Climate Change and the carbon tax





Dr Bill Barber

6^{th} December 2012

Victorian Biosolids Workshop
- Linking Industry and Research

RMIT UNIVERSITY

Australian & New Zealand Biosolids Partnership

WQRA water quality research australia

VICTORIAN WATER INDUSTRY ASSOCIATION INC.
"Innovation, Co-operation and Sustainability"

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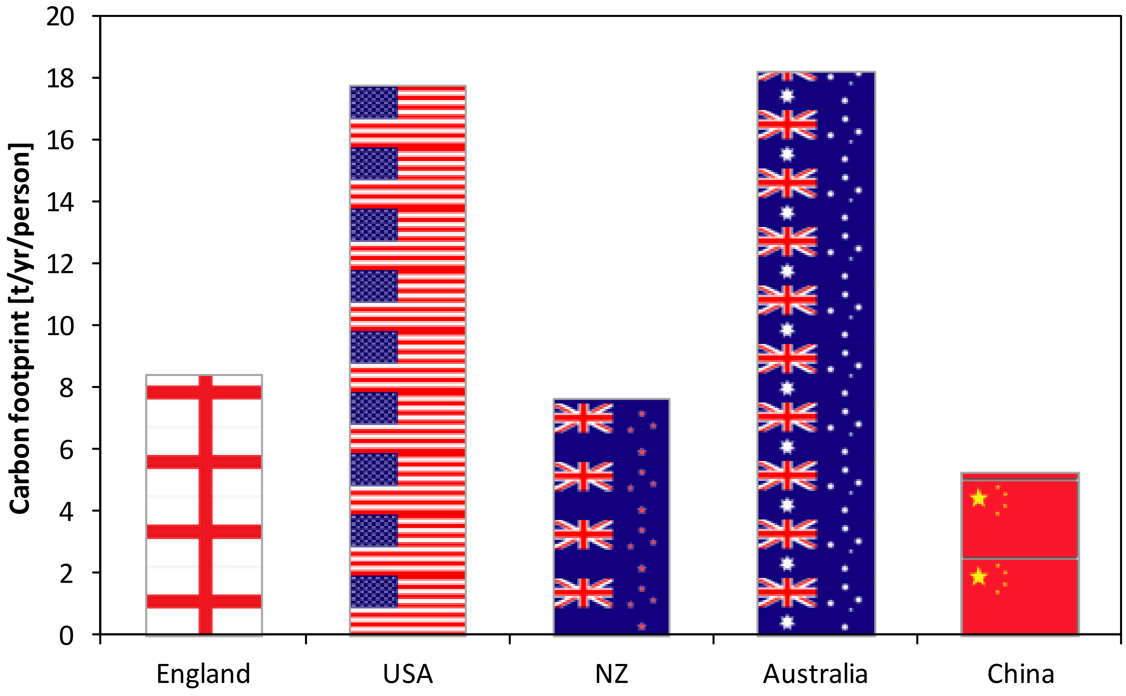
Carbon footprint of selected nations (normalised to population)



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The Carbon Pricing Mechanism in Australia

- Australian government reduction target of 5% of 2000 levels by 2020
  - 357 million t/CO_2 e year
- Currently being measured and reported
- Carbon pricing mechanism came into force 1 July 2012
  - Will cover 500 worst polluters (approx 60% of the emissions)
  - Entities with carbon footprints of 25,000 t CO_2-e/yr will be taxed
  - This will include all large water companies
  - $ 23 AUD/t carbon dioxide
    - Rising 2.5% per year
- Will become trade scheme 1 July 2015

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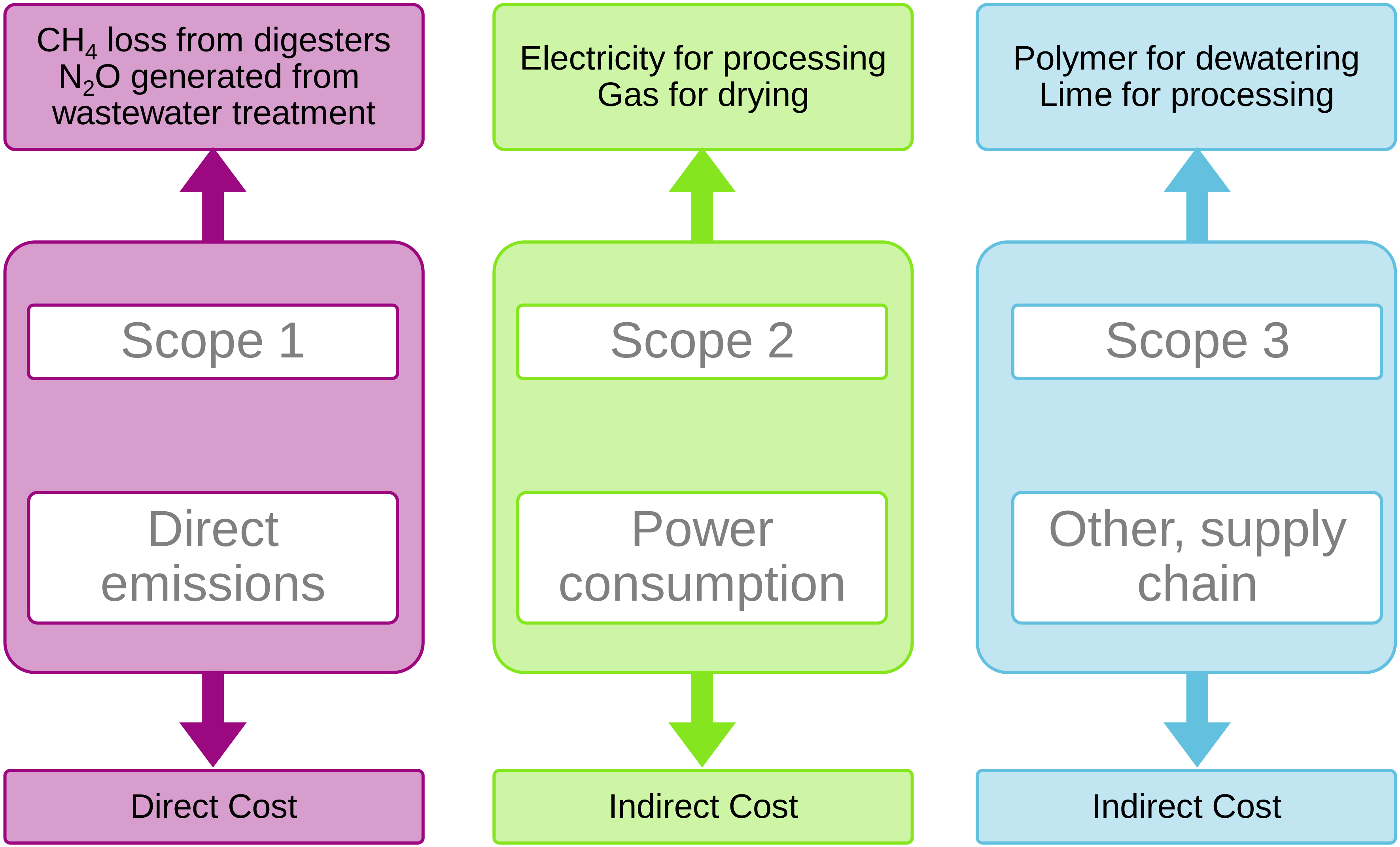
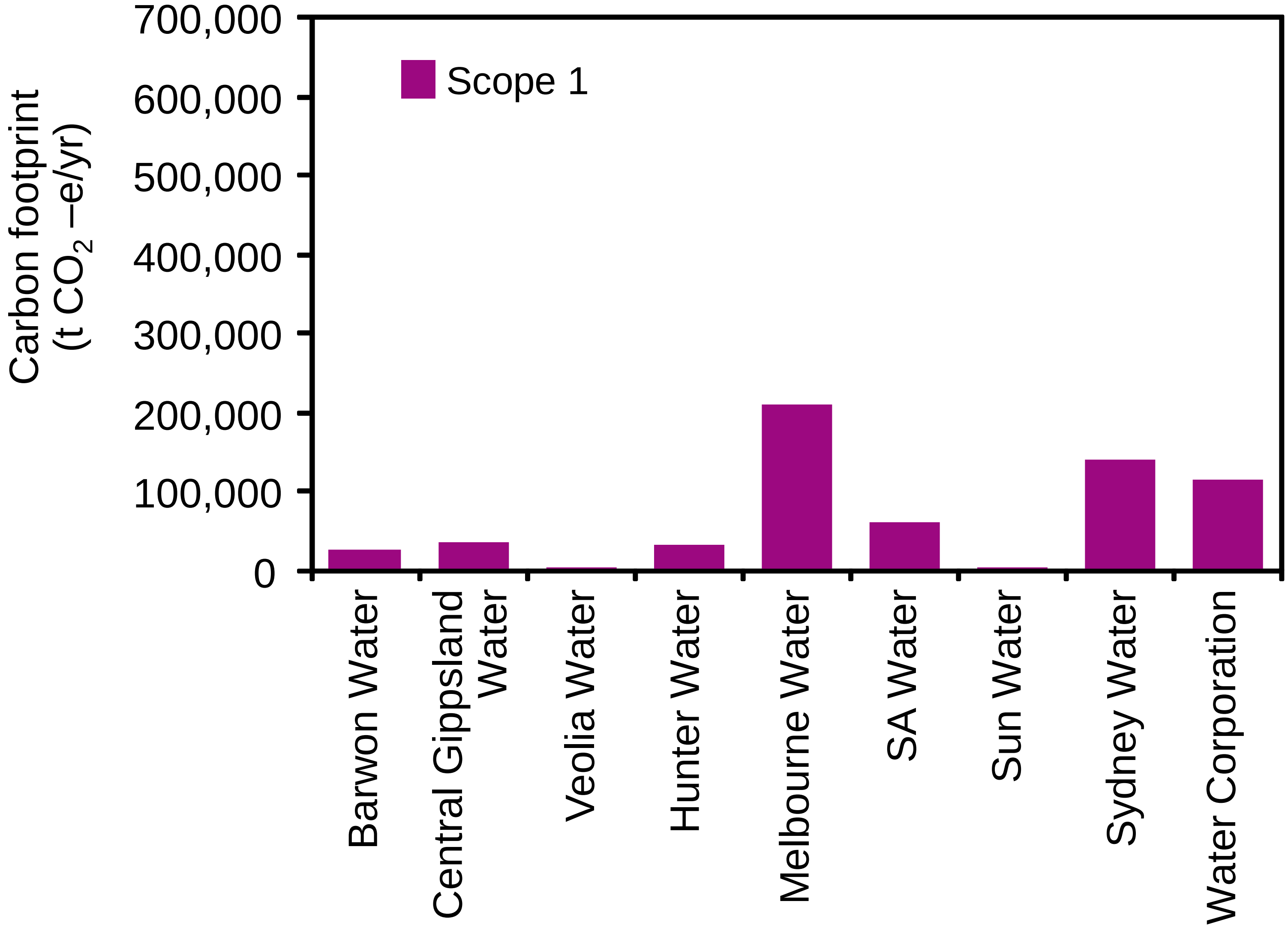
Carbon footprint

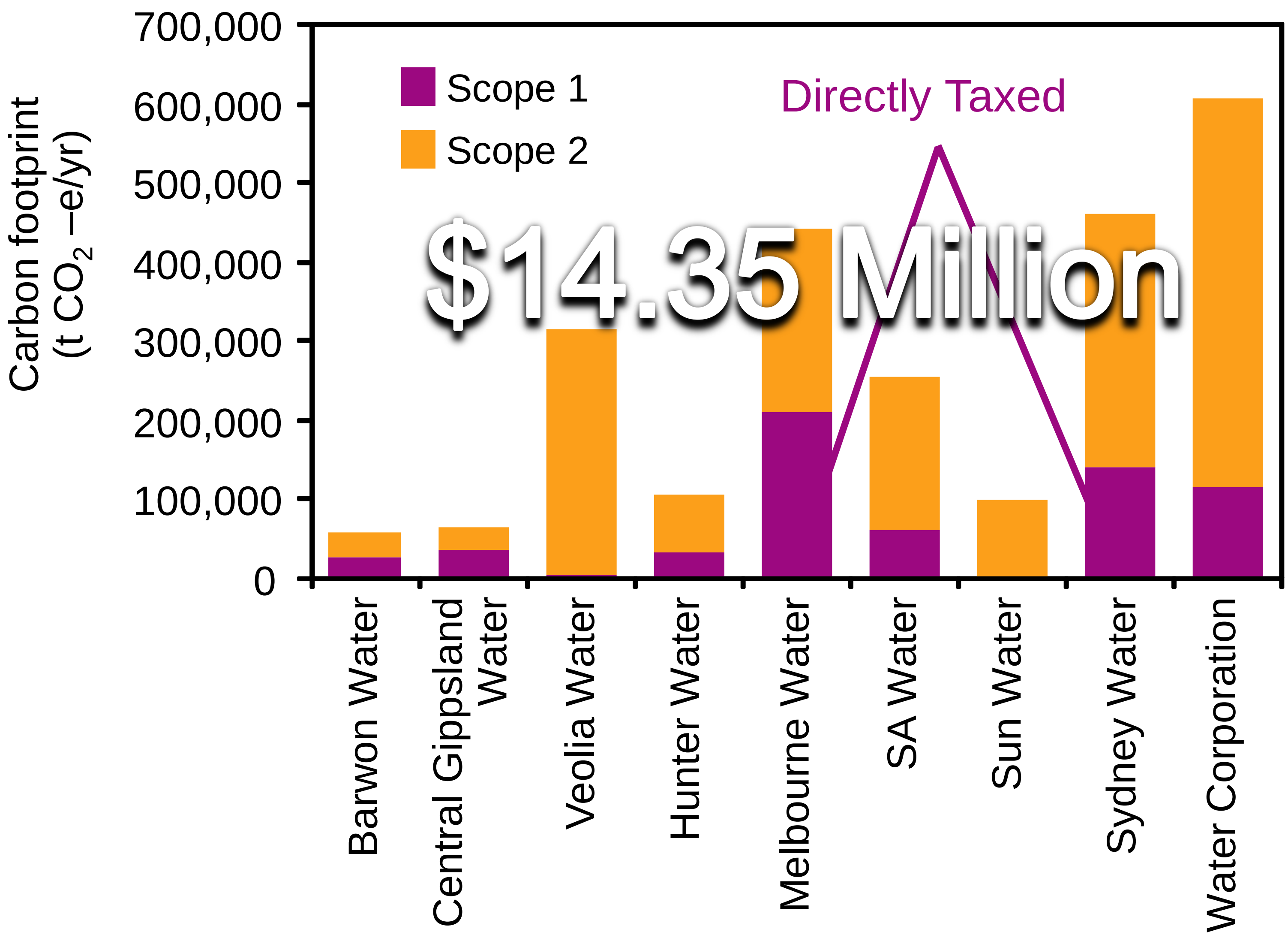


Carbon Footprint of Australian Water Industry



Data plot using Australian Government NGER 2010/11 data

Carbon Footprint of Australian Water Industry



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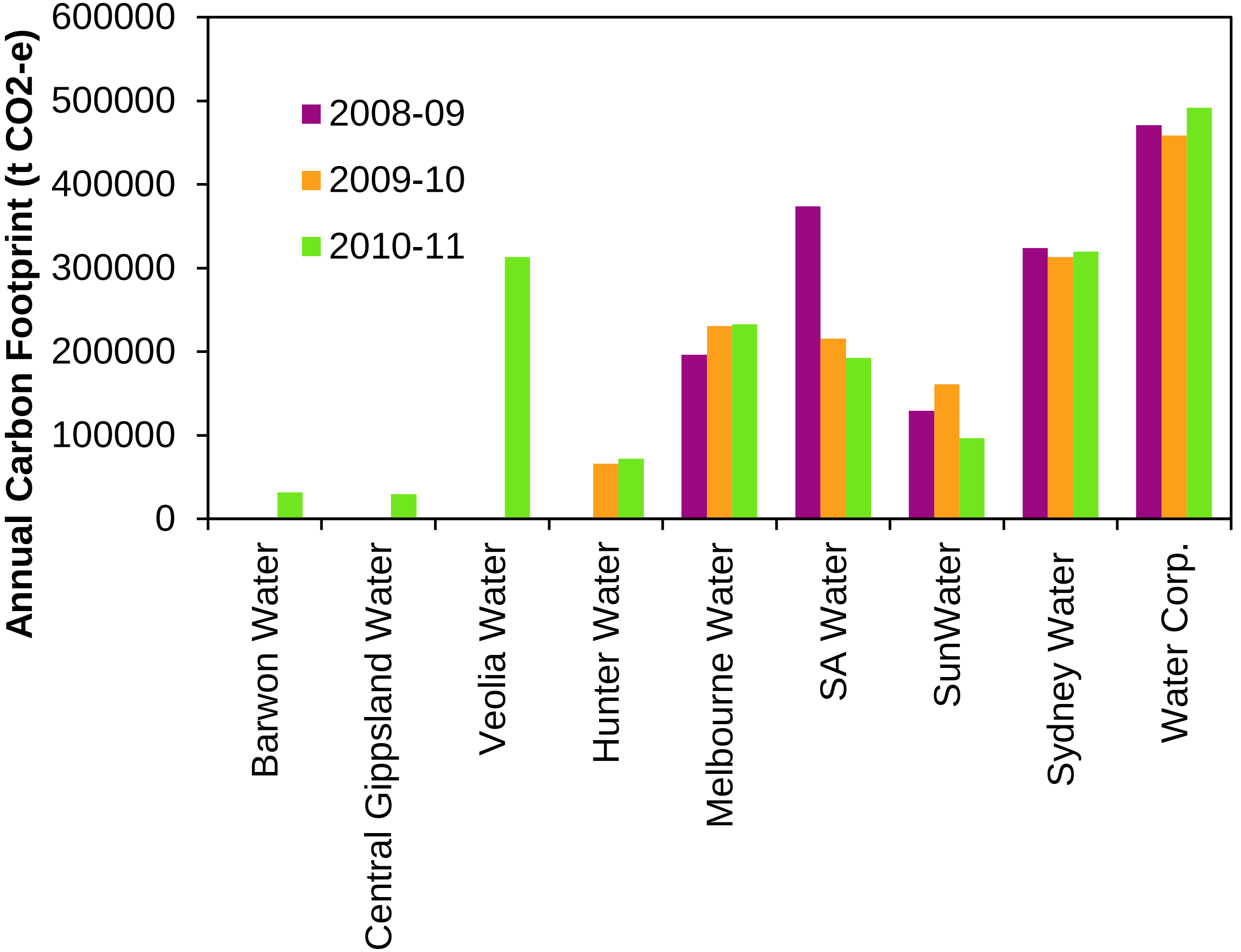
Data plot using Australian Government NGER 2010/11 data

Water Company Carbon Footprints



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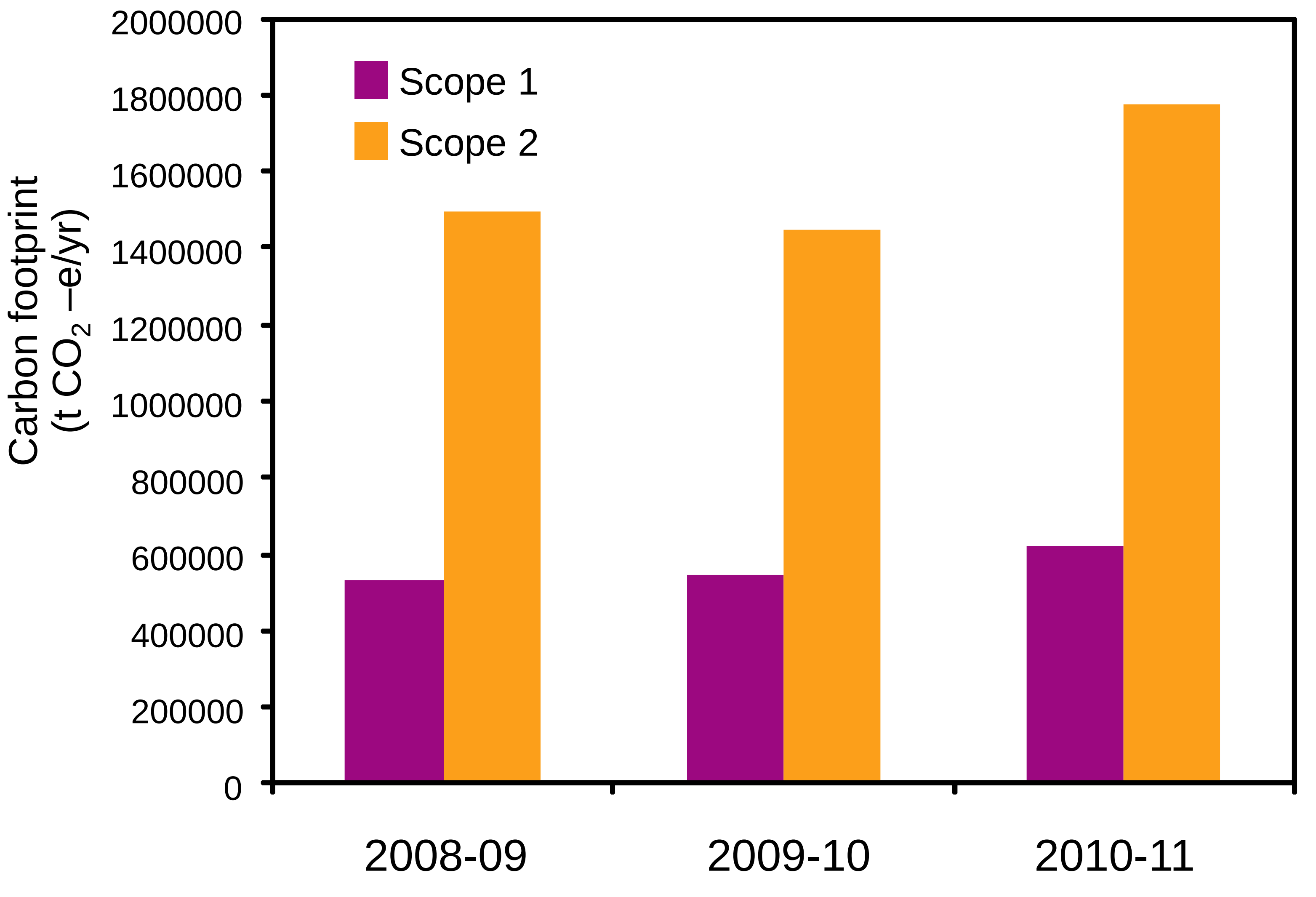
Carbon Footprint of Australian Water Industry



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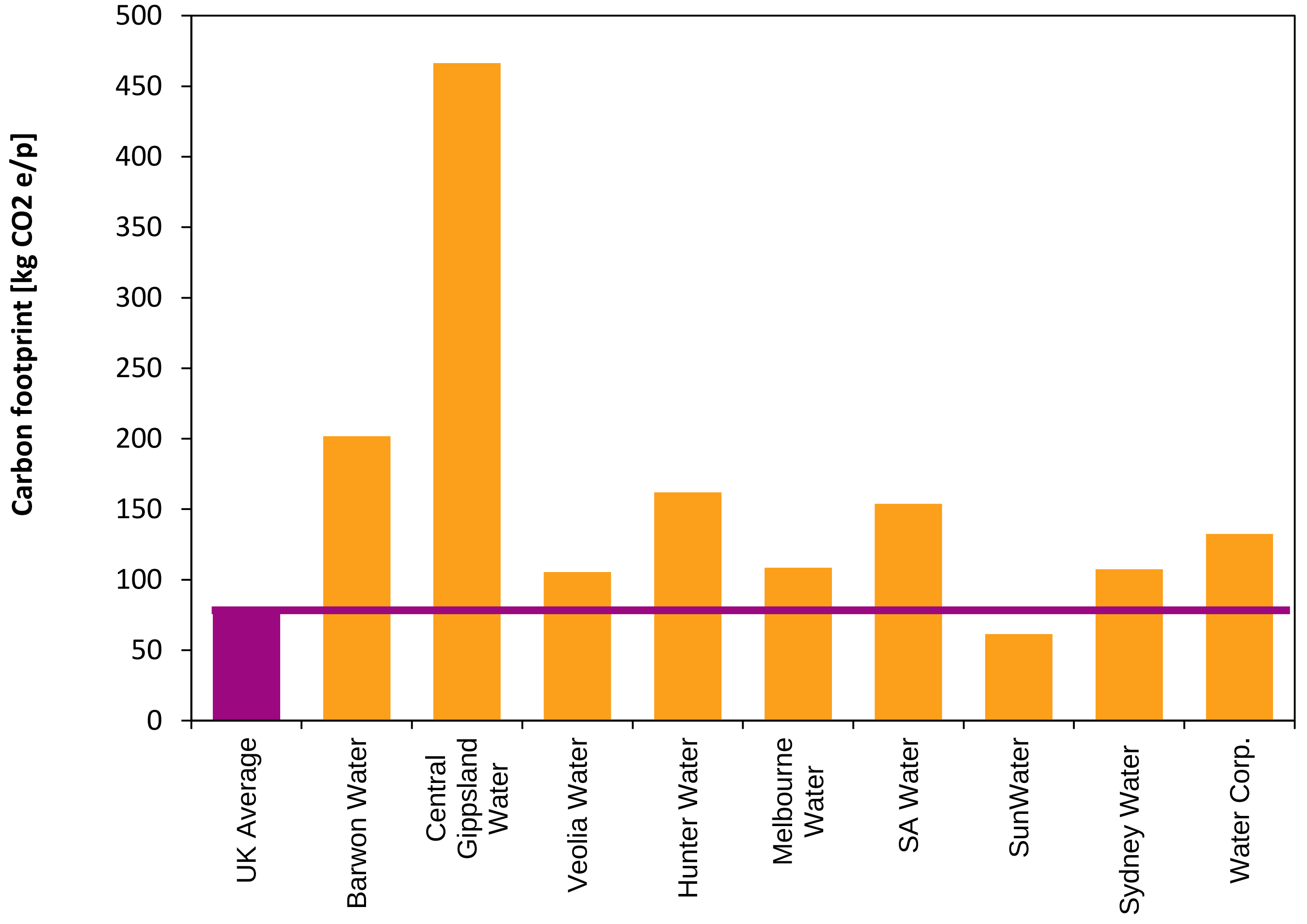
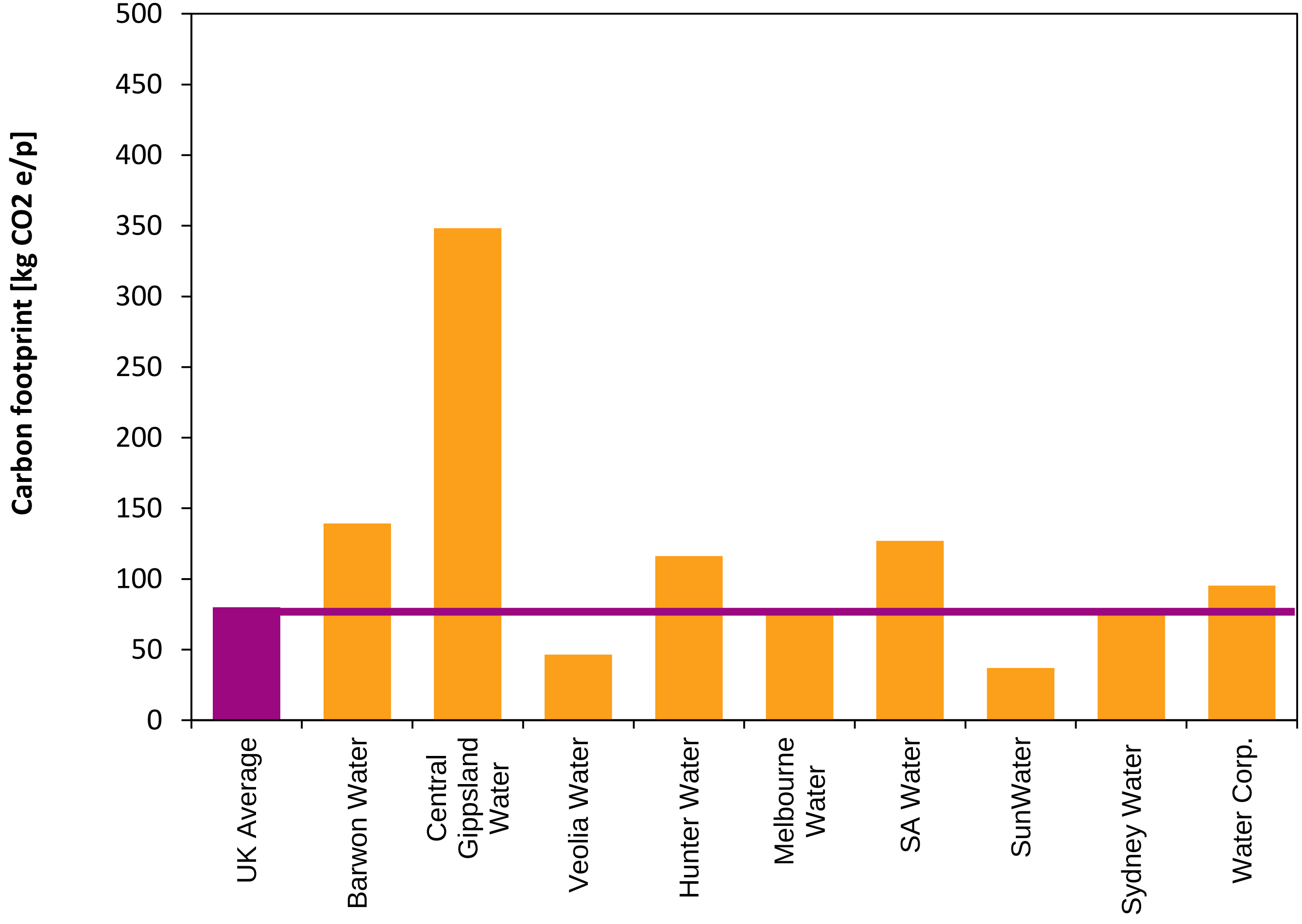
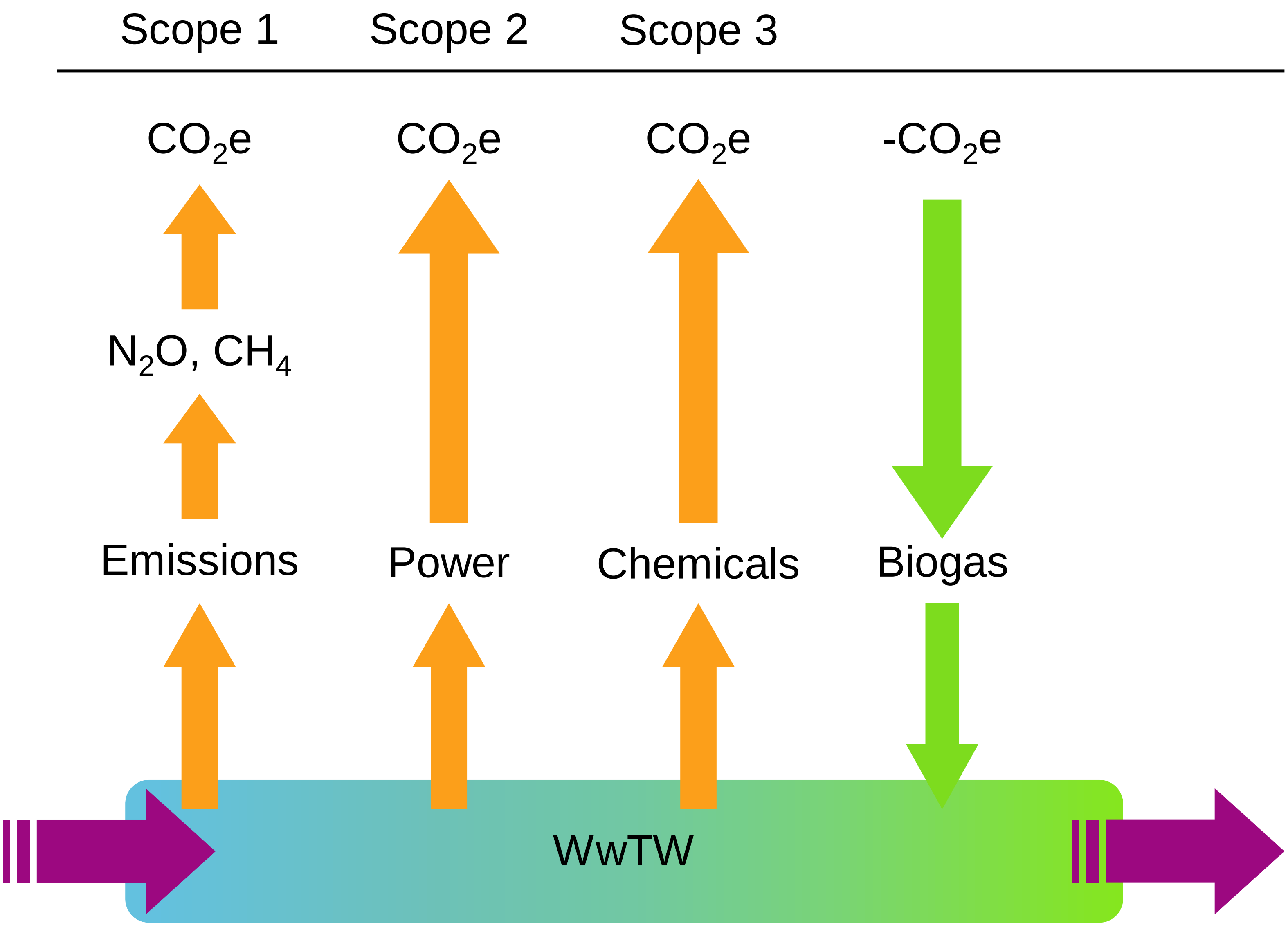
Carbon Footprint of Australian Water Industry



Normalised (to UK) Carbon Footprint of Australian Water Industry



Influence of Biosolids on Carbon Footprint



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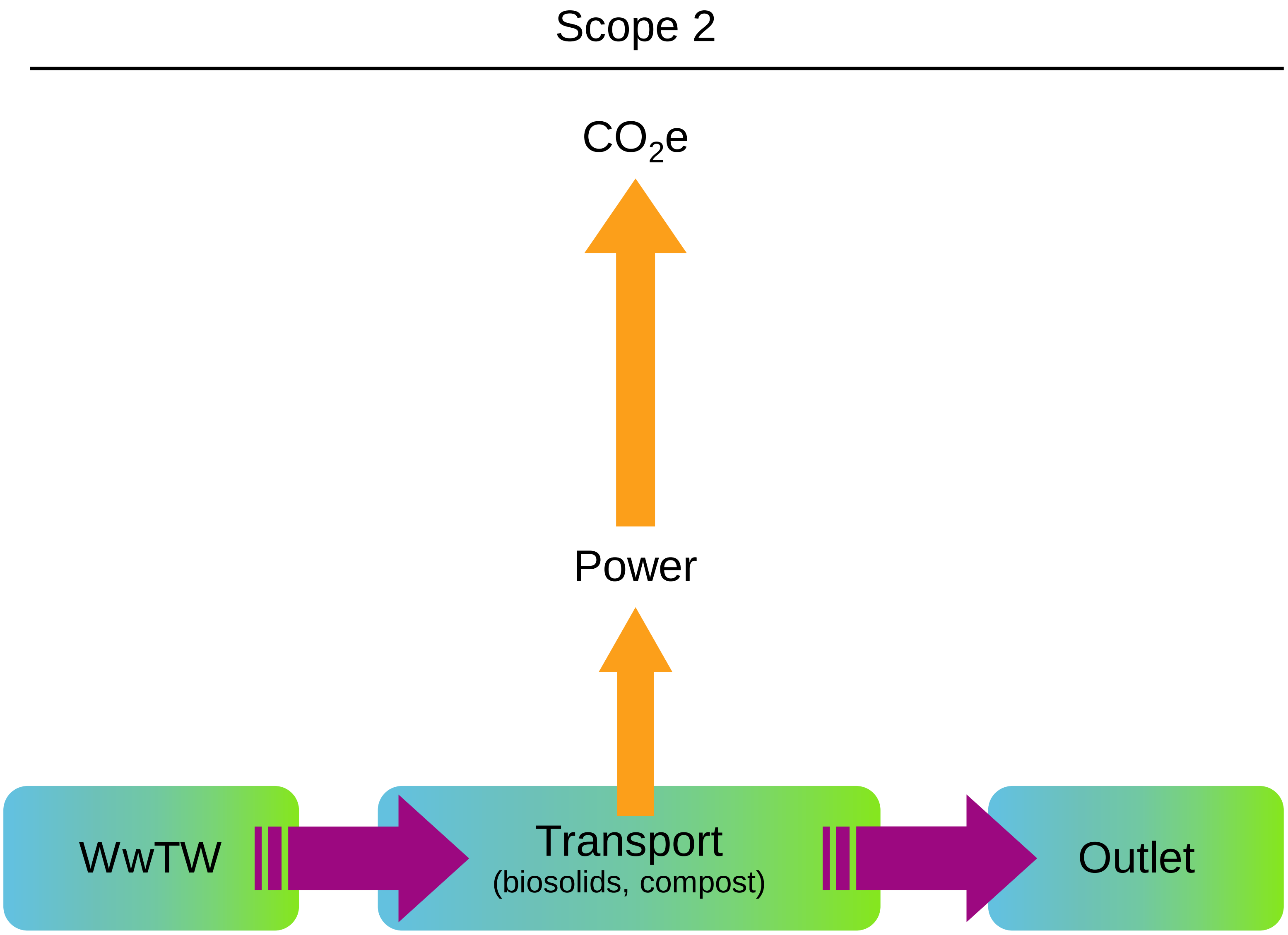

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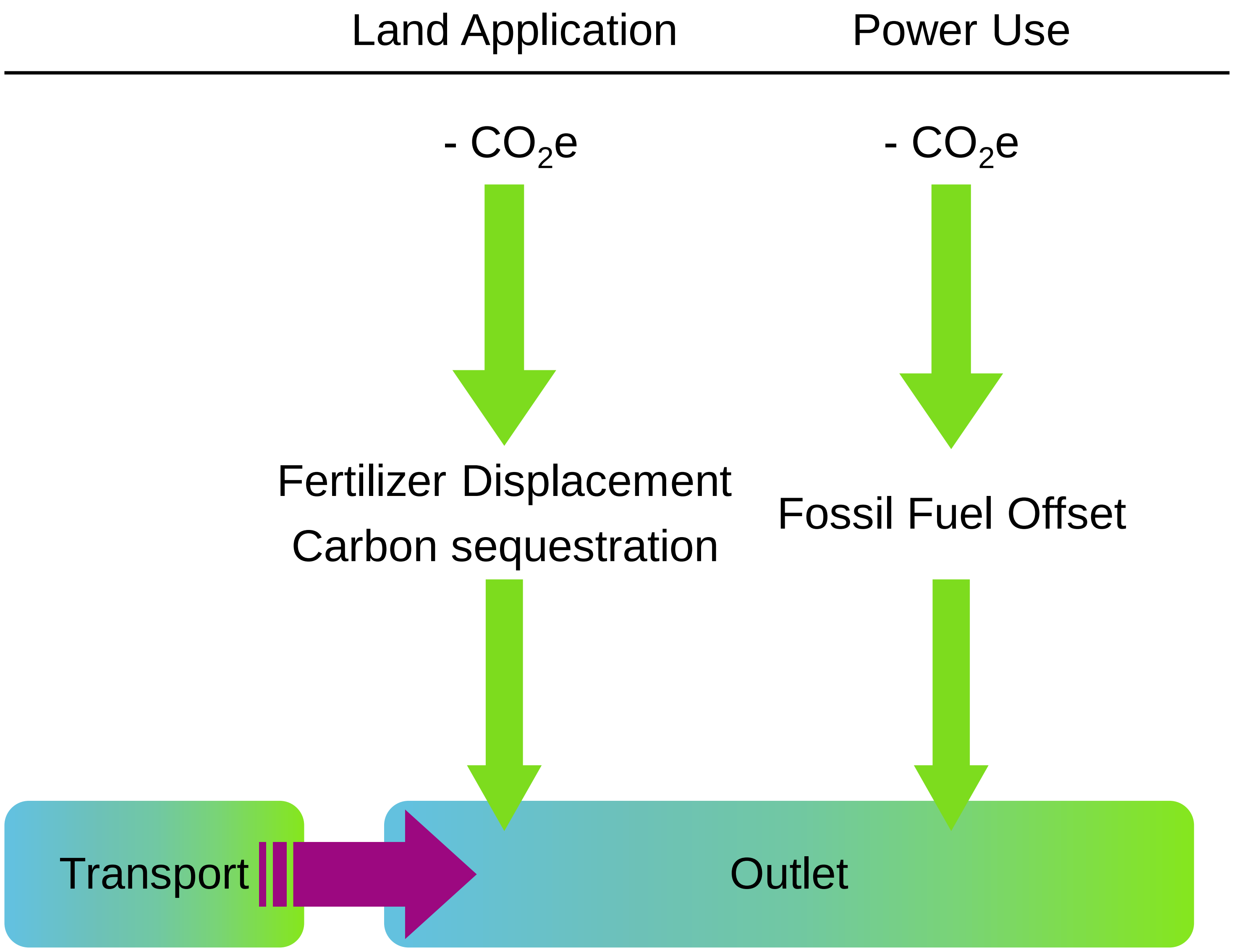
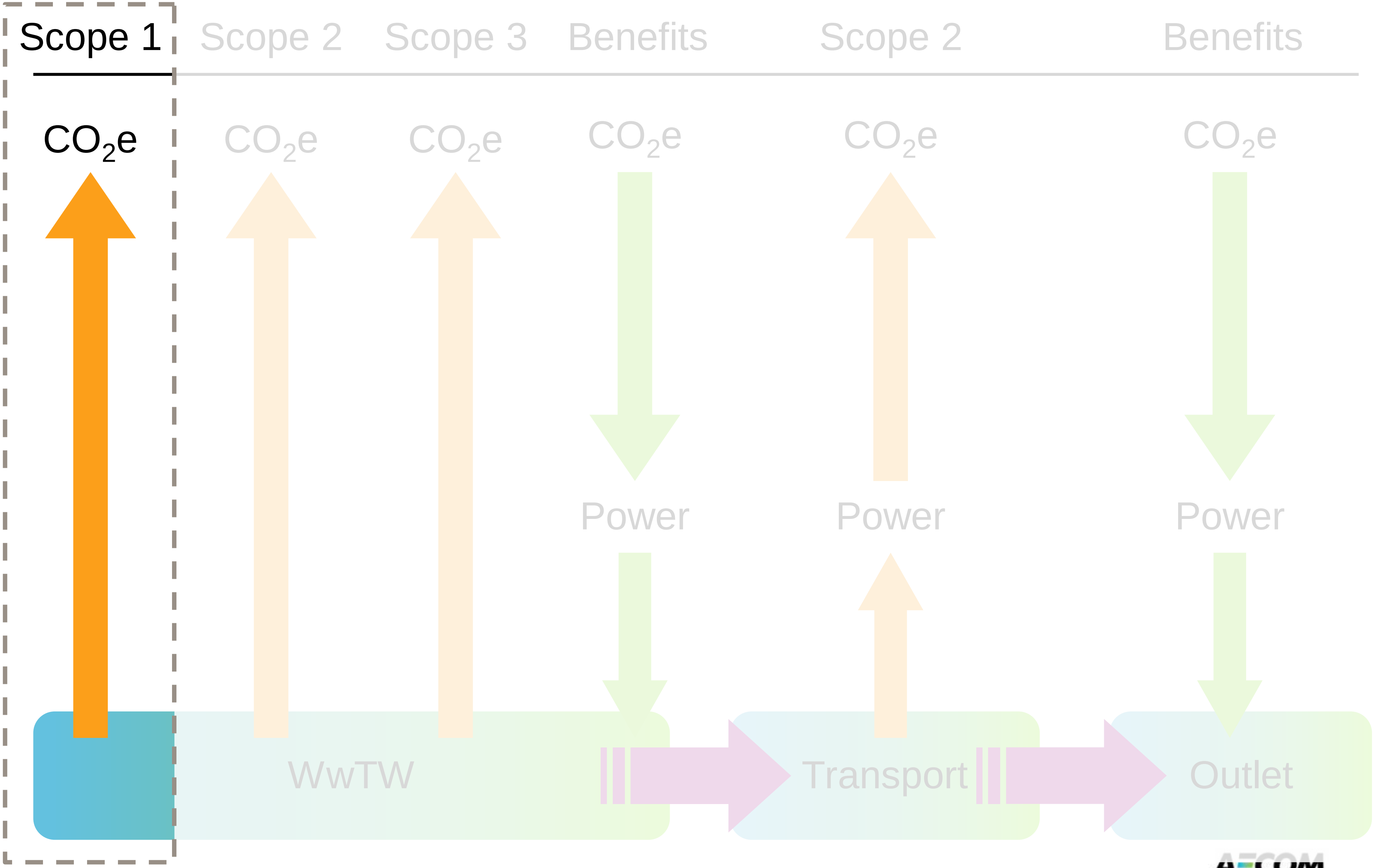
Influence of Biosolids on Carbon Footprint



What is counted under current methodology



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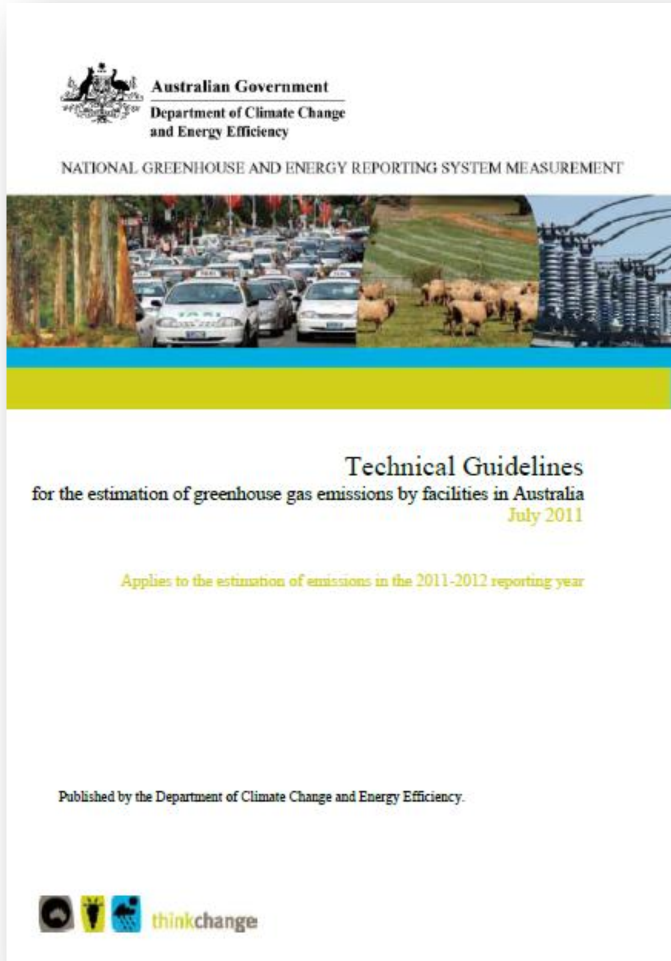
Methodology Description


Australian Government
Department of Climate Change and Energy Efficiency

NATIONAL GREENHOUSE AND ENERGY REPORTING SYSTEM MEASUREMENT

Technical Guidelines
for the estimation of greenhouse gas emissions by facilities in Australia
July 2011

Applies to the estimation of emissions in the 2011-2012 reporting year

Published by the Department of Climate Change and Energy Efficiency.

thinkchange

Scope 1 – Methane Emissions

$$E_j = [CH_4^* \; - \; \gamma\,(Q_{cap} + Q_{flared} + Q_{tr})]$$

Theory

Measured

Methane Captured

Methane Flared

Methane Transferred

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Scope 1 – Methane Emissions – Theory

$$CH_{4gen} = [(COD_w - COD_{sl} - COD_{eff}) \times MCF_{ww} \times EF_{wij}]$$

COD Balance × Correction Factor × Emission Factor

$$+ [(COD_{sl} - COD_{trl} - COD_{tro}) \times MCF_{sl} \times EF_{slij}]$$

COD Balance × Correction Factor × Emission Factor

For Wastewater

For Sludge

Where $EF_{wij} = EF_{slij}$ = default methane emission factor for wastewater (wij) *or* sludge (slij) = **5.3** CO_2-e tonnes per tonne COD

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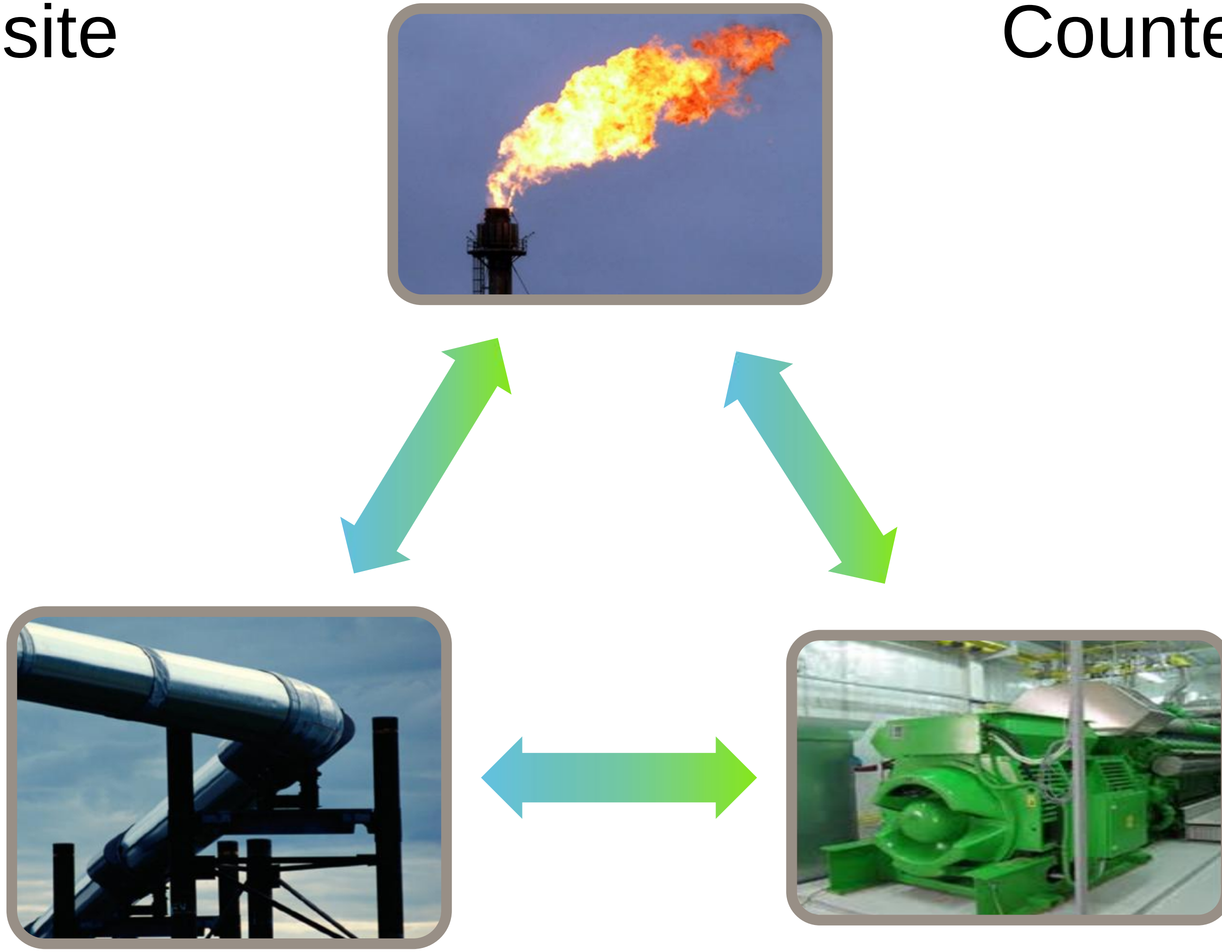
Scope 1 – Direct emissions. Biogas under the current methodology

On-site

Counted



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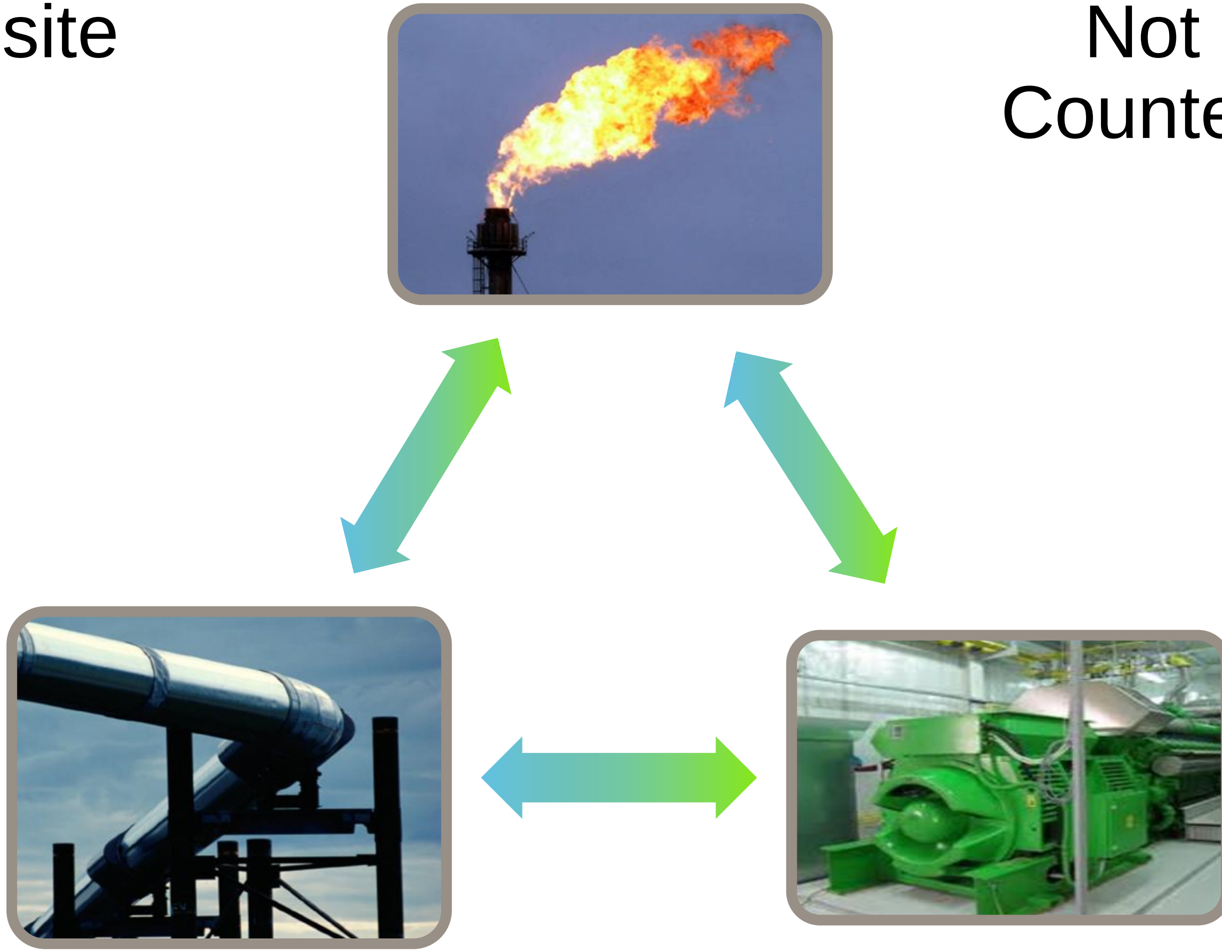
Scope 1 – Direct emissions. Biogas under the current methodology

Off-site

Not Counted



Scope 1 – Emission Factor (EF_{wij} and EF_{slij})

$$C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O$$

0.746 m^3 /kg COD destroyed

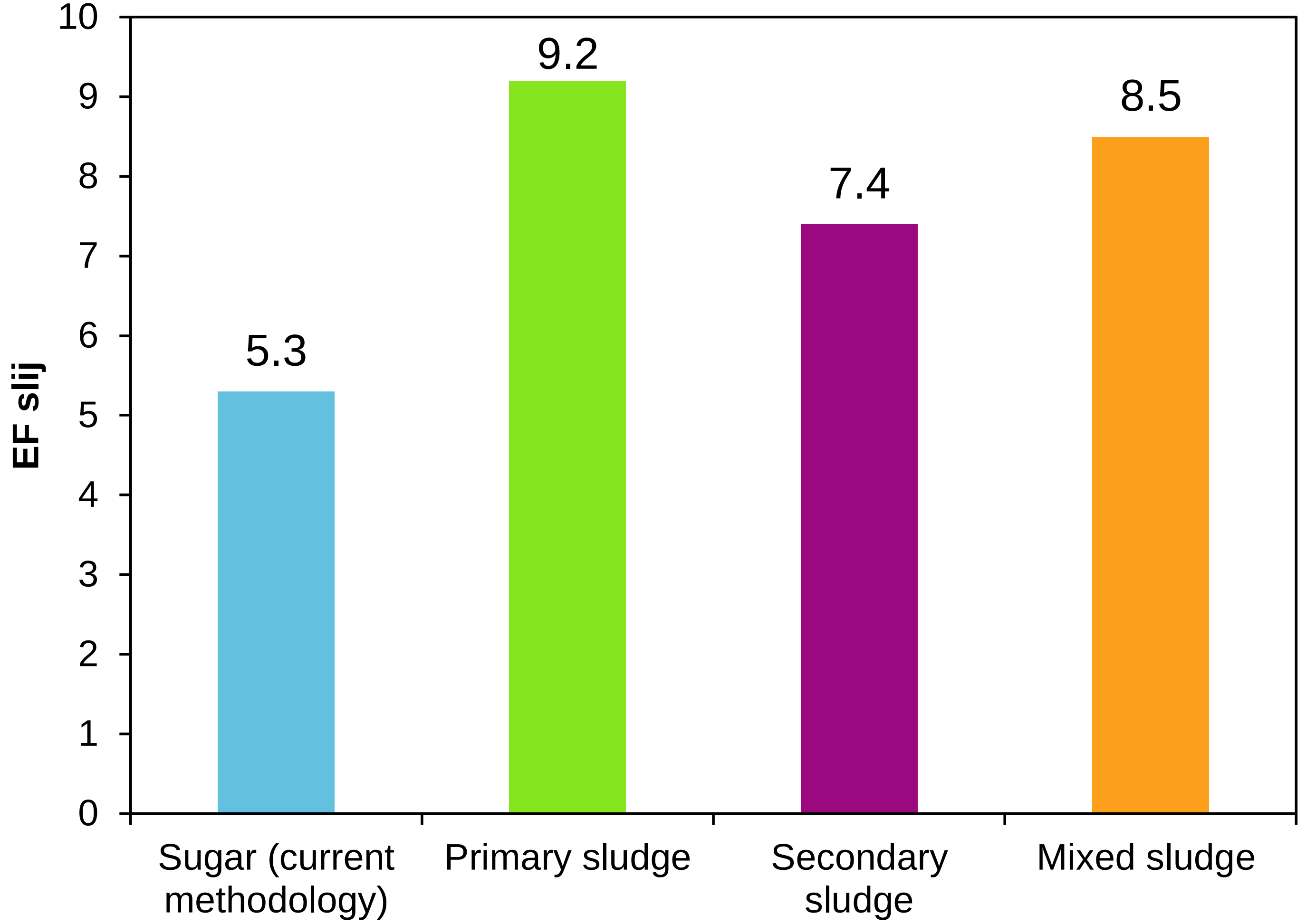
Contains 50% methane, therefore:

0.373 m^3 methane/kg COD destroyed (= 0.746 x 50%)

0.250 kg methane/kg COD destroyed (= 0.373 x 0.66 kg/m^3)

5.3 kg CO_2e /kg COD destroyed (= 0.250 x 21)

Emission Factor (EF_{wij} and EF_{slij})



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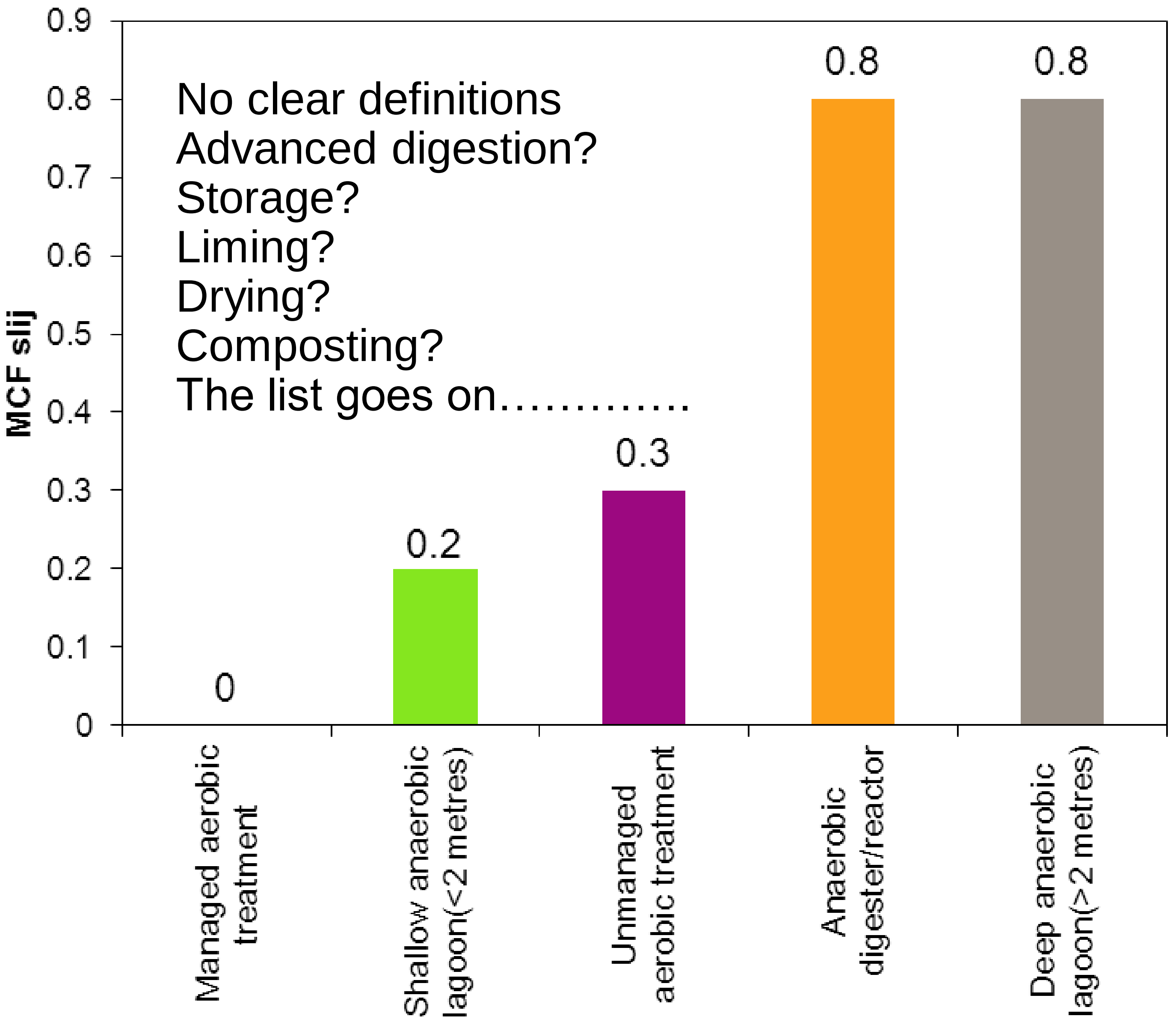
Scope 1 – Correction Factor (MCF)



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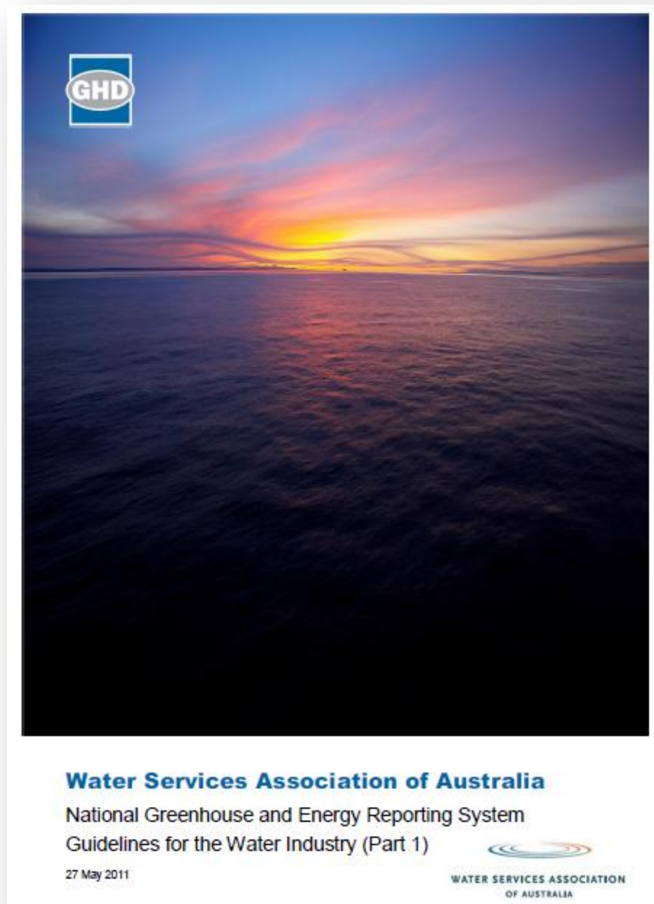
WSSA Guidance document for water industry


GHD

Water Services Association of Australia

National Greenhouse and Energy Reporting System
Guidelines for the Water Industry (Part 1)

27 May 2011

WATER SERVICES ASSOCIATION OF AUSTRALIA

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WSSA Guidance document for water industry

Aspect	Baseline
Plant size	50,000 pe
Sludge production	60 g/he/d
Quantity of sludge which is primary	60%
Primary sludge dry solids	3%
Primary sludge volatile solids	80%
Quantity of sludge which is secondary	40%
Secondary sludge dry solids	0.8%
Secondary sludge volatile solids	80%
Water consumption	235 l/pe/d
Treatment type for wastewater	Managed aerobic
Treatment type for sludge	Anaerobic digestion
Volatile solids destruction for anaerobic digestion	50%
Quantity of biogas either used, transferred from site or flared	100%

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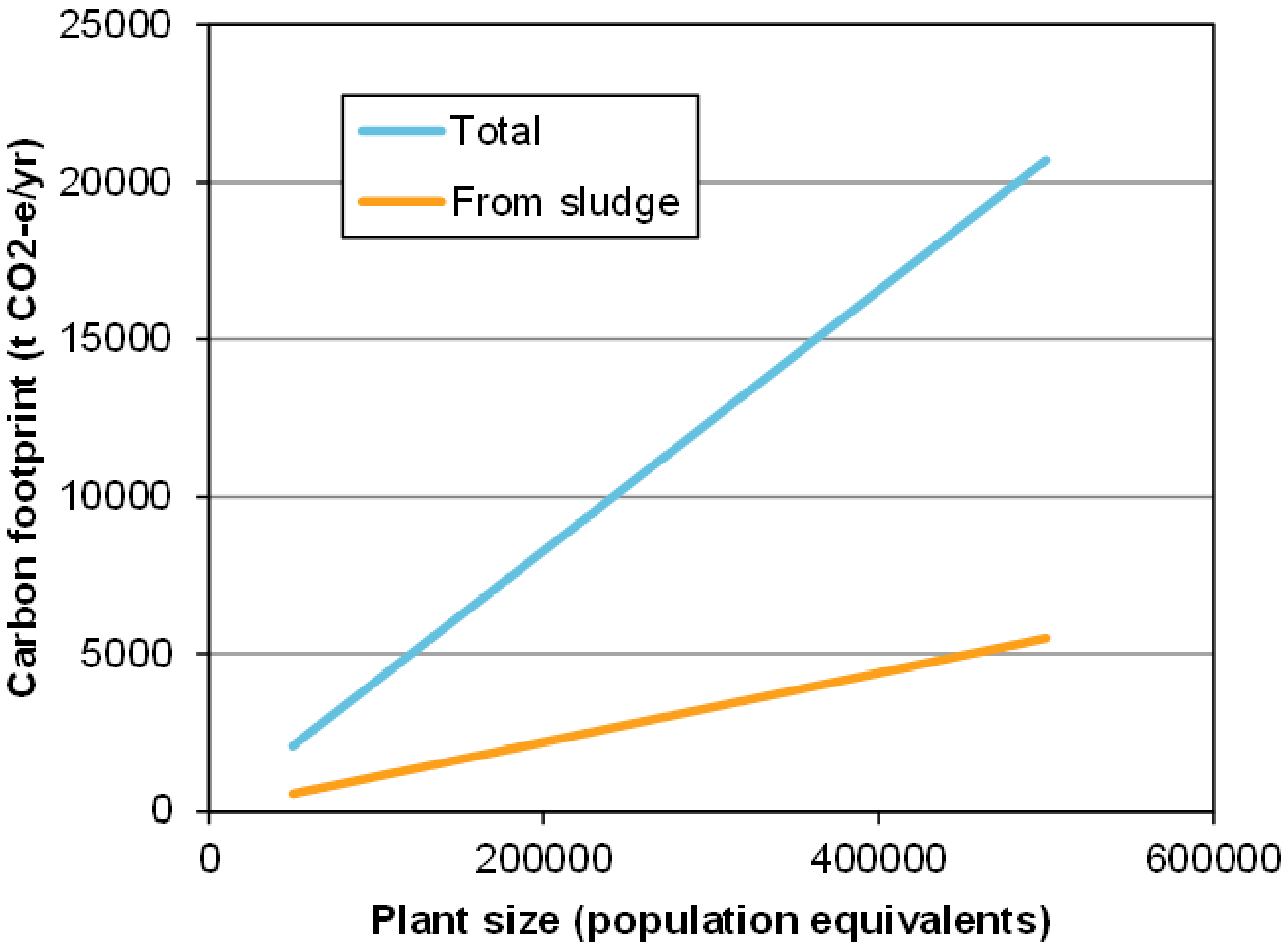
Plant Size



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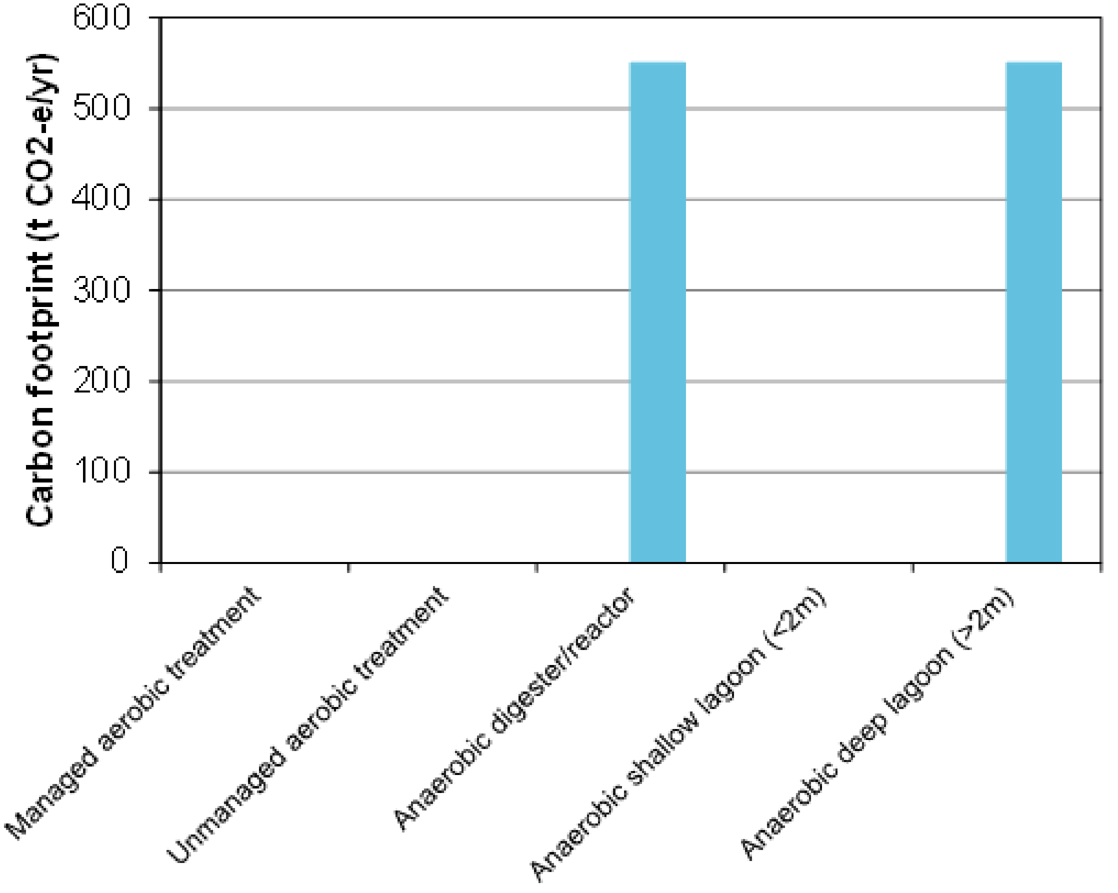
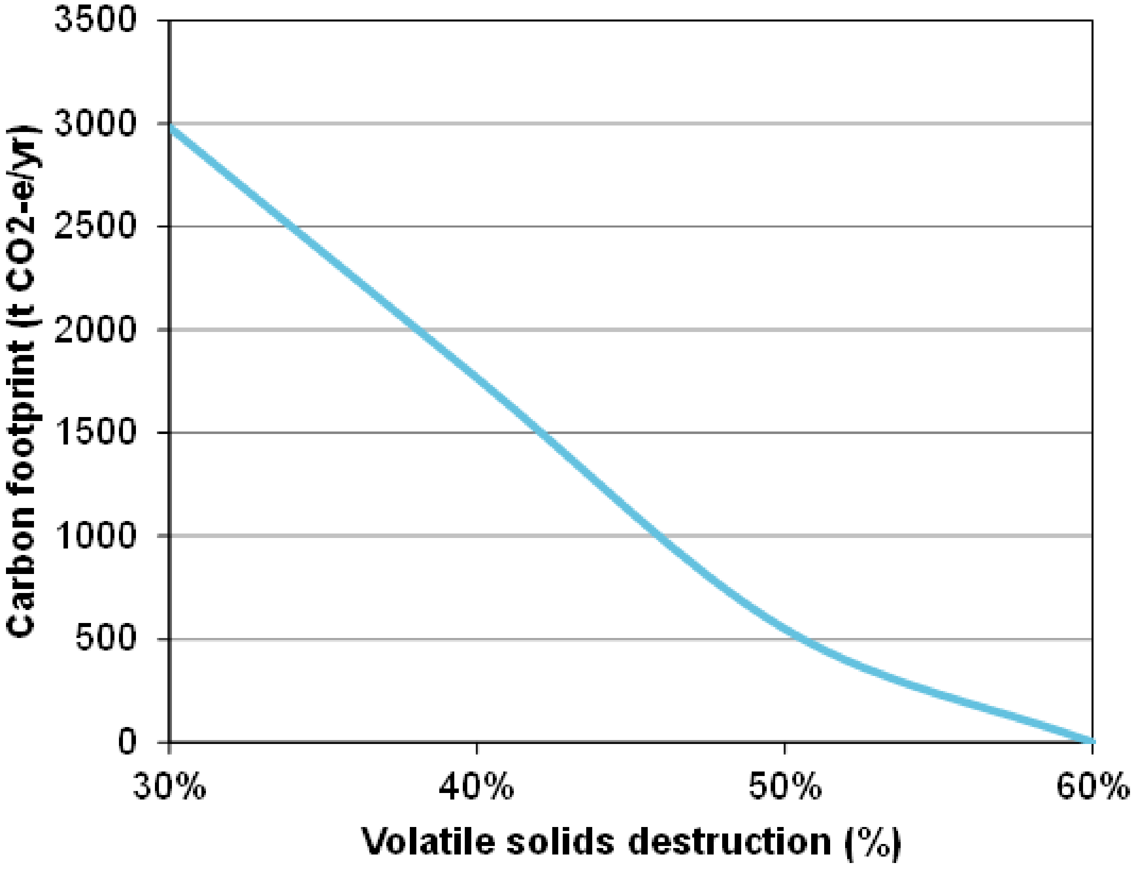
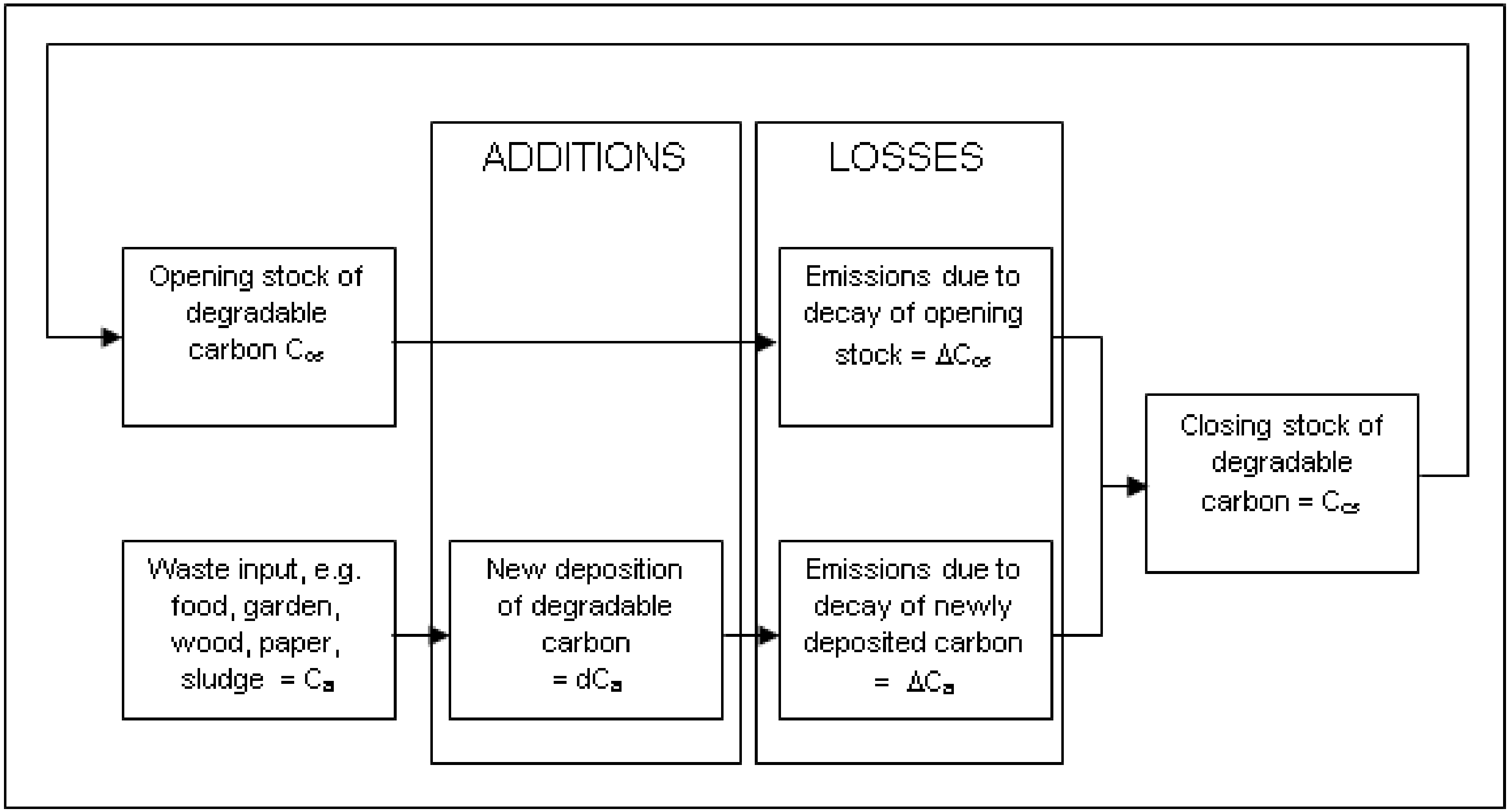
Treatment Type



Volatile solids destruction



Stockpiling
(Pseudo land-fill based on FOD model)



$$CH_{4\ gen} = ((DC_a(t) + (DC_{os}(t)) \text{ x } F \text{ x } 1.336 \text{ x } 21$$

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Stockpiling

Aspect	Baseline
New quantity stockpiled	10,000 wet tonnes
Accumulated carbon stock	1,000 tonnes
Geographic location	VIC
Month for decay	7

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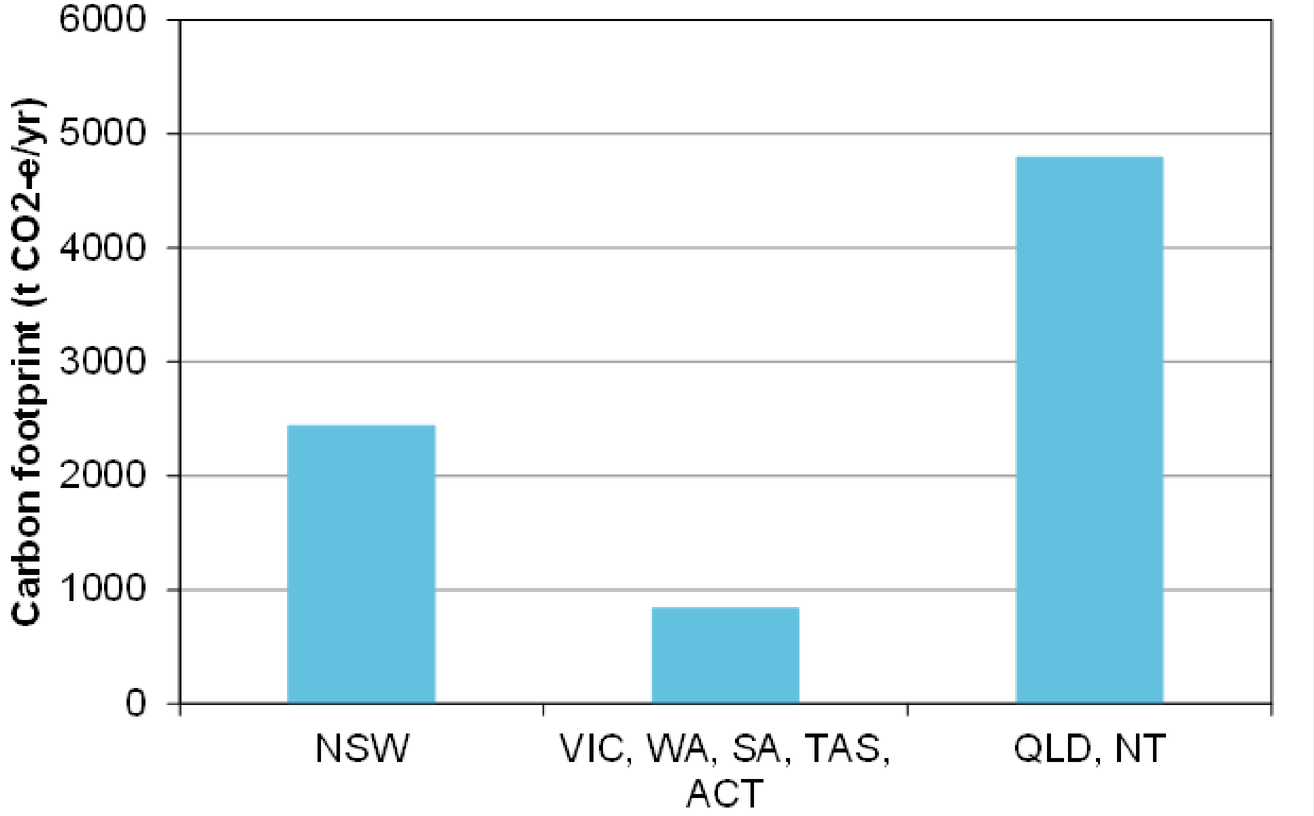
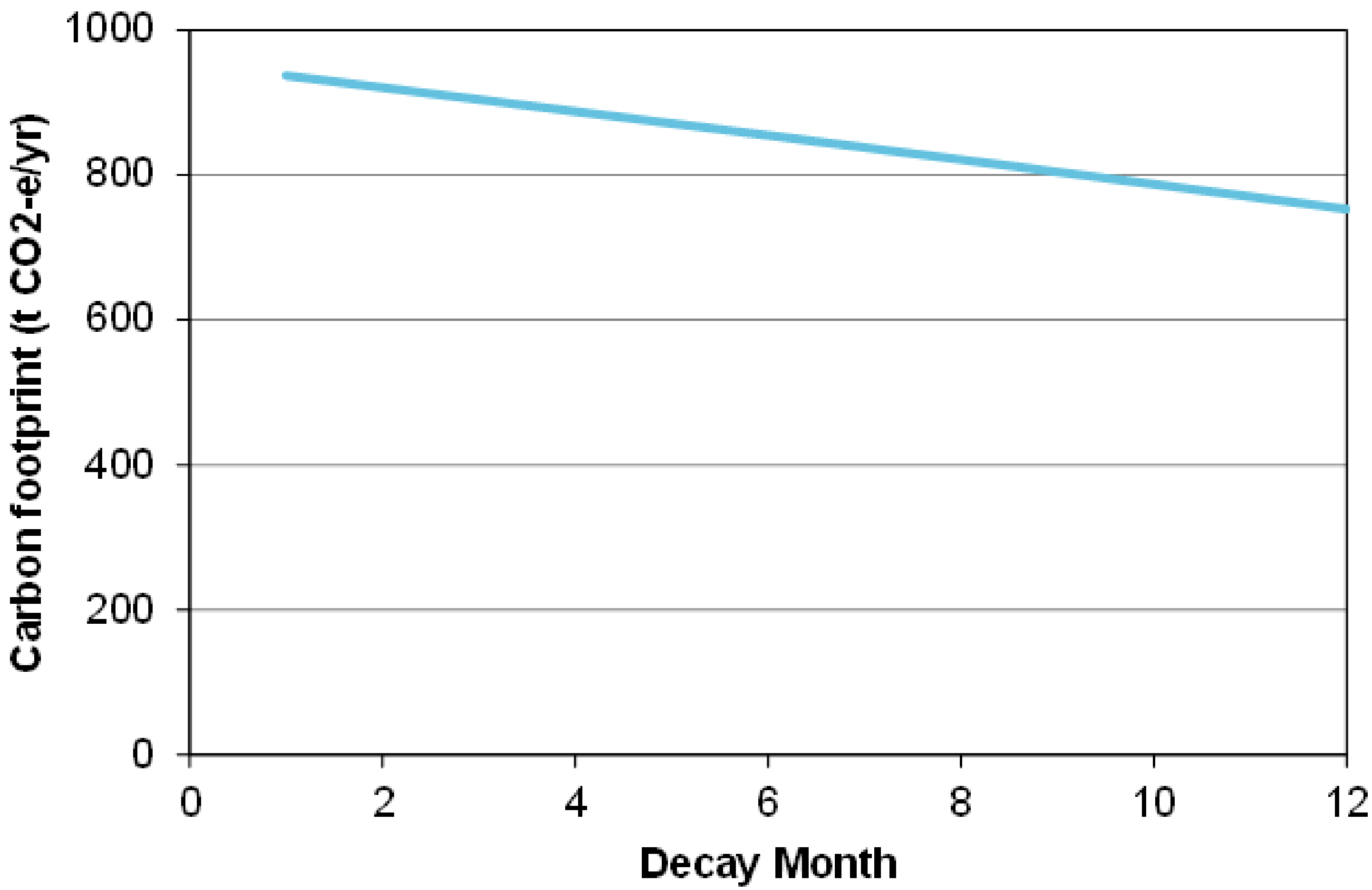
Location of stockpile



Month of decay



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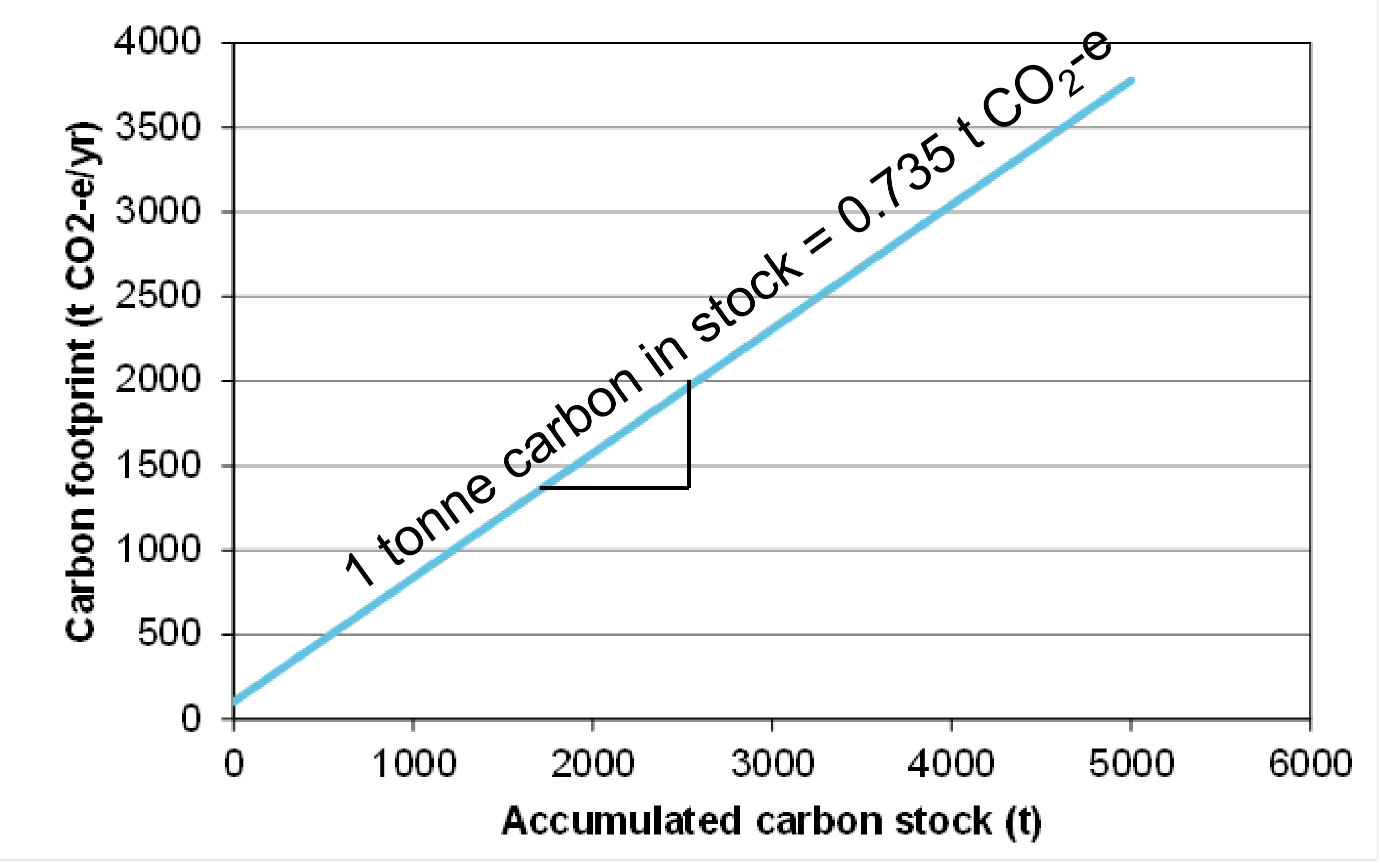
Accumulated Carbon Stock

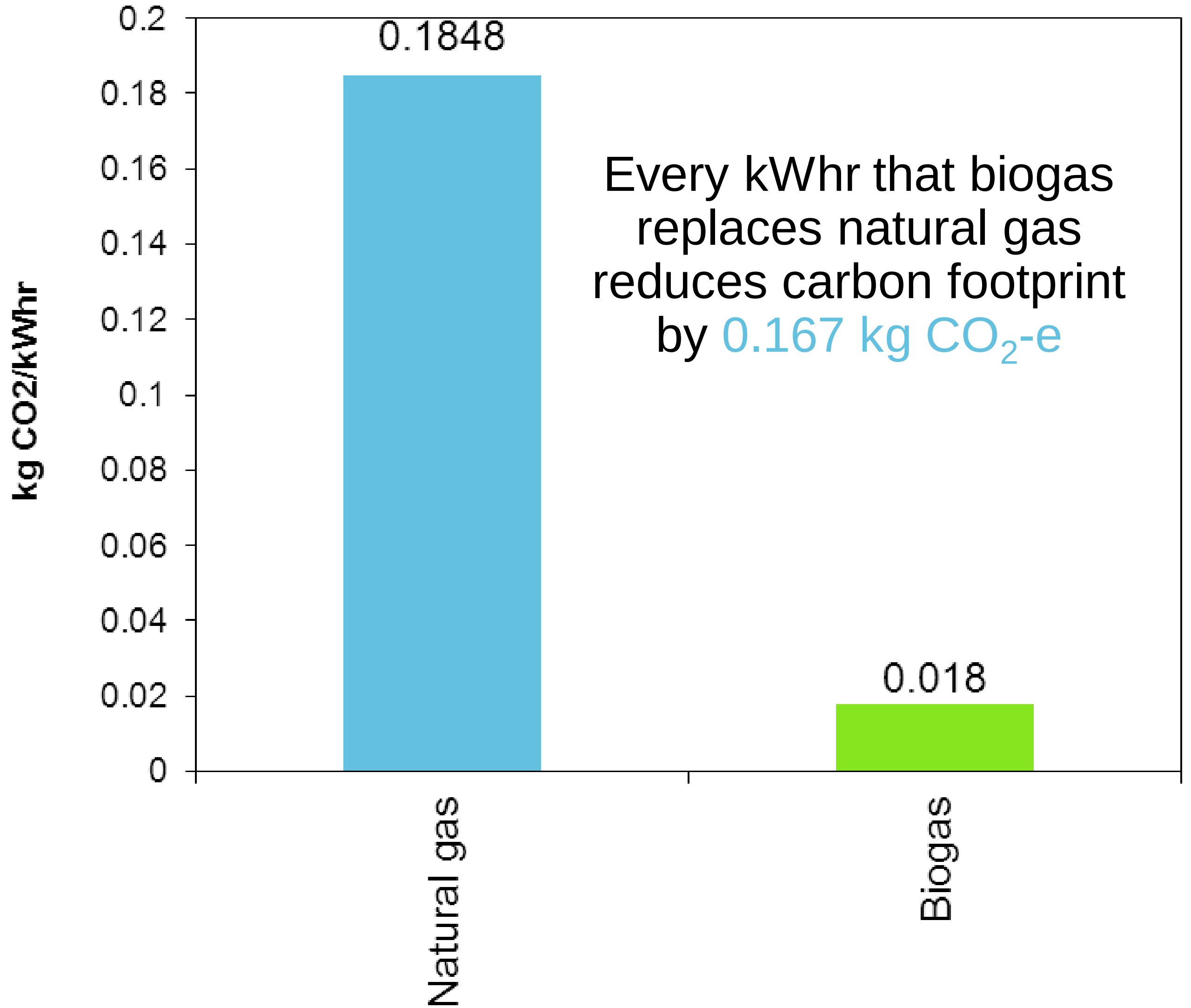


Opportunities

- Which could currently be recognized
  - Energy from biogas produced by anaerobic digestion
  - Low carbon fuel for burning
- Potential (but not covered under regulation)
  - Low carbon fertilizer
- Other
  - Carbon sequestration

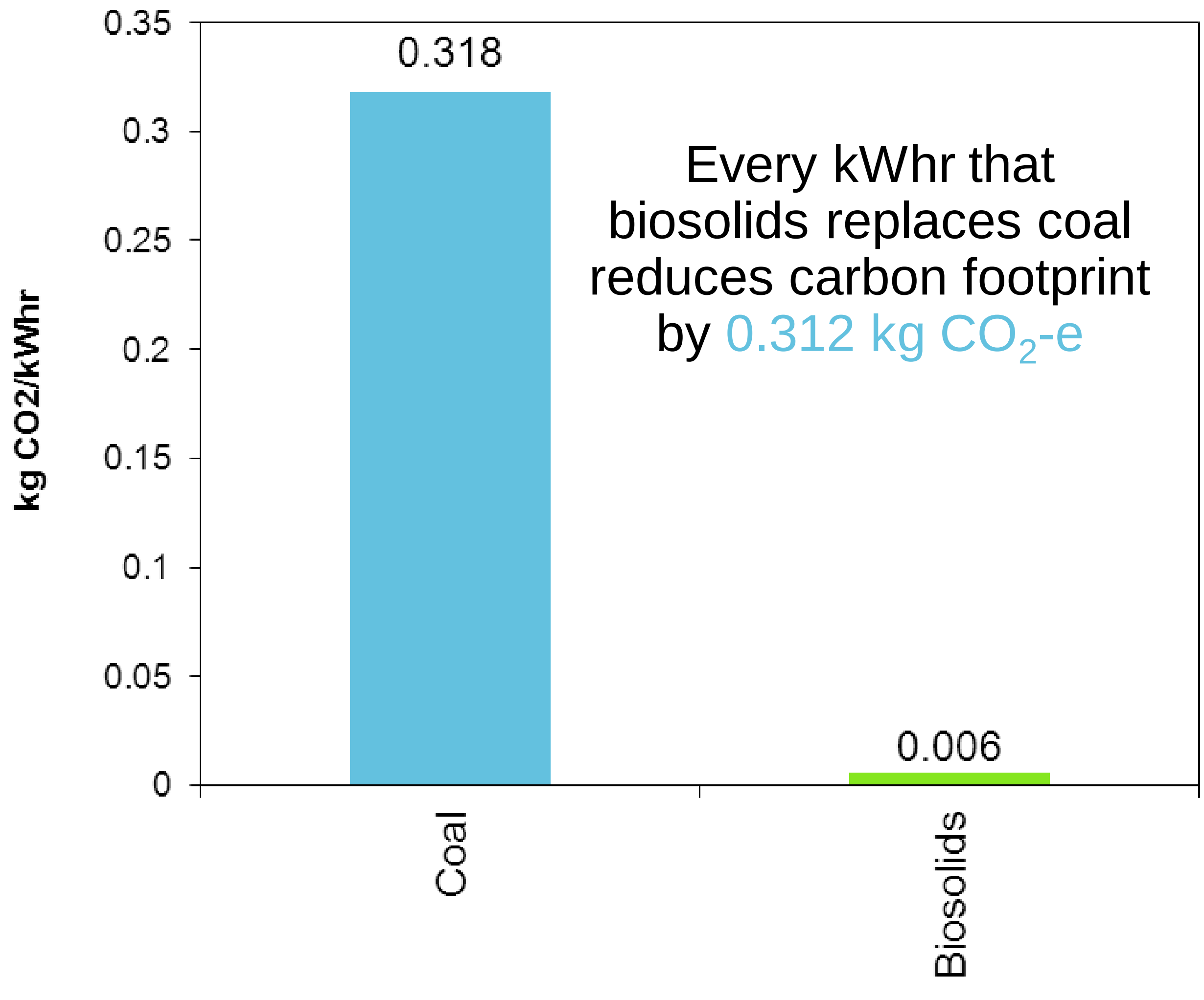
Opportunities – Biogas

– Based on NGER methodology



Opportunities – Biosolids Burning

– Based on NGER methodology



Opportunities – Biosolids Burning

100 MW → 280,000 t CO_2e → $6.41M

Opportunities – Biosolids Burning

95 MW → 265,000 t CO_2e → $6.09M

↑

5 MW

Biosolids are worth $315k to the power station in reduced carbon taxes

↓

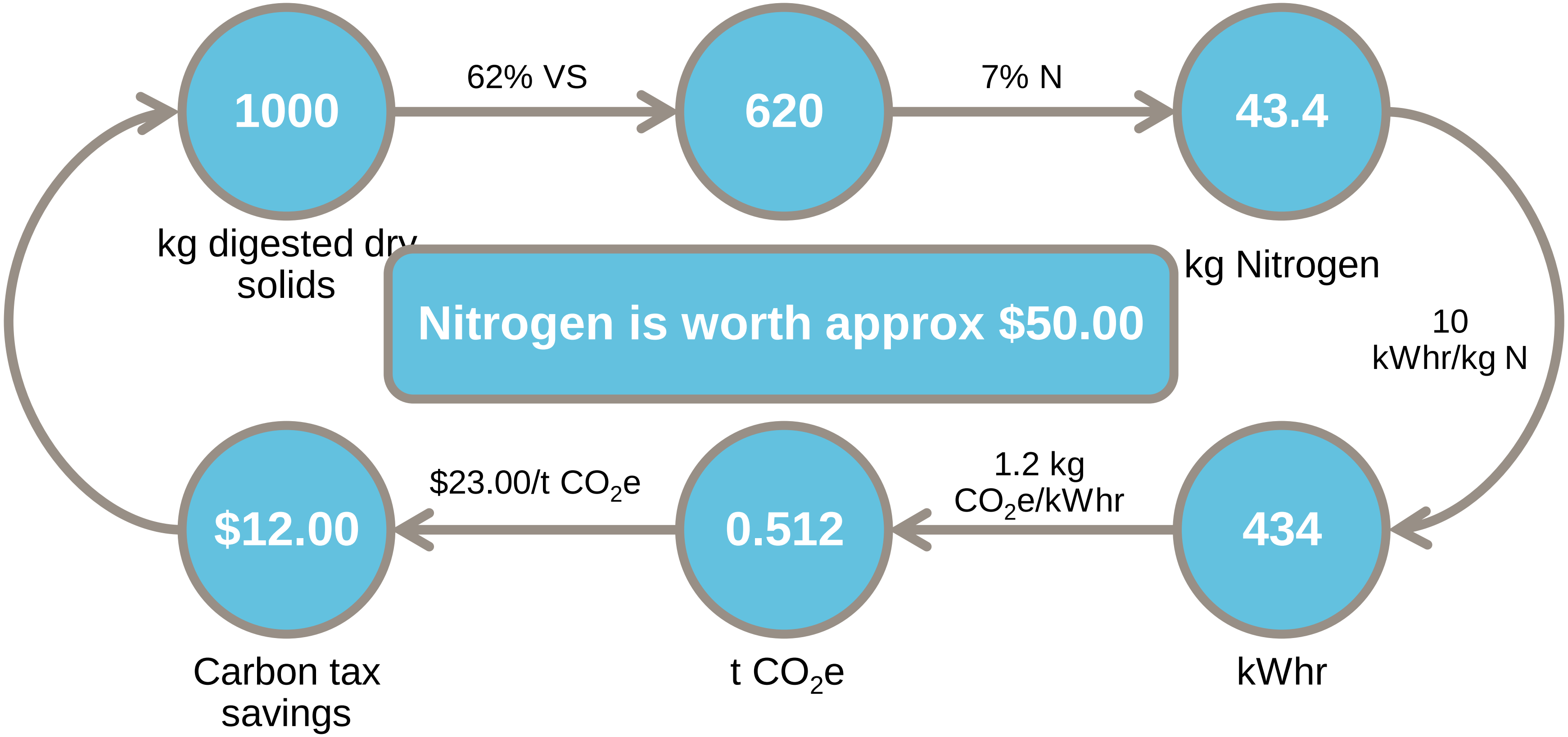
You need <13,000 tDSA biosolids to generate 5 MW

↓

The biosolids are worth approx $25/tDS to the power station in carbon tax reductions

Opportunities – Low Carbon Fertilizer

– Fertilizers are large consumers of fossil fuels
  - 1 kg N consumes 10 kWhr energy
  - 1 kg P consumes 10 kWhr energy



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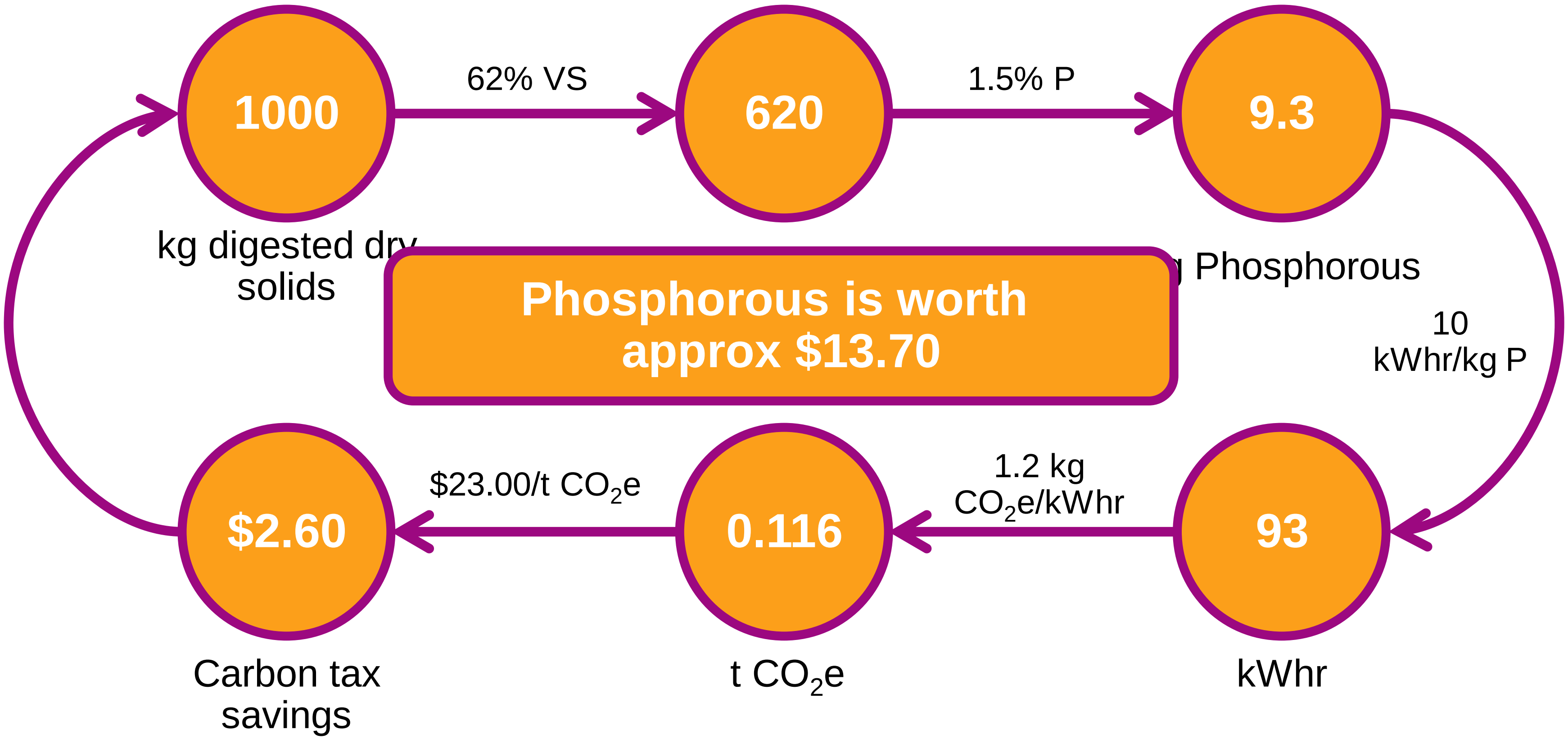
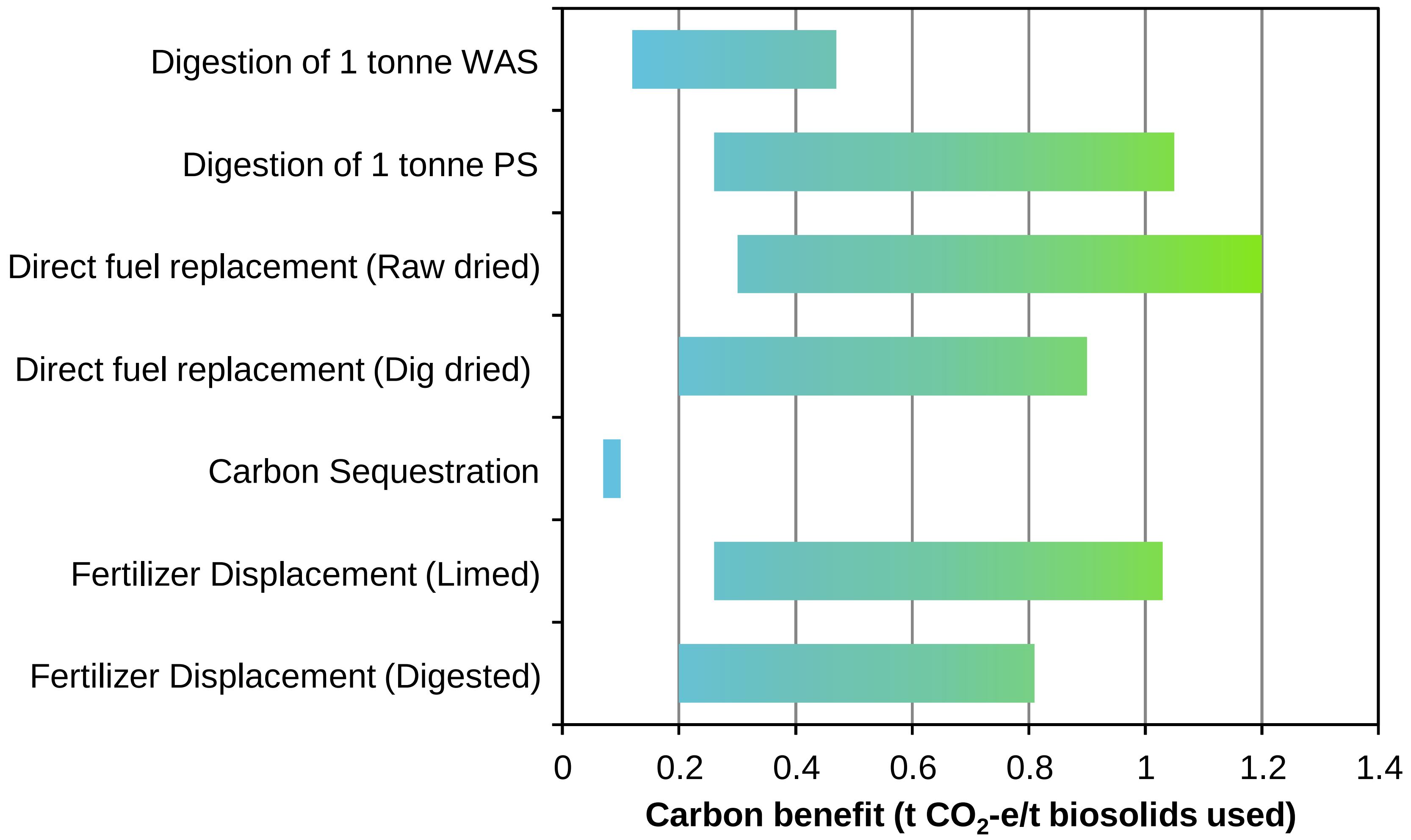


Carbon benefits of biosolids use



Conclusions

Australia will introduce a carbon tax July 1 2012

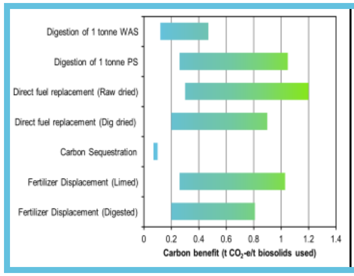
Based on Scope 1 direct emissions of greenhouse gases. The tax will start at $23/t and increase

Under current legislation, Scope 1 emissions from biosolids and biogas management are only counted if the biosolids and biogas are kept on-site

Many of the important reductions achievable by biosolids reuse may not be realized

Biosolids reuse has a large impact on reducing carbon footprint

By: displacing natural gas; renewable energy generation; compressed gas fuel for vehicles; direct use as an energy source, displacement of fossil-fuel dependent fertilizers; carbon sequestration on soils



Many opportunities from biosolids use, however issues/limitations found with current methodology which need further work

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Thankyou

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