



**Potential Carbon Multiplier Effects or Re-spending decisions
following increased energy efficiency: A tool for assessing
regional carbon/energy implications of spending decisions**

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- Introduction
- Our project
- Input-output (IO) multipliers : assessing carbon/energy implications of different types of spending.
 - What is the Multiplier Tool?
 - Calculating Output-Carbon and Carbon Saving Multiplier (CSM)
 - Regional example of carbon saving multipliers
 - Other applications of IO multiplier tool
- Advantages of IO multiplier tool
- Can the tool be developed to influence people's behaviour?
- Conclusion

Our Project

EPSRC EUED project 'Energy saving innovations and economy-wide rebound effects'
EPSRC Grant Ref. EP/M00760X/1

Impacting decision makers in policy, industry and potentially household behaviour



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WP1 – Applying the existing model to estimate energy savings and rebound effects in UK road transport



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WP2 – Developing the model database and extending to international supply chains



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WP4 – Modelling energy savings and rebound effects following energy efficiency improvements by households



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WP3 – Exploring the implications of improving the specification of the energy sector in the model



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WP5 – Modelling energy savings and rebound effects following energy efficiency improvements by producers



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WP6 – Integration and stakeholder engagement

Project partners: EUED CIED centre at Sussex and Fraser of Allander Institute (Strathclyde)

Project web-page:

<http://cied.ac.uk/research/impacts/energysavinginnovations>



Our Project

- Input-output multiplier work on emissions and considering cases of deciding between re-spending options following efficiency improvement
- Develop useful tool for policy to consider impacts on range of environmental sustainability indicators
- Multiplier results which consider potential differences/trade-off on local pollutant (carbon and waste).
- Potential of influencing household behaviours

Energy Savings Trust (EST) and Zero Waste Scotland (ZWS) are interested in using IO multiplier tool to develop a tool not just for energy improvements, more generally if people reduce spend on energy and food respectively



What is the IO Multiplier Tool?

Multipliers measures the economy-wide impacts of changes in final demand for the output of specific production sectors. (e.g employment multipliers)

Calculating output-carbon and carbon saving multipliers (CSM)

$$q_i = e[I - A]^{-1}y \quad (1)$$

Output-emissions multipliers: total amount of carbon generated across all sectors per monetary unit of final demand for the output of a given sector-and we can also compute a 'pollution-pollution' multiplier:

$$csm = \frac{\Delta \text{ total embodied emissions}}{\Delta \text{ direct household emissions}} \quad (2)$$

This measures the change in embodied supply chain emissions per Kilotonnes (kt) directly saved by the household – calculate using results of (1) and information on change in direct emissions (not here)



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WP2 – Developing the model database
and extending to international supply
chains



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Regional Example of Energy/Carbon Saving Multipliers

GHG multiplier Impacts



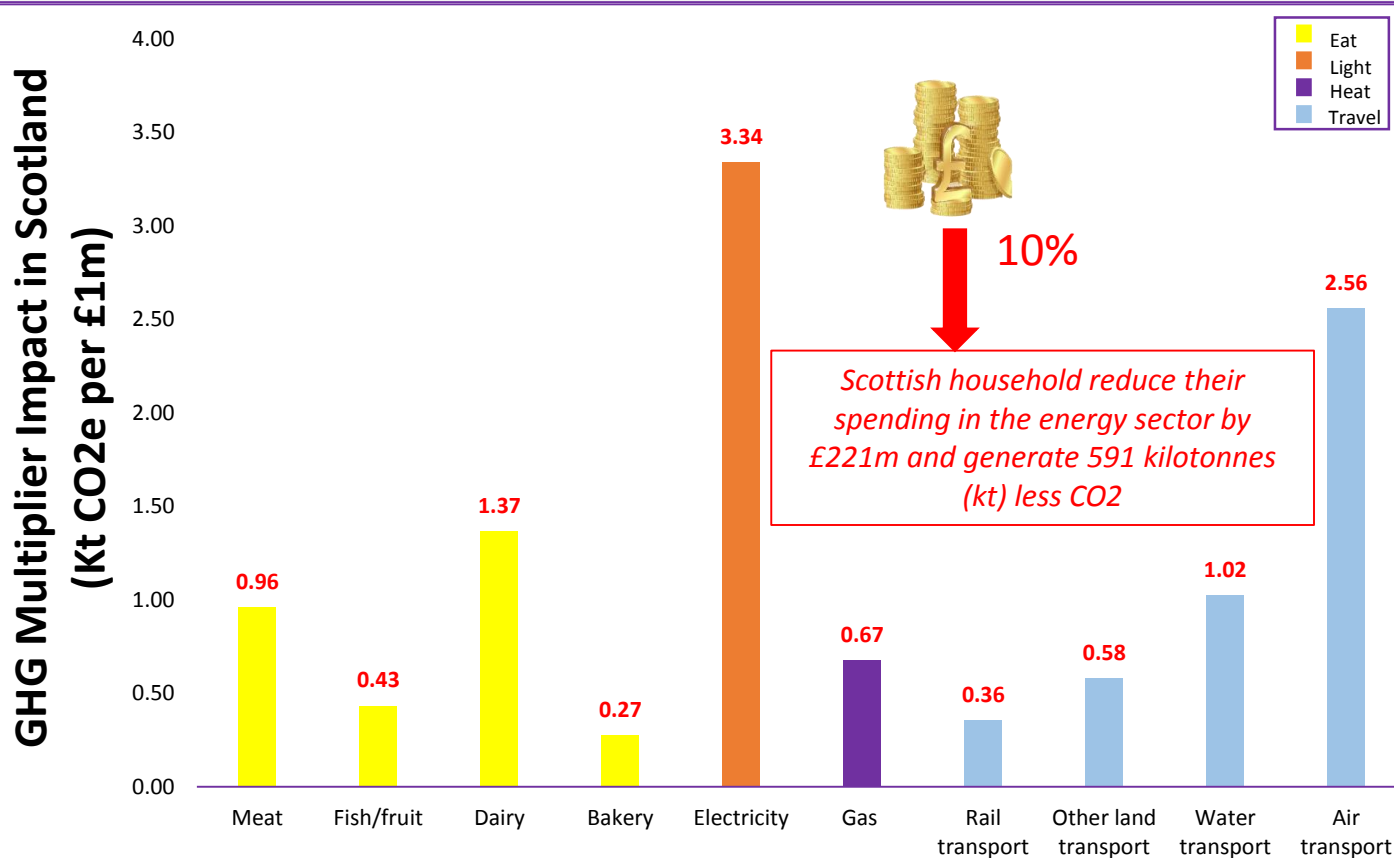
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Scottish Input-Output (IO) Tables (2012) and UK average sectoral GHG Intensities.

Scotland has sets a long-term target to reduce emissions of greenhouse gases (GHGs) by 80% in 2050 with an interim target to reduce emissions by 42% in 2020.

GHG Multipliers impacts in Scotland (Kt CO₂e per £1m) for 'Eat', 'Light', 'Heat' and 'Travel' domestic spending options (focus on underlying output-pollution multiplier)





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Other, or more extended,
applications of the IO multiplier
tool



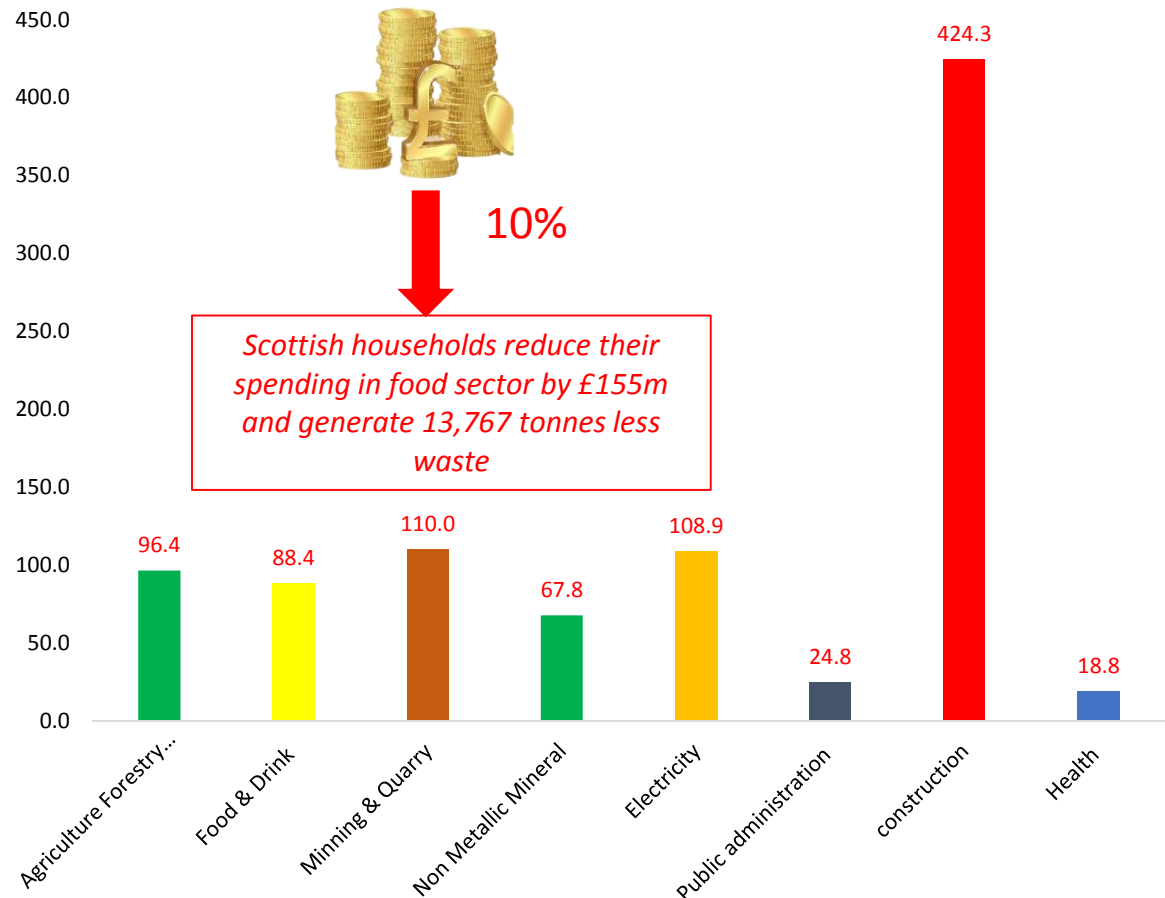
Scottish Input-Output (IO) Tables (2011) and Scottish Waste Intensities.

- *Scottish Food Waste Reduction Target: Cut food waste by 33% by 2025- Expected savings of about £500m savings for business and household*

- **GFCF** 39%
Construction (89%)
- **Household** 25%
Food & drink (82%)
- **RUK** 19%
Mining (81%)

Waste multiplier impacts – a local pollutant

Waste Multiplier Impacts in Scotland (Tonnes per £1million)





IO multiplier analysis is useful tool

- ❑ Examining the interdependences within an economy and the interactions between the economy and the environment.
- ❑ Flexible framework or tool (e.g. Inter-country, regional)
- ❑ Alternatives tool/method to Rebound measures.
- ❑ Use a range of physical variables (e.g. global vs. local pollutants) could look at multiple implications/trade offs of different spending decisions (e.g. carbon vs. waste)
- ❑ Impacting decision makers in policy, industry, and potentially household behaviour
(Ongoing collaboration with Energy Saving Trust (EST) to influence household spending behaviour in the UK).
- ❑ Framework to construct a regional Computable General Equilibrium (CGE) model.
Gioele Figus – Energy efficiency ,fuel poverty and rebound
- ❑ Other Advantages of regional IO analysis.
Antonios Katris -The benefits of using regional Input-Output tables and the importance of region-specific satellite emissions data.



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On going work : Developing the IO tool to influence people's behaviours

Your thoughts.....

- Bearing in mind, IO multipliers reflect average impacts, problematic in applying to marginal analysis
- But transparent and more familiar to policy communities
- Can an IO tool be a useful one to influence people's behaviours?
- Can it built as an extension/alternative to existing tools? (e.g. EST home energy checker)
- Who should be the targeted audience?
- As an energy consumer will you be interested in using the tool and why?

IO analysis is a useful method to examine various economic and environmental Impacts - but there are challenges....

- Scottish Government *produce and publish Scottish IO tables- environmental data not generally available* (e.g. GHG data not available but waste per sector is available)
- Office of National Statistics (ONS): *Publish IO tables periodically-but not in useful form for calculating multipliers (product by industry and purchaser prices).*
- *For multiplier analysis IO tables need to be in symmetric industry by industry or product by product tables (Fraser of Allander Institute has adjusted UK IO tables 2010 to symmetric form).*

Thank You for Listening

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