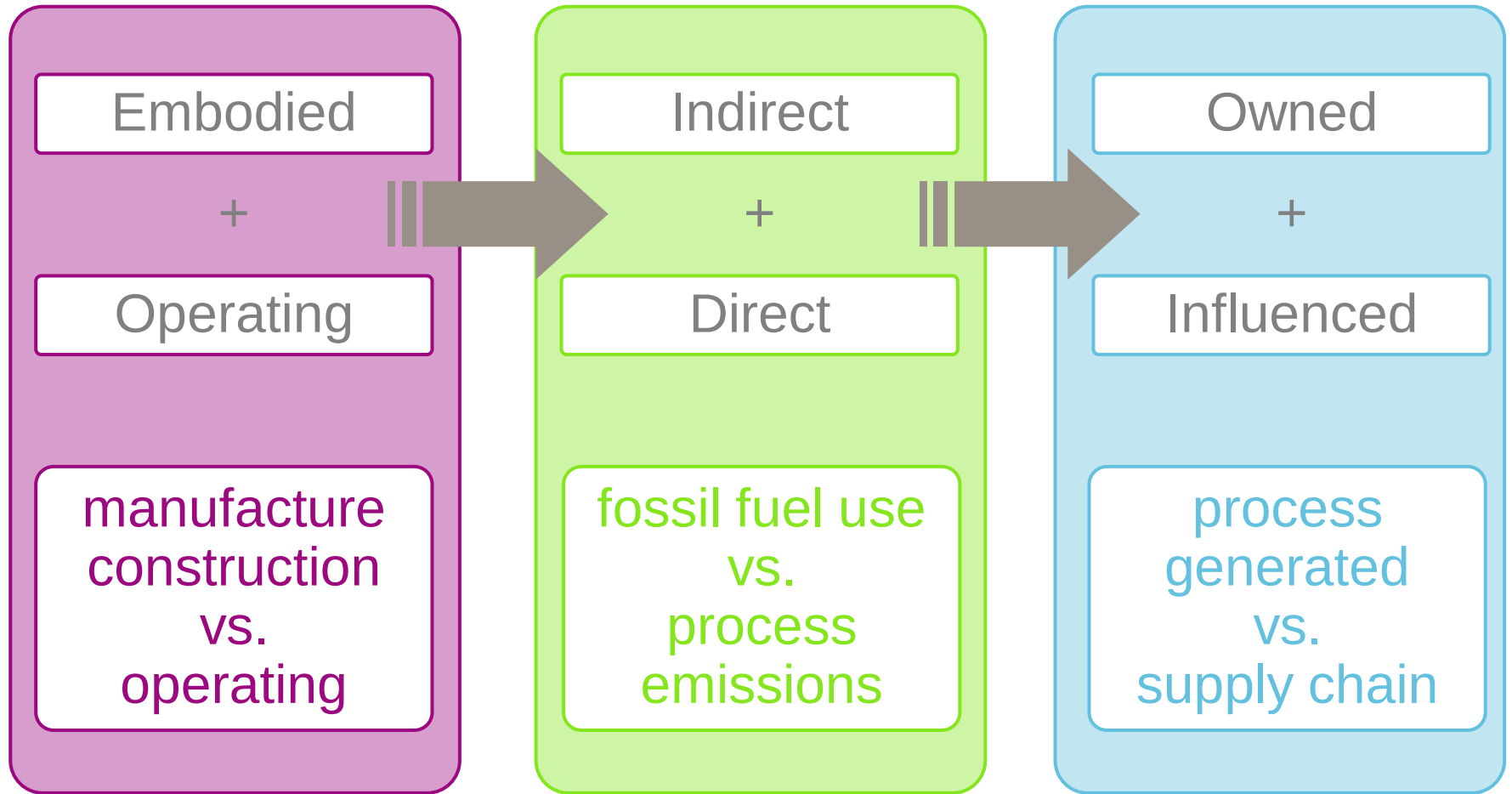


Carbon footprint and biosolids treatment

Dr Bill Barber

Carbon footprint



Indirect Carbon Footprint

Depends on power source

Wind	0.05
Solar	0.02 – 0.04
Nuclear	0.05
Biomass	0.02 – 0.08
Gas	0.20
Coal	0.80 – 1.20

CO₂e / kWhr

N₂O, CH₄

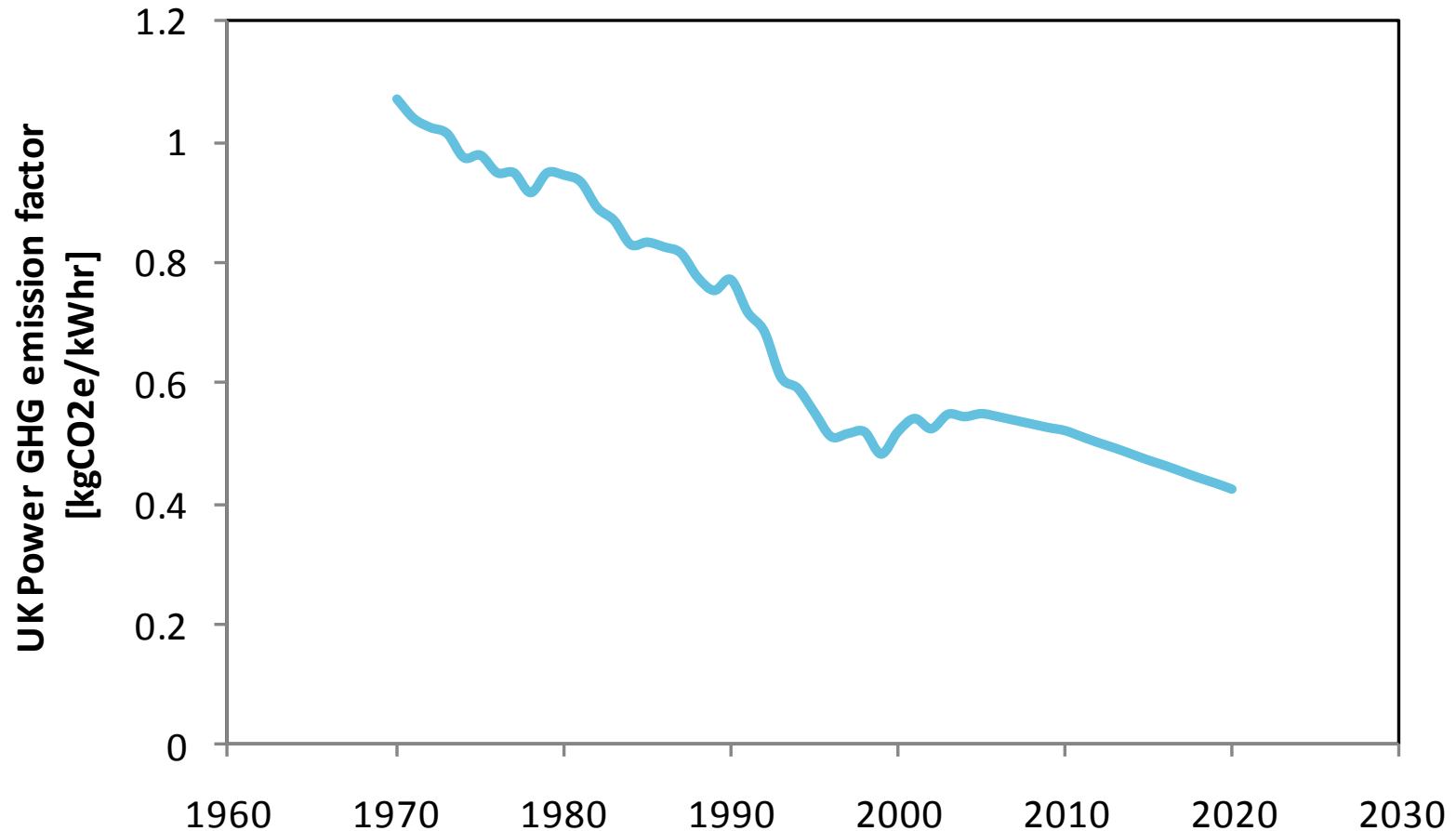
Emissions

Processing

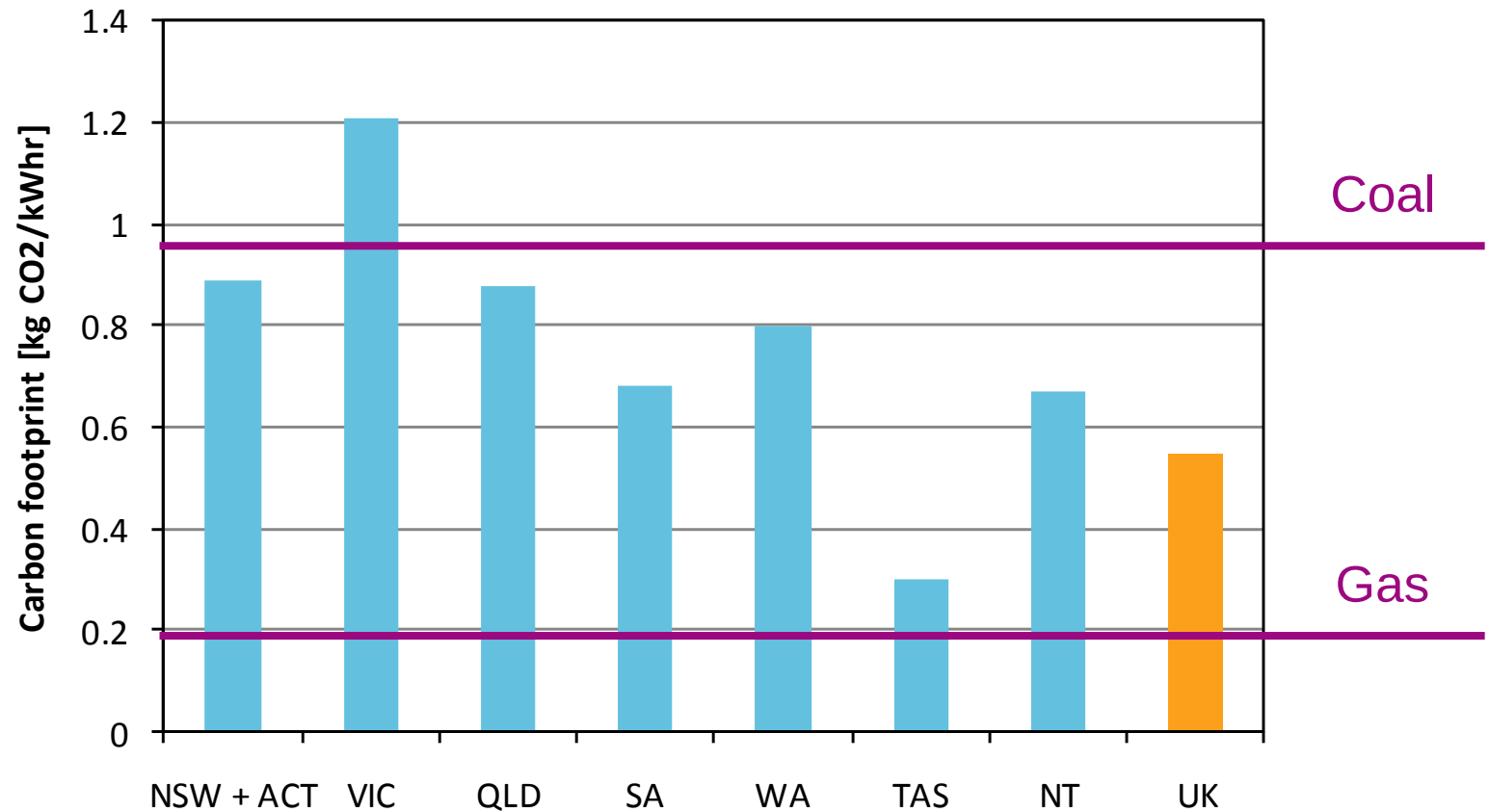
Power (kWhr)
Fuel



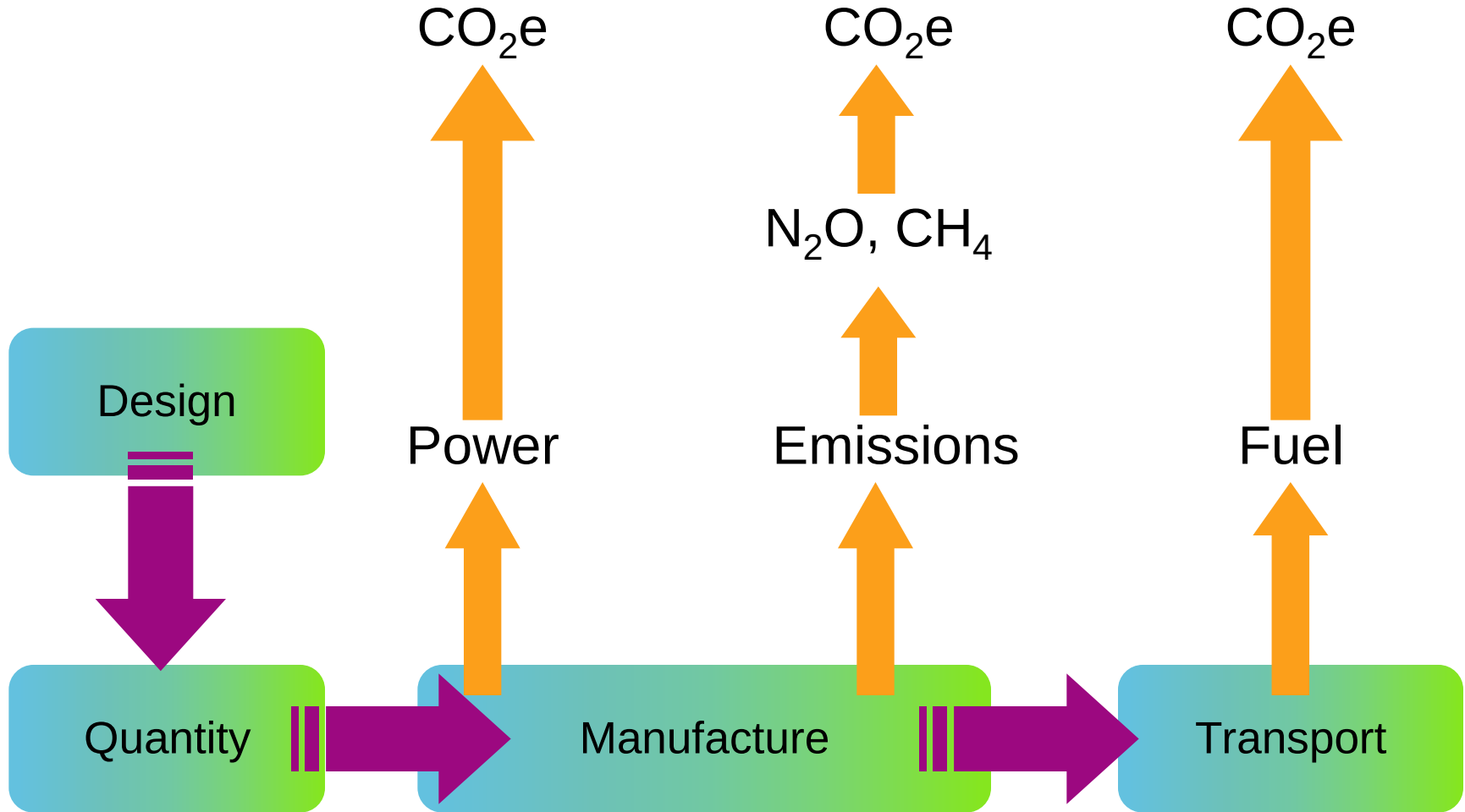
Power Emission Factors depend on energy mix



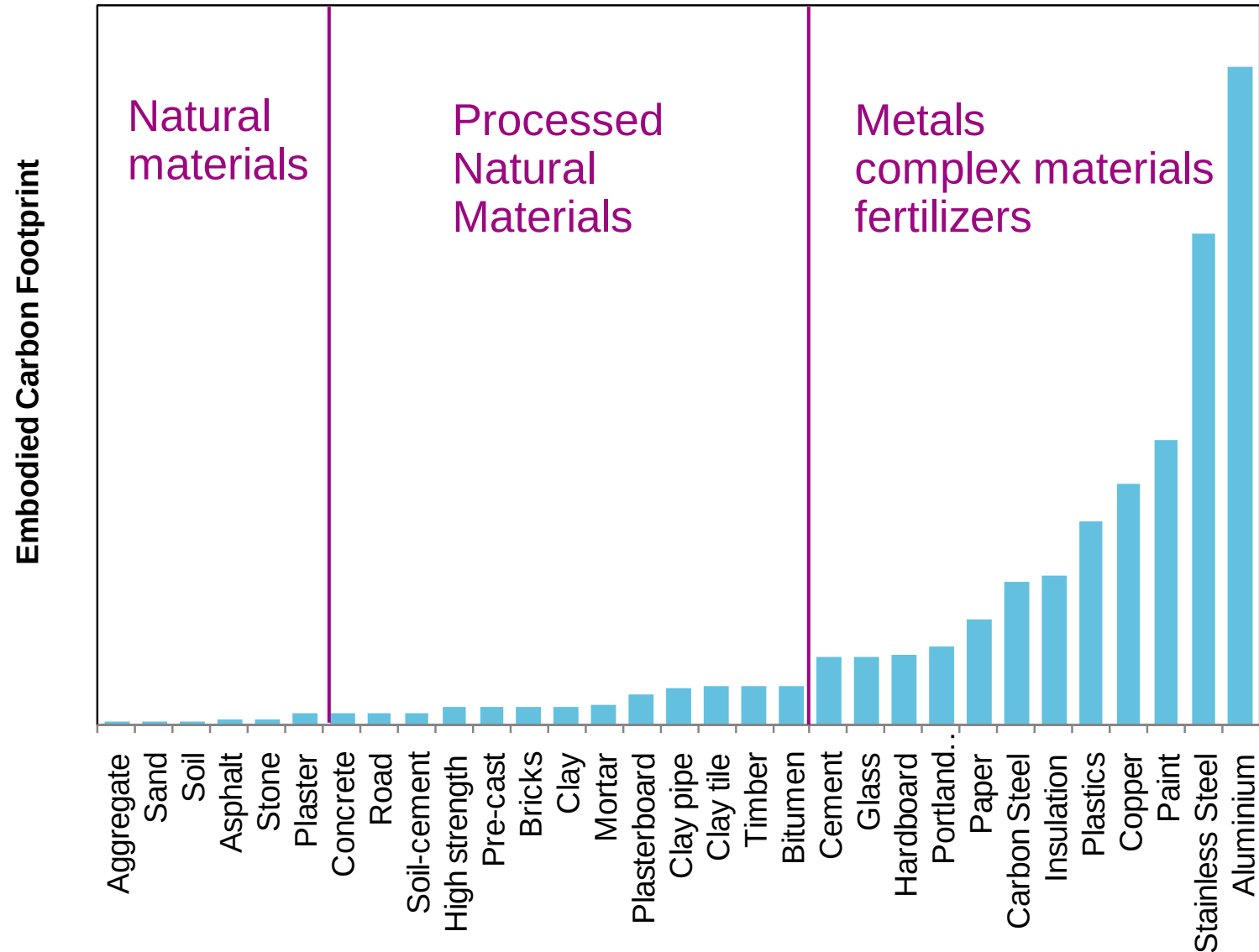
Power Emission Factors depend on energy mix



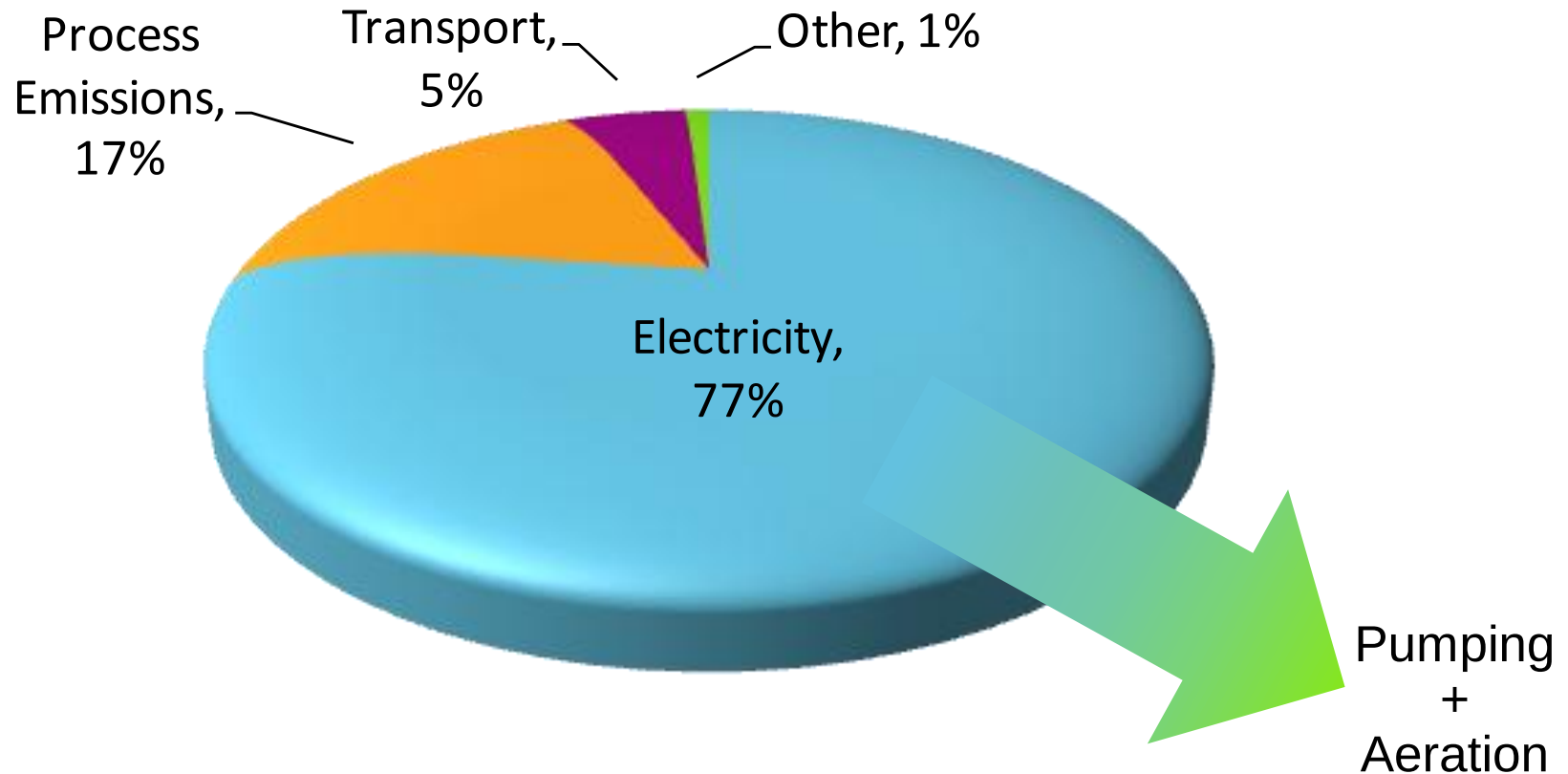
Embodied Carbon Footprint



Embodied Carbon Footprint

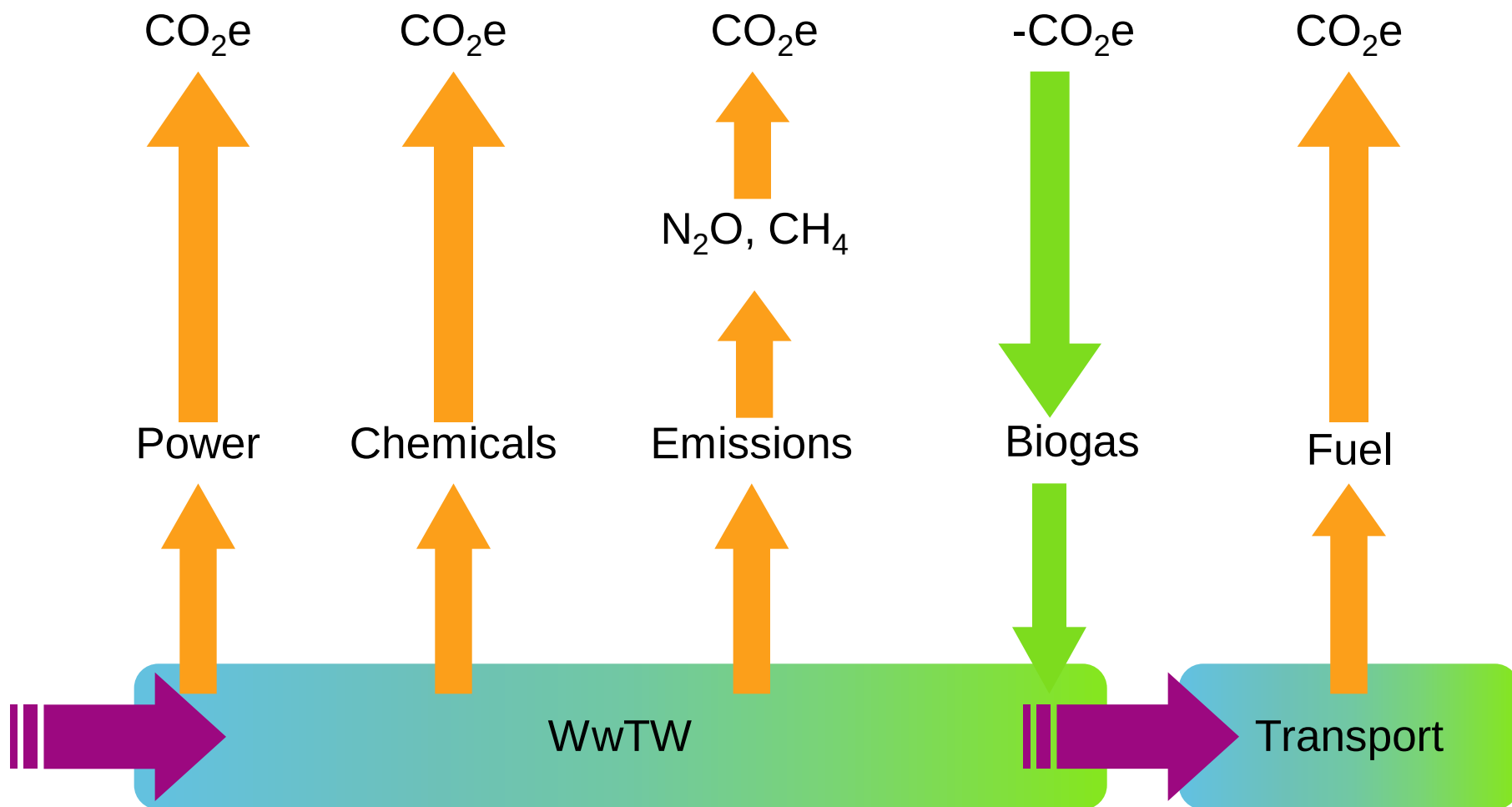


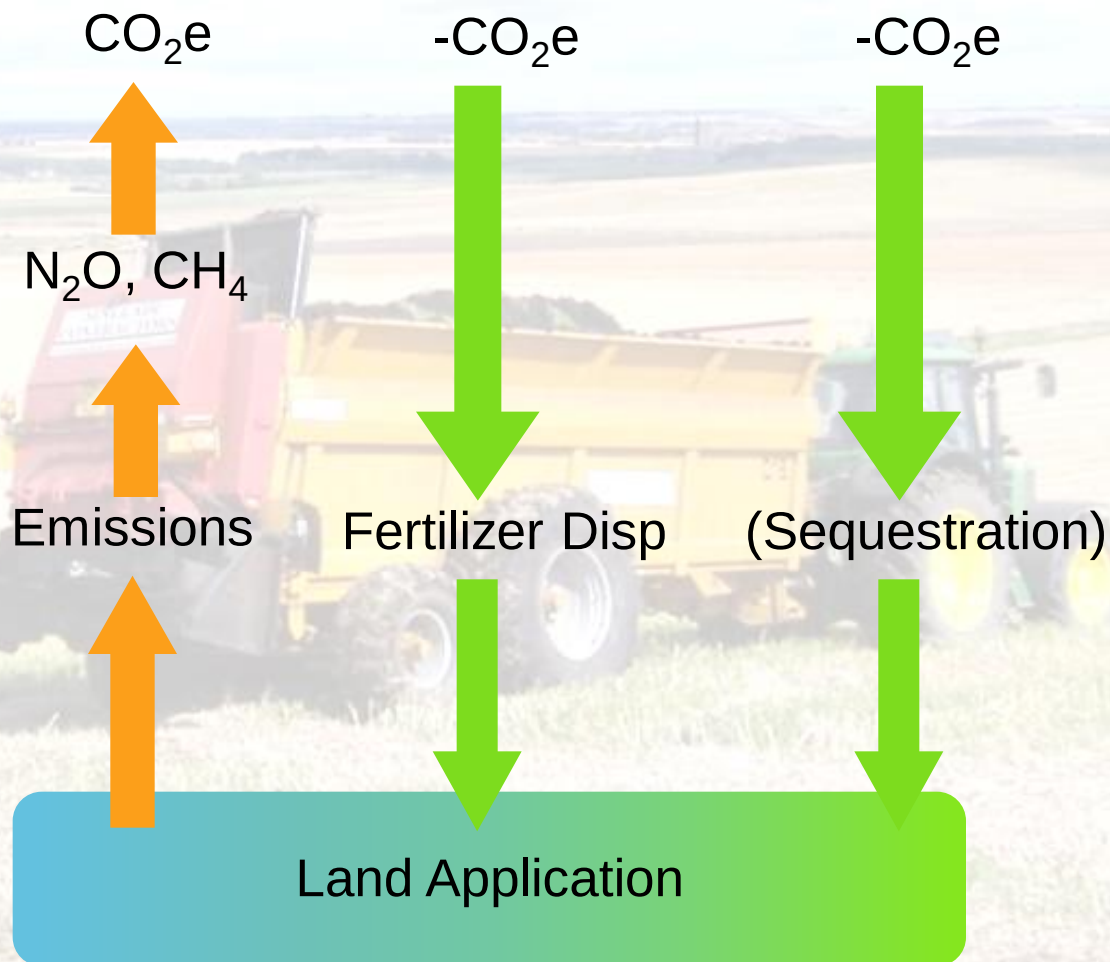
Sustainability – Carbon Footprint

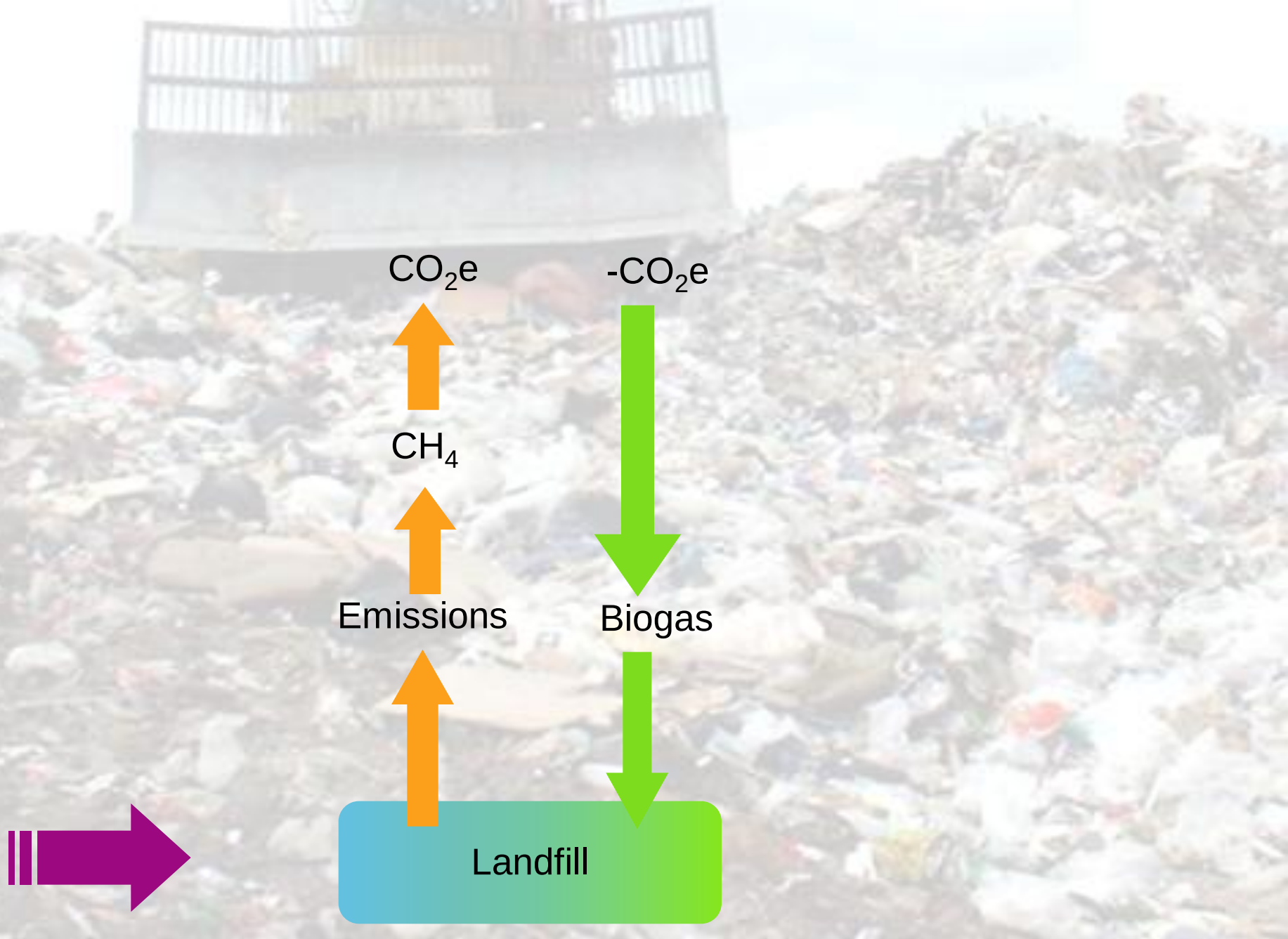


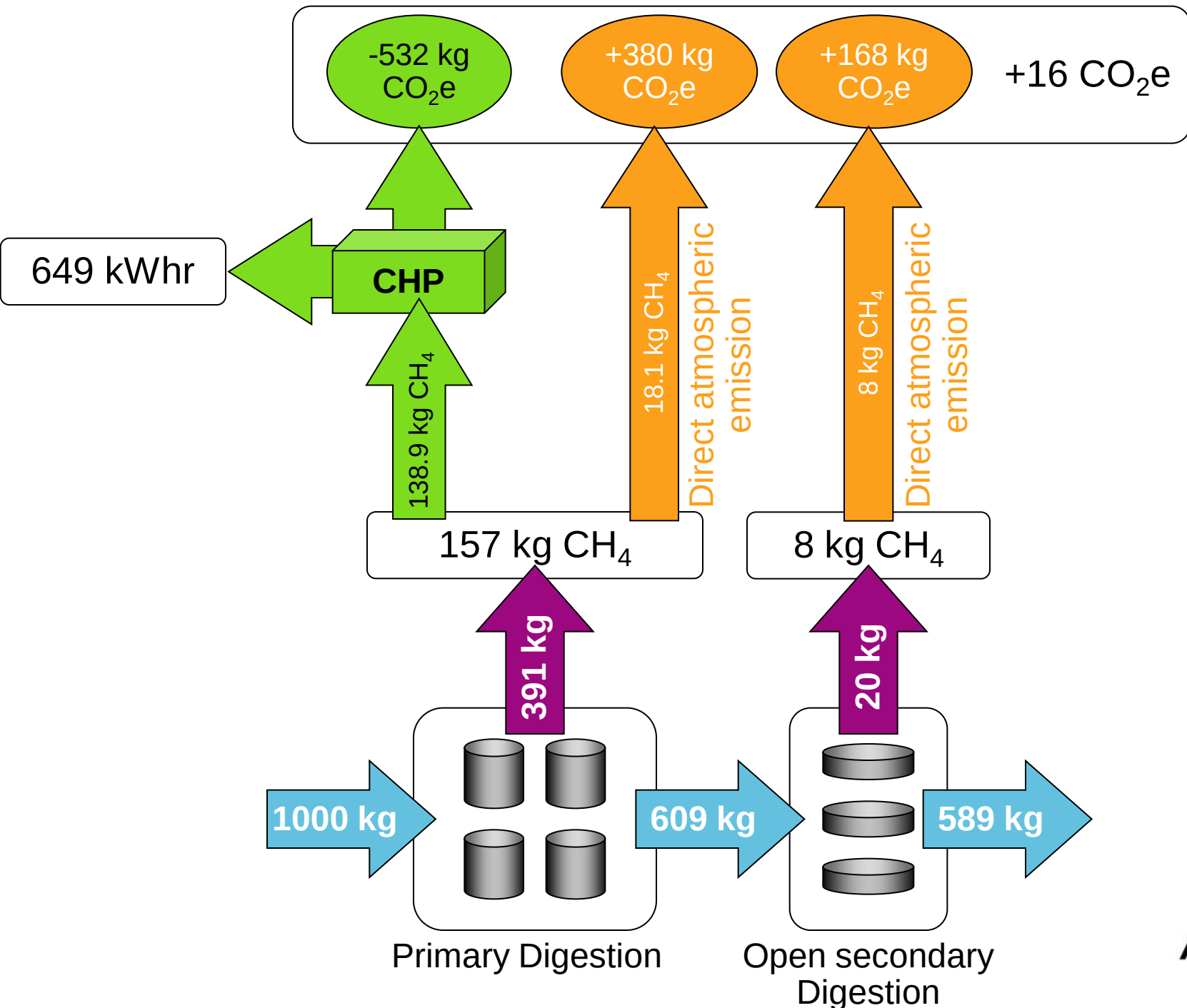
- **Biosolids** influences all of these parameters
- UK Water industry > **5 million tonnes CO₂e**
- Only the power industry emits more carbon footprint

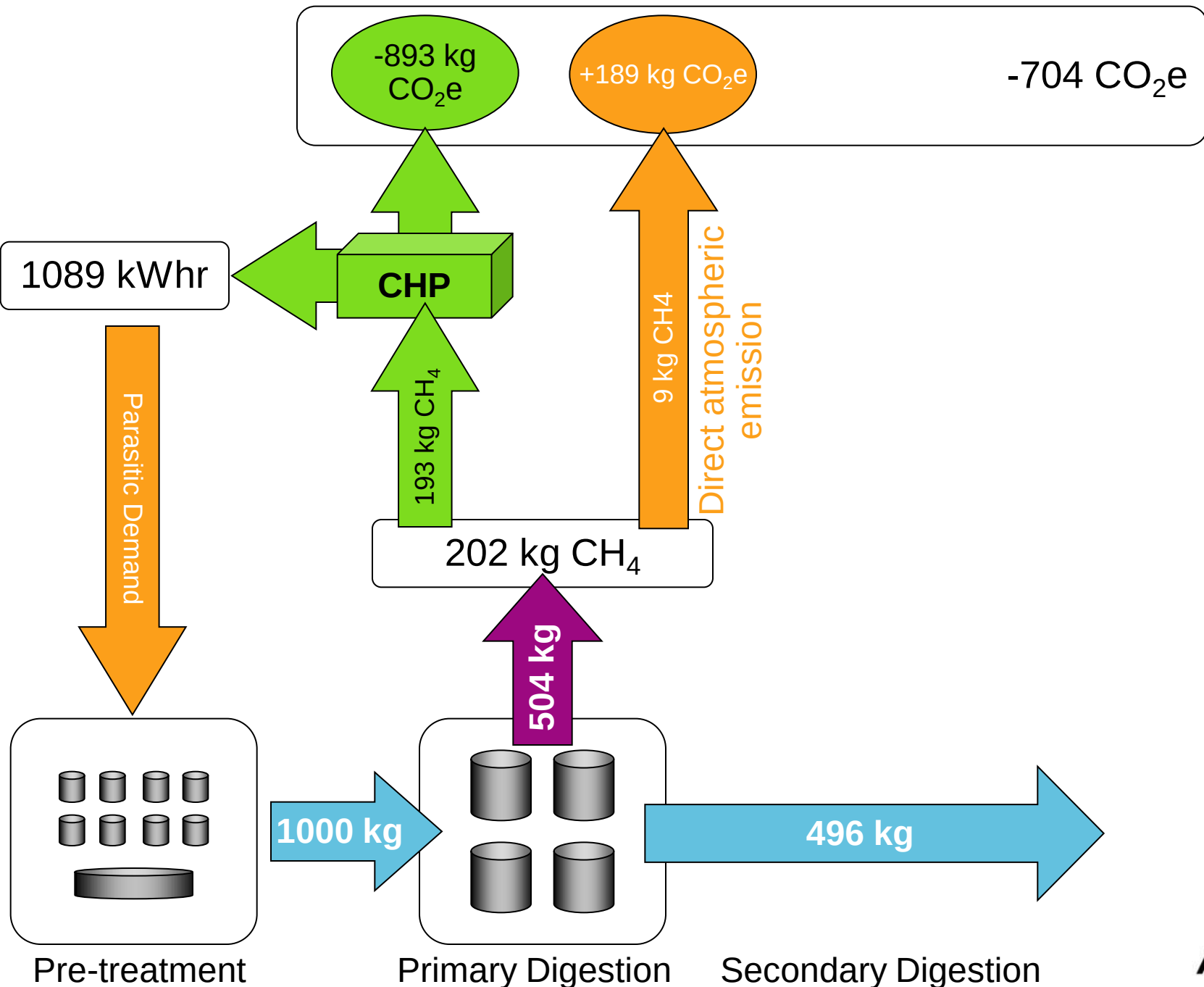
Carbon Footprint of Biosolids



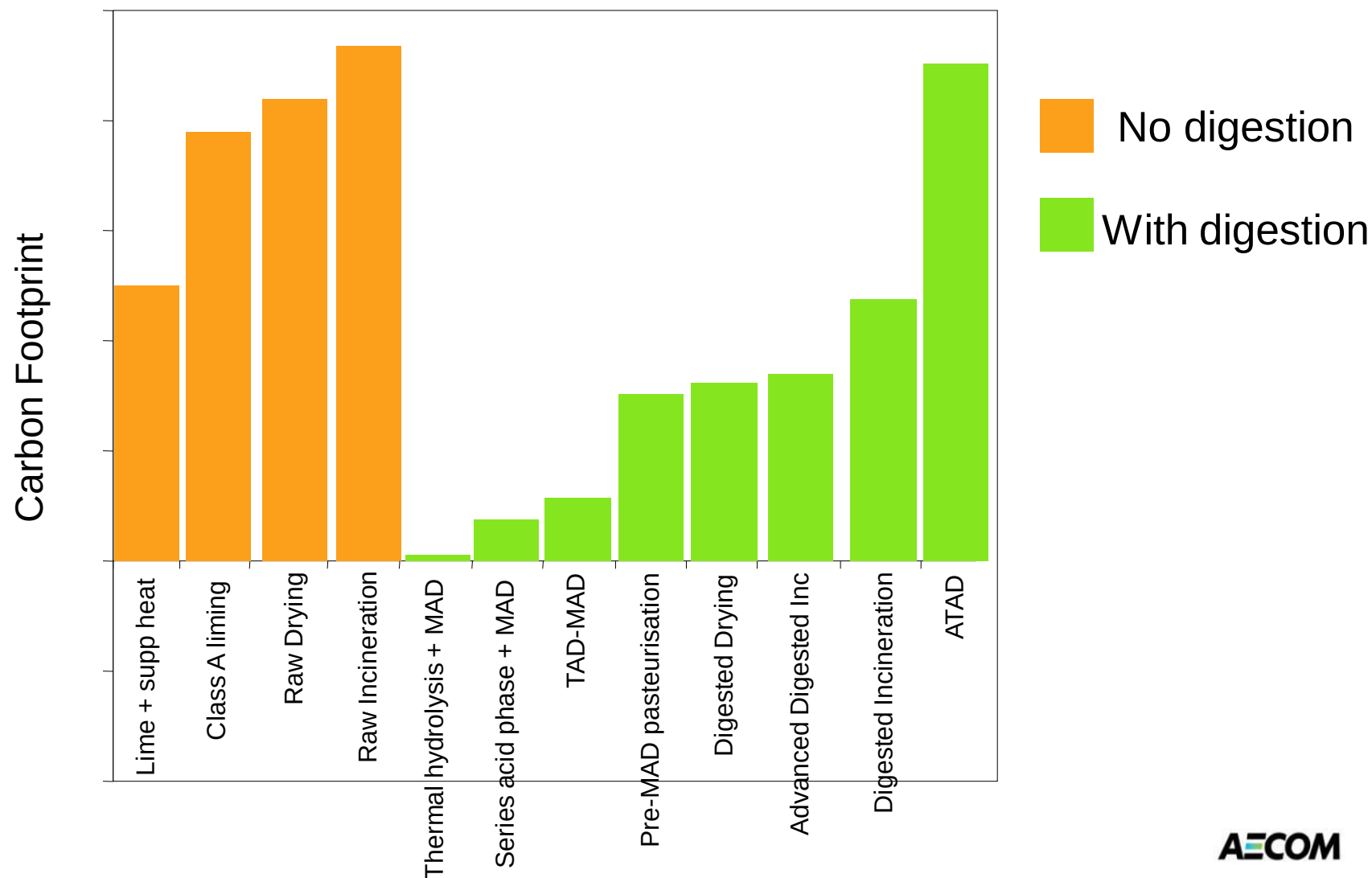


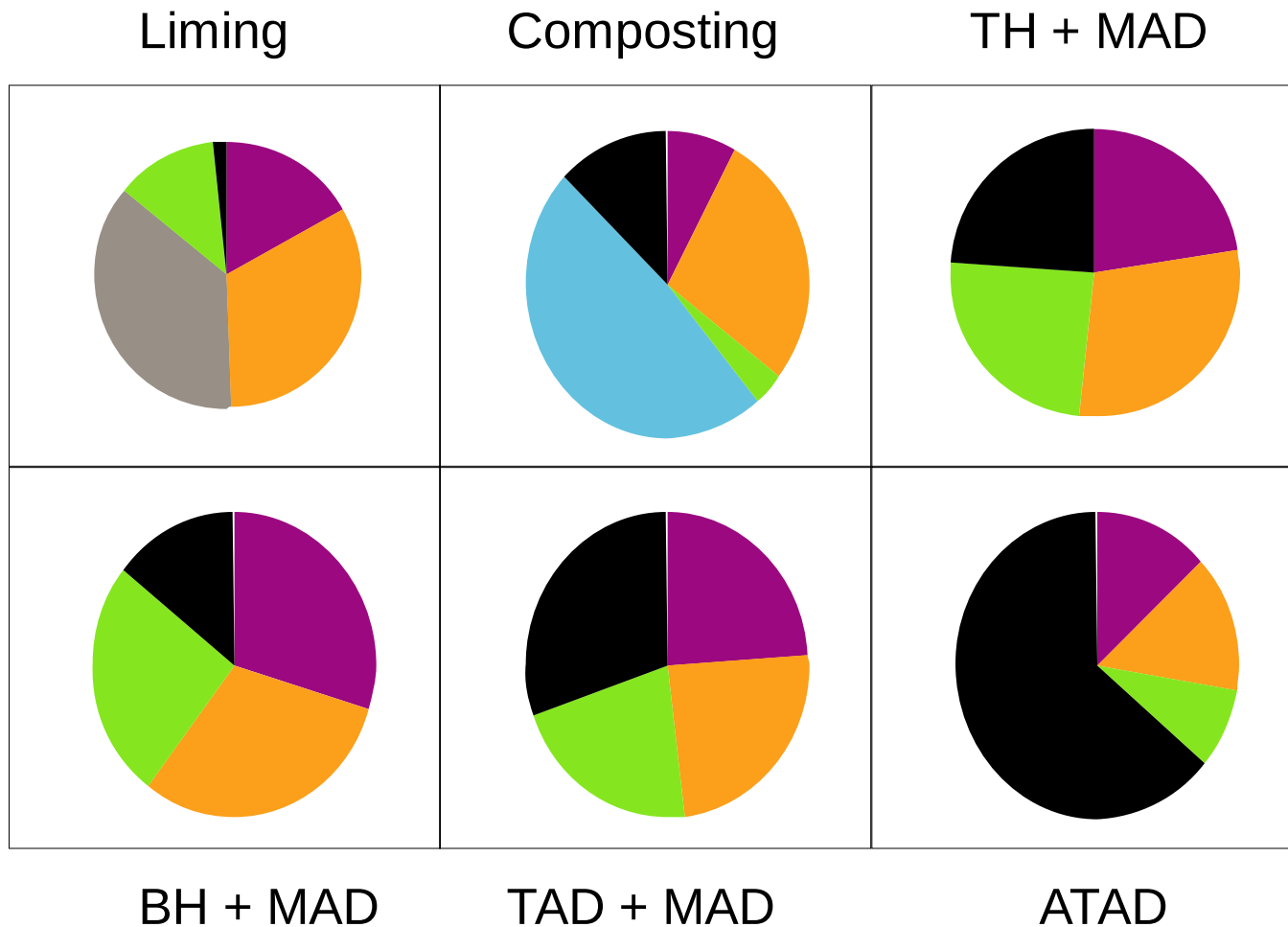






Carbon Footprint of Class A Biosolids treatment



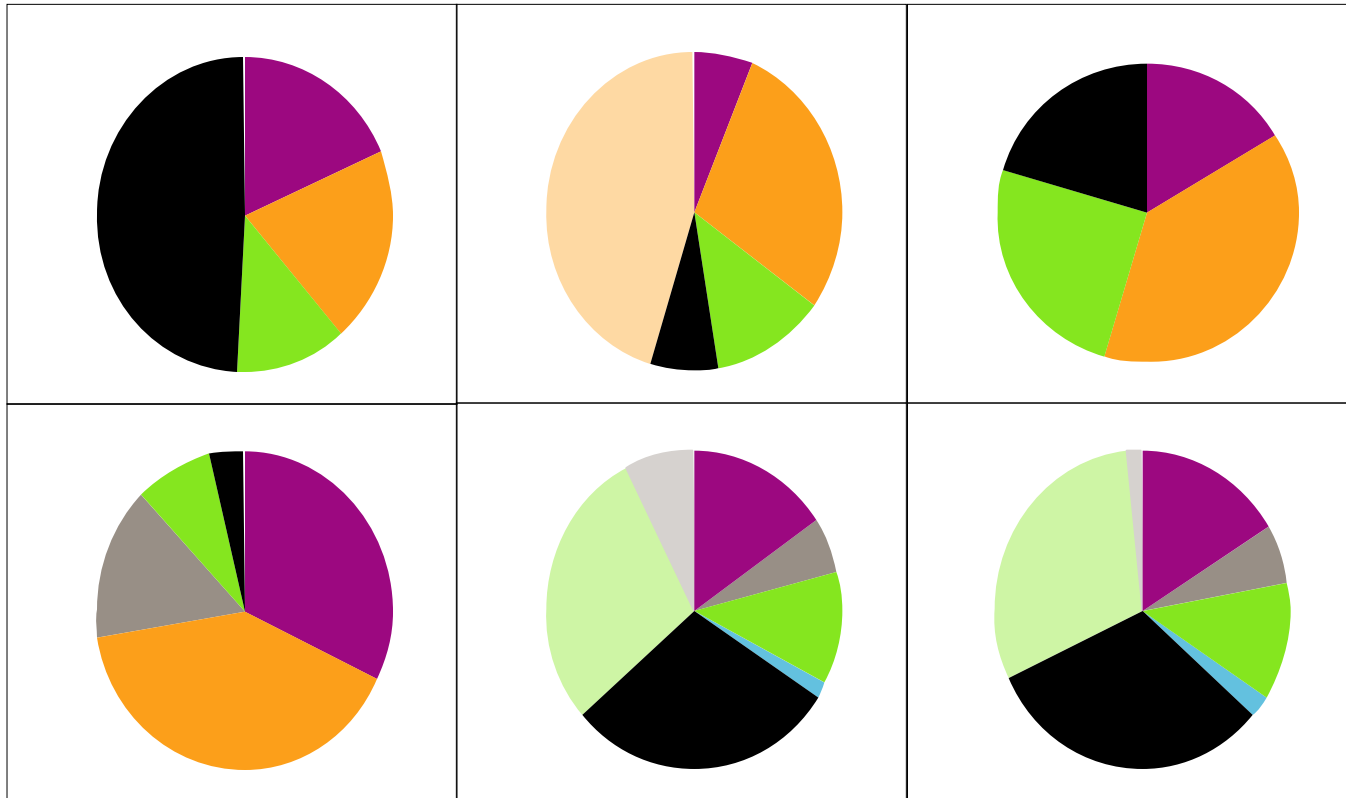


Key: (■ Biosolids Transport); (■ Land Emissions); (■ Chemicals); (■ Dewatering);
 (■ Transport Other); (■ Power); (■ Gas); (■ Process Emissions); (■ Down Time)

Liq Past + MAD

Raw Drying

MAD + Drying



Lime + S H

Raw
Incineration

MAD +
Incineration

Key: (■ Biosolids Transport); (■ Land Emissions); (■ Chemicals); (■ Dewatering);
(■ Transport Other); (■ Power); (■ Gas); (■ Process Emissions); (■ Down Time)

Australia

- Australian government reduction target of 5% of 2000 levels by 2020
 - 357 million t/CO₂ e year
- Currently being measured and reported
- Carbon tax will come in force 1 July 2012
 - Will cover 500 worst polluters (approx 60% of the emissions)
 - This will include all large water companies
 - \$ 23 AUD/t carbon dioxide
 - Rising 2.5% per year
- Will become trade scheme 1 July 2015





GIVE RUSSIES
THE CHOICE TO SAY NO TO

CARBON TAX

London is a Product



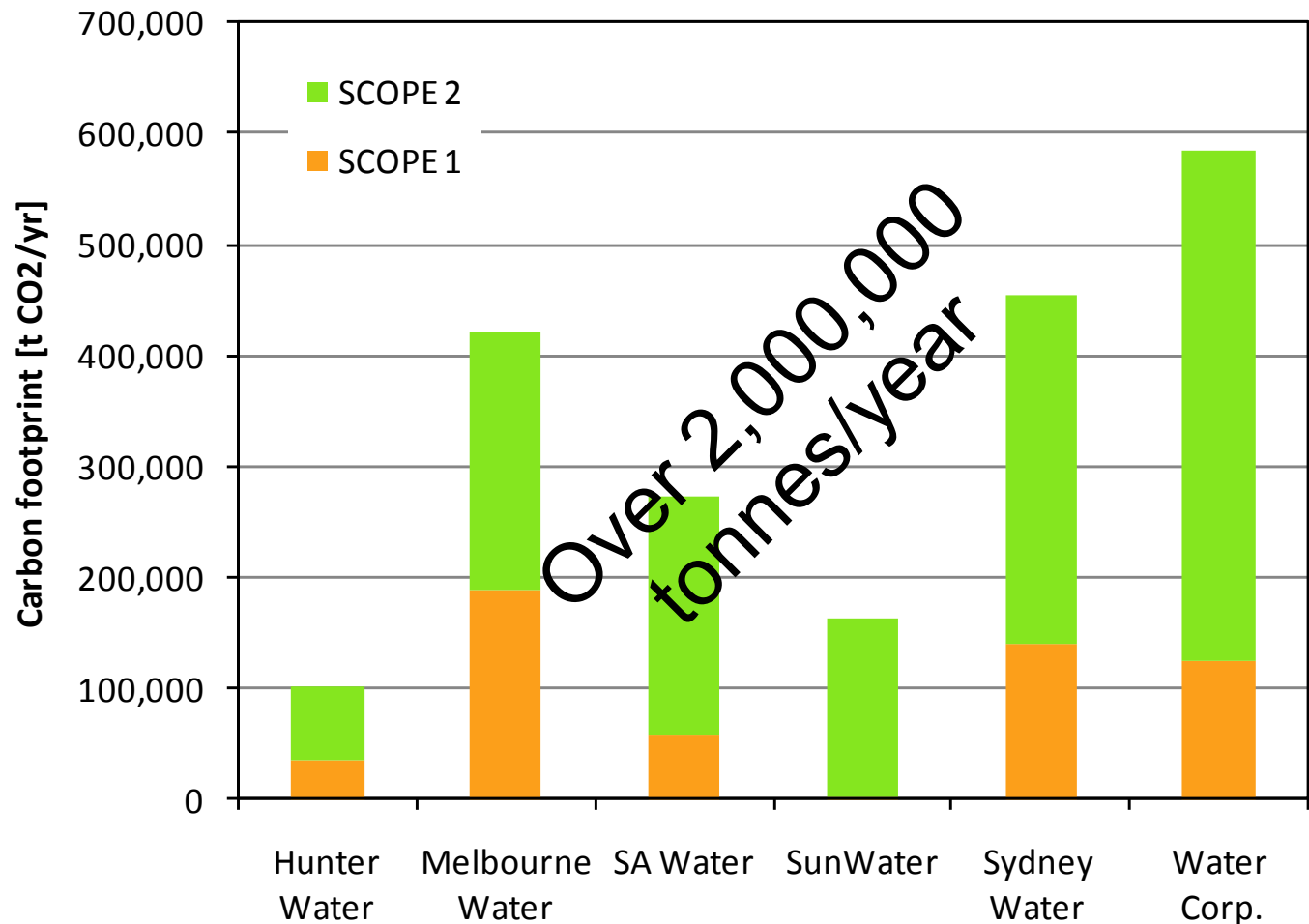
No Carbon Tax Rally



Australian families can't afford it, Julia.

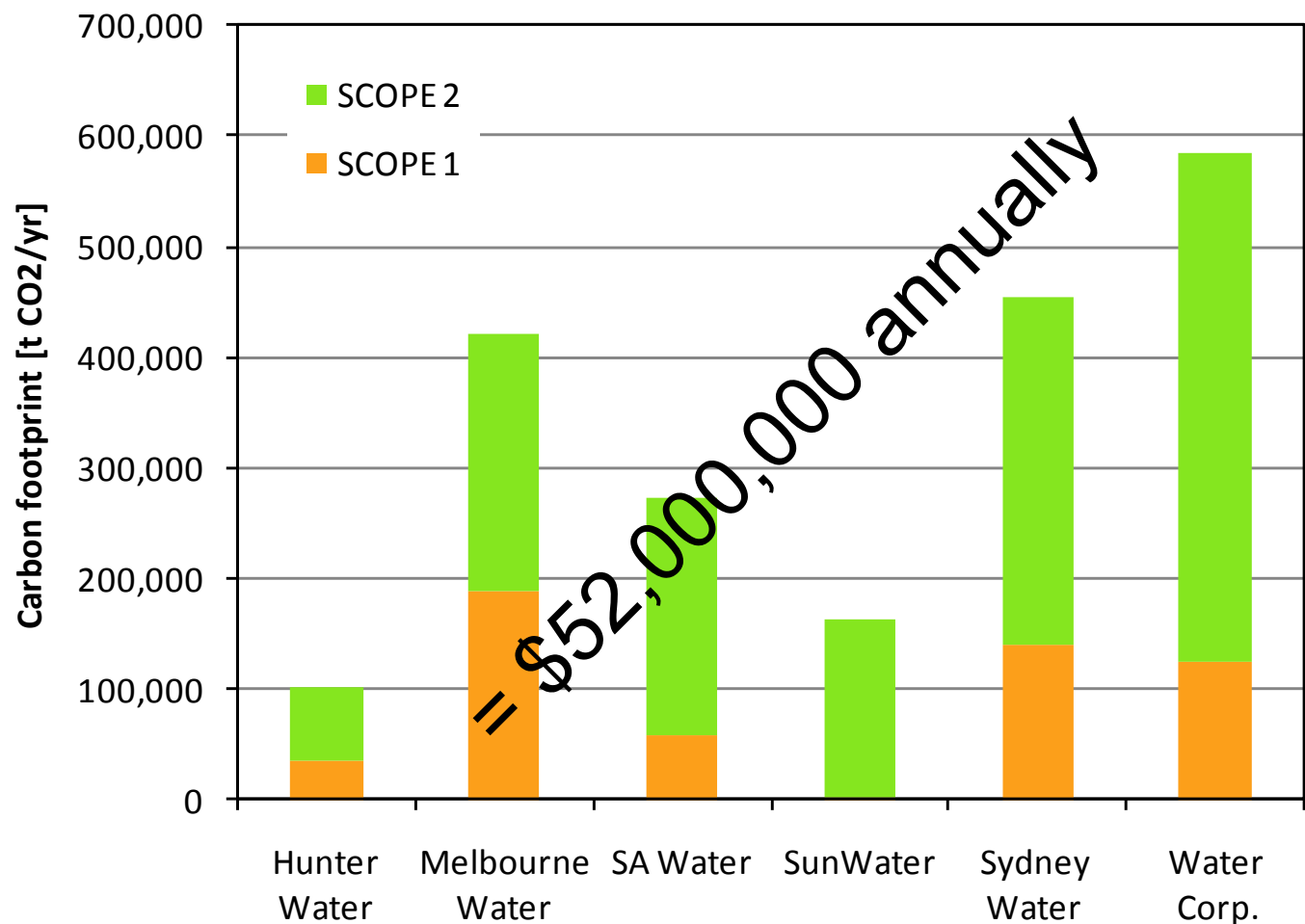


Carbon Footprint of Australian Water Industry



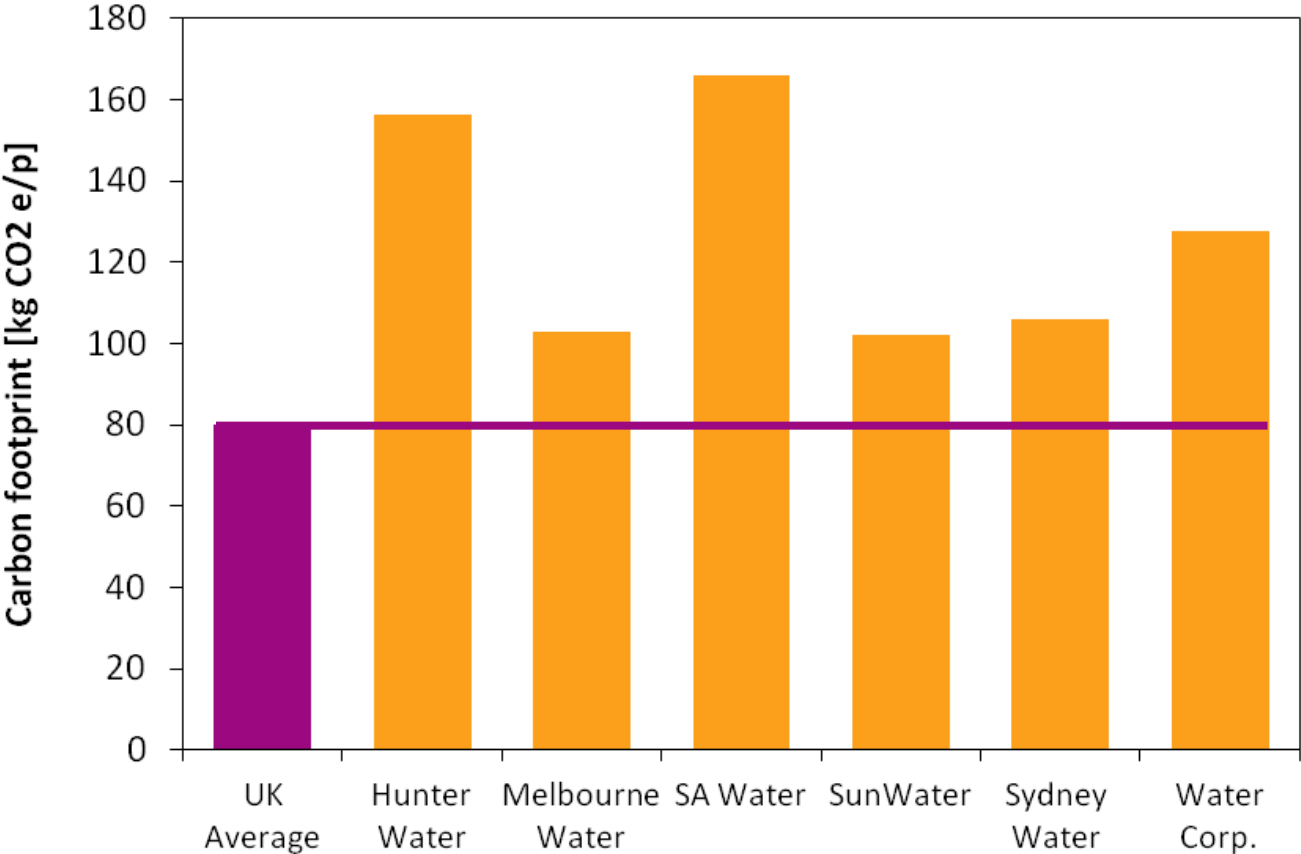
Data plot using Australian Government NGER 2009/10 data

Carbon Footprint of Australian Water Industry

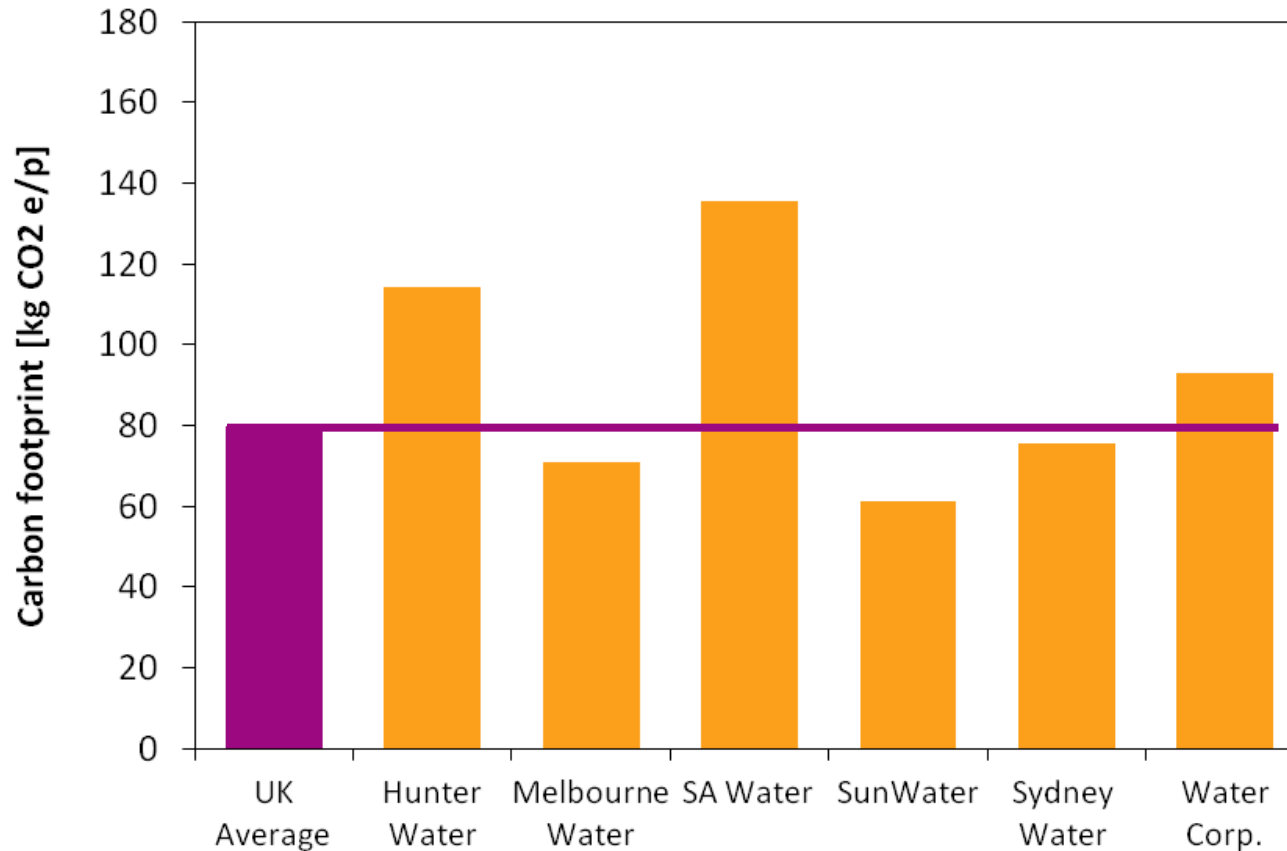


Data plot using Australian Government NGER 2009/10 data

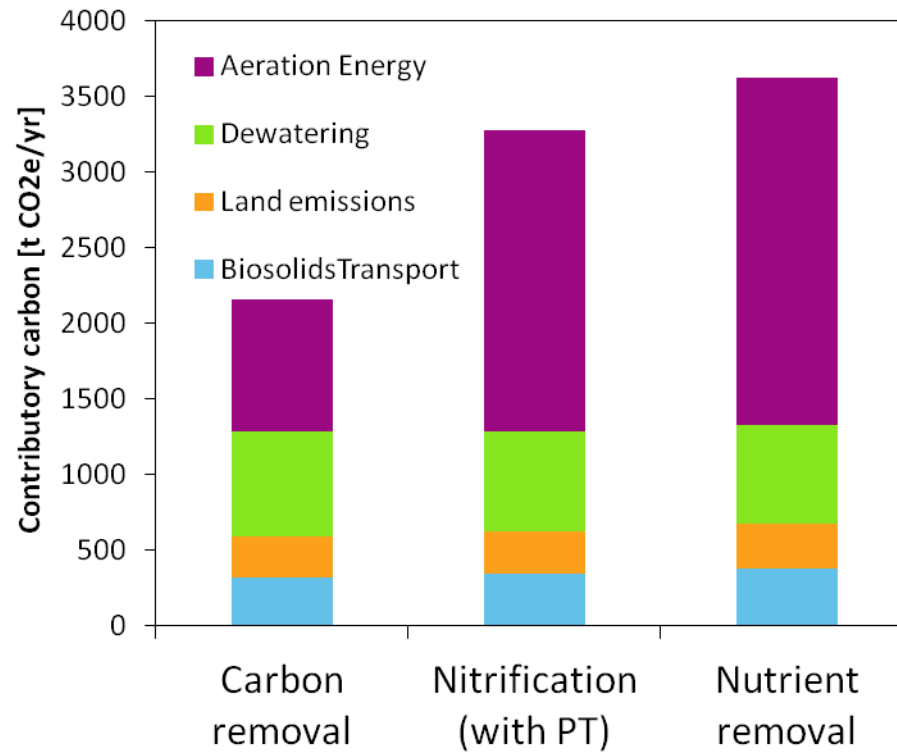
Carbon Footprint of Australian Water Industry



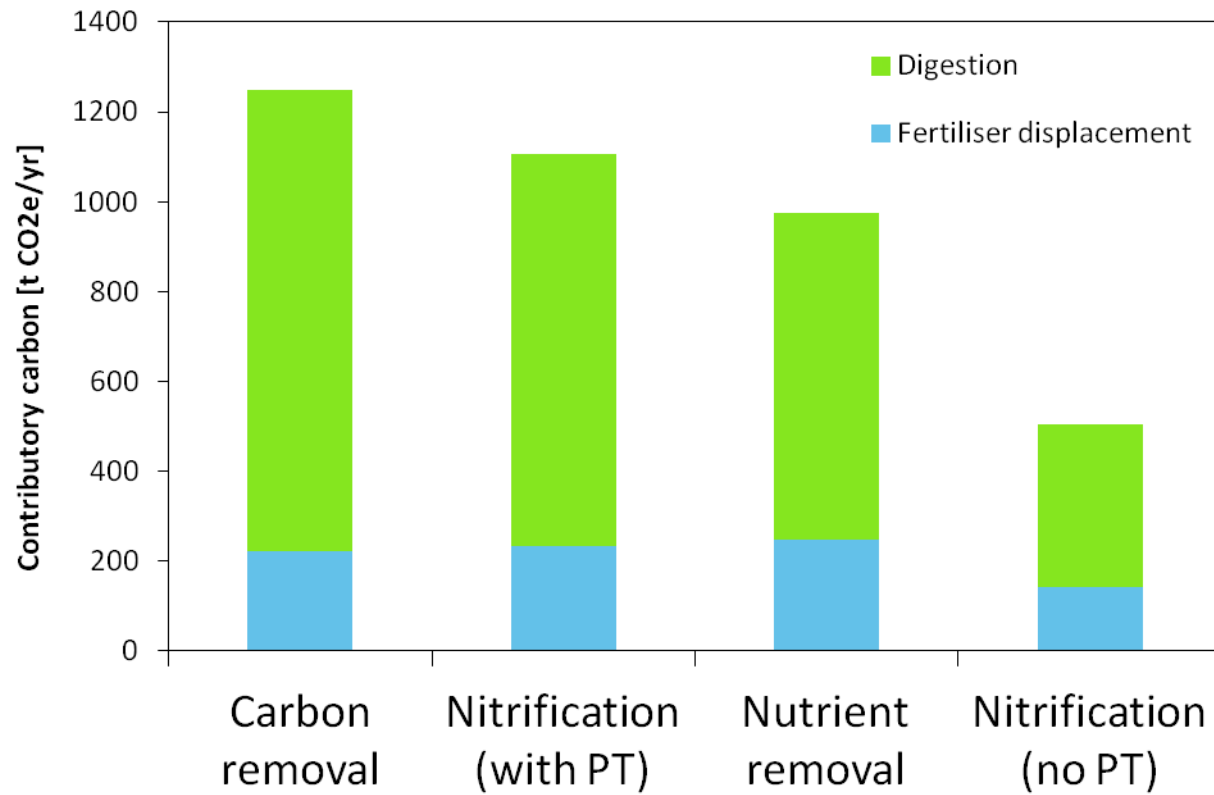
Normalised (to UK) Carbon Footprint of Australian Water Industry



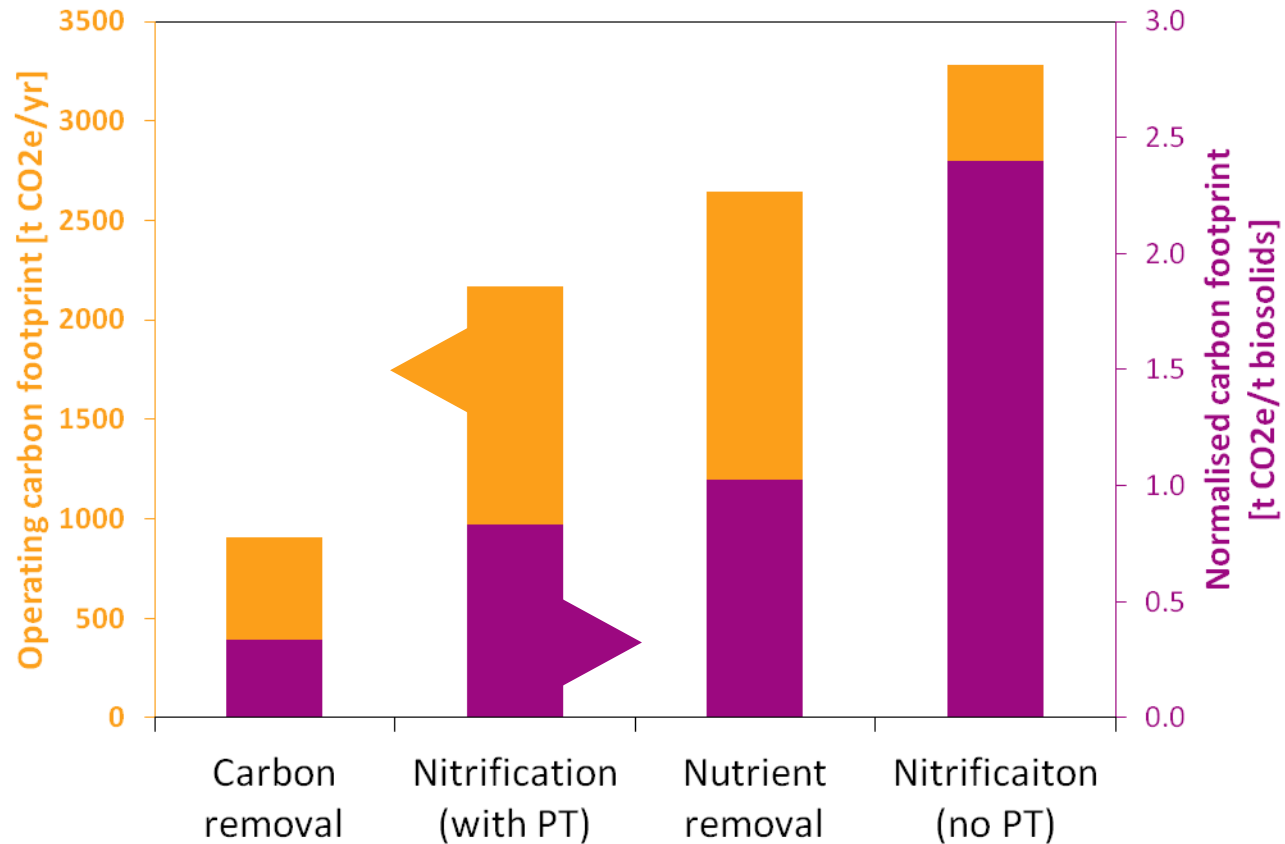
Tightening Legislation



Tightening Legislation



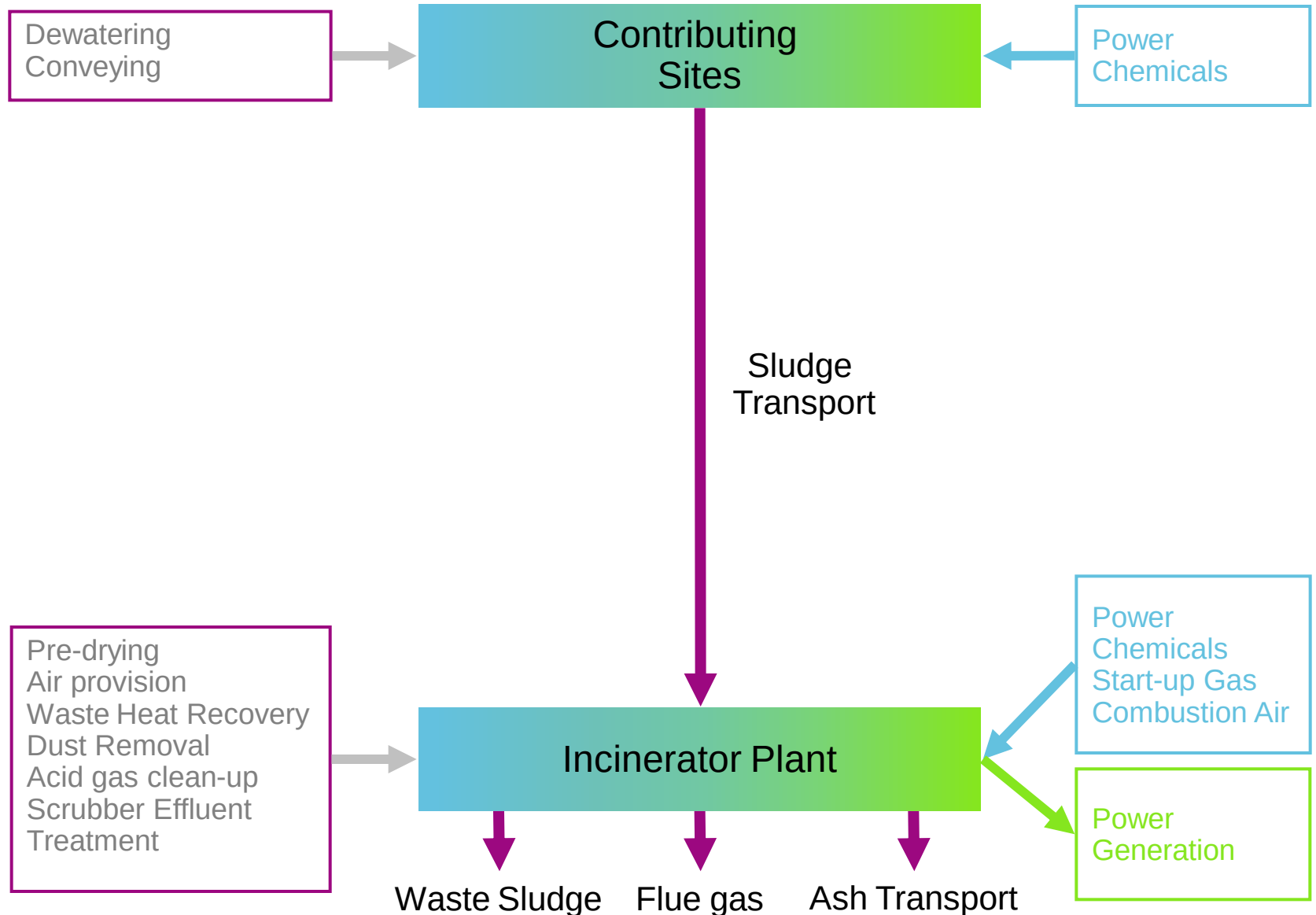
Tightening Legislation



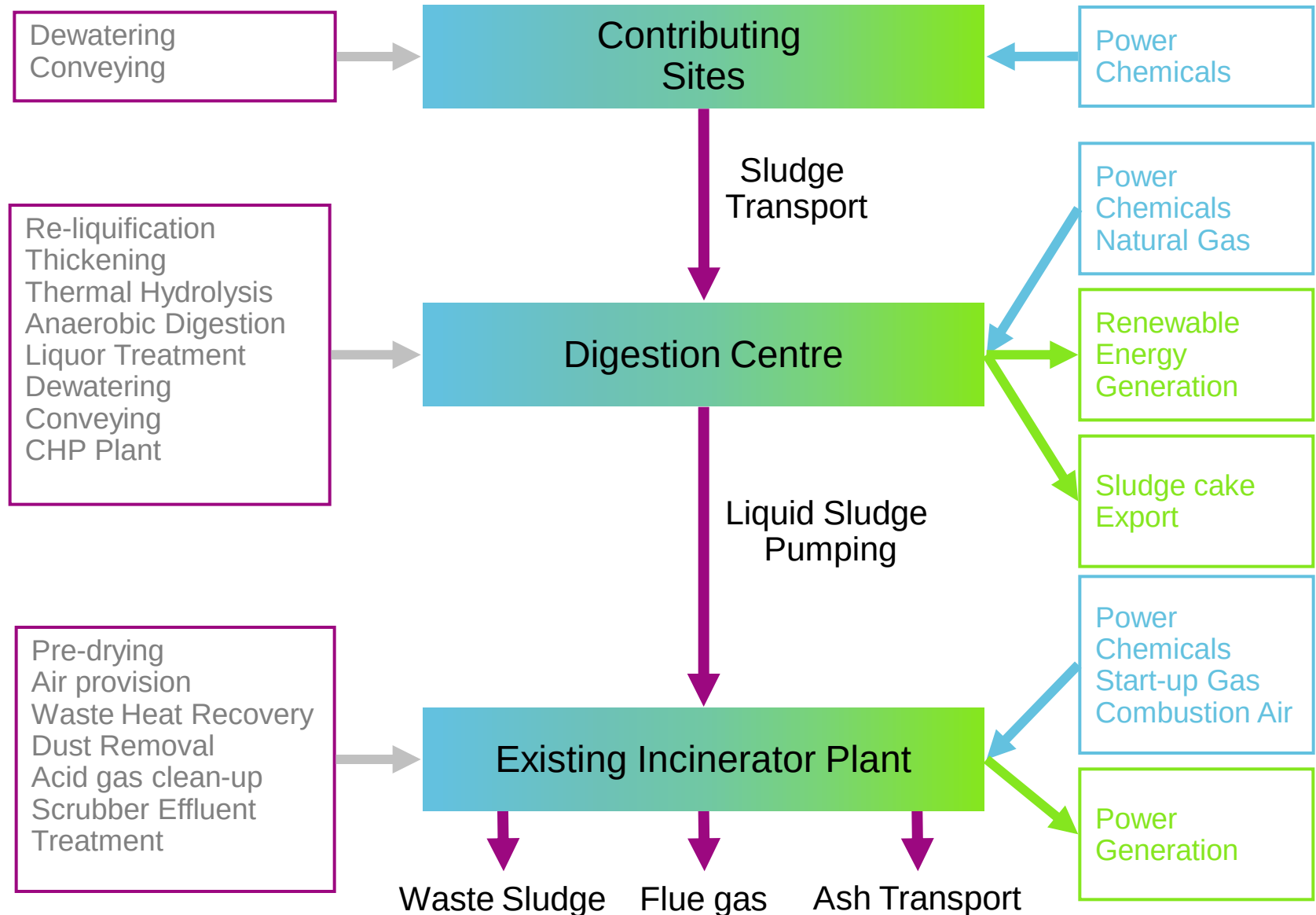
Case Study – New advanced digestion facility

Option 1 – New raw sludge incineration plant

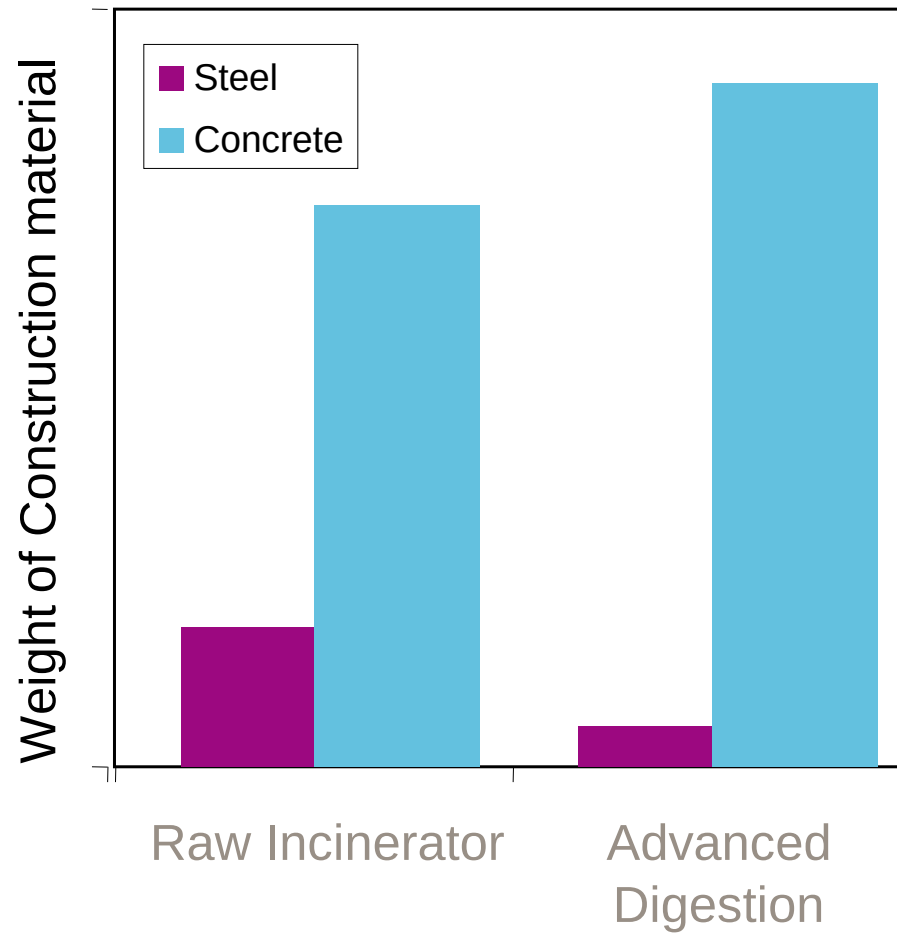
Main Inputs/Outputs impacting Carbon



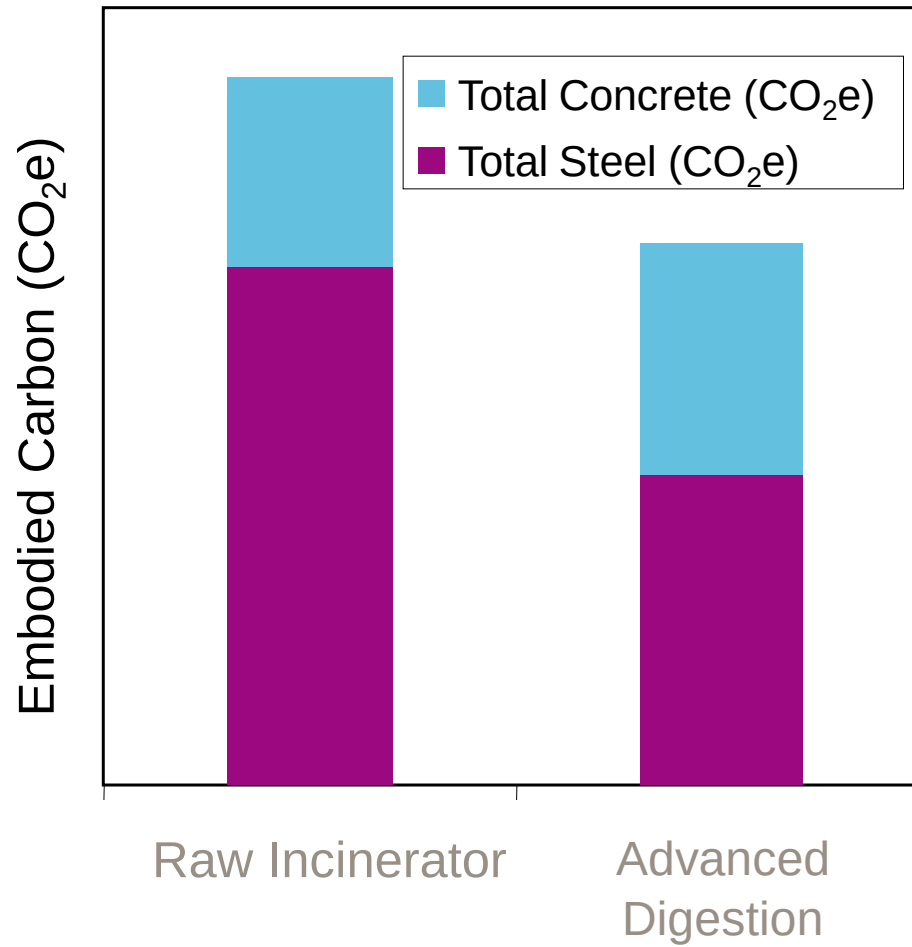
Option 2 – Advanced Digestion with existing incineration



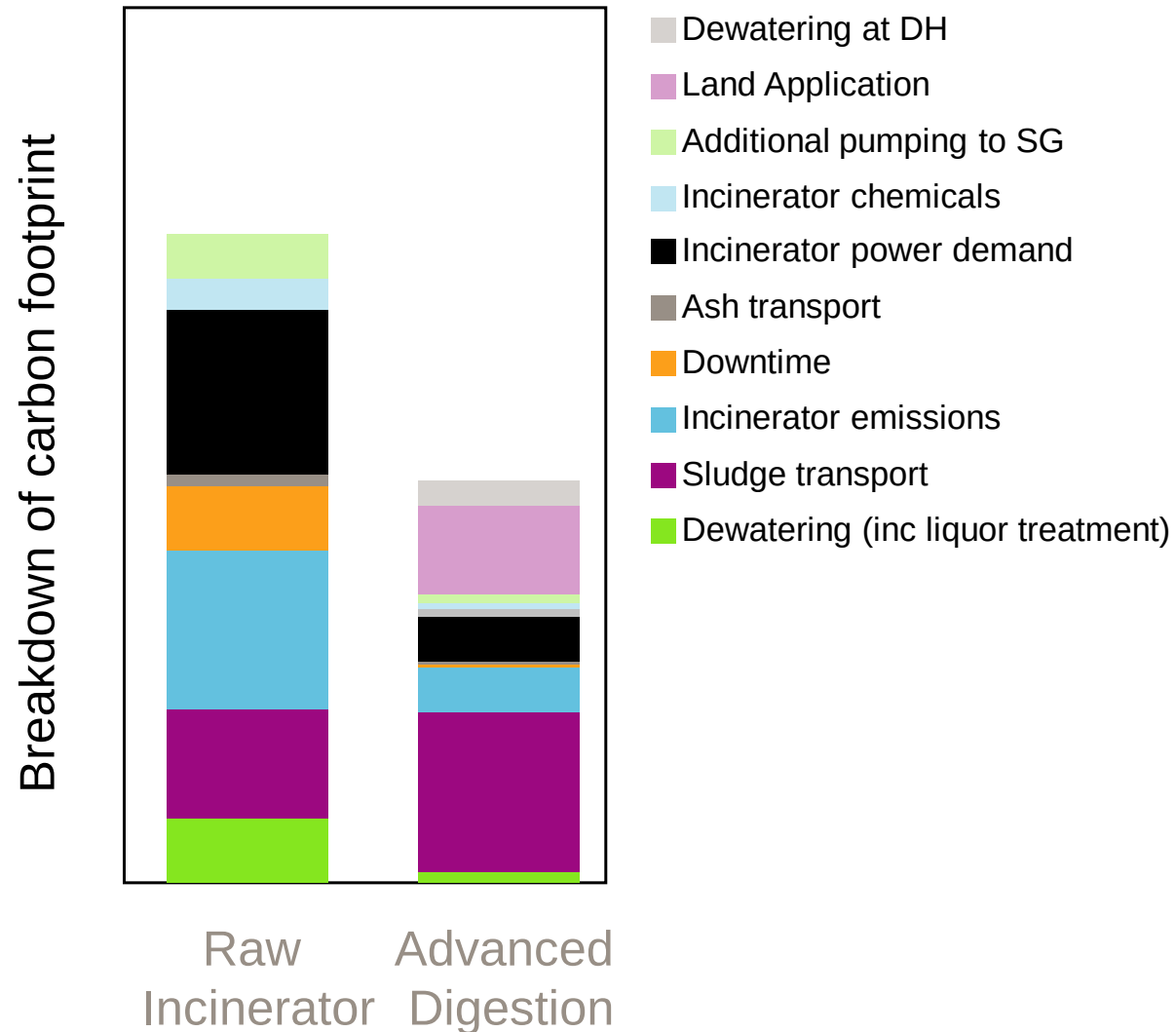
Weight of Construction Materials



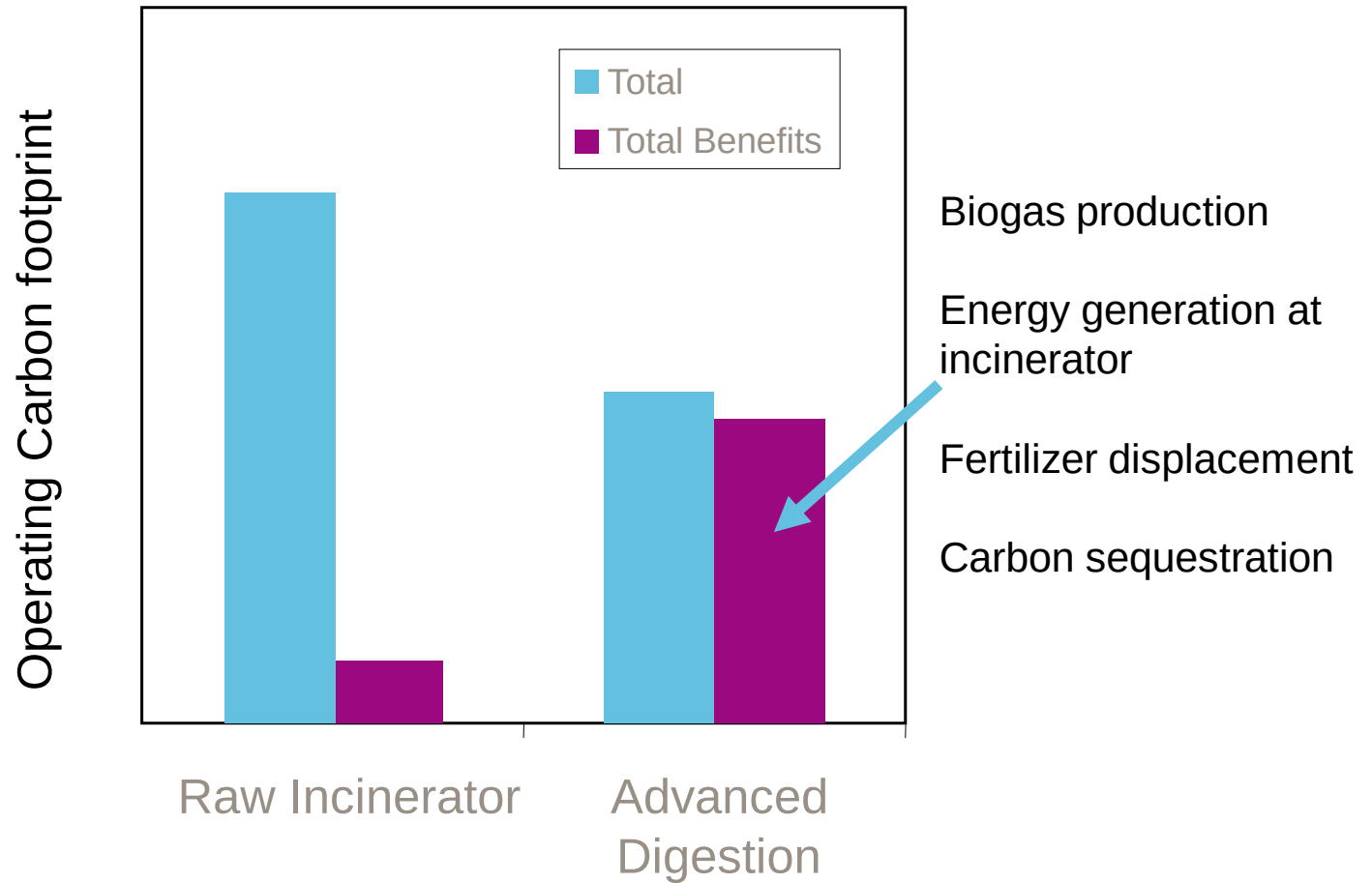
Embodied Carbon



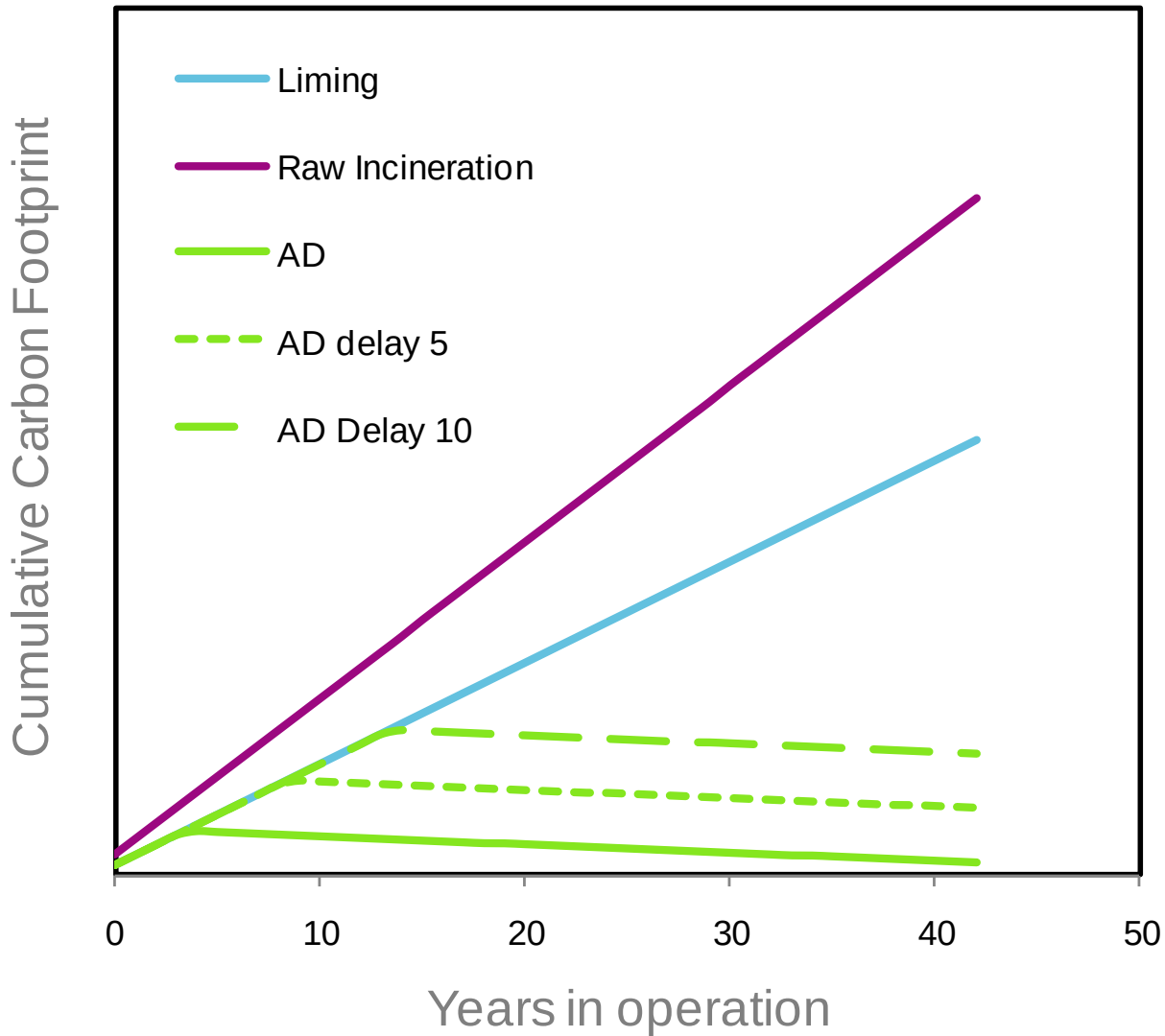
Factors Contributing to Increasing Operating Carbon



Impacts and benefits on operating carbon



Whole Life Carbon Impact



Summary

- Everything we do has a carbon impact and that also includes biosolids production and processing
- Carbon footprint is made up of:
 - embodied and operating
 - Indirect and Direct
 - Owned and influenced emissions
- Choice of technology has large impact on carbon footprint of biosolids options
- Anaerobic digestion is very influential
 - Renewable energy generation
 - Reduces biosolids for further processing
 - Can improve dewatering so reducing transport

Thank You

bill.barber@aeacom.com

44,870 (Raw Incineration)

52,230

6,220

8,640

37,370

7,360

CO₂e

CO₂e

CO₂e

CO₂e

Manufacture

Polymer

Power

Fuel

Manufacture

Chemicals

Power

Emissions

N₂O

Downtime

CH₄ + N₂O

Ash

Transport

Gas

Avoided Power

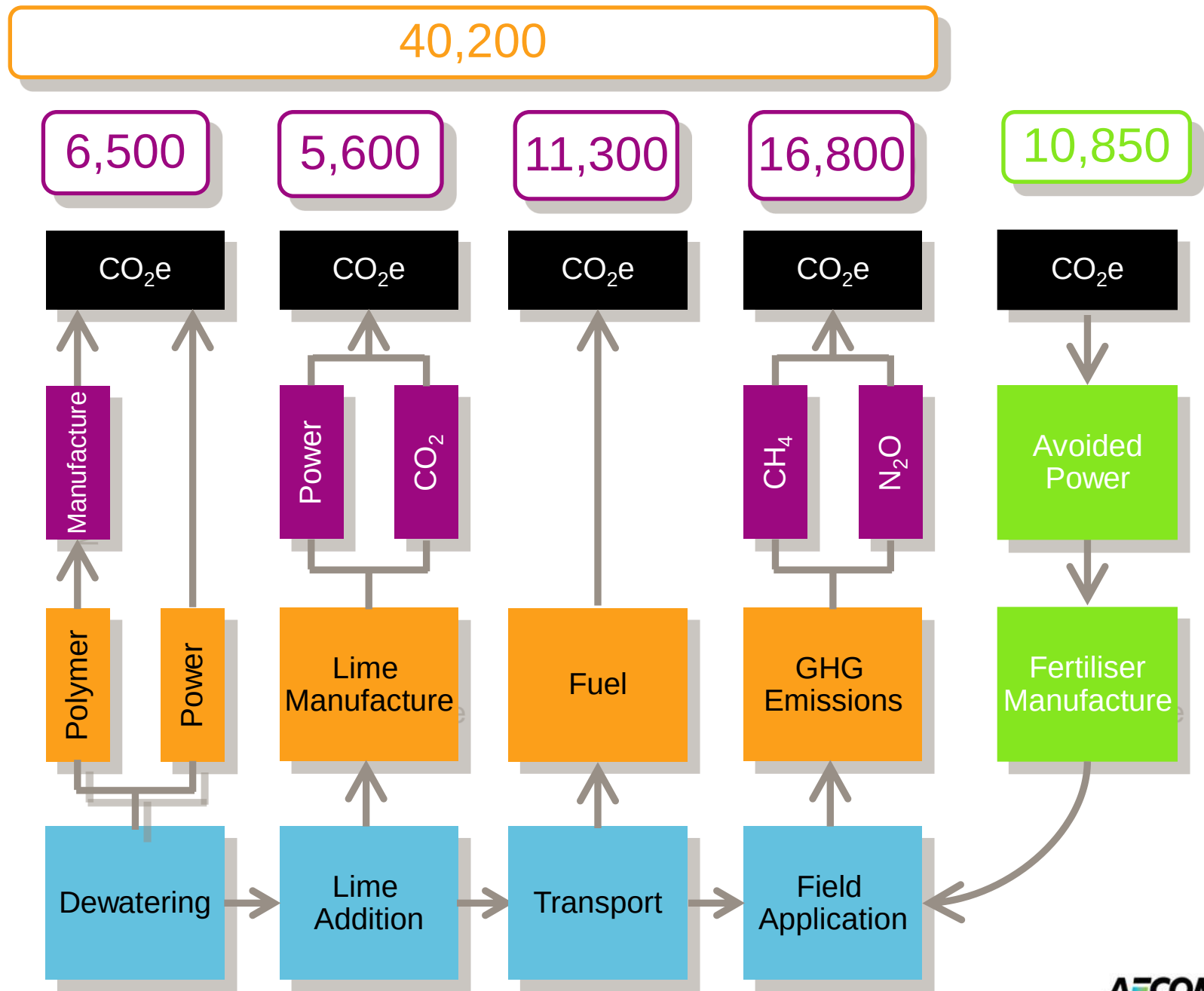
Power Generation

Dewatering

Transport

Incineration

29,300 (Option 1 – Existing)



Advanced Digestion Carbon Footprint

1. Impact on existing digestion plant
2. Impact at existing incineration facility processing additional sludge
3. Recycling of additional Class A biosolids
4. Additional transport (double-handling)

Impact on existing digestion plant

$$\begin{array}{r} 652 \text{ (Existing Digestion)} \\ - 26,282 \text{ (New Digestion)} \\ \hline = 26,934 \text{ (Reduction at Existing Digestion)} \end{array}$$

Additional land application emissions

10,778 (*Contributory land application*)

– **1,969** (*Beneficial land application*)

= **8,809** (*Additional land application*)

Impact on existing incineration plant

10,778 (*Contributory incineration*)

– **1,969** (*Beneficial incineration*)

= **8,809** (*Additional Incineration*)

Total for Advanced Digestion Option

	-26,934 (<i>Reduction at existing digestion</i>)
+	3,829 (<i>Additional land application</i>)
+	8,809 (<i>Additional Incineration</i>)
+	11,408 (<i>Additional Transport</i>)
=	-2,888 (<i>Advanced Digestion Total</i>)