



The Future is Circular

The circular economy, climate change, and the role of the public sector

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Presentation Outline

1. Why a circular economy is essential to fight climate change
2. (Some of) What's happening in Scotland
3. Why the public sector is essential to the circular economy story



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About Zero Waste Scotland

Funded by Scottish Government and ERDF, we exist to help Scotland achieve its vision of a more circular, sustainable economy in a world with limited resource.

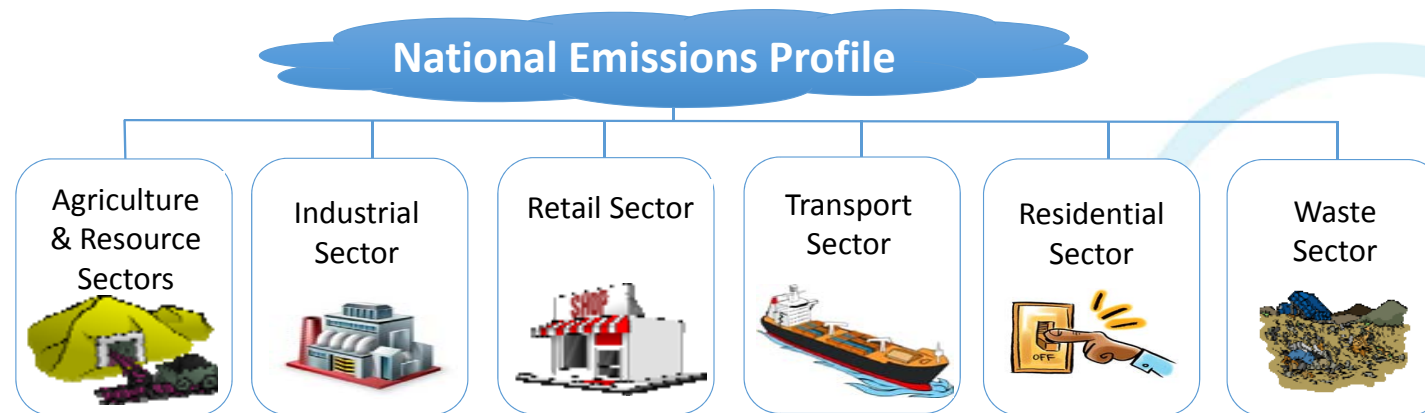


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'Supply-Side' Decarbonisation

The predominant approach to tackling climate change

- **Reducing the carbon intensity per unit of supply (kwh, km, kg etc.)**
- Very practical approach
 - Matches existing government structure
 - Sector-specific, discrete actors, focused interventions
 - Techno-focus (no behavior/business model changes)
- Basis for international emissions reporting





'Supply-Side' Decarbonisation

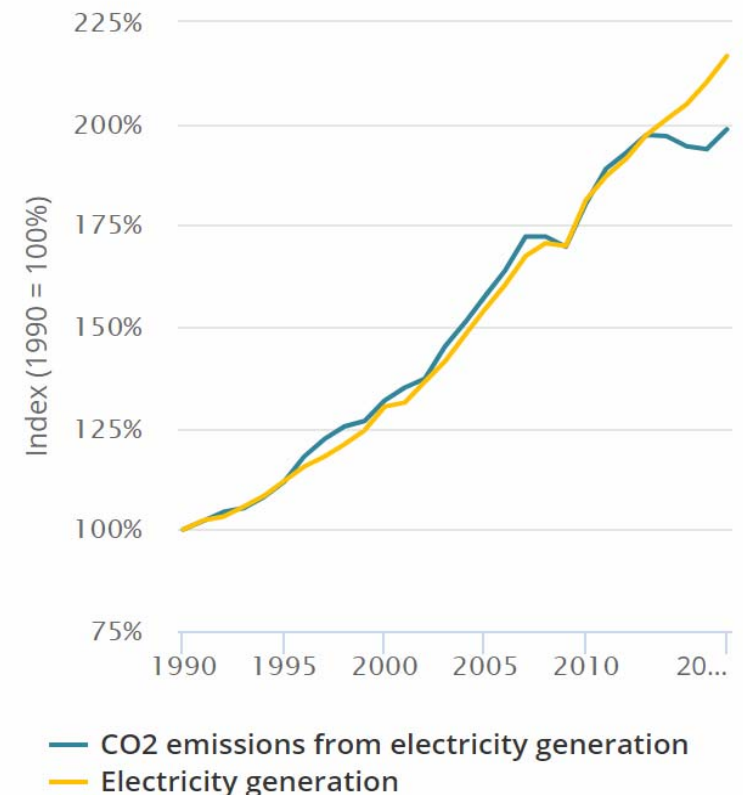
From cars to trains to washing machines, supply-side decarbonisation is working!

- Between 2010-2018, global carbon intensity of electricity generated fell 10% (avg. 475gCO₂e/kwh).

But it's outpaced by demand growth:

- Over the same period, electricity consumption grew 20%

[International Energy Agency \(2019\)](#)

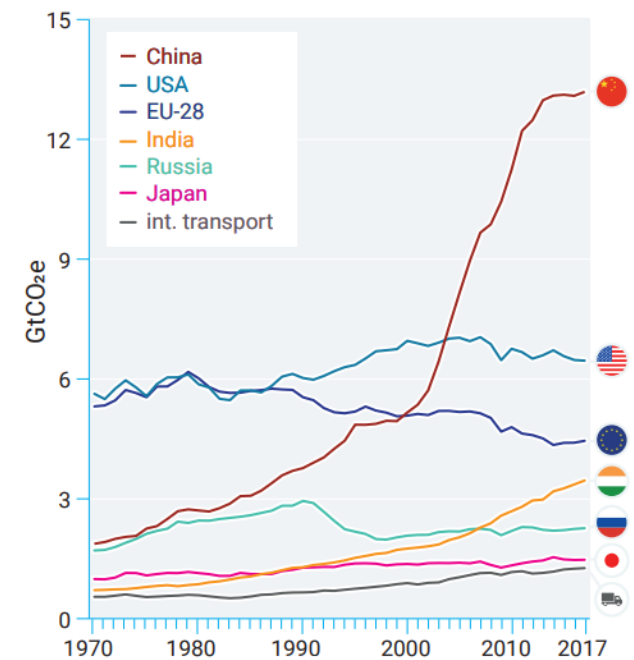
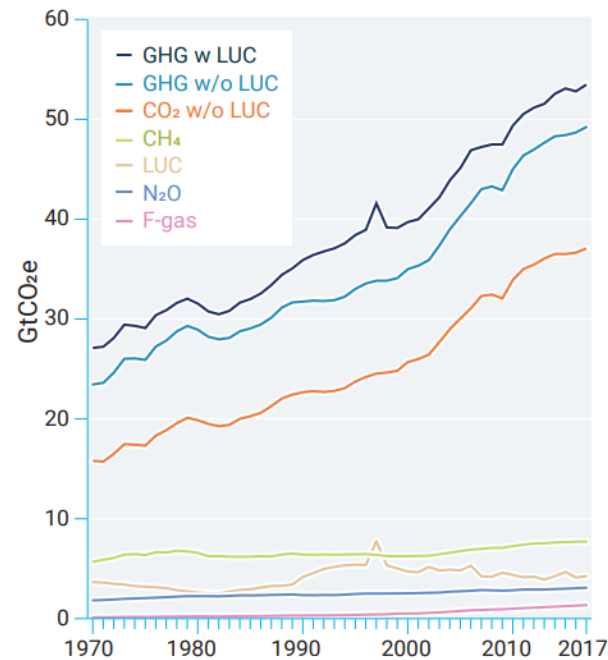


'Supply-Side' Decarbonisation

Global emissions continue to increase because demand is growing faster than we can decarbonize supply.

Key Drivers:

- Global population growth
- Rising global middle class
- Economic growth
- 'Offshoring emissions'



Source: EDGAR v5.0/v4.3.2 FT2017 CO₂ (Olivier et al., 2018) and Global Carbon Project (Le Quéré et al., 2018).

Territorial vs. Consumption Emissions

By offshoring emissions, developed countries are hitting emissions targets but not solving climate change

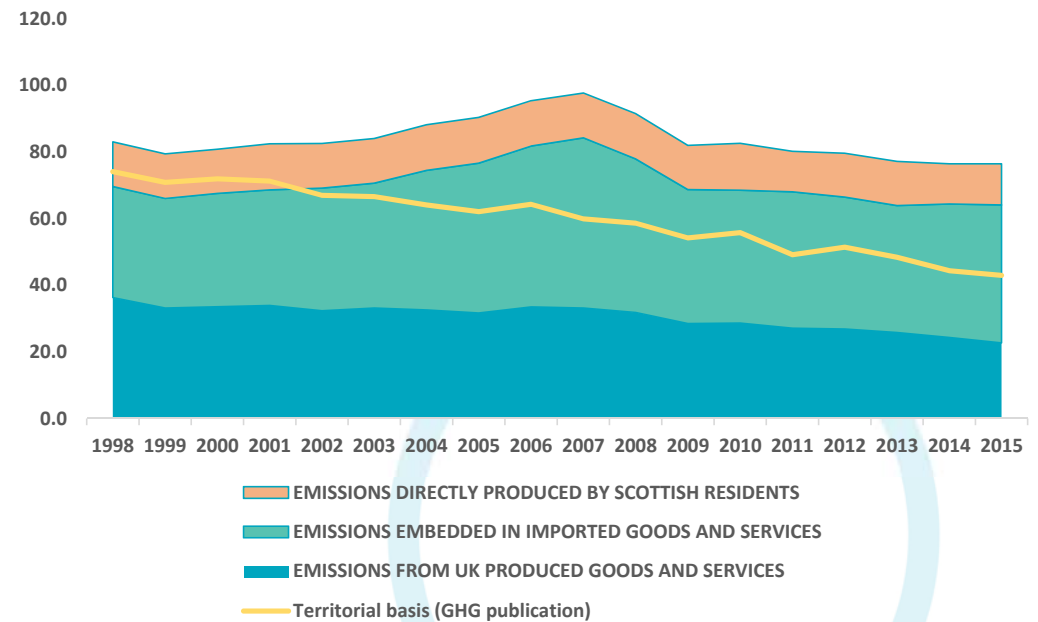
84% of Scotland's carbon footprint are from goods and services

- ¾ due to material consumption (ZWS, 2015)
- Increasing carbon imports (emissions outsourcing)

Growing gap between Scotland's territorial emissions & carbon footprint:

- Between 1998 and 2015, Scotland's territorial emissions fell 42%; carbon footprint just 8%

Scotland's Carbon Footprint vs. Territorial Emissions





**Decarbonising supply remains critical,
but we also need to reduce demand...**

Enter the Circular Economy...



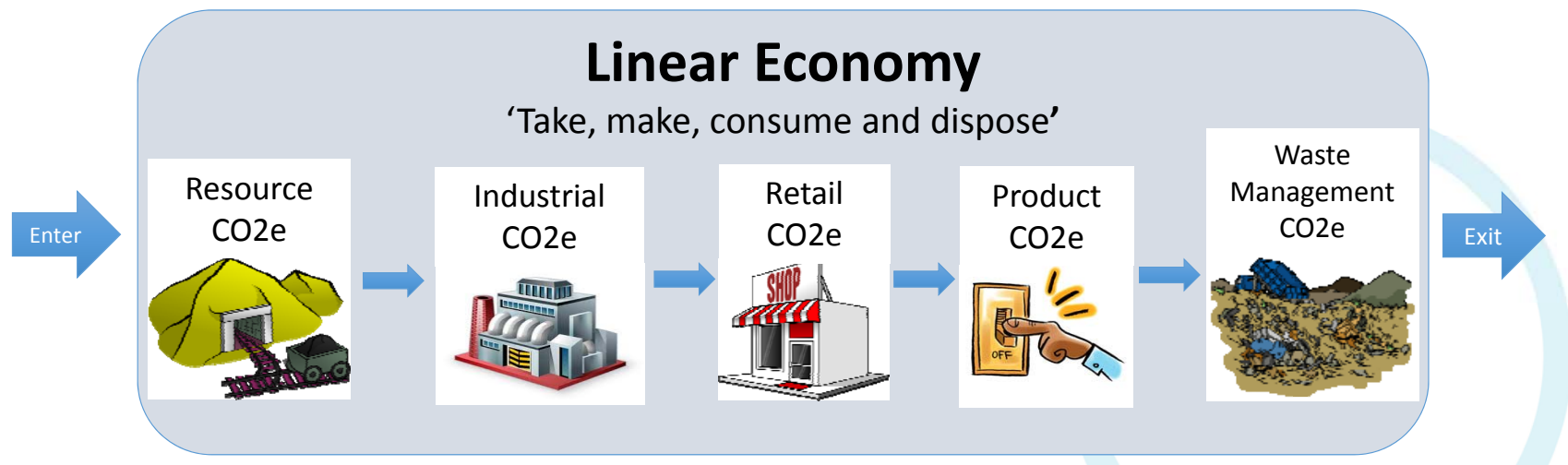
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The Circular Economy

The Linear Economy

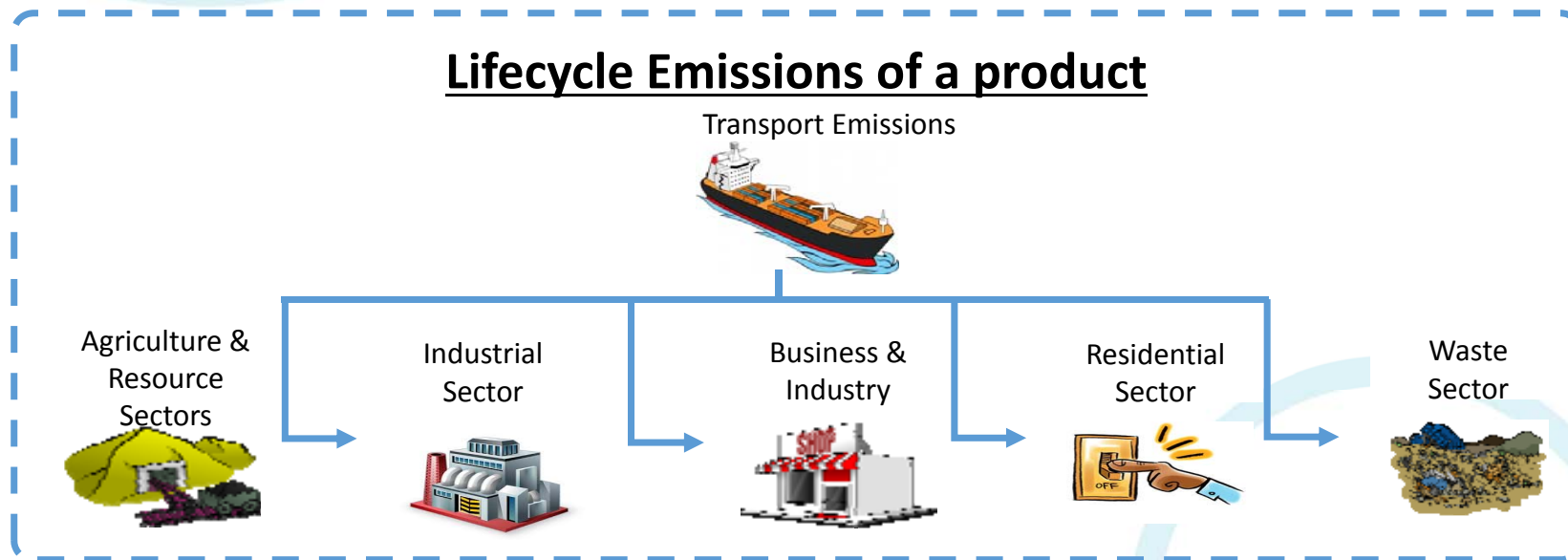
1. Materials enter the economy through resource extraction
2. Are processed and transformed into products (generating emissions at each stage)
3. And eventually exit the economy as waste

The Linear Economy's high material demand and low material retention makes it carbon inefficient. Energy decarbonisation does not address this fundamental inefficiency



The Circular Economy

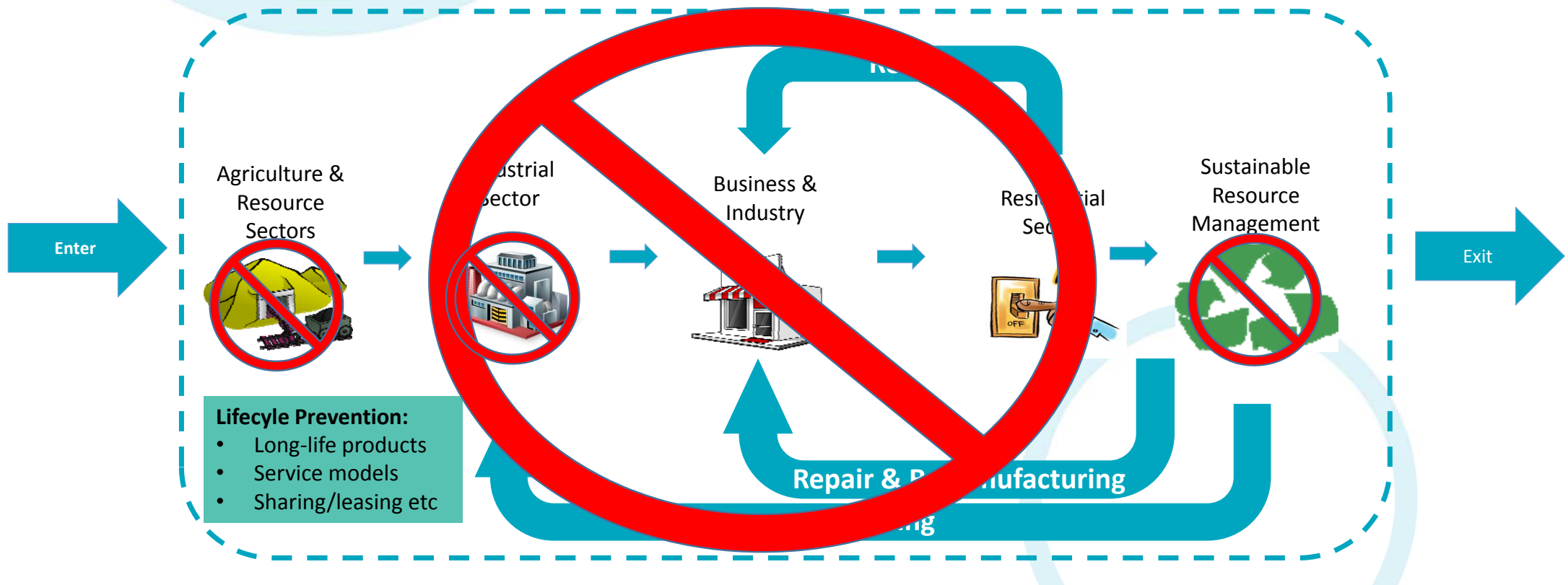
Lifecycle Perspective: The majority of global emissions are driven by material consumption and waste



The circular economy focuses on reducing the cause (not the source) of emissions

The Circular Economy

CE interventions aim to eliminate lifecycle stages or whole product lifecycles





The Circular Economy

‘Demand-side dematerialization’

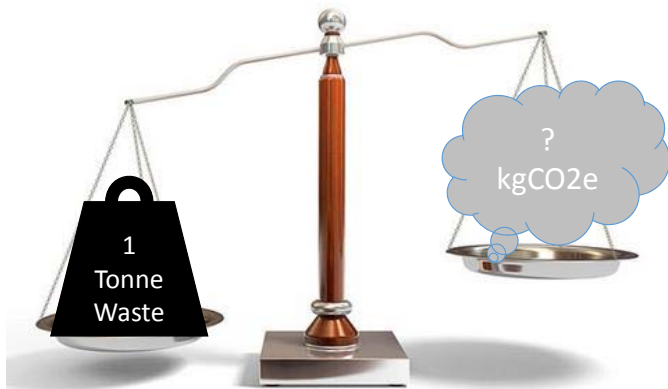
By providing the same services while reducing overall material demand, the circular economy offers a complementary approach to conventional ‘supply-side decarbonization’.

Key Challenges:

- 1. Lack of Material Data** - limits our ability to measure, implement and even imagine circular solutions.
- 2. Requires behavioural and business model change** – this takes time, imagination and leadership!

The Carbon Metric

Making the most of waste data



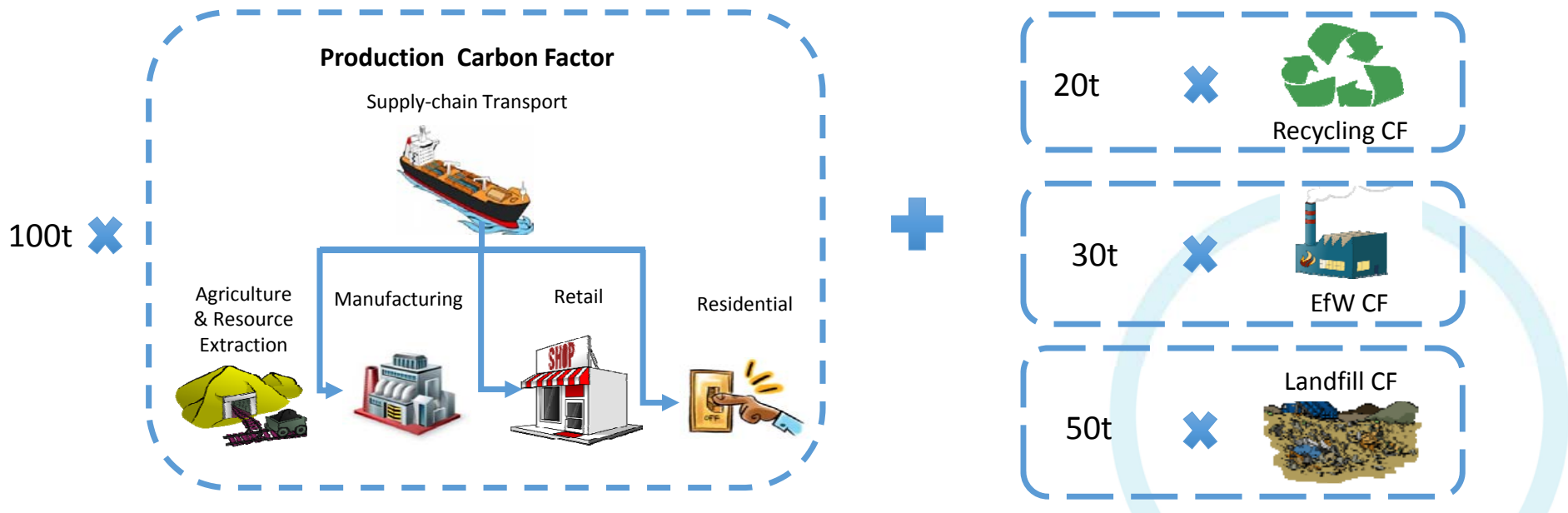
- Waste data is the best material data available
- Carbon Metric measures the whole-life impacts of Scotland's waste using lifecycle analysis
- Annual publication began with the 2011 Carbon Metric (2013)
- In 2018, elevated by Scottish Government to official statistic

The Carbon Metric

Making the most of waste data

2 components:

1. SEPA's National Waste Data (33 material categories, 3 disposal pathways)
2. Corresponding lifecycle database



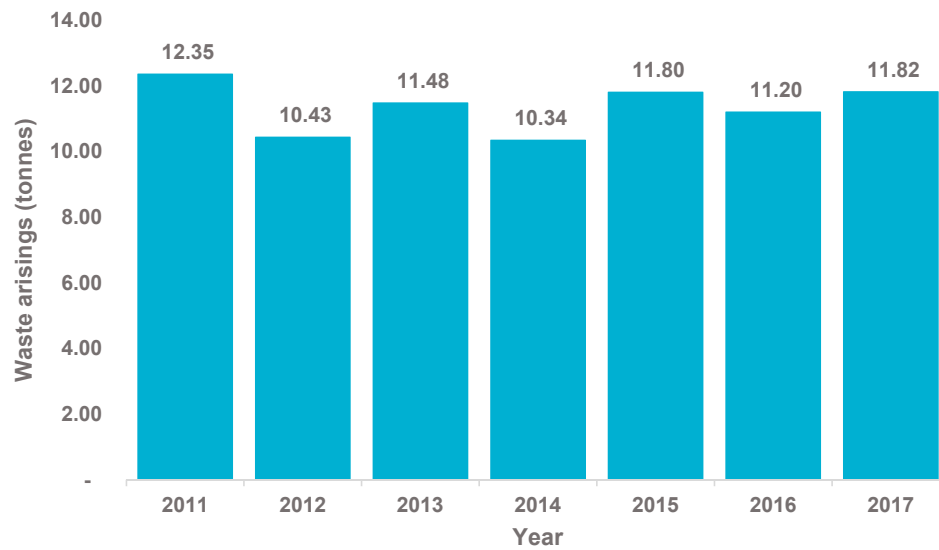


The Carbon Metric

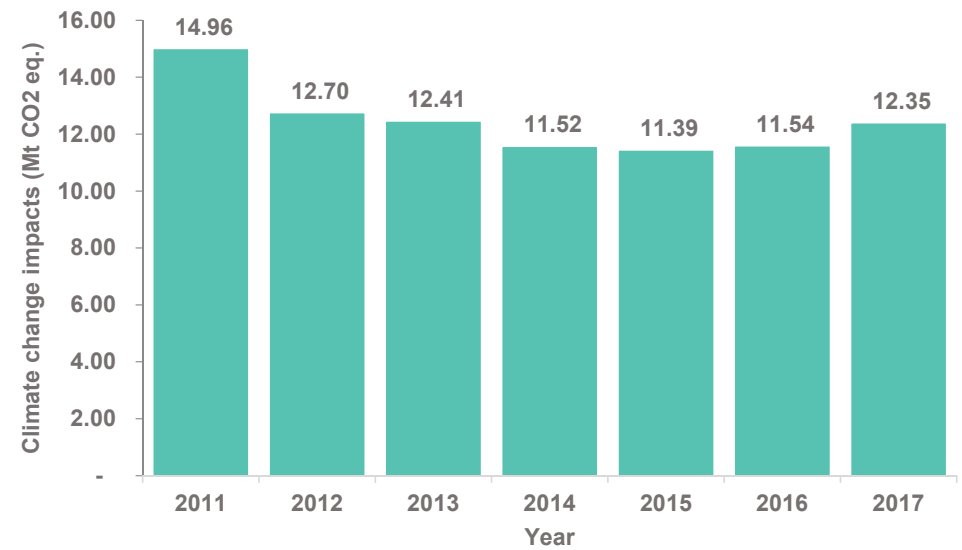
Making the most of waste data

Scotland's waste carbon impacts have fallen 17% since 2011

Total Waste Generated (Mt)



Total Waste Carbon Impacts (MtCO₂e)

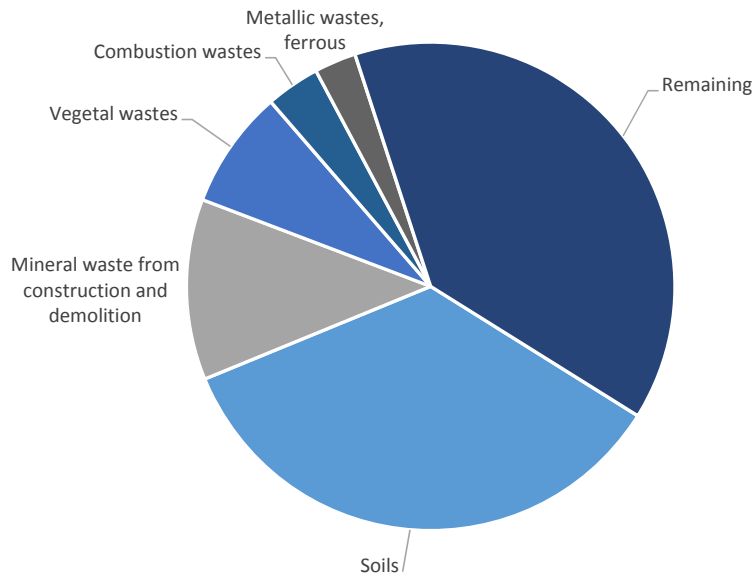


The Carbon Metric

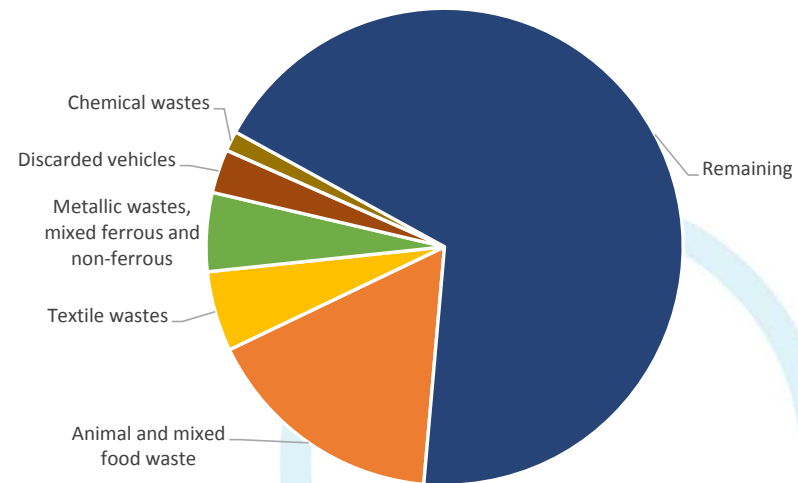
Making the most of waste data

Focusing waste policy where it has the greatest climate benefits

Top 5 Waste Materials by Weight



Top 5 Waste Materials by Carbon Impacts



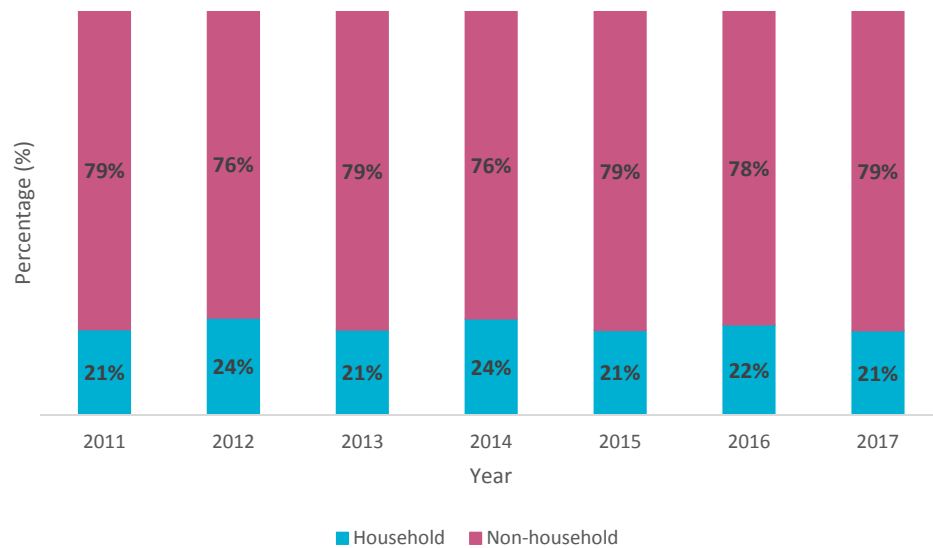


The Carbon Metric

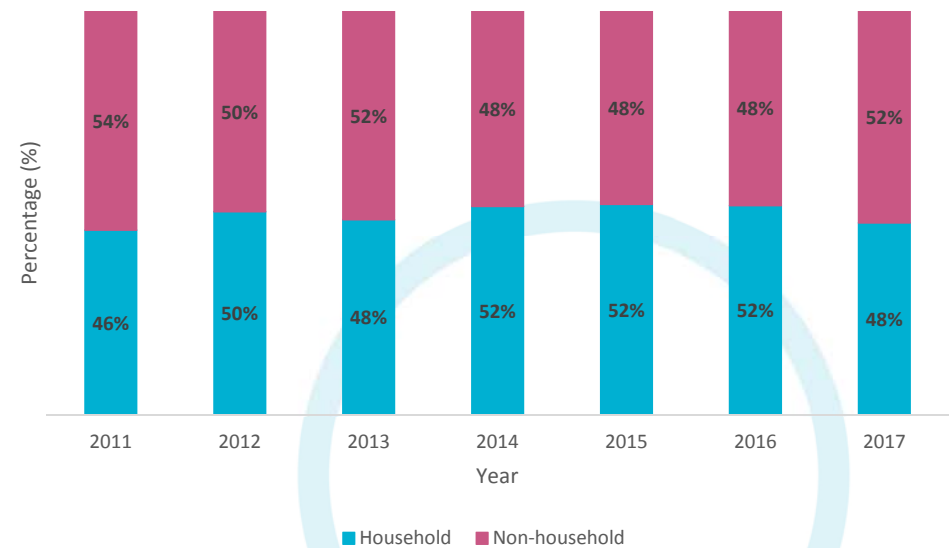
Making the most of waste data

Household waste accounts for <25% of Scottish Waste, but ~50% of waste carbon impacts

Share of Scotland's Waste by Weight



Share of Scotland's Waste Carbon Impacts



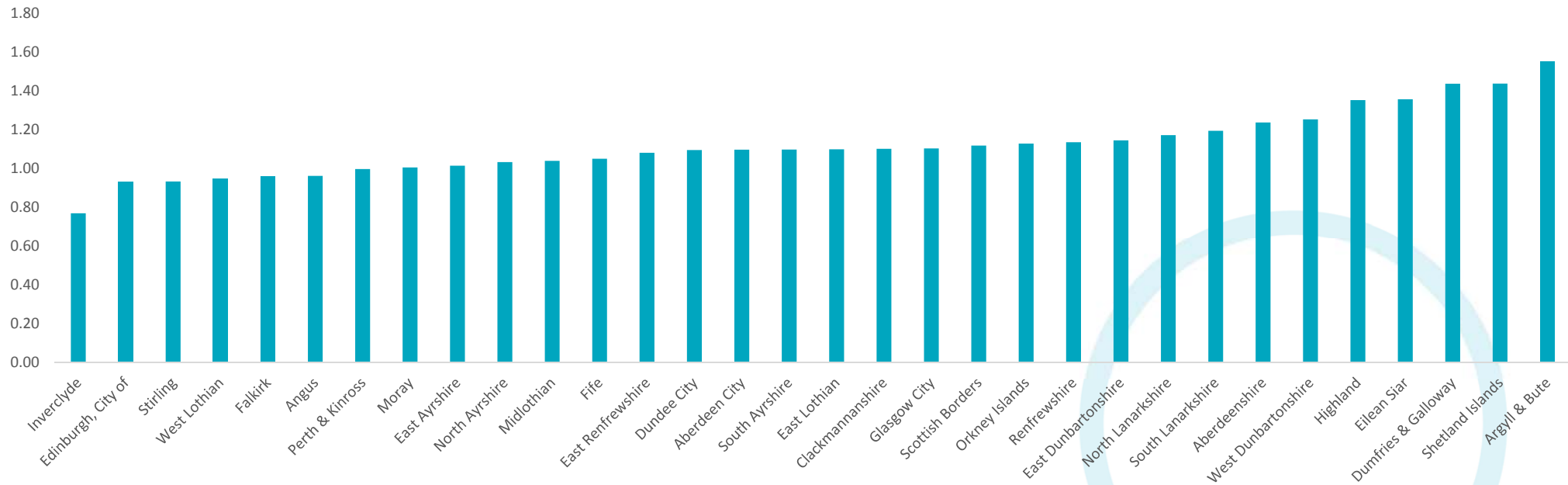


The Carbon Metric

Making the most of waste data

Highlighting large differences in per capita waste carbon impacts between LAs

2015 Waste Data: tCO₂e per capita



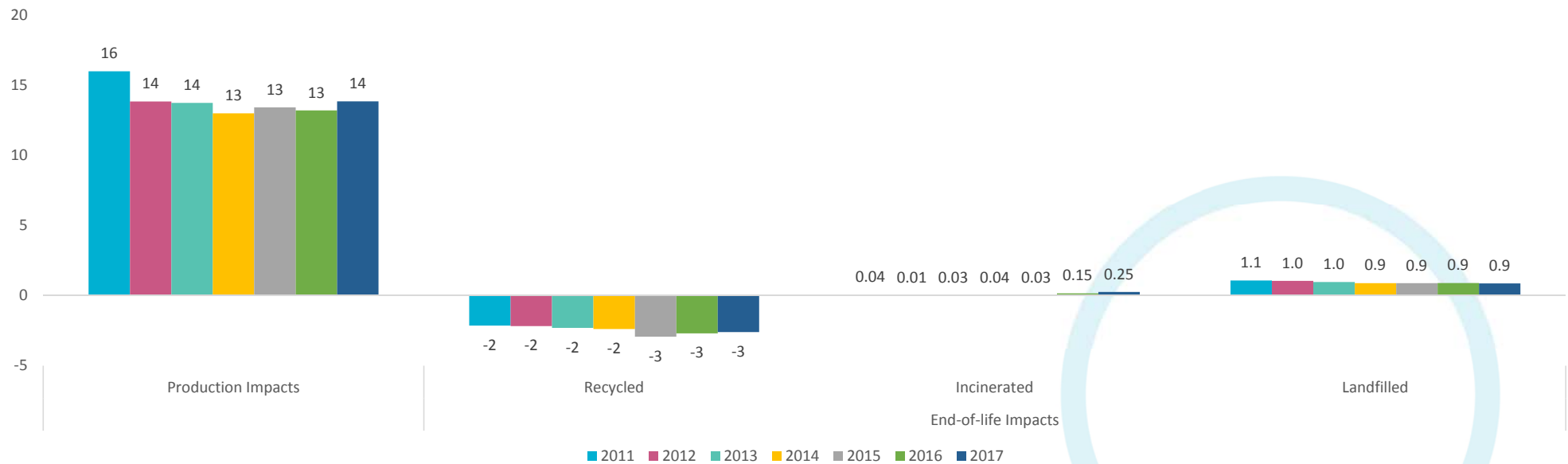


The Carbon Metric

Making the most of waste data

- Production accounts for the vast majority of waste carbon impacts
- The benefits of prevention far exceed those of recycling

Lifecycle Impacts of Scotland's Waste





The Circular Economy

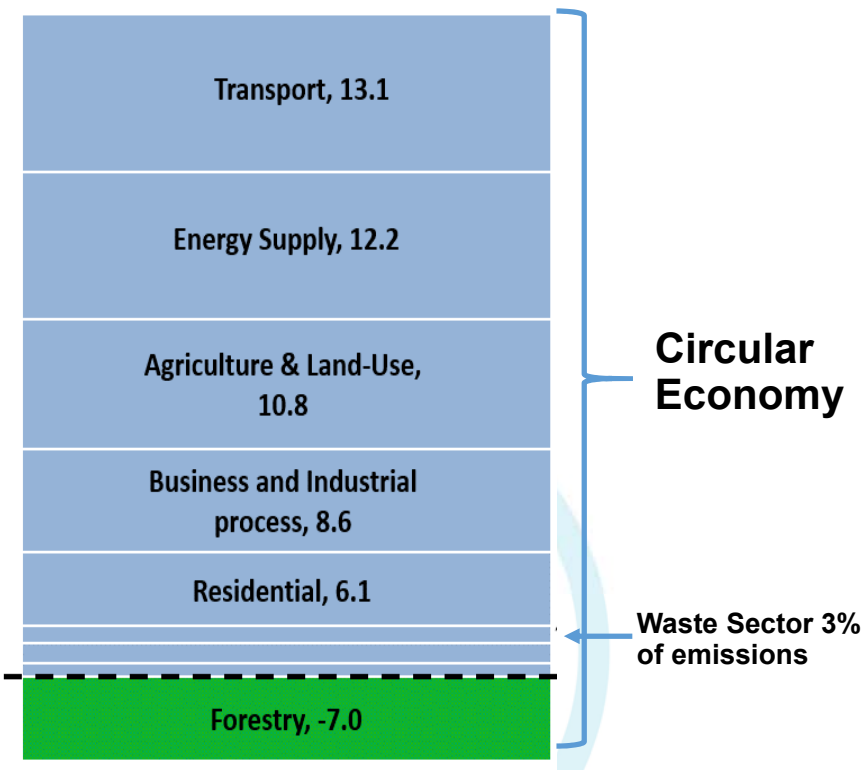
Moving beyond Waste

Waste & the CE: a 'marriage of convenience'

- Waste data is the best material data available with which to imagine and measure the CE
- But the CE affects all economic sectors!

Better materials data is required to grasp CE's full potential.

- Afterall, *"you can't manage what you can't measure."*
- Scotland and Zero Waste Scotland are leading in this effort...





How Scotland is Closing the Material Data Gap

Moving beyond Waste

1. Mapping sector-specific material flows

- i. Public sector studies (e.g. NHS procurement and catering)
- ii. Reuse sector studies
- iii. North Sea Decommissioning – explored reuse options for >500kt of O&G infrastructure.

2. Mapping Scotland's bioresources

- i. Beer, Whisky and Fish (2015) – quantified wastes and byproducts from 3 sectors and identified inter-utilization potential worth £0.6b.
- ii. Biorefining Potential for Scotland (2017) – quantified, characterised and located 27Mt pa of bioresource feedstock to support bioeconomy



How Scotland is Closing the Material Data Gap

Moving beyond Waste

3. Understanding urban metabolism

- i. *Circular Glasgow (2016)* – quantified material flows within city and created strategy for circular innovation

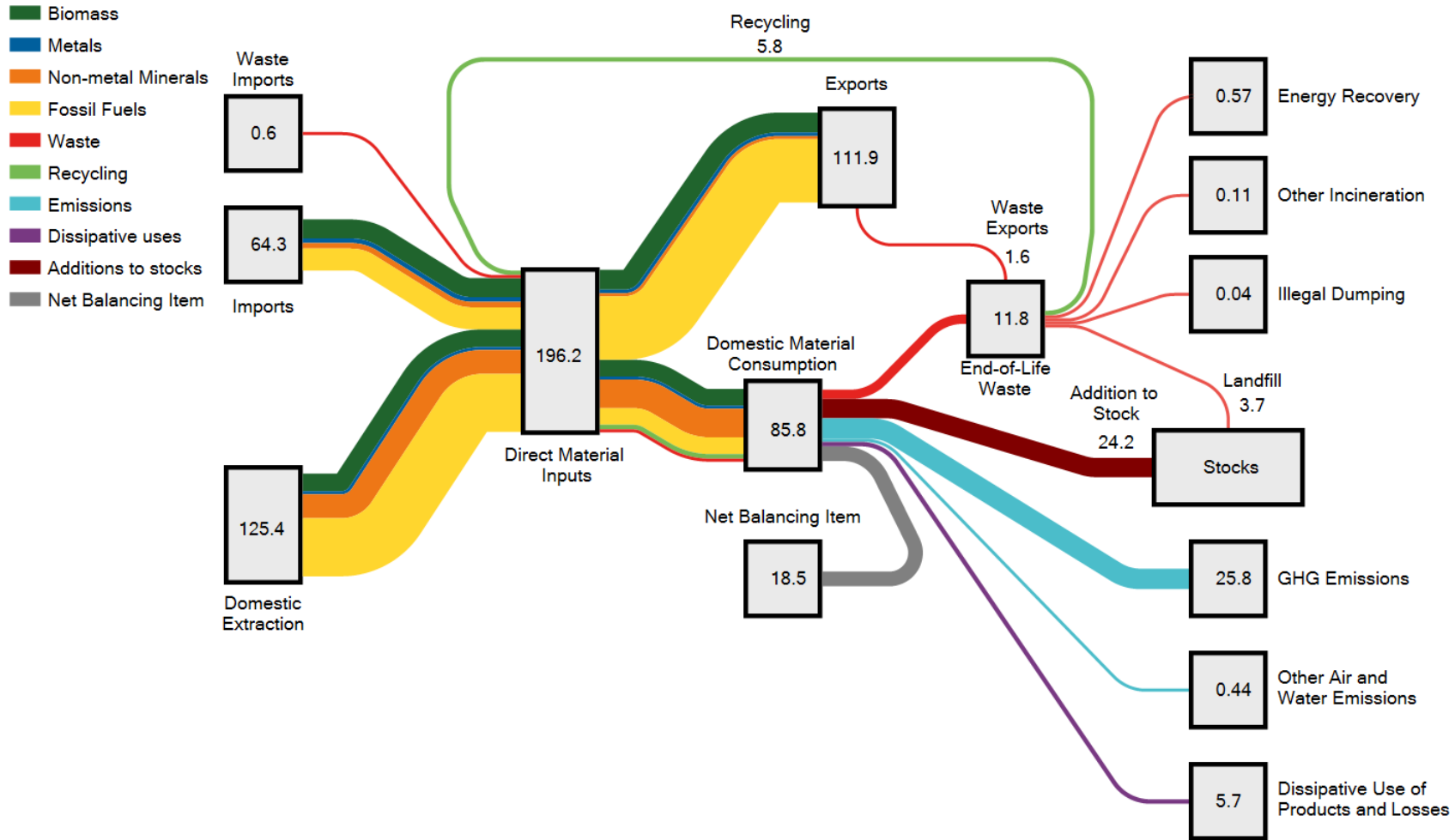
4. Quantifying Scotland's Material Footprint

- i. *Carbon Impacts of the Circular Economy (2015)* – first study to estimate net carbon impacts of material consumption at country scale.
- ii. *Scottish Material Flows Account (2019)* – comprehensive account of Scotland's material inputs and outputs; first ever at sub-national scale.

Scotland: Material Flow Diagram

Units: Million tonnes

Year: 2016





The Role of the Public Sector

Helping bring circular economy solutions to market

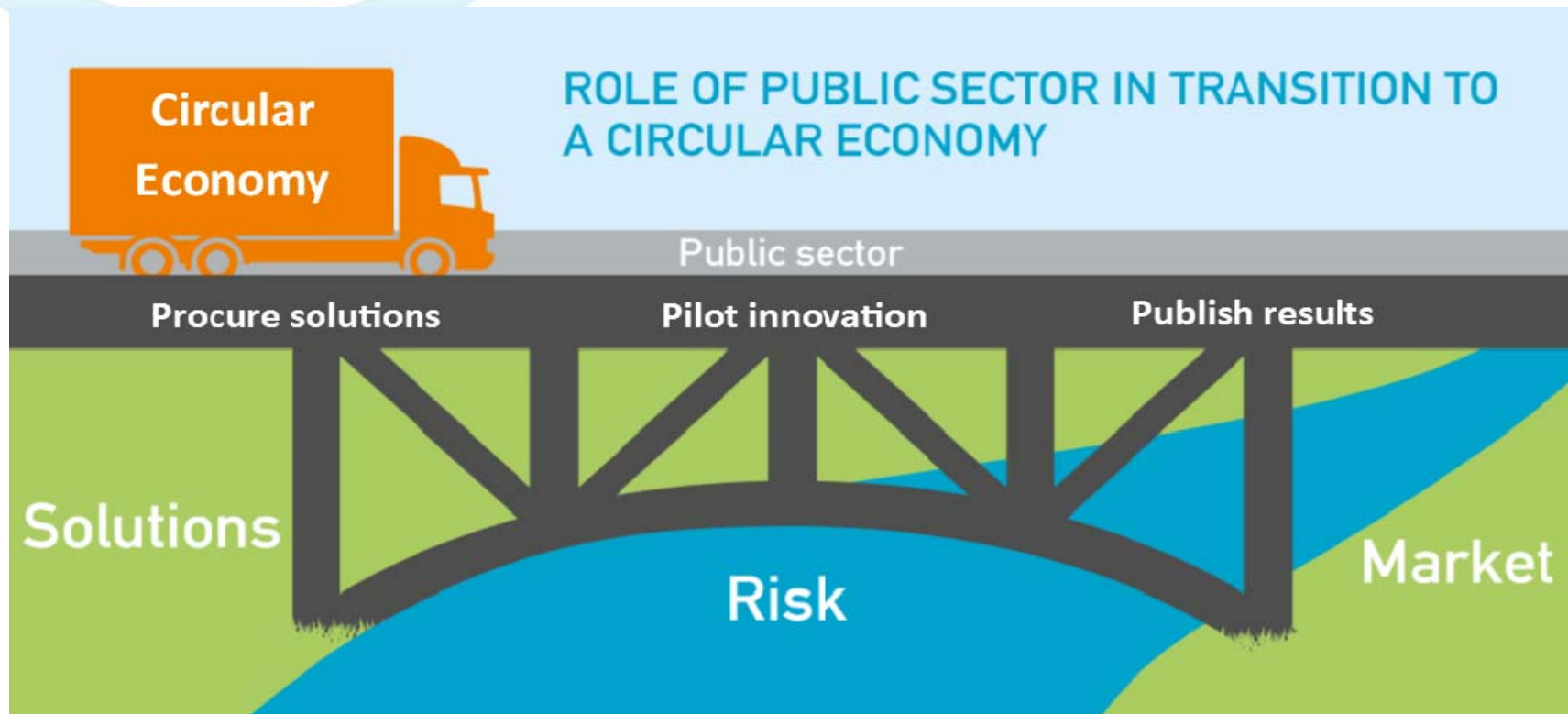
- **Vision, leadership and capital are required to scale-up circular economy solutions and bring them to market.**
- With few exceptions, this won't come from the private sector
- The public sector must lead the way, and drive market-wide behavioural and business model innovation

“We will mobilise the £11 billion of annual public procurement to support our [...] climate change and circular economy obligations.”

Scottish Government, 2019-20 Programme for Government

The Role of the Public Sector

Helping bring circular economy solutions to market





The Role of the Public Sector

Helping bring circular economy solutions to market

Zero Waste Scotland has been working with public sector partners to deliver real-world circular economy innovations

- **NHS Cups Trial:** reduced single-use cup consumption at University Crosshouse Hospital by 57k/year
- **Cups Sold Separately Trial:** proved cost-neutral single-use cup charges can raise reuse rates without raising costs
 - **National policy impact:** upon reviewing these two trials, and expert panel recommended in August Scottish Government implement separate charging obligations of 20-25p on single-use drinks cups across Scotland. This would be a world first!



Beyond Carbon

The Circular Economy is more than a climate change solution

- Our material consumption is also responsible for habitat and species loss, deforestation, marine plastic pollution, declining ecosystem services etc. at a global scale.
- Even if we achieve zero carbon, these non-carbon impacts will increase unless we reduce our material footprint...
- Increasingly, these non-carbon impacts are capturing public attention, and driving demand for action
- **The Circular Economy can not only help solve climate change; it can also help address the myriad other environment issues we face.**



Summary

Why the Circular Economy matters

- Decarbonisation is working, but not fast enough to outpace global demand growth.
- Material consumption and waste is the primary driver of global emissions.
- The circular economy can curtail material and product demand at the same time we decarbonize supply, which is essential to cutting global emissions.
- The circular economy also addresses many other environmental issues.
- The public sector is critical to accelerating our transition to a sustainable, circular future.



Thank you.

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