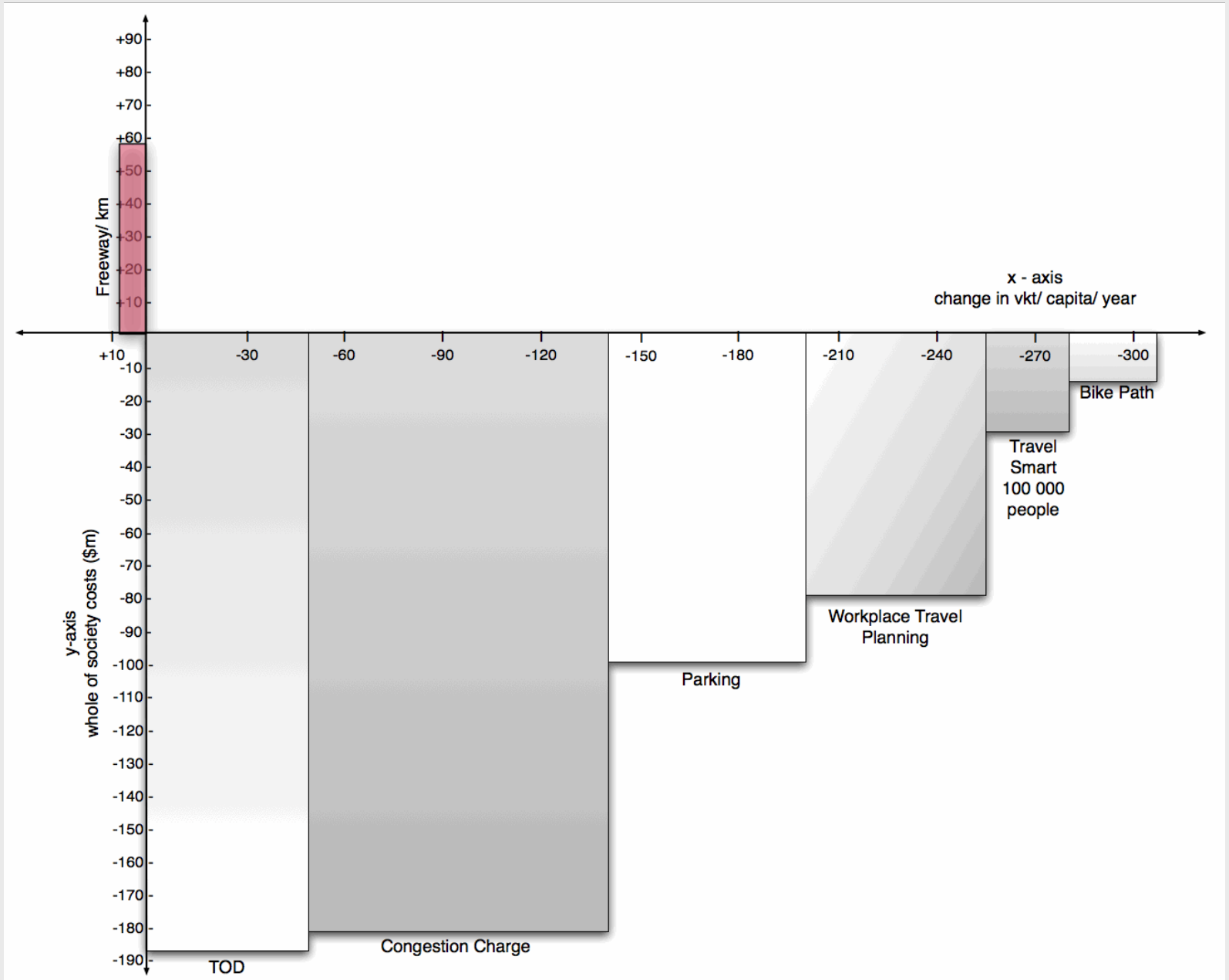


Sustainable phosphorus management – a soft landing and a solution-multiplying solution

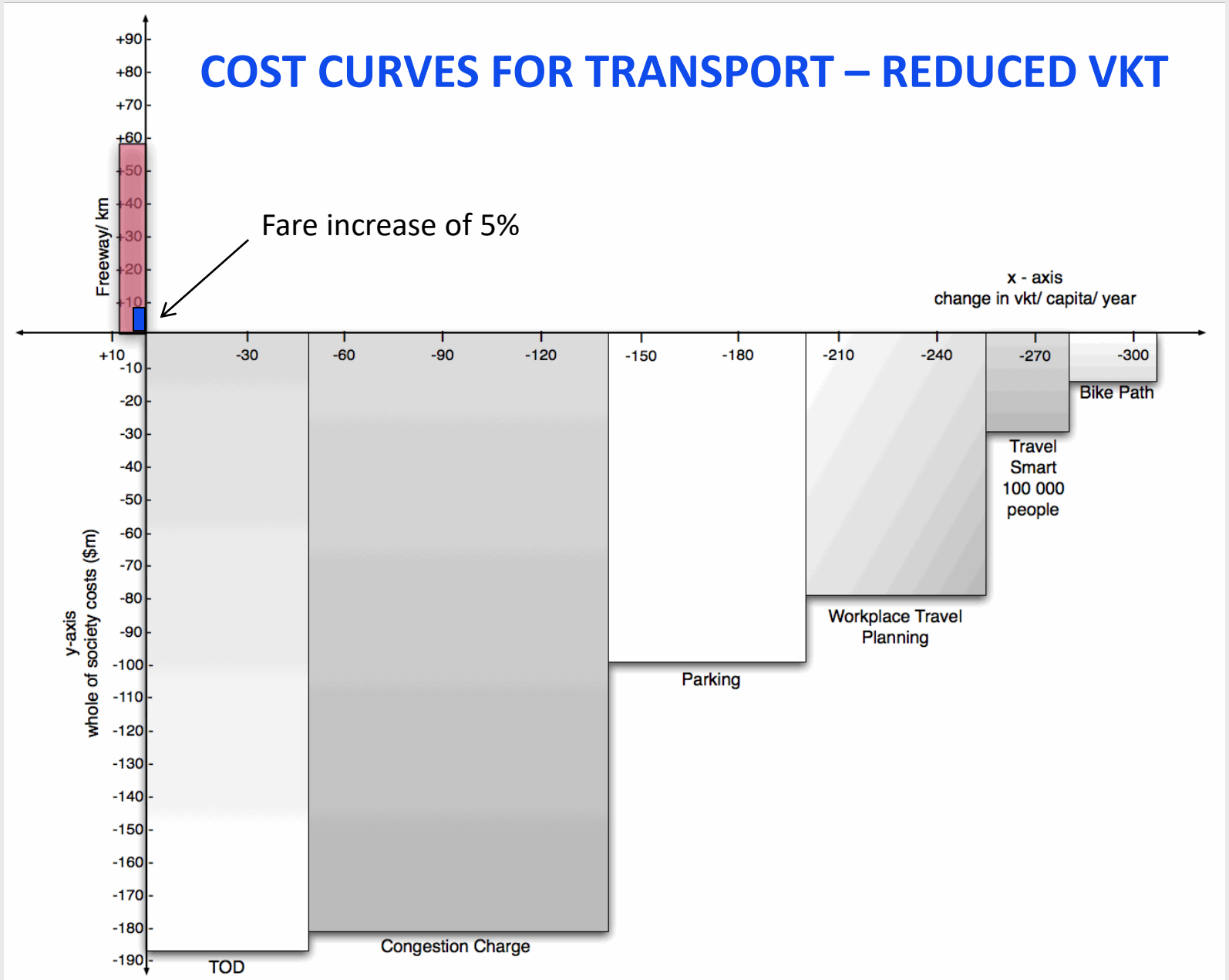
Case study: Transport

The question of the functional unit

COST CURVES FOR TRANSPORT – REDUCED VKT



COST CURVES FOR TRANSPORT – REDUCED VKT



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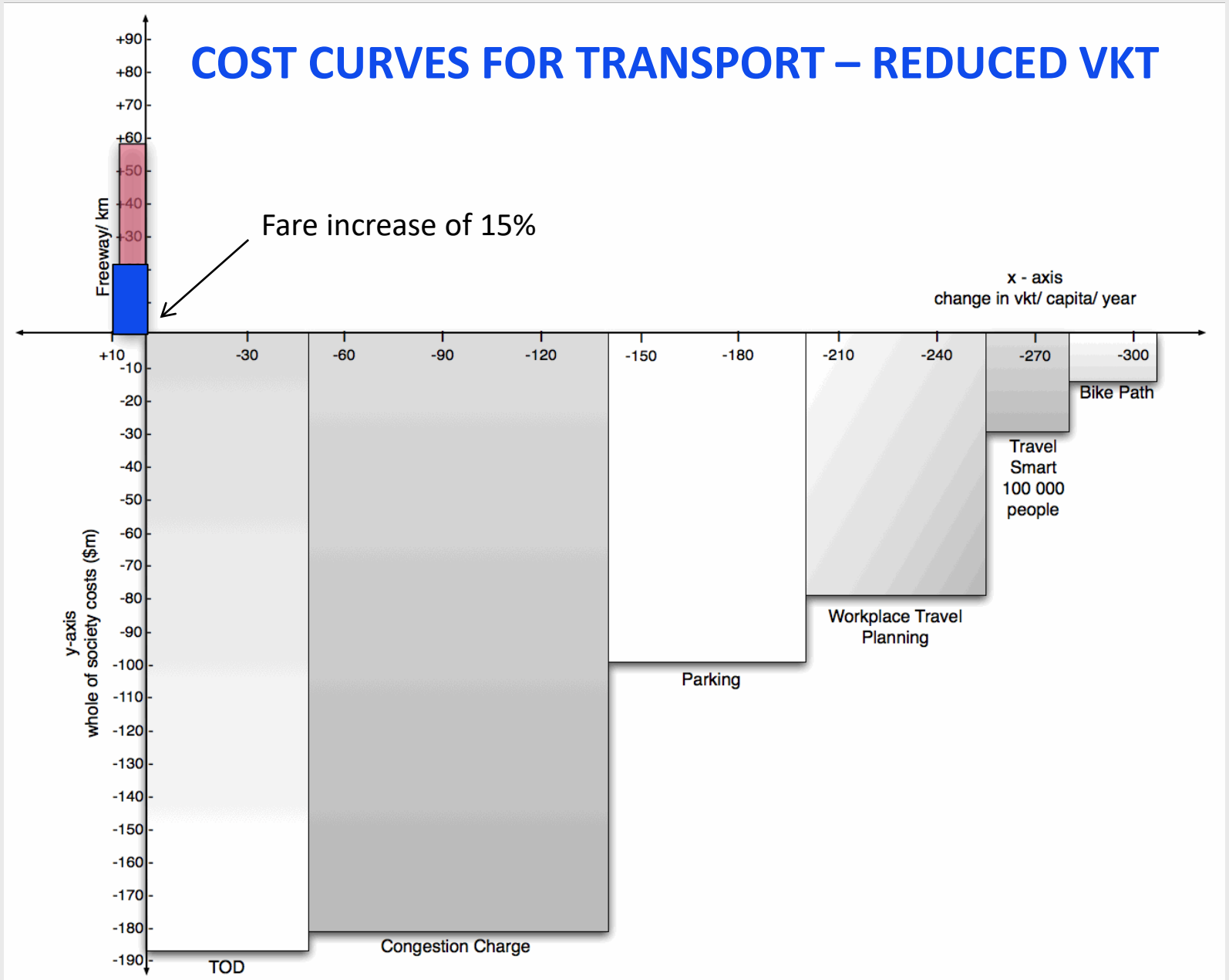
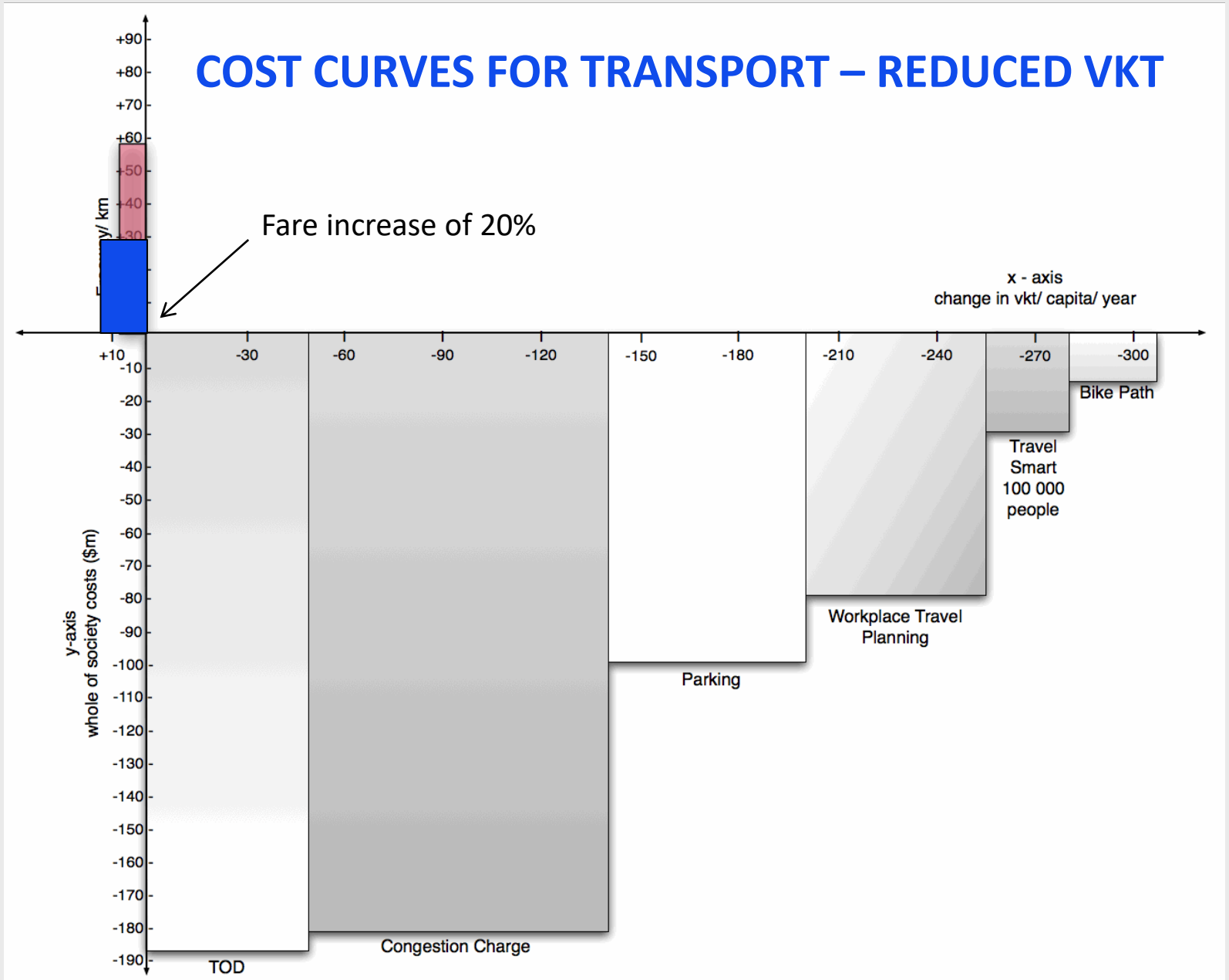


COST CURVES FOR TRANSPORT – REDUCED VKT



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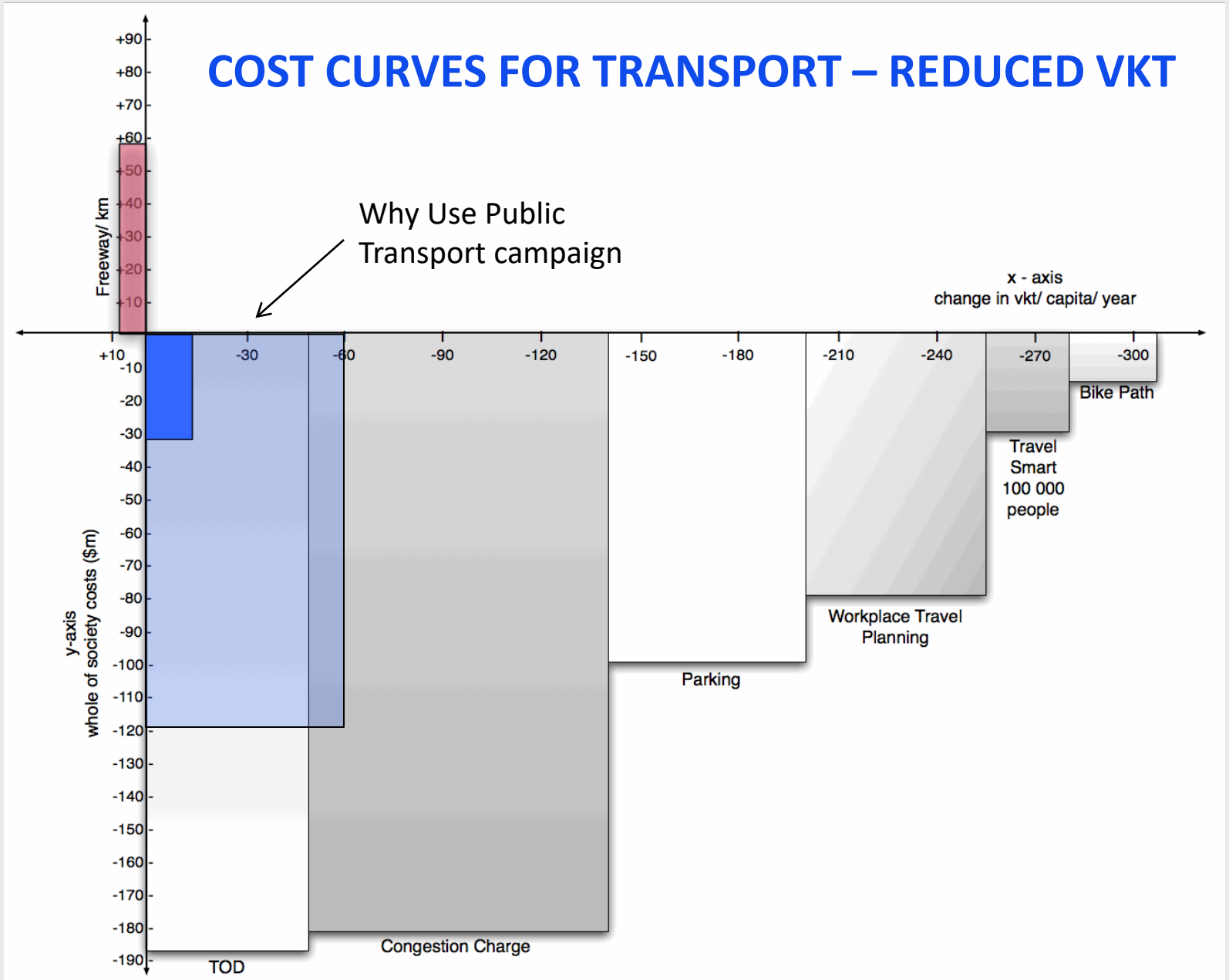
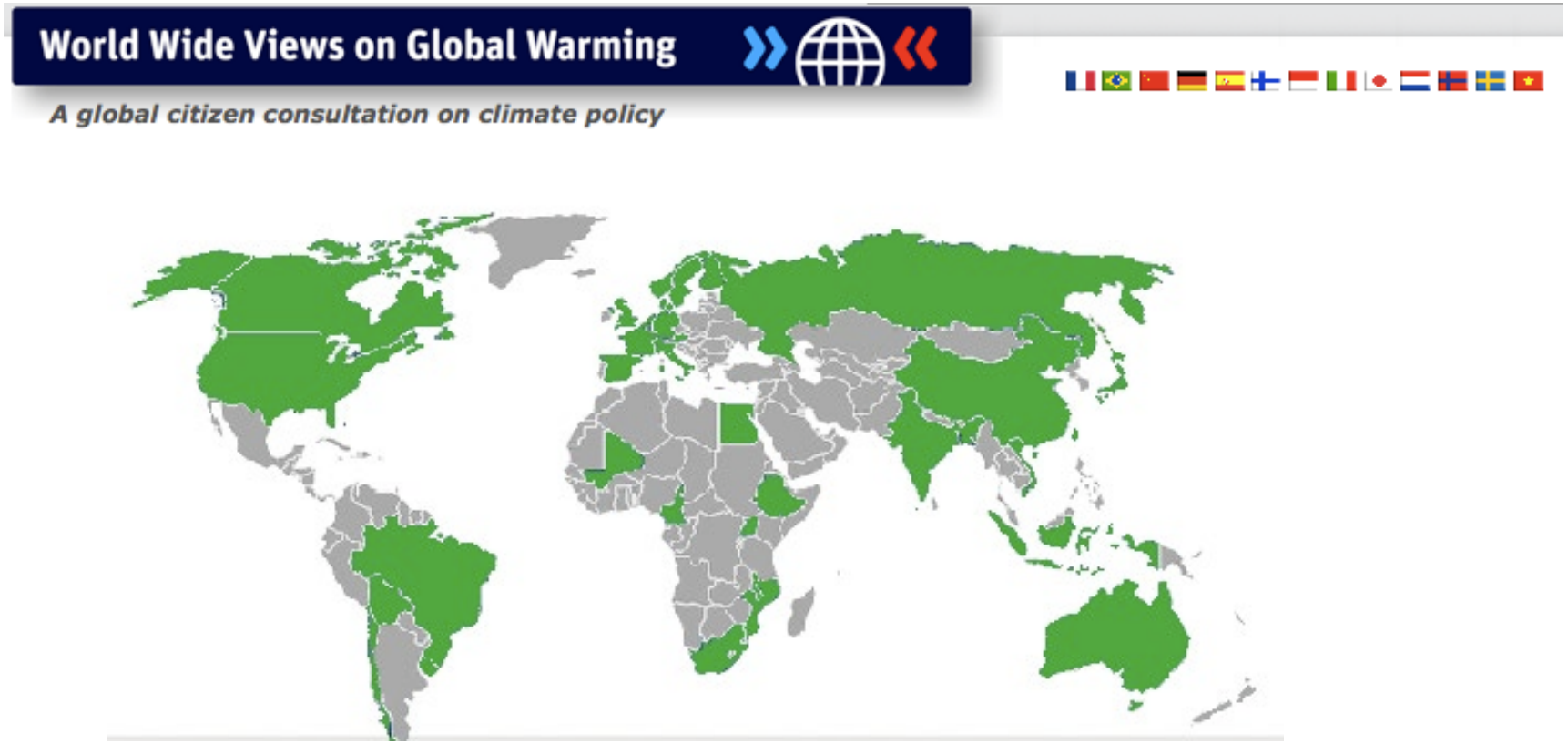


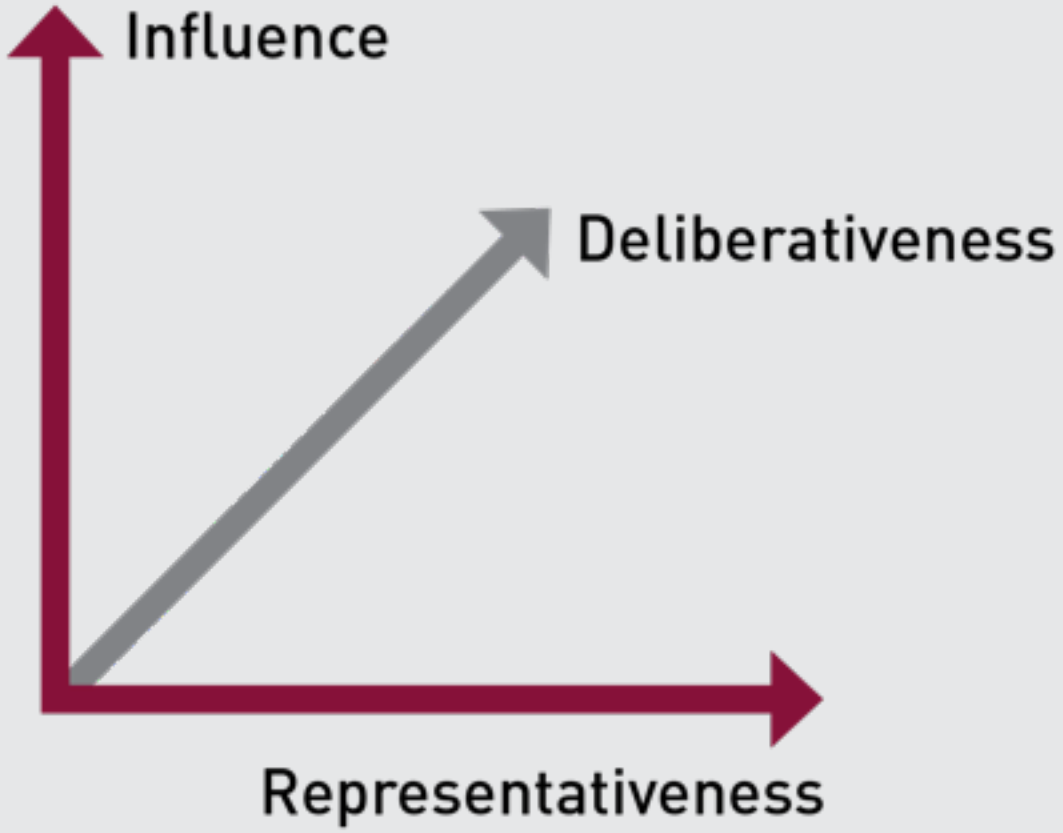
Case study: Deliberative democracy

Hearing from all the voices



http://www.wwviews.org/

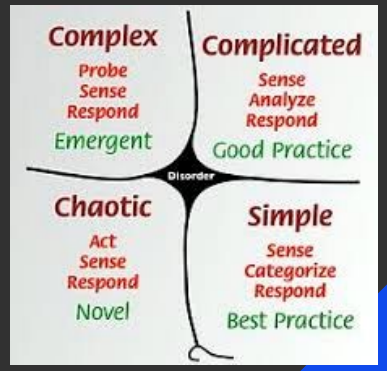
Three ideals for effective community engagement



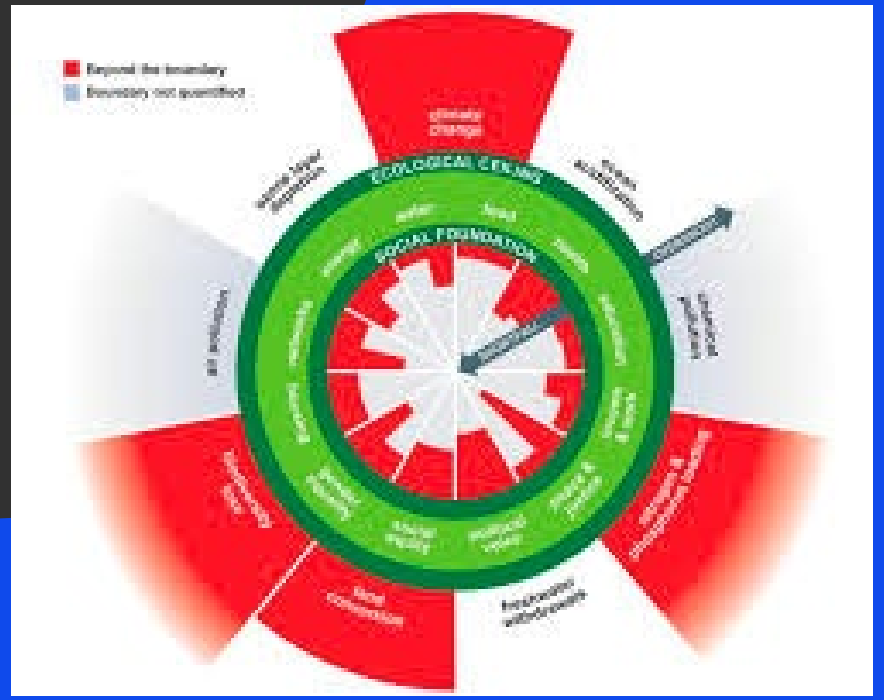
Examples

Delegates at Old Parliament House in Canberra for the
Australia Deliberates convention on the republic referendum

Conclusions



- We have some clear directions – SDGs, Paris, other targets, planetary boundaries, social foundations
- Trend is not destiny – the power of backcasting
- Windows of opportunity – policy (and other) processes are mostly non-linear
- What was the question? The importance of defining the functional unit
- An ounce of prevention… the power of the demand side
- Choosing solution-multiplying solutions



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Thank you

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