Managing capital carbon

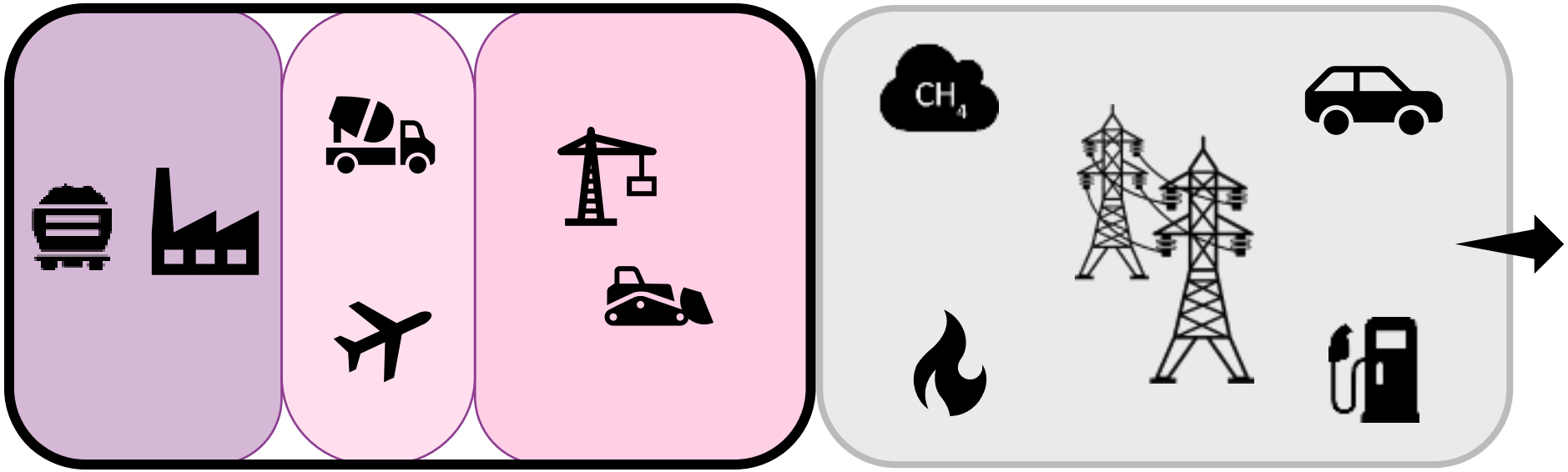
CEPNZ Conference
27 May 2021

Nick Dempsey

Agenda

1. What is capital carbon?
2. The New Zealand context
3. What can be done?
4. Examples

Capital carbon



Capital Carbon (CapCarb)

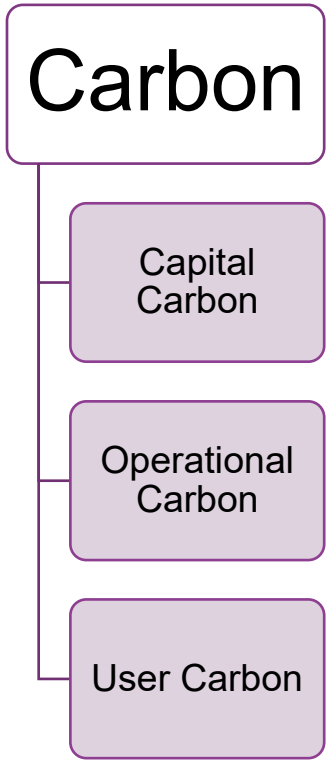
Operational Carbon (OpCarb)

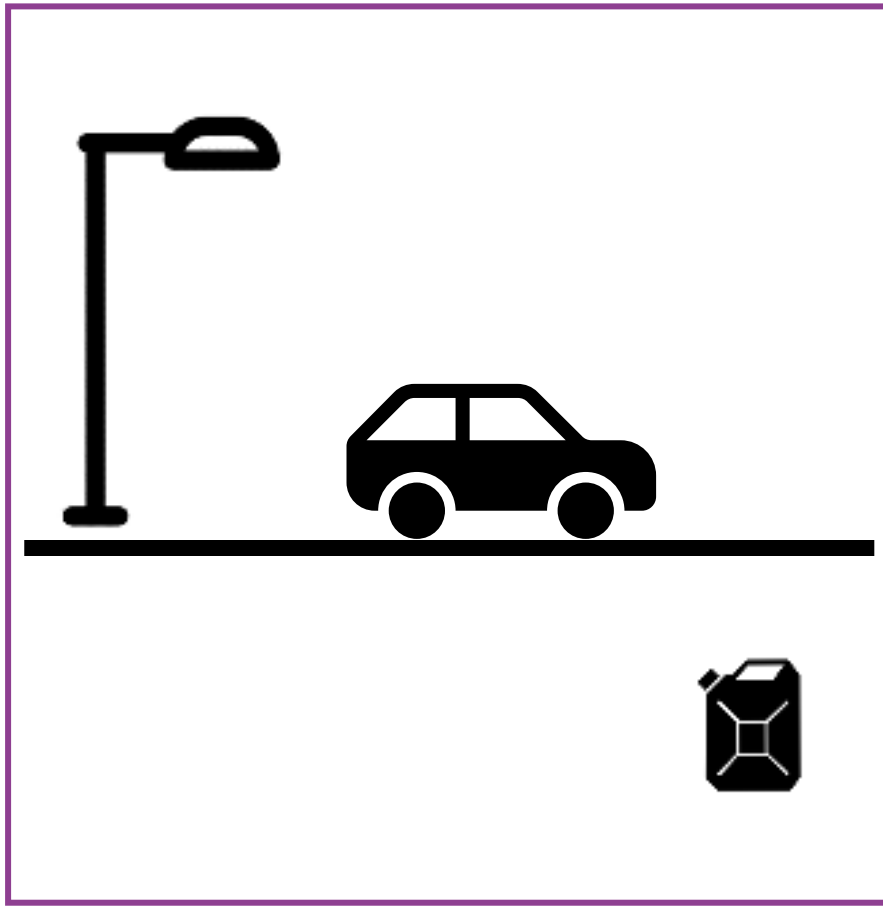
Where is the CapCarb, OpCarb and UseCarb?

A greenhouse gas is a gas that absorbs and emits thermal radiation.

GHG emissions

- Carbon dioxide
- Methane
- Nitrous oxide
- Flourinated gases





UK climate change policy summary

Climate Change Act 2008

Committee on Climate Change

PARIS CLIMATE AGREEMENT

1. Climate Change Act 2008 – 80% reduction by 2050
2. Committee on Climate Change (CCC), 2008
3. 5-yearly national carbon budgets (2018: GHGs 44% below 1990)
4. Net zero by 2050 – 2019 legislation
5. UK Water sector commitment: Net Zero 2030 Routemap, 2021

We don’t need to reinvent the wheel

Reduce carbon, reduce cost, unlock innovation

CapCarb: 39% reduction

- Capex: 22% reduction

OpCarb: 34% reduction

- Opex: 20% reduction

UK economic benefit:
£1.5b/y by 2050

Infrastructure Cost Review (2010)
Infrastructure Carbon Review (2013)
ICR Technical Report (2013)
ICR 7 Year Review (2021)

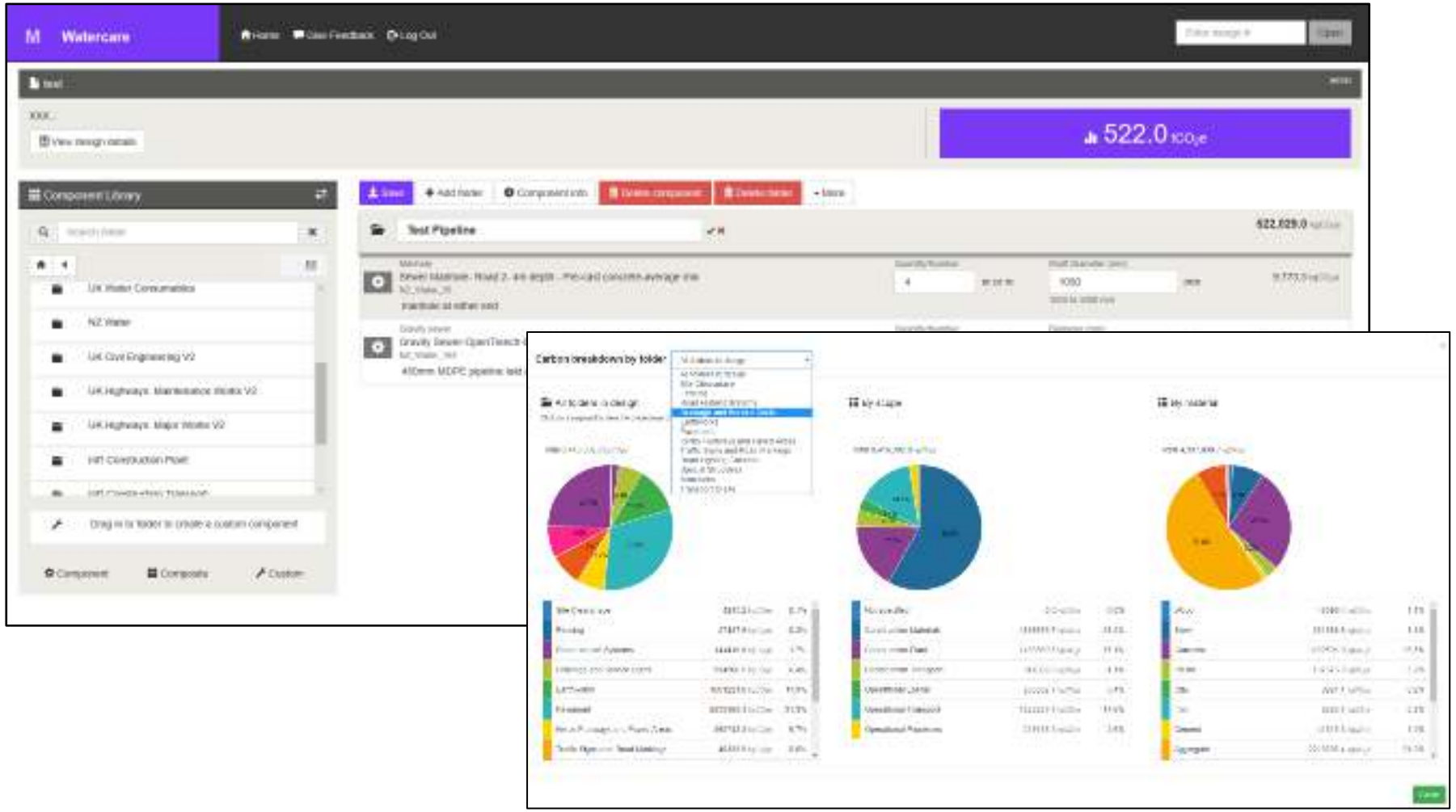
Common tools and cross sector collaboration

Moata Carbon Portal

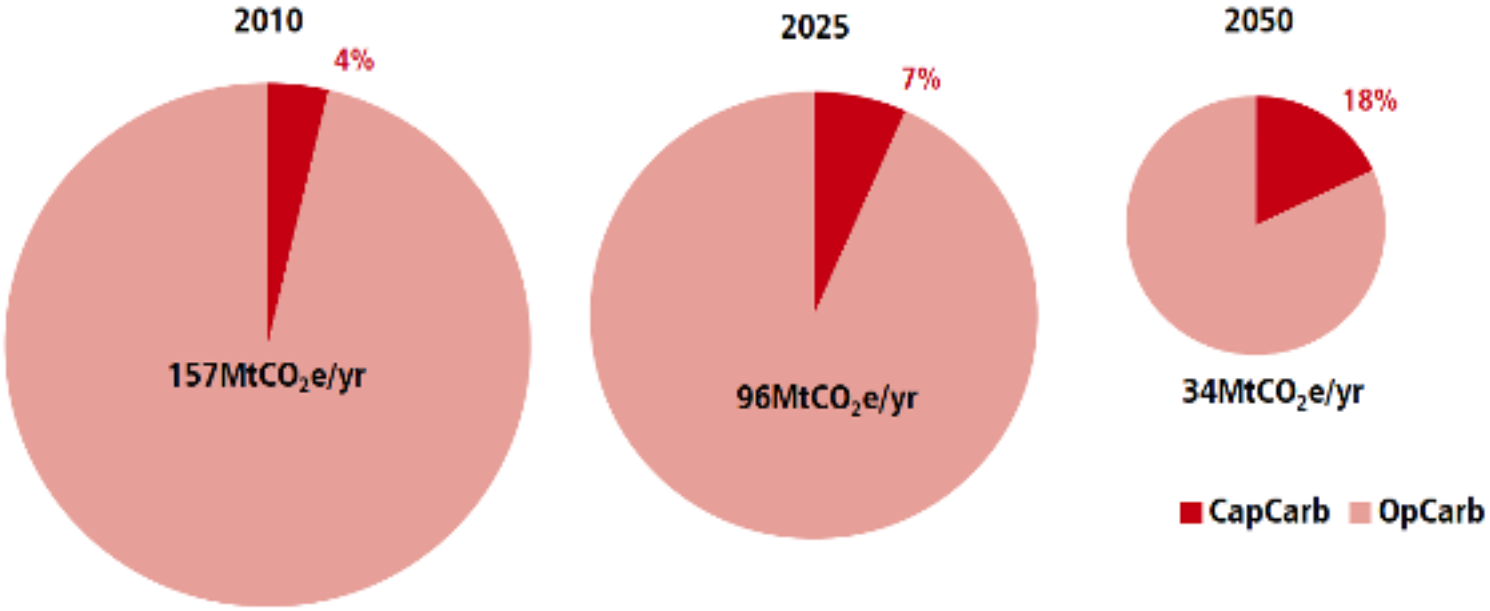
Measures construction and operational carbon footprint in designed assets

Key aspects

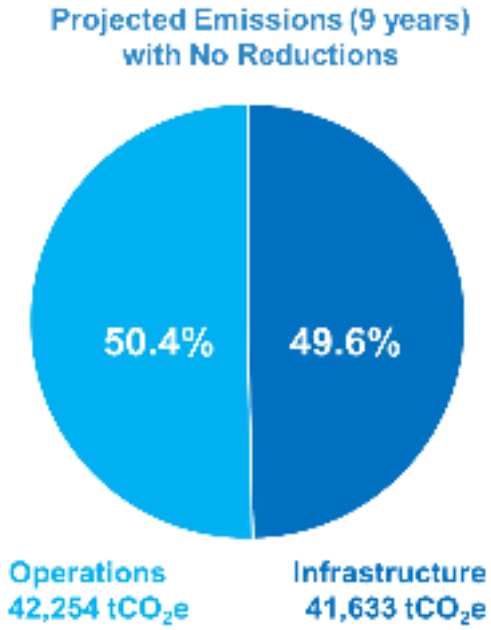
- NZ data
- Focuses on assets not materials
- Rapid calculations
- Simple to use
- BIM enabled
- PAS2080 framework



Increasing significance of capital carbon



Source: Green Construction Board (2010)

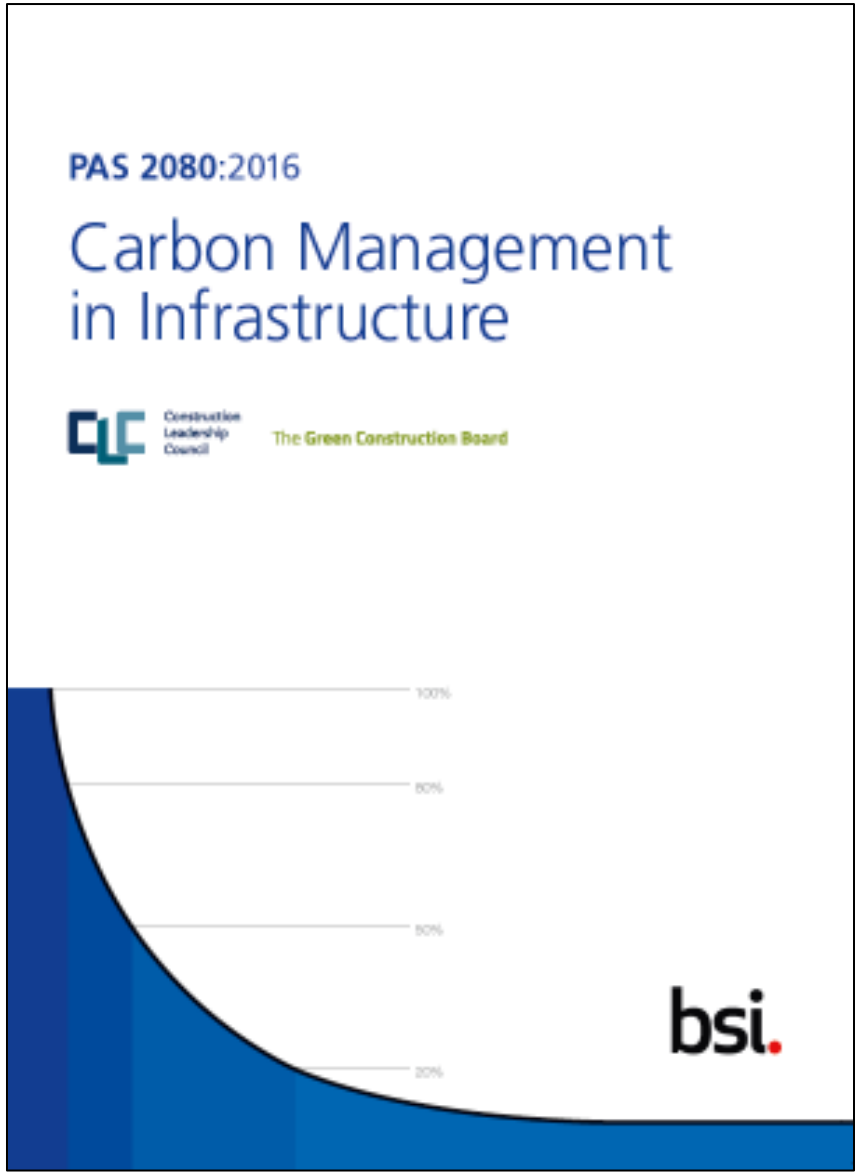


Source: Watercare (2020)

PAS 2080

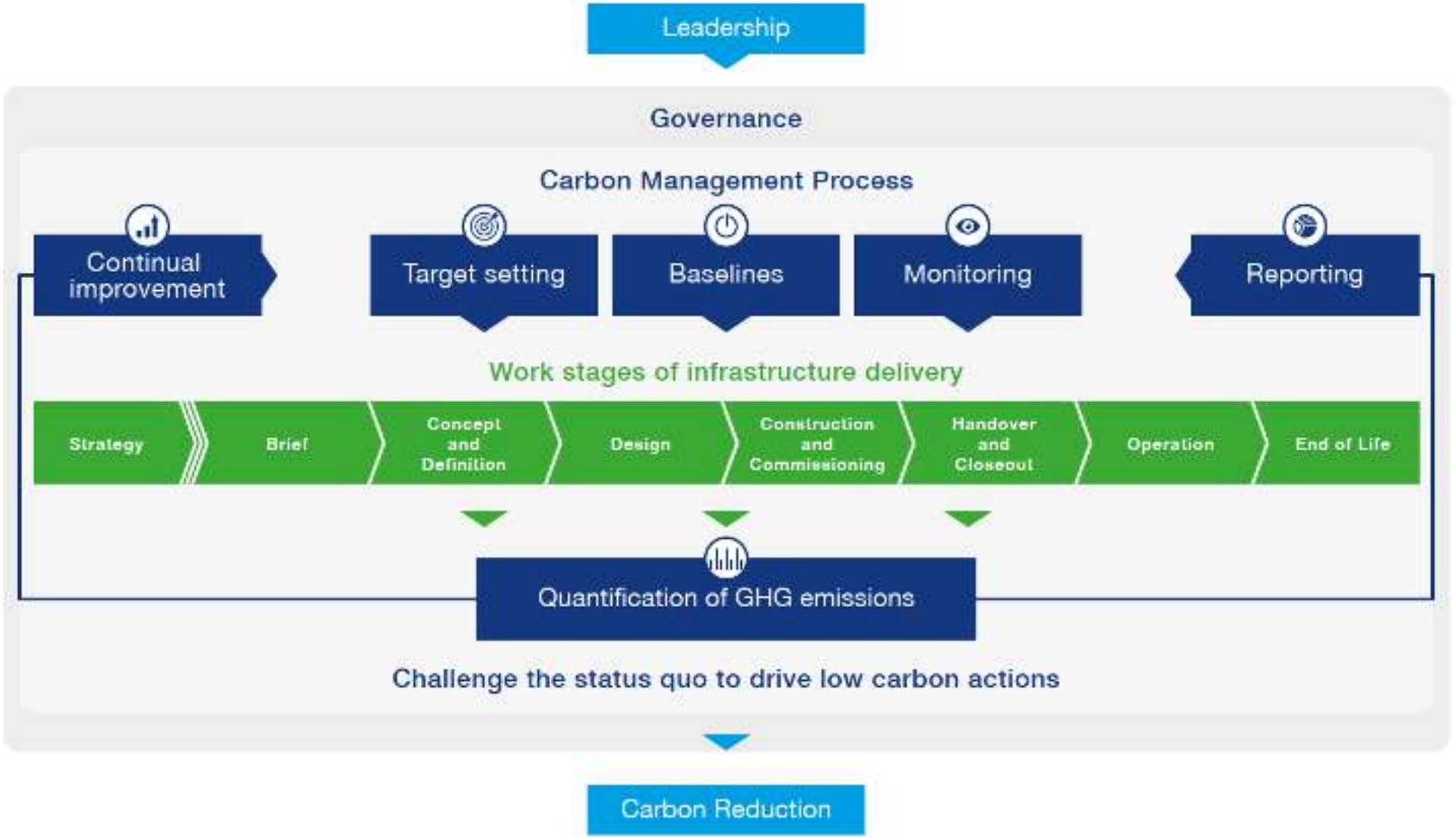
To deliver the benefits the whole value chain should be aligned and consistent in their approach.

PAS 2080 provides the framework for a carbon management process.

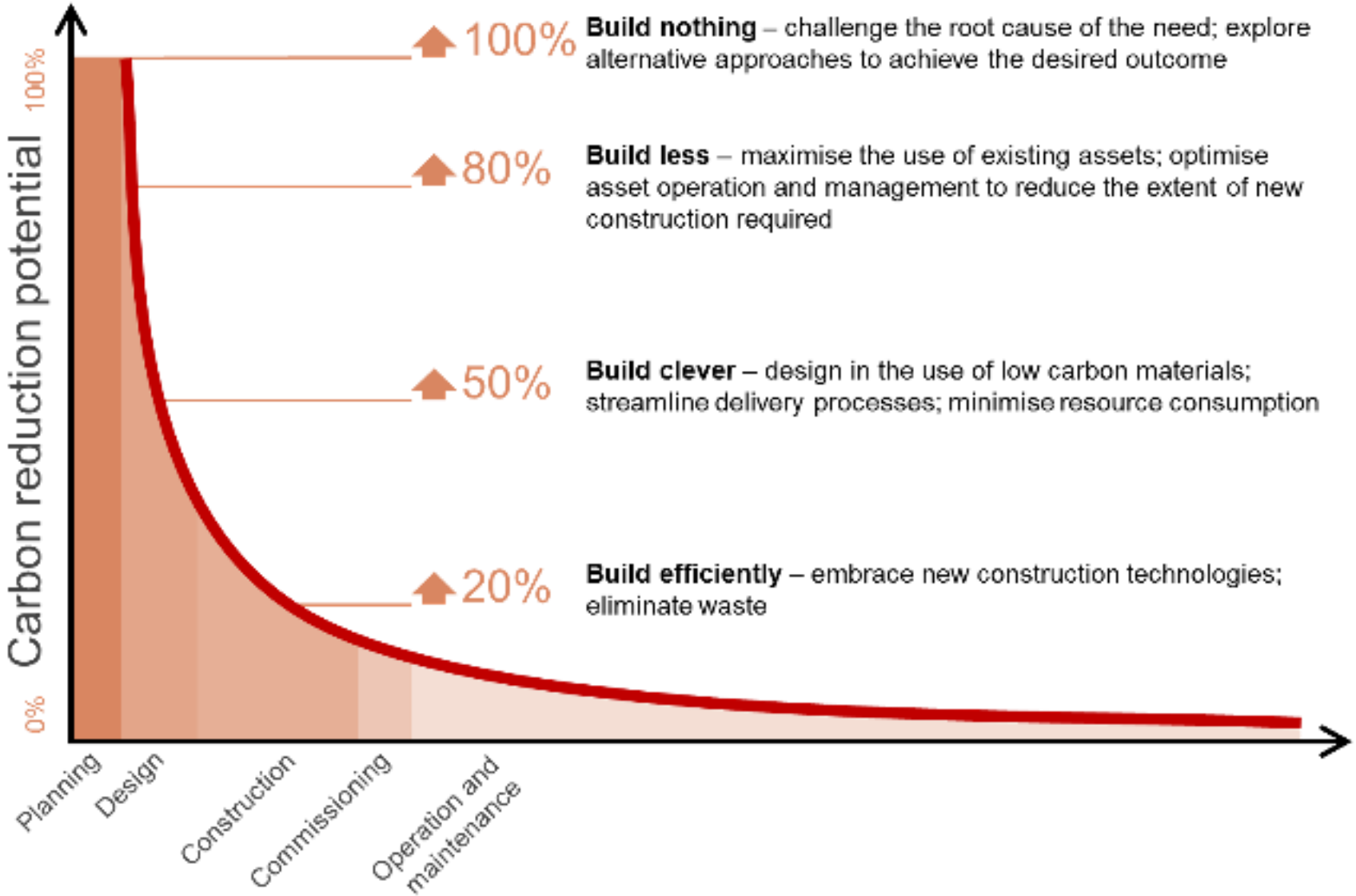


PAS 2080 (2016)
Guidance Document for PAS 2080 (2017)

PAS 2080 carbon management

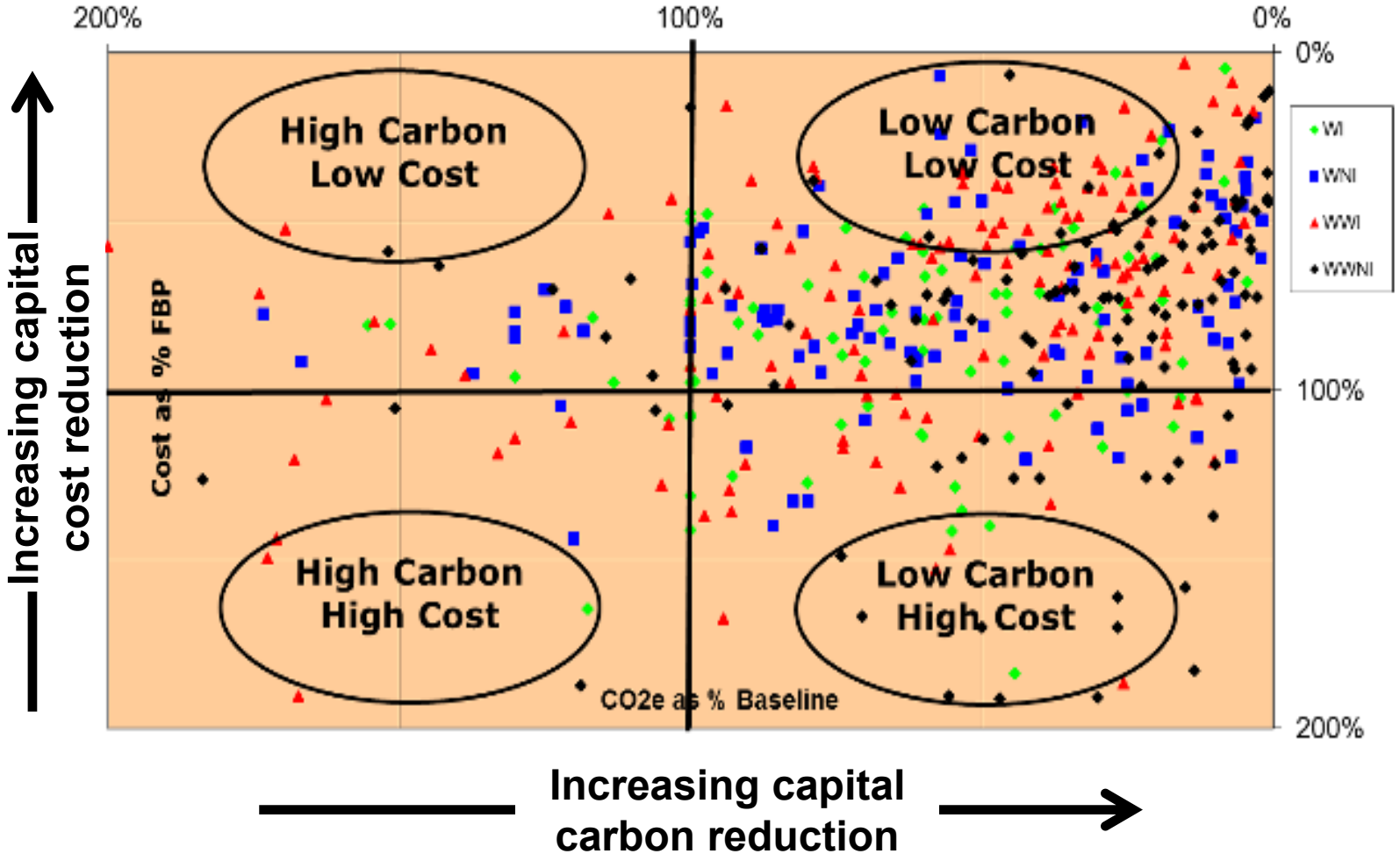


Capital carbon reduction heirarchy

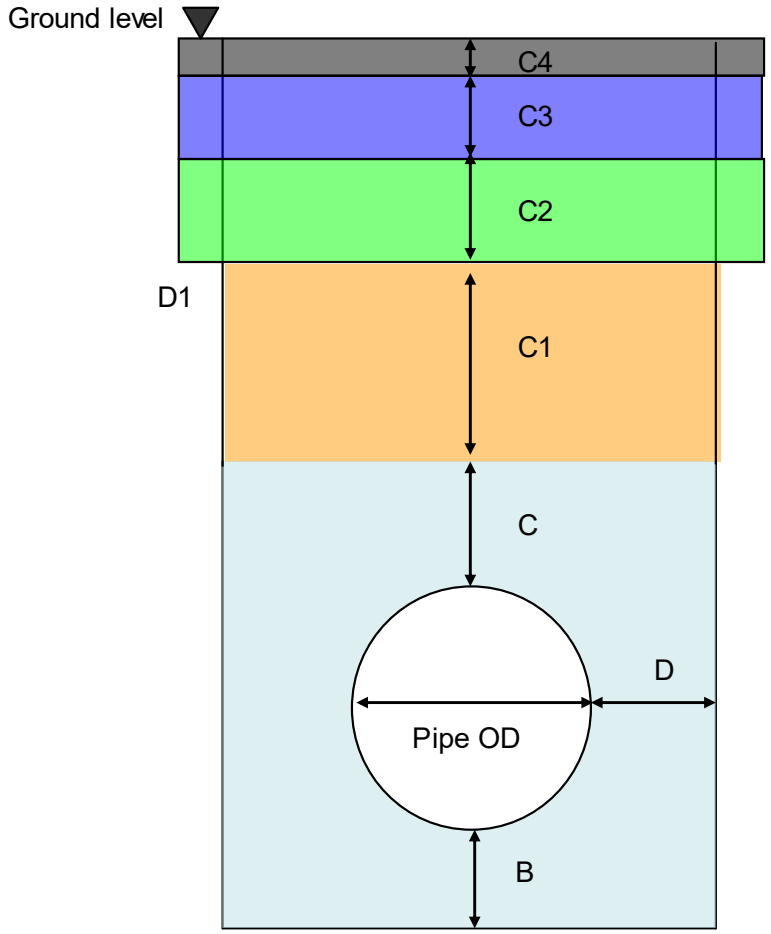


Reduce carbon, reduce cost

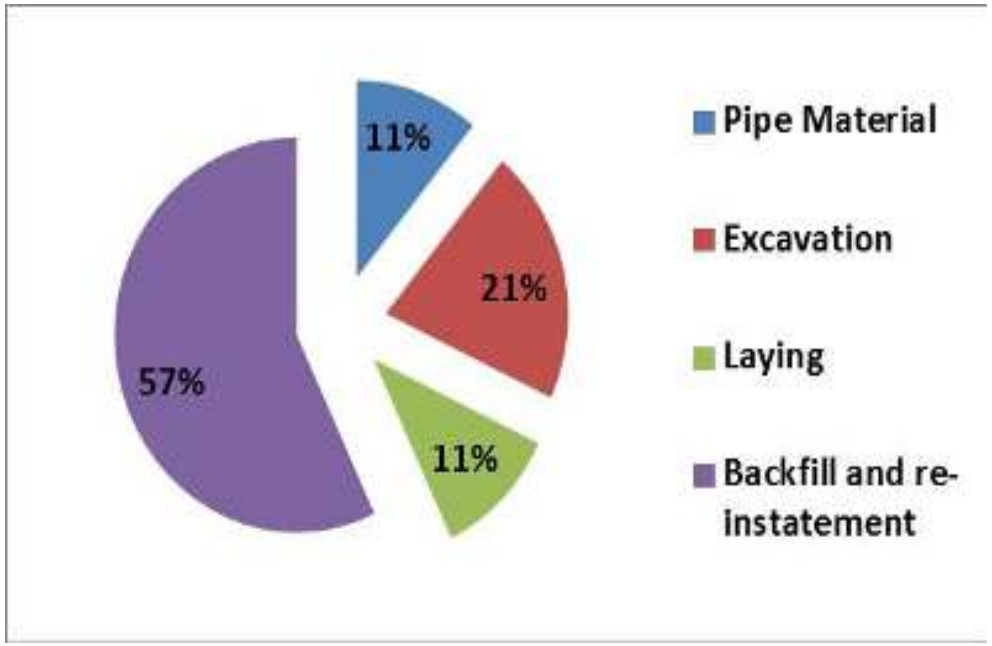
Anglian Water 2010– 2015 capital programme 22% capex reduction



Identifying hotspots – focussing on reductions

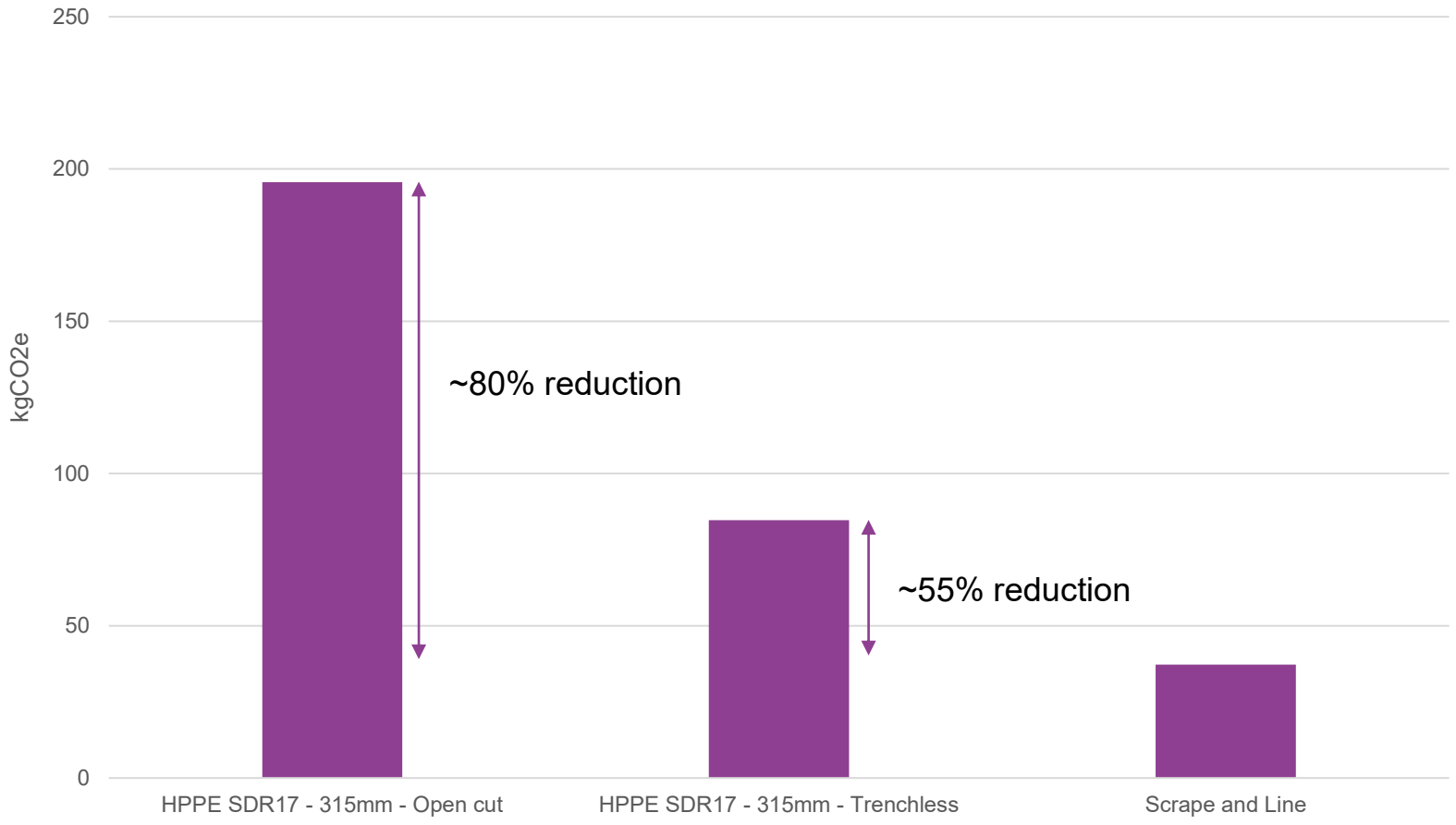


- Example HPPE SDR17 in road
- Pipe material only 11% of total CO_2e
- 89% for excavation, laying, backfill



Construction techniques on pipe laying

Capital carbon emissions comparison between Lining DI pipe,
HPPE open cut install, HPPE trenchless install @315mm diameter



- Scrape and line 80% lower embodied carbon per m laid compared to open cut HPPE installation.
- Scrape and line 55% lower capital carbon per m laid compared to trenchless HPPE installation.

Build clever, build efficiently

Low carbon thinking unlocks innovation

Precast concrete

28% cost saving
19% carbon saving
(50% with cement replacement)

Rounded bucket

Reduces excavation, backfill and compaction

Conventional in-situ reinforced concrete

Baseline scenario

Structural plastic with conventional bedding

34% cost saving
39% carbon saving

Structural plastic in curved trench

38% cost saving
50% carbon saving

Build less, build clever

UK: Covenham to Boston water transfer pipeline

£40m
(approx. $80m NZD)

60km - 600mm
pipework

25%
Cost saving

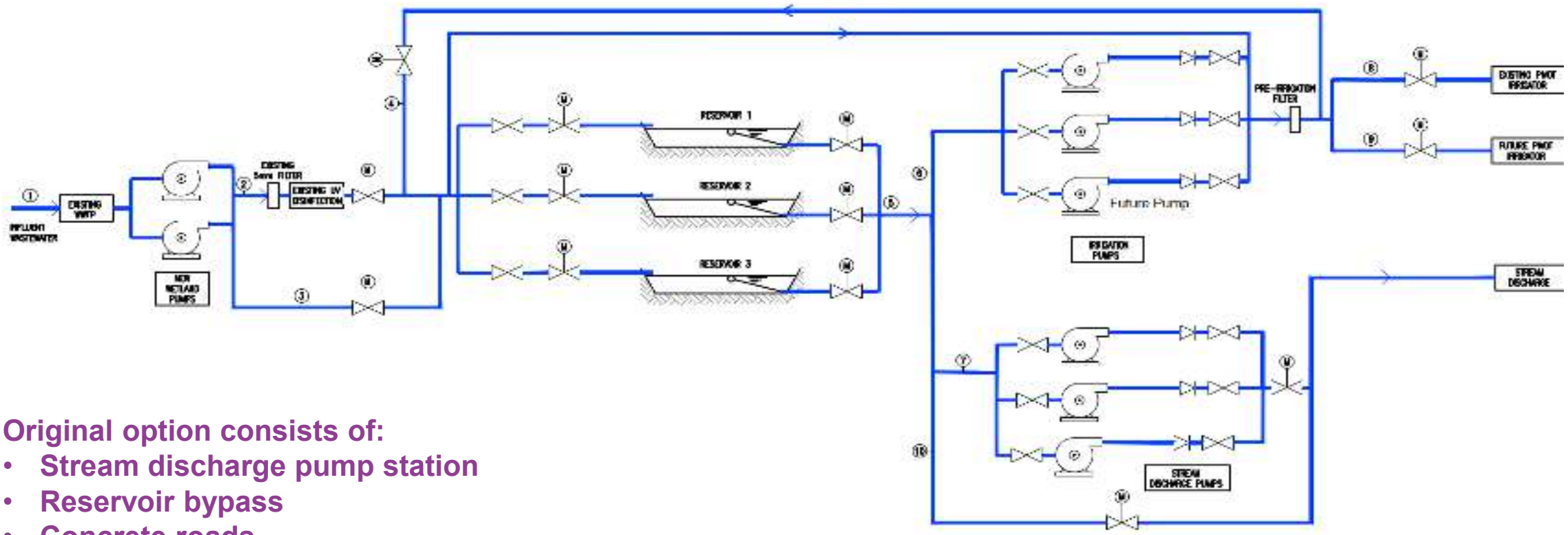
57%
Capital carbon saving

40km - 500mm
20km - 400mm
pipework

Client: Anglian Water, UK
Delivered by: @one Alliance (including Mott MacDonald)

New Zealand example – Carterton WWTP

Original option – pumped irrigation and to stream

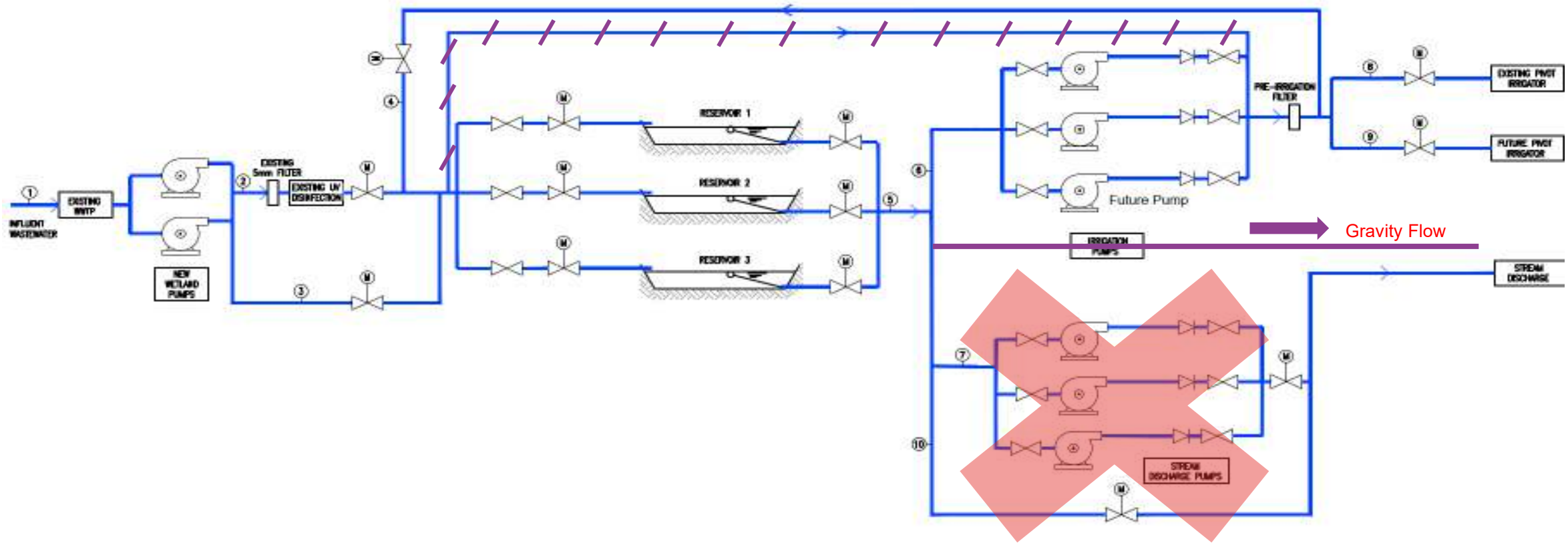


Original option consists of:

- **Stream discharge pump station**
- **Reservoir bypass**
- **Concrete roads**

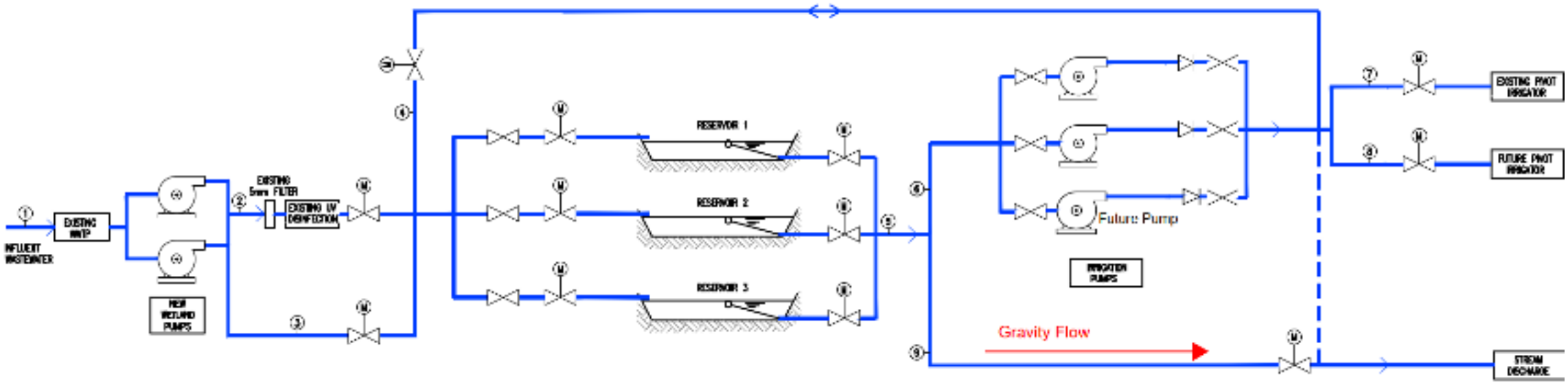
New Zealand example – Carterton WWTP

Carbon challenge



New Zealand example – Carterton WWTP

Revised lower carbon solution – build less!



Revised option consists of:

- **Gravity flow to the stream**
- **Reservoir bypass removed**
- **Gravel roads**

New Zealand example – Carterton WWTP

Carbon comparison

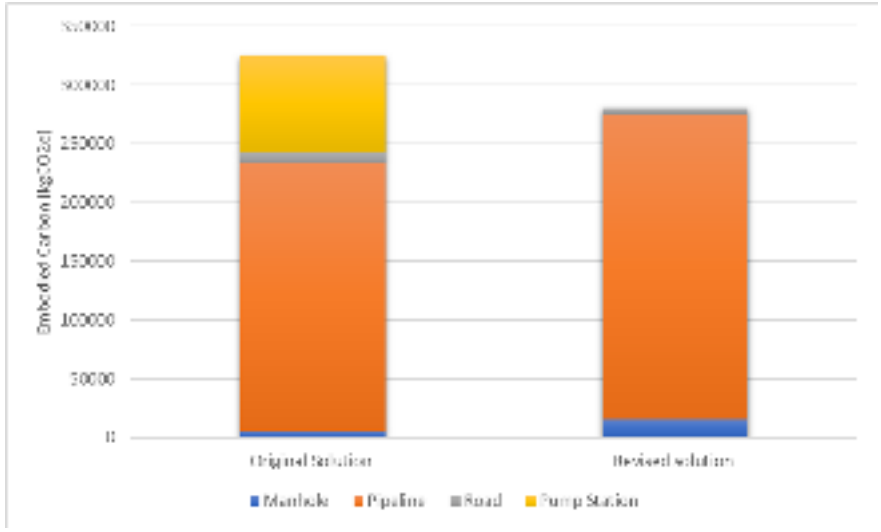
ASSET	ORIGINAL OPTION	tCO_2e	REVISED OPTION	tCO_2e
Pipeline	425m 315 OD rising main (1m deep) 800m 560 OD rising main (1.2m deep)	228	800m 630 OD Gravity open cut (2.5 deep)	259
Manholes	2x1800mm	6	4x1800mm	16
Pump Station	225kW Total installed power	82	No pump station	0
Roads	Concrete	10	Gravel	5
Total		**325**		**280**

This carbon assessment is a like for like comparison and only the components being changed have been included.

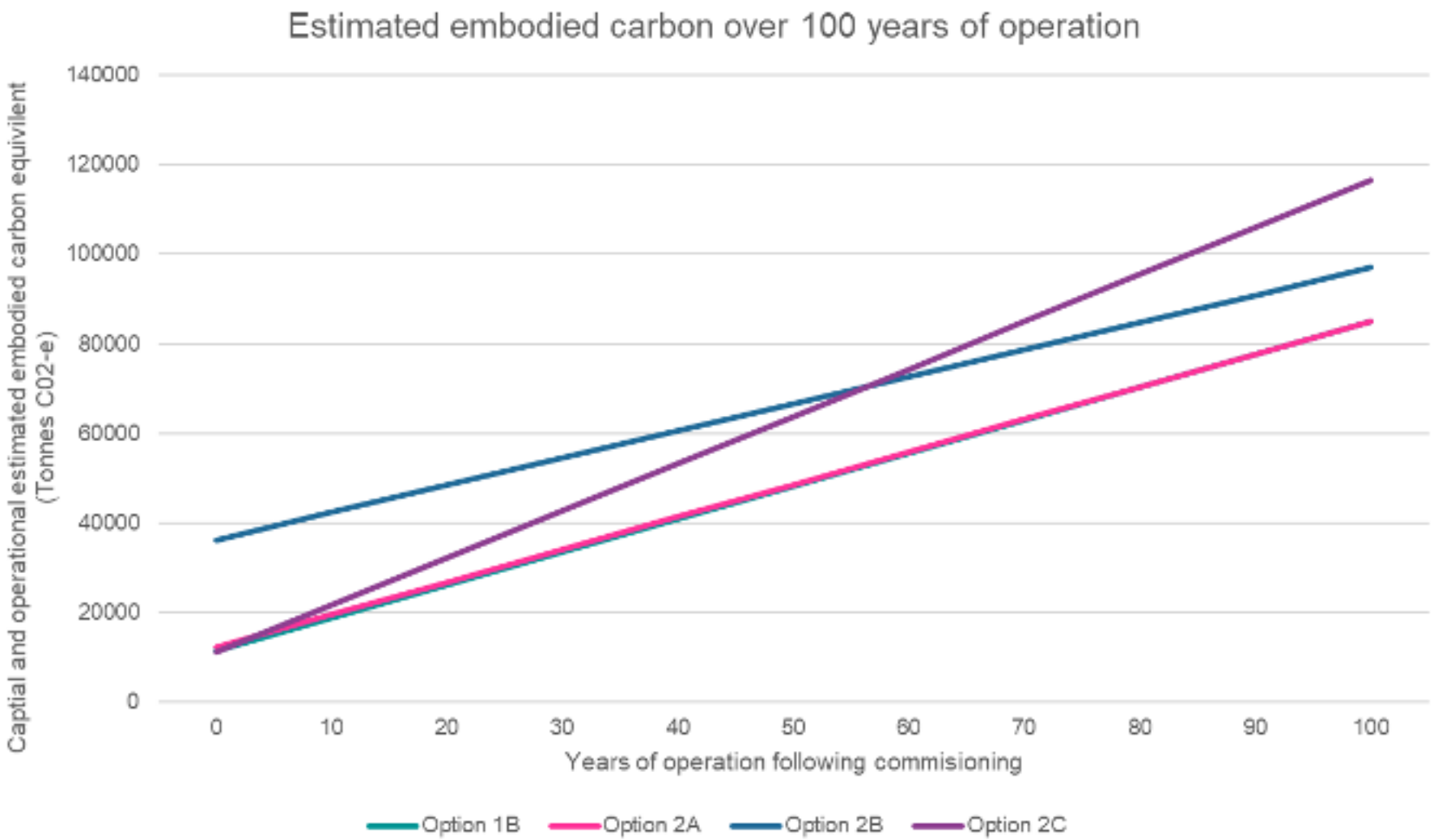
45 tCO_2e Savings!

This carbon assessment only takes into account the capital (embodied) carbon.

Additional savings would be made in terms of operational carbon due to the removal of the discharge pump station.



Whole life carbon



Takeaway challenges

1. Recognise untapped opportunities in Capital Carbon
2. Focus on reductions early
3. Bring supply chain on the journey
4. Carbon-cost relationship
5. Collaborate and share low carbon ideas

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Thank you

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