Carbon-CAP

Consumption-based Accounting and Policy

Carbon-CAP: An overview

Prof. Arnold Tukker,

Project Coordinator, TNO and CML

Carbon Consumption-based Accounting and Policy

Project team meeting Geneva, 7-9 October 2015

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Welcome!

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Basics

- Contract
  - From 1 October 2013 to 31 December 2016
  - 3.6 Mio Euro of which 3 Mio EU FP7 funded
- Management
  - PO, Ewa Kusmierczyk, DG RTD
  - Scientific adviser to PO, Peter Horvath, DG RTD
  - Scientific Coordinator, Arnold Tukker, TNO
  - Project manager, Ming Chen, TNO

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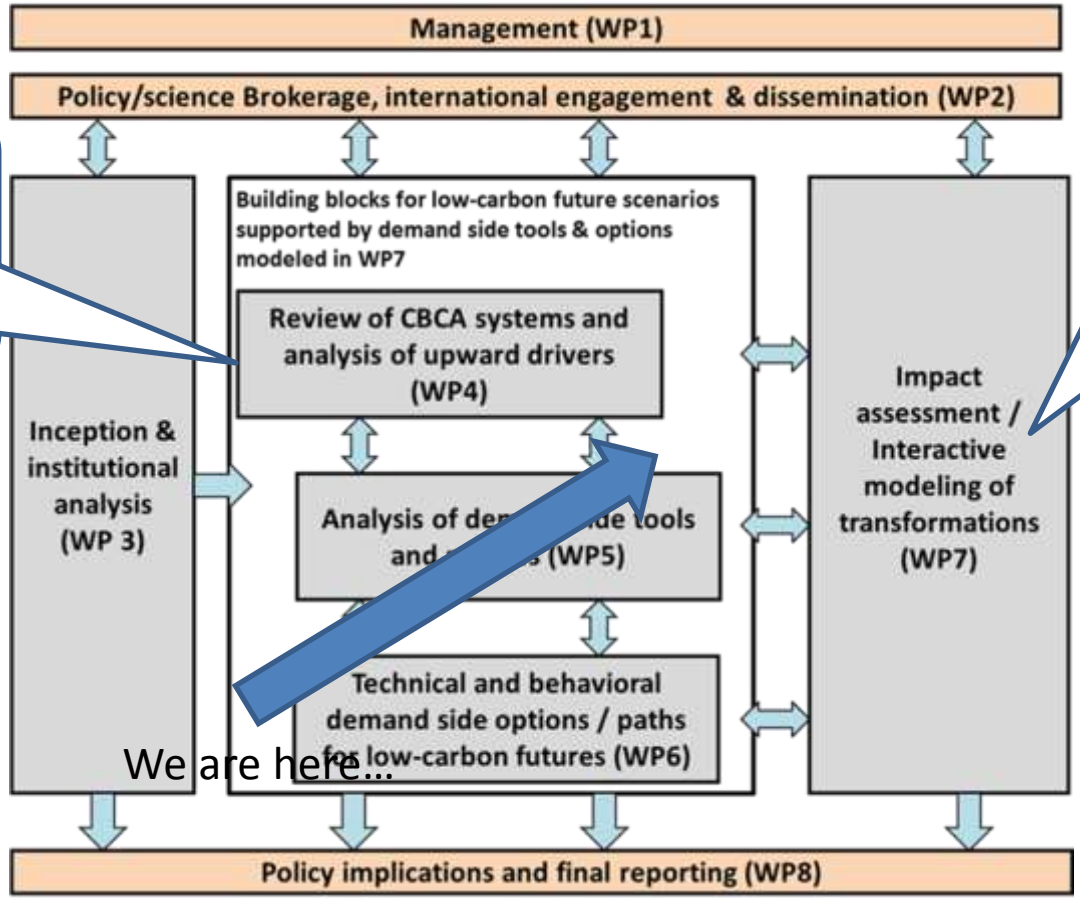
Work flow

Multi-regional EE IO database (EXIOBASE) used



Models used:
E3ME (Cambridge)
FIDELIO (DG JRC IPTS)
EXIOMOD (TNO)

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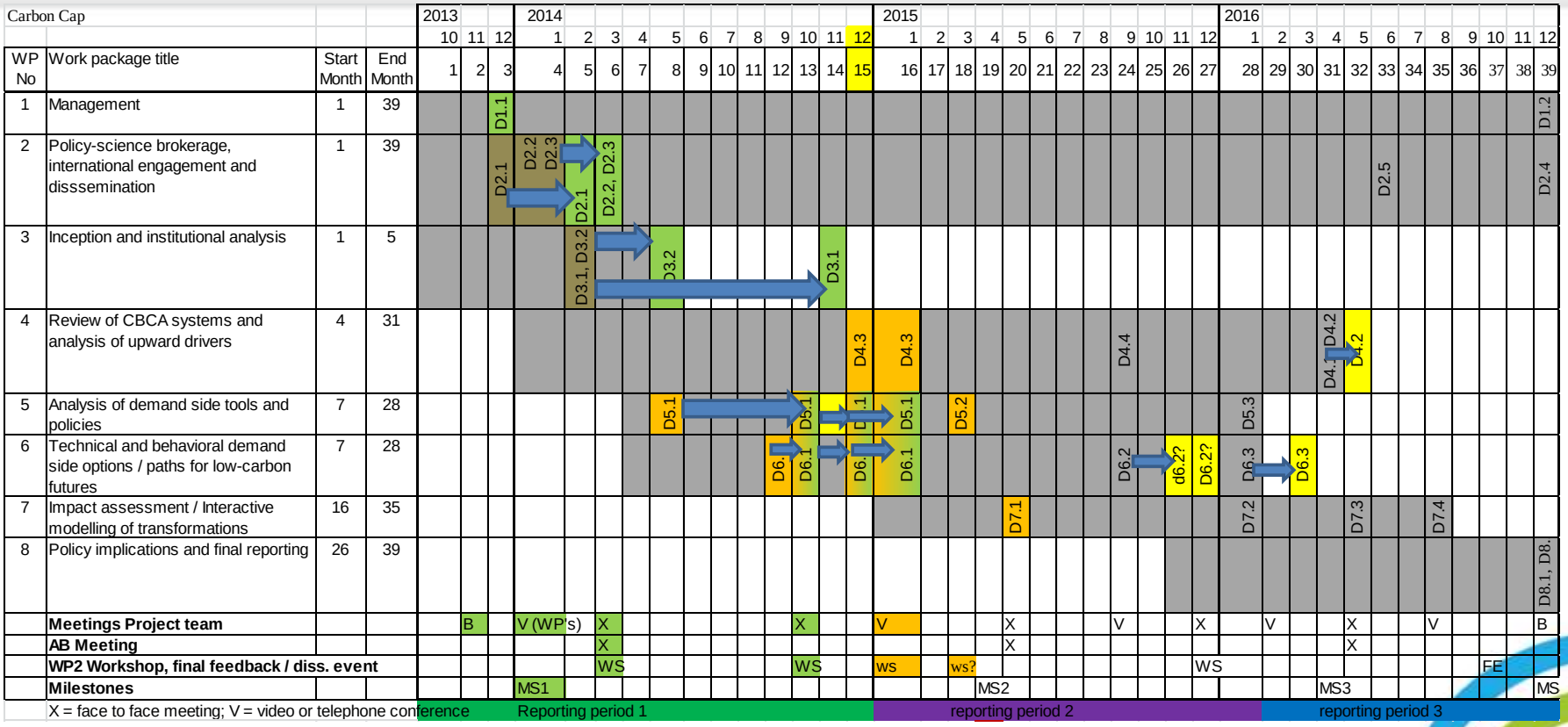
GANTT Chart



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Carbon-CAP: Rationale for consumption based accounting and policy

Prof. Arnold Tukker,

Project Coordinator, TNO and CML

Carbon Consumption-based Accounting and Policy

Geneva Meeting, 7-9 October 2015

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Introduction

- Introduction to the project
- What we work on
- Today's agenda
- Some basic facts
  - Supported by EU FP7, DG RES, 3 Mio Euro
  - Contact DG RES: Peter Horvath
  - From 1 October 2013 to 31 December 2016
  - Project management: TNO (Arnold Tukker, Ruud Baartmans)

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Consortium

Project Partners	
The Netherlands Organisation for Applied Scientific Research (TNO, co-ordinator) (NL)	Cambridge University Centre for Climate Change Mitigation Research (4CMR) (UK)
Wirtschaftsuniversität Wien (WU) (AU)	Cambridge Econometrics (CE) (UK)
EC DG JRC Institute for Prospective Technical Studies (IPTS) (BE)	Climate Strategies (CS) (UK)
Institute of Environmental Sciences, Leiden University (LU-CML) (NL)	Deutsches Institut für Wirtschaftsforschung (DIW) (DE)
Norges Teknisk-Naturvitenskapelige Universitet NTNU (NO)	International Centre for Trade and Sustainable Development (ICTDS) (CH)

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Challenge

- Currently: territorial emission reduction approaches
- Global economy: growing share of GHG emissions
- Growing consumption: is a main driver GHG emissions
- Consumption oriented mitigation approaches hence can have added value
  - address consumption as a driver
  - carbon leakage.

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Bridging Gaps

- Gap 1: Quantification of global emissions related to consumption of goods and services and understanding drivers for upward trends
- Gap 2: Understanding of the levers, potential mechanisms, and feasibility of demand side tools and policies.
- Gap 3: Understanding of the effectiveness and impacts of demand side tools and policies.
- Gap 4: No shared view on the added value, implementation challenges and acceptability of demand side tools/policies and related accounts, and no “roadmap” of evolution from production towards consumption-based policies.

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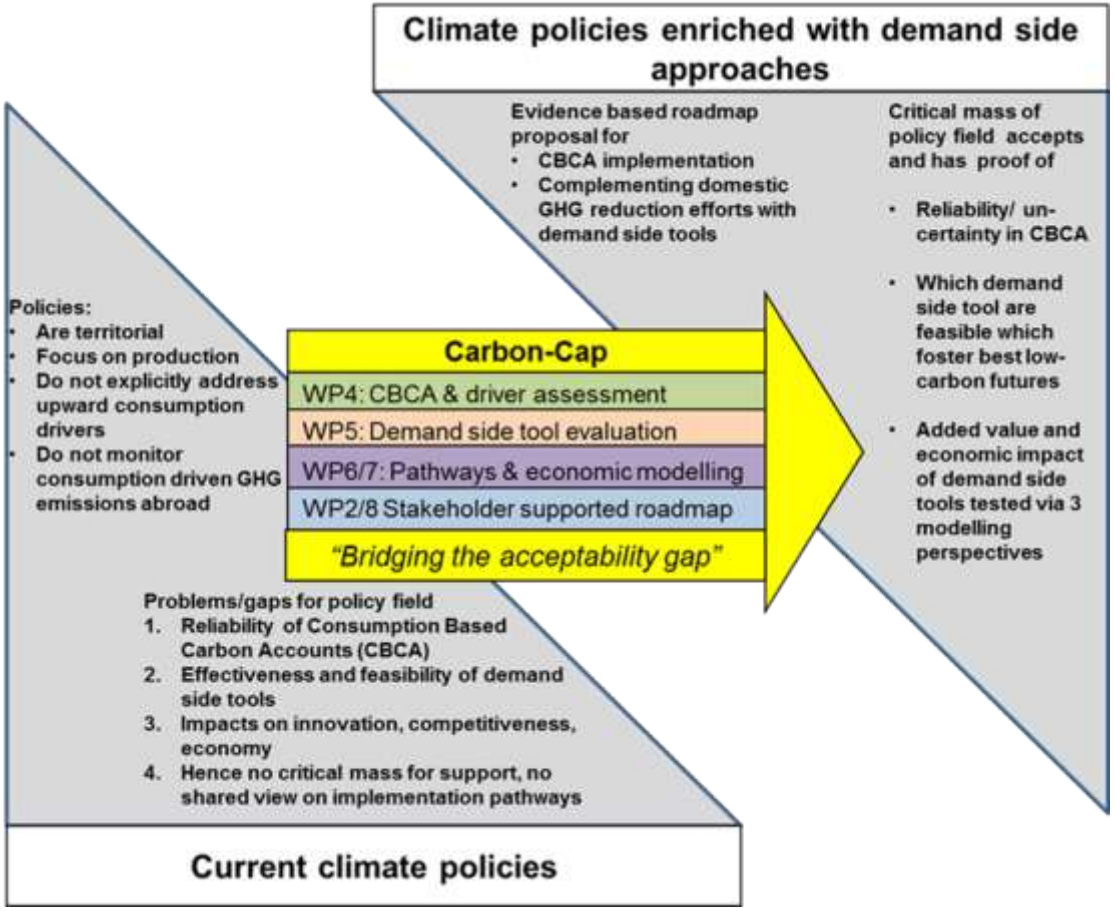
Work Breakdown



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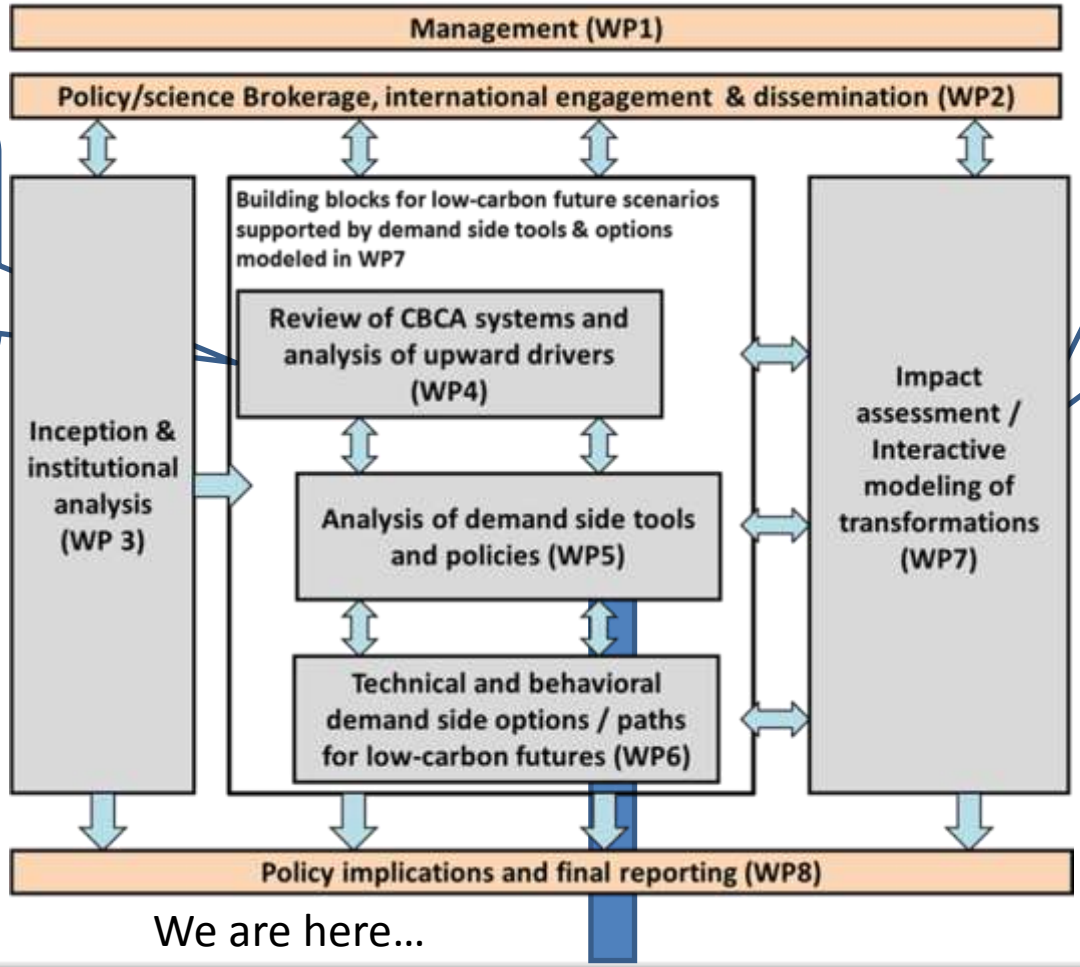
Work flow

Multi-regional EE IO database (EXIOBASE) used



Models used:
E3ME (Cambridge)
FIDELIO (DG JRC IPTS)
EXIOMOD (TNO)

We are here…

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What we want to achieve

- Stimulate innovative demand side oriented climate policies
- Realise a more effective policy mix

- ….by more reliable improved shared insights about consumption based GHG emissions….
- …. And quantitatively analyzing consumption-oriented climate mitigating policies

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Agenda today

1. Consumption-based accounting in international climate negotiations
2. Consumer-oriented improvement options and their implementation
3. Consumption-based policy instruments for a more effective climate policy mix

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Questions so far?

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Focus (1)

- Carbon CAP needs to be careful
  - Many scenario studies have been done
  - We should not repeat, but show added value of consumption oriented policies
  - This has implication for how we set up the modelling -> we would like to discuss!

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Focus (2)

Box: Definition of the scope of the Carbon-Cap project

Research in the Carbon-Cap project focuses on emissions occurring along the supply-chains, which are embodied in the intermediate and final demand of non-energy products and services and have a potential trade impact. New scenarios combining options for improvement and policy instruments from this perspective

By setting this specific focus, the Carbon-Cap project excludes building new scenarios (improvements/policy options) for two other important categories of emissions, which have already been widely researched in a number of other projects:

(a) emissions stemming directly from final demand (such as household or government consumption), including e.g. emissions from heating of homes or from gasoline consumption by private or government transport.

(b) emissions caused by the production processes of energy for final demand, such as emissions in the production of electricity, which is directly consumed by households or government.

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Focus (3)

- Which would lead to the following types of scenarios
  - Scenario ‘no intervention’: developments if no or only weak tradition-oriented climate policies are implemented
  - Scenario ‘baseline’: developments when production-oriented climate policies are implemented
    - Based on existing research on production-oriented improvement options and policies, e.g. IEA Blue Map
    - Pragmatically probably a scenario that already has been used in E3ME, Fidelio and EXIOMOD to analyse production-oriented climate policies
  - WP5 and WP6 must hence focus on
    - Improvement options inducing CO2 reductions in the supply chains
    - Effectiveness of policy instruments supporting such improvements…
    - …as a complement to production-oriented improvements

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Thank you for being here today!

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Consumption-based accounting in climate negotiations 2030 and 2050 global scenarios

Annela Anger-Kraavi
Cambridge Econometrics

Carbon-CAP Stakeholder workshop
Geneva
Thursday, 8 October 2015

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Climate policy

- Doha Amendments > 2020
- Paris Agreement (INDCs) > 2020 - 2030
- Marrakesh (?)…. (?) > 2030….
- CBDR-RC – historical and **traded**

COP21 · CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

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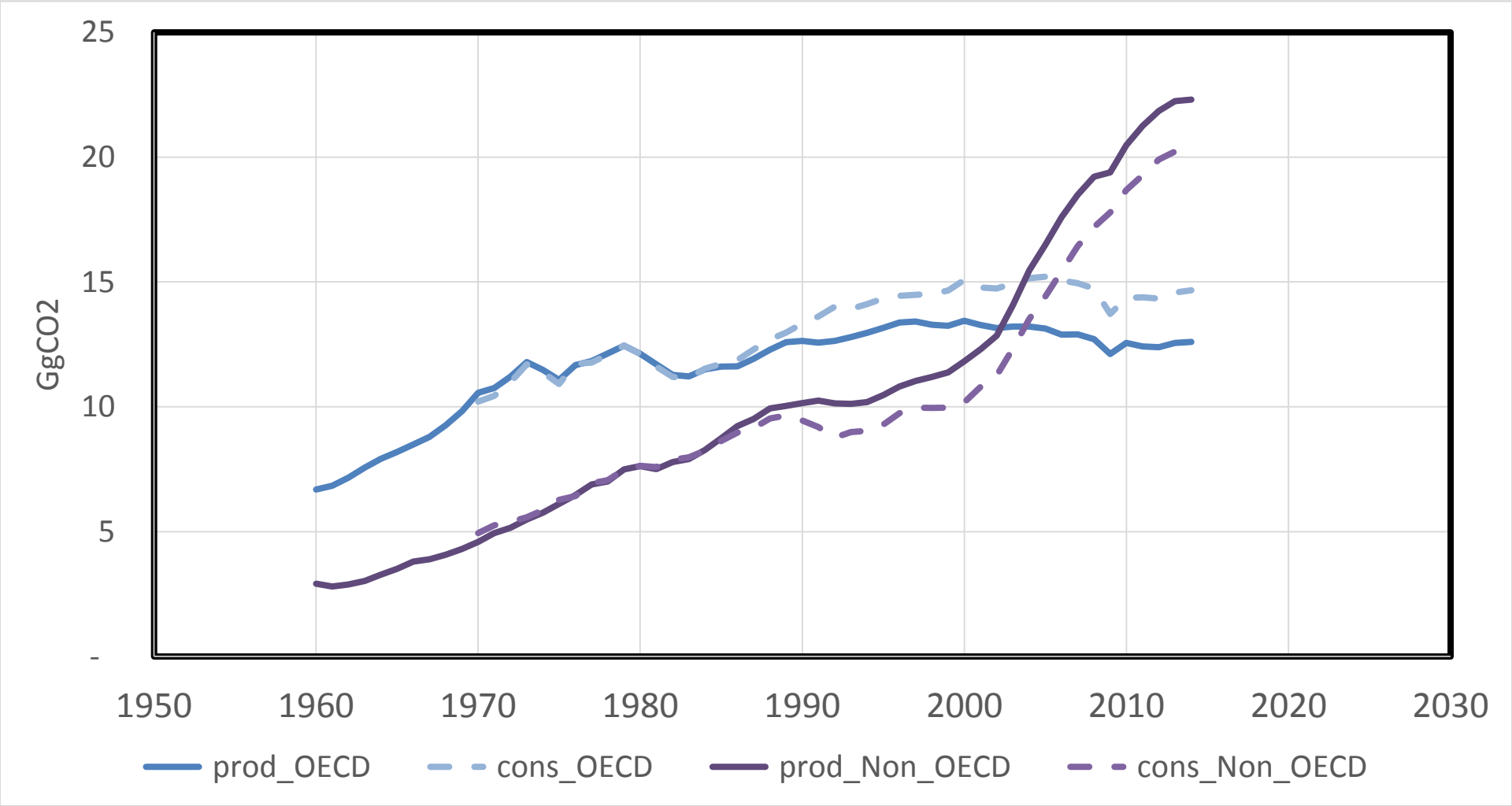
Emissions



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Expected outcome

- A policy portfolio of **consumption-based policies** that shifts the burden back to developed countries and results in reduction of production and consumption based emissions in developing countries
- Additional to production-based/more traditional polices and national commitments

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Models

- E3ME (Cambridge Econometrics, UK) macroeconometric energy-environment-economy (E3) model
- EXIOMOD (TNO, Netherlands) a Global Computable General Equilibrium (CGE) model based on detailed EXIOBASE MREEIO
- FIDELIO (IPTS, Spain) a dynamic econometric input-output model based on Eurostat's supply and use tables and the WIOD

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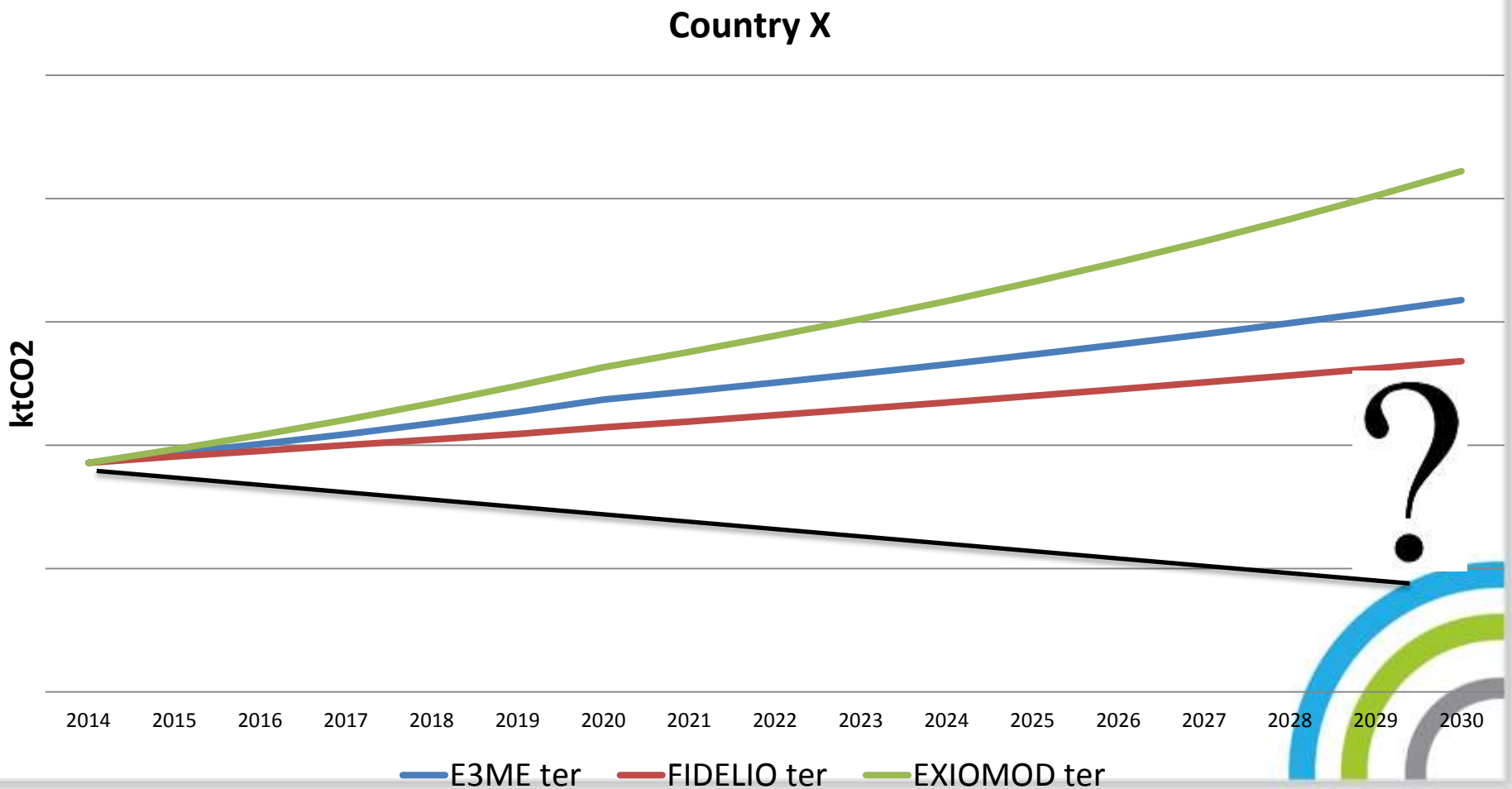
Emissions



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Policy issues

- No accounting standards for consumption based emissions
- No monitoring, reporting and verification
- Current methods (differences <30%)

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Thank You!

aak@camecon.com

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Consumption based emissions for the UK

John Barrett

Global trade flows

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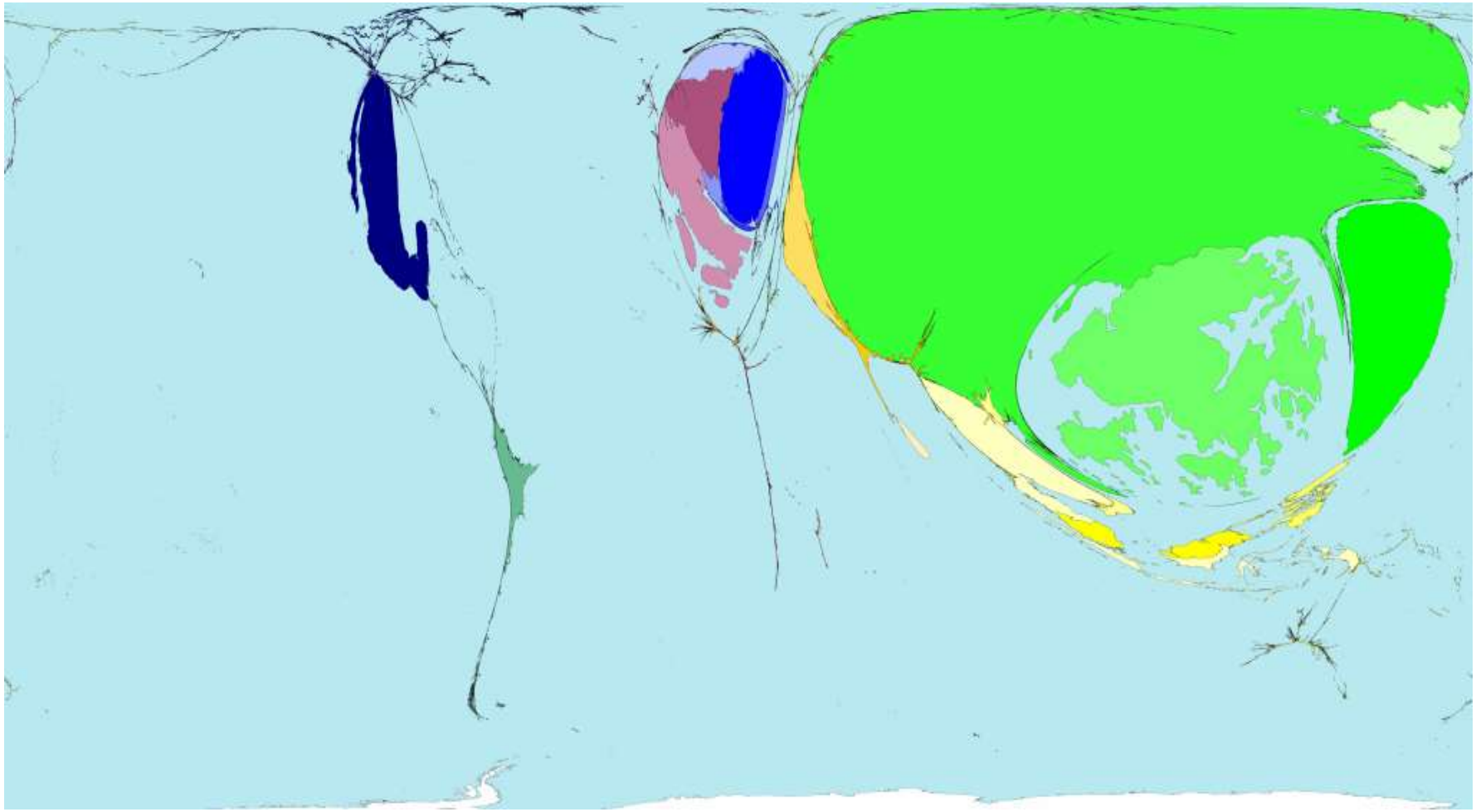

Source: Dorling – pers comm

UK Emissions - Territorial

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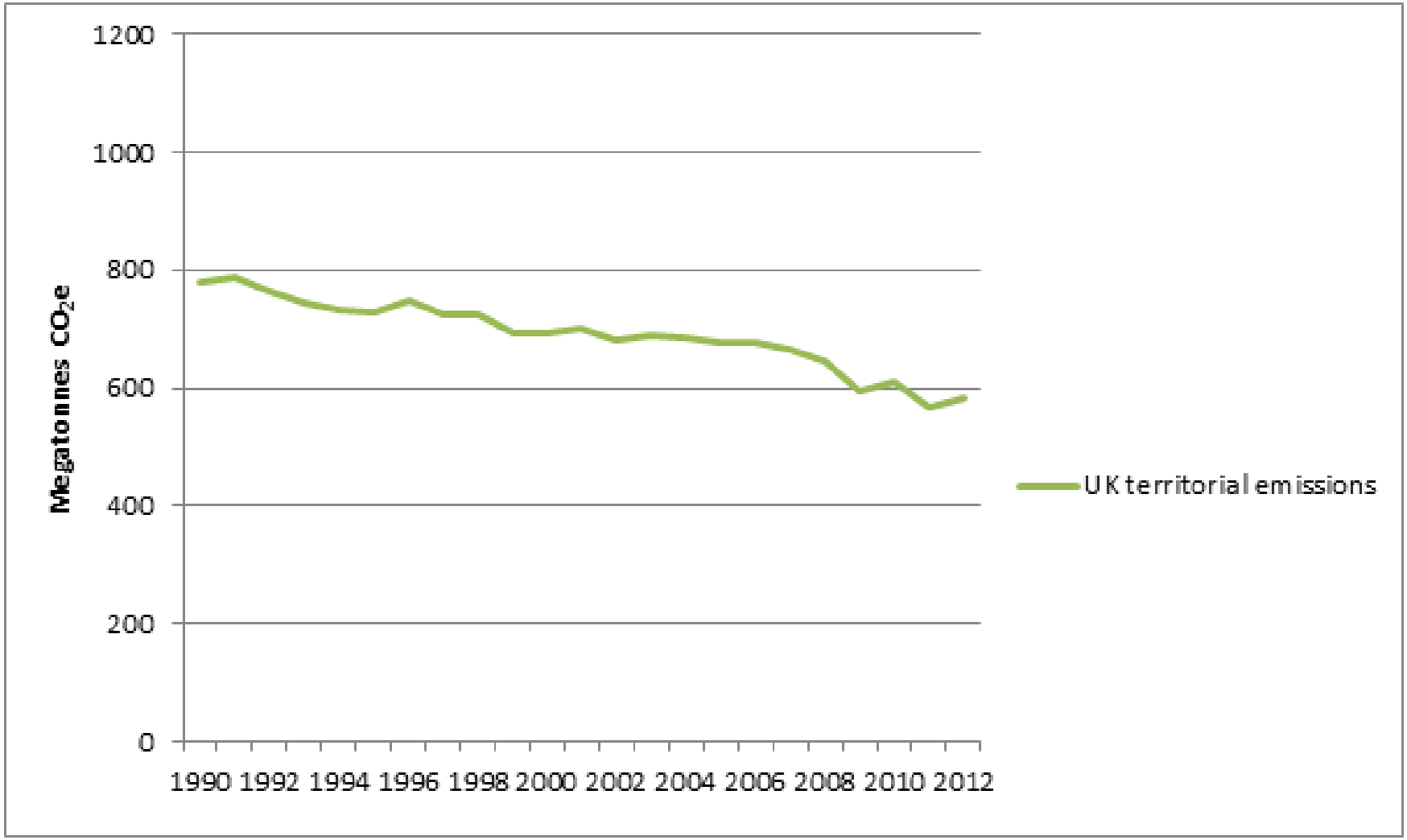

Source: Barrett et al (2013)

UK emissions – Territorial and Consumption

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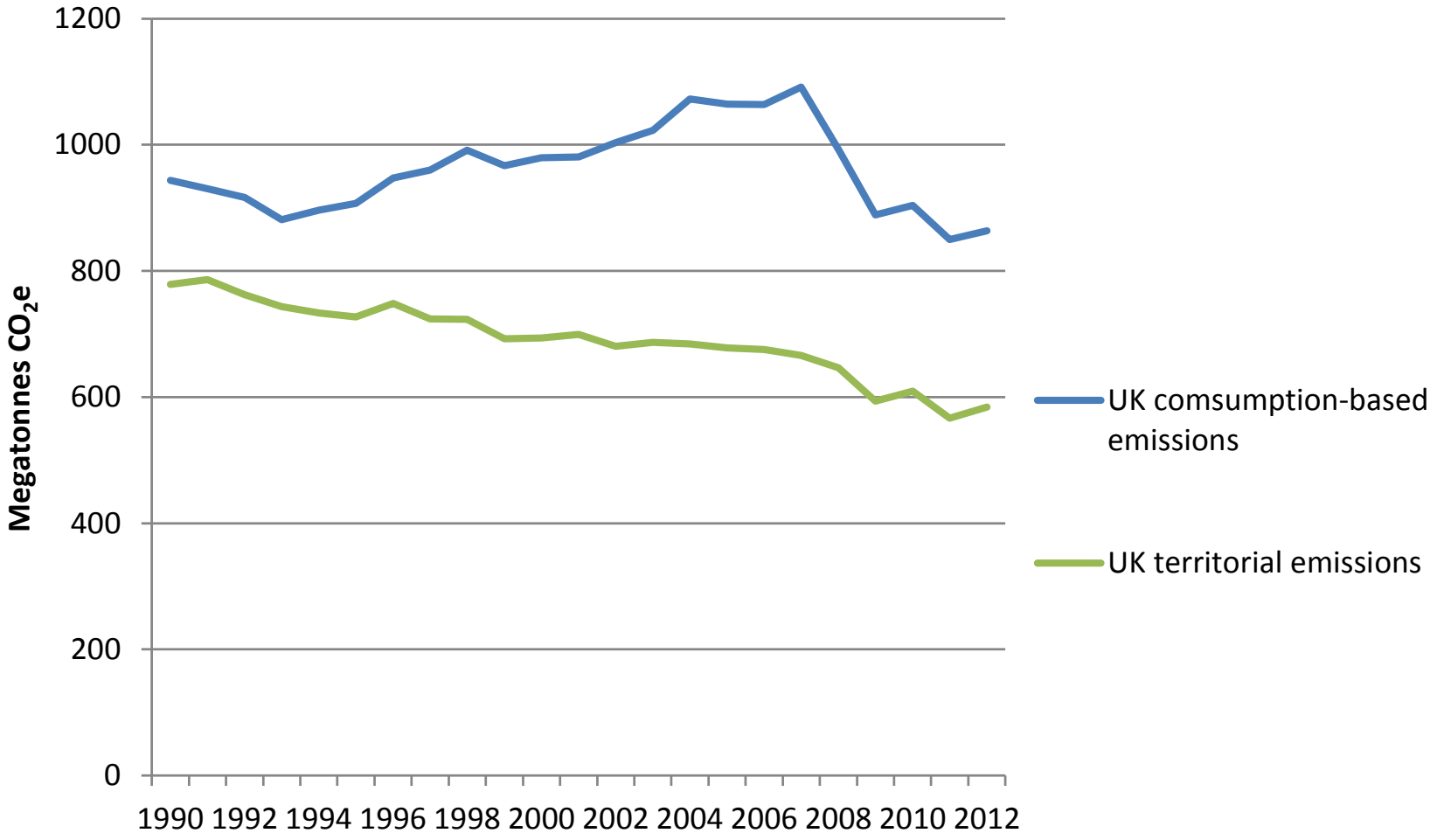

Source: Barrett et al (2013)

Growing emissions embodied in trade

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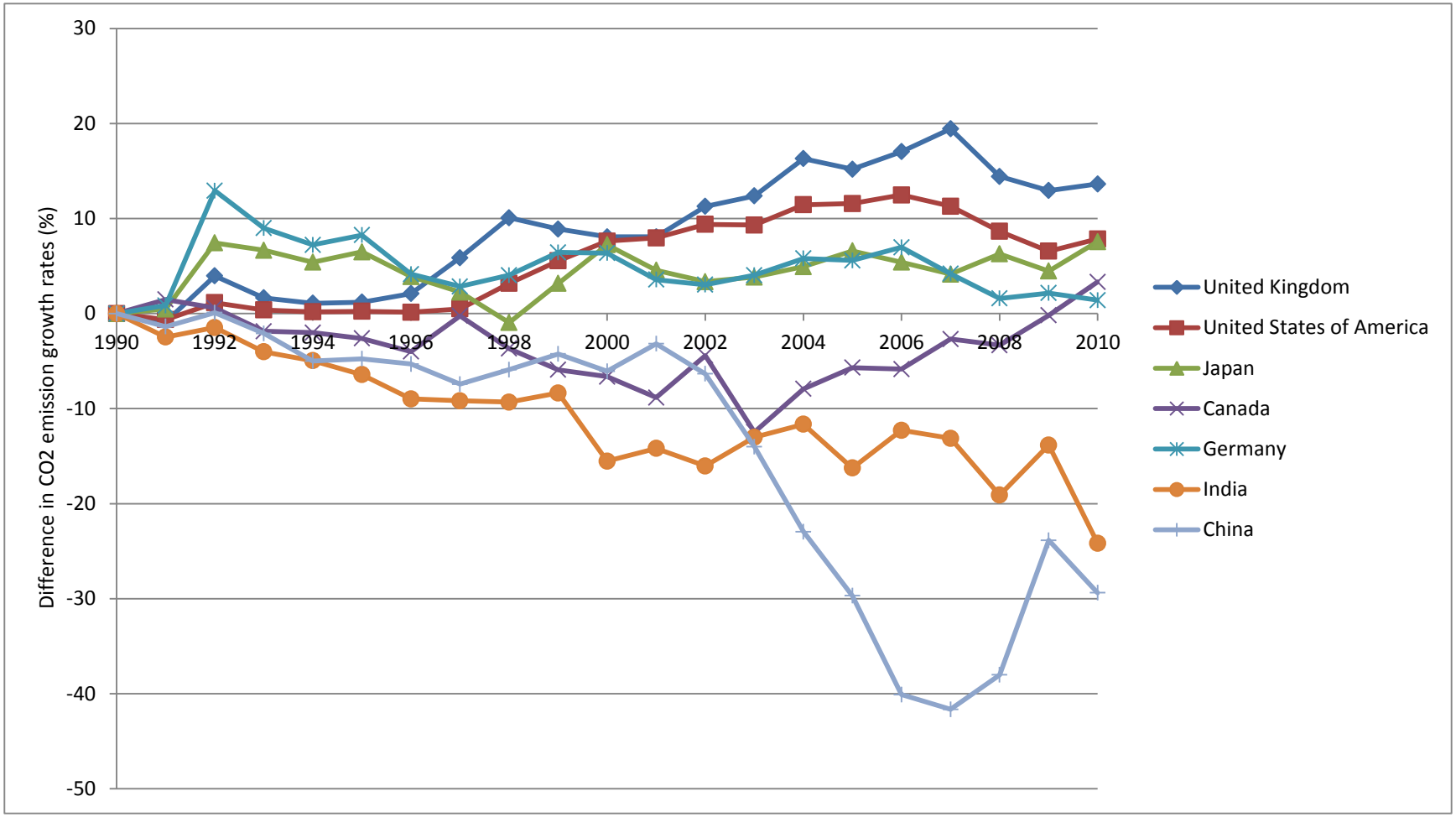

Source: Barrett et al, 2013

UK's Global Emissions

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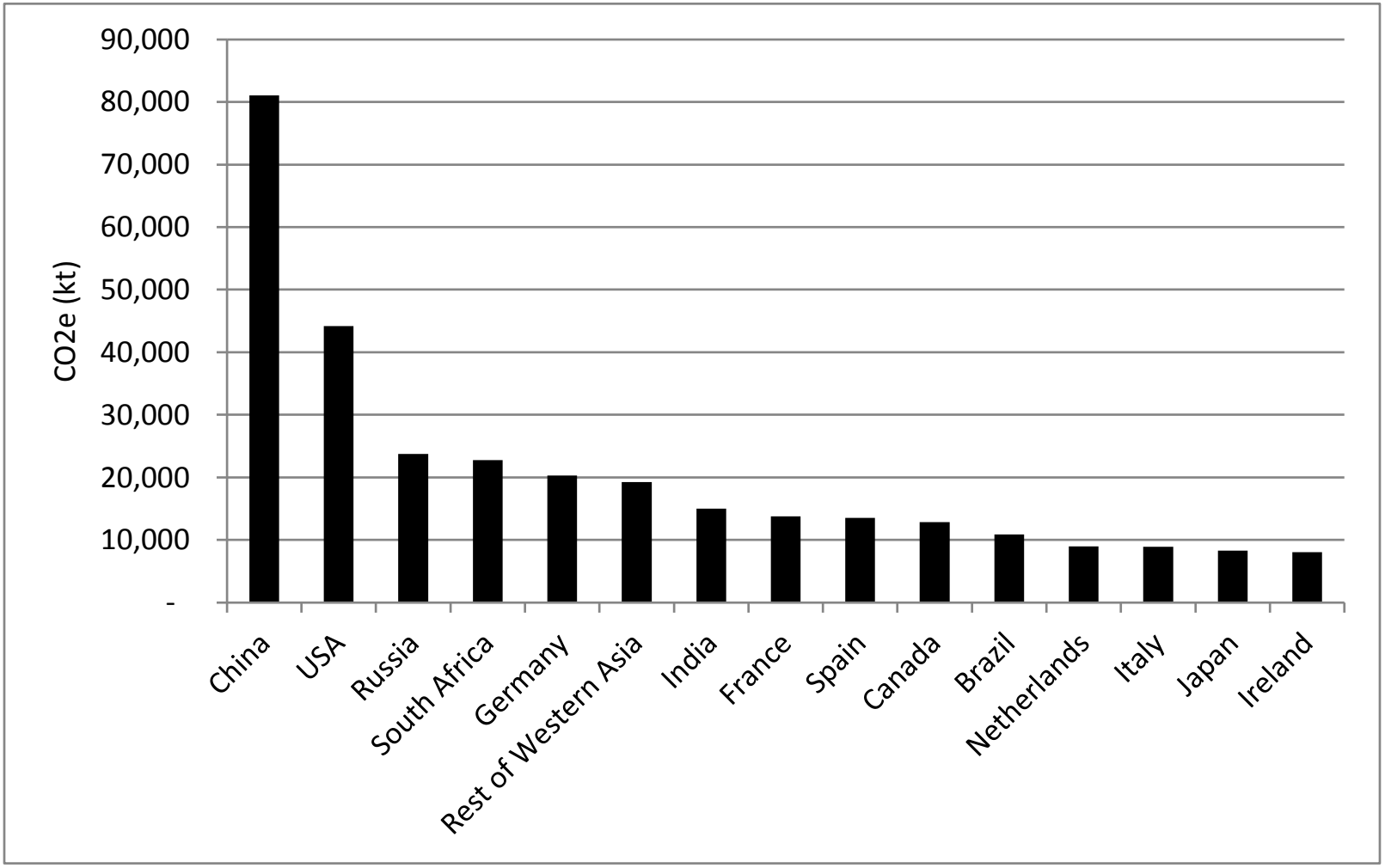

Source: Barrett et al, 2013

Products analysis

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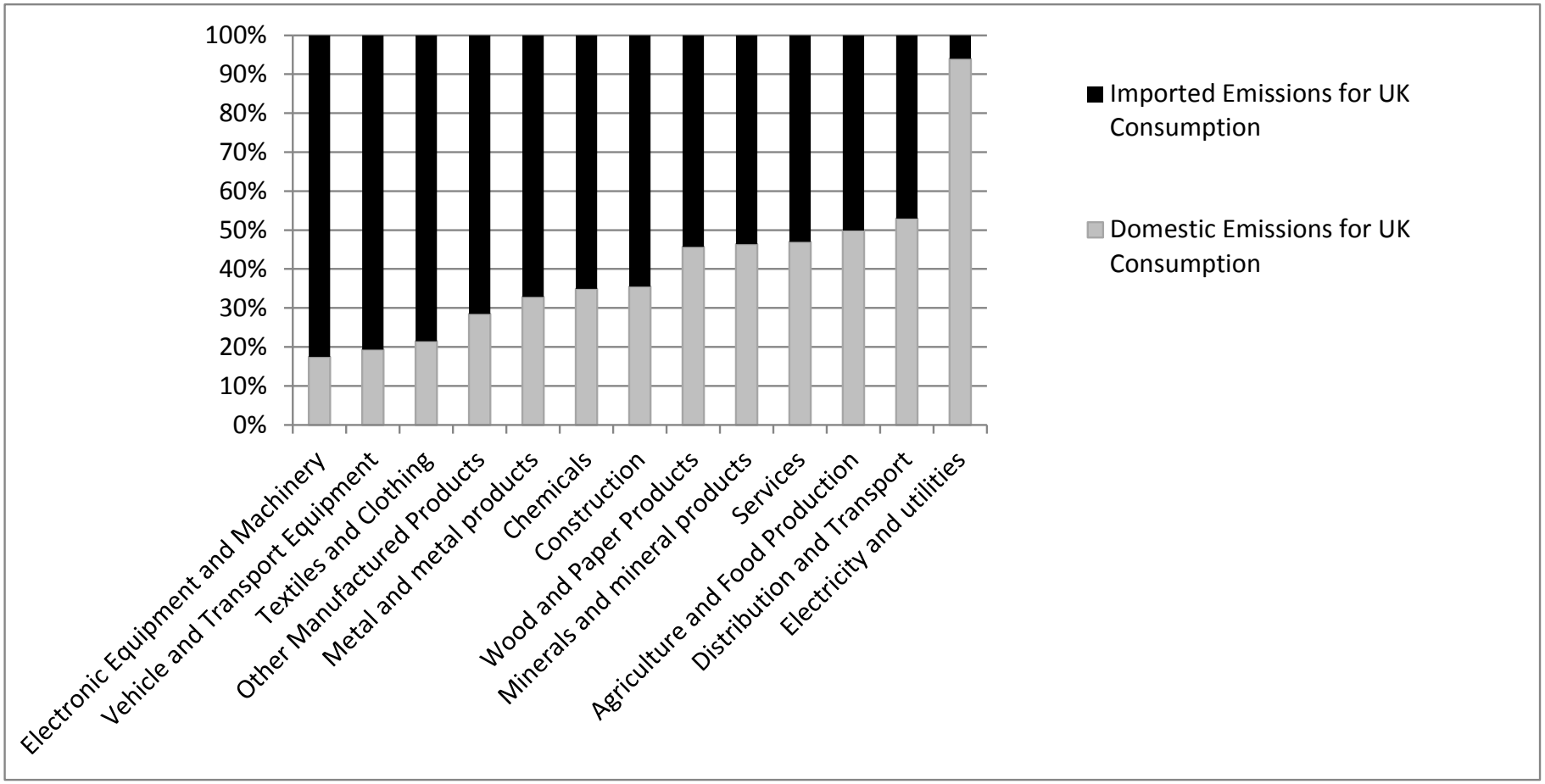

Source: Barrett et al, 2013

Scale of Traded Emissions - Sector

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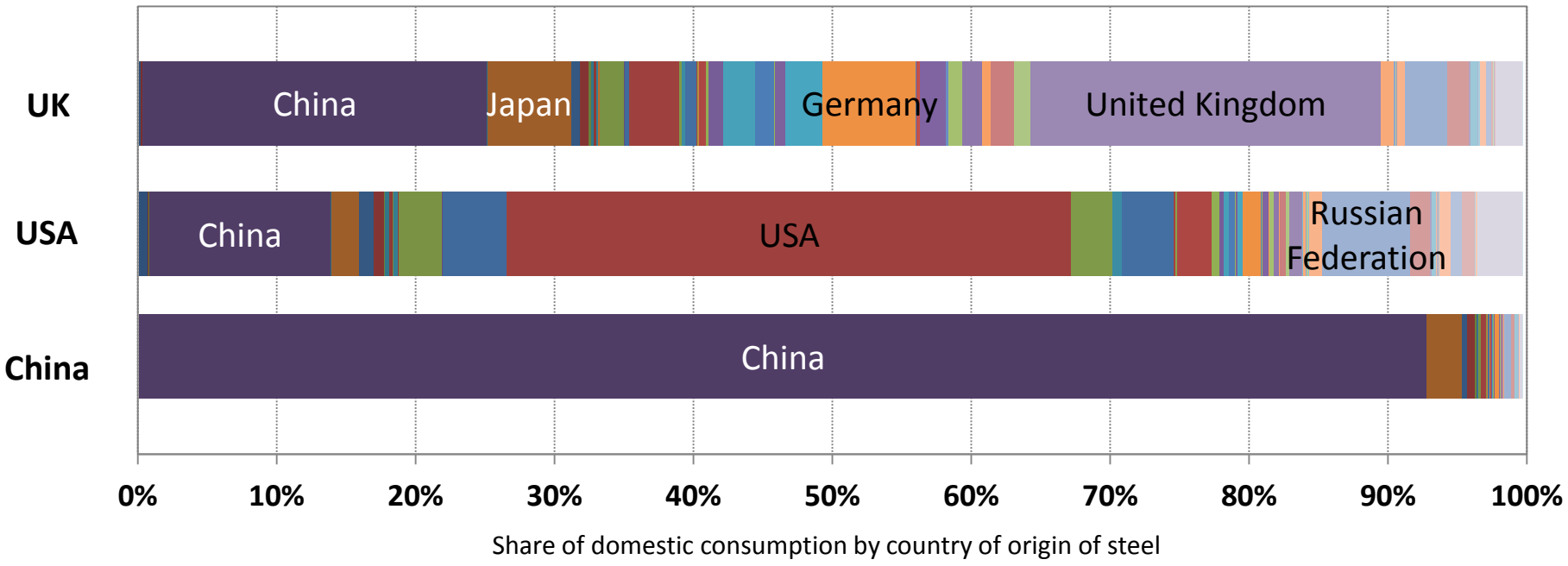

Source: Sakai et al (2012)

Drivers of change of the indirect energy used by the UK

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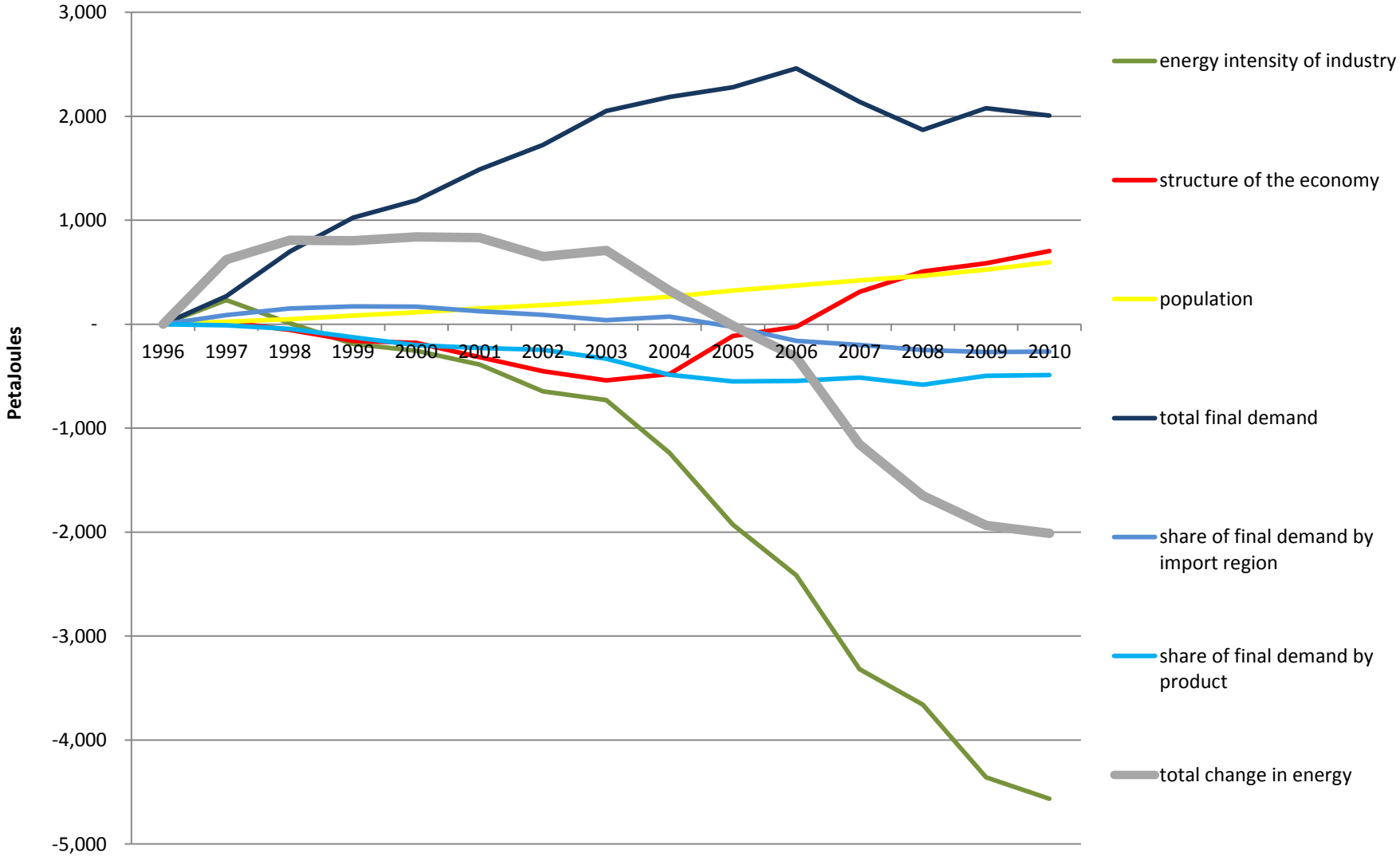

Source: University of Leeds

Emissions and social distribution

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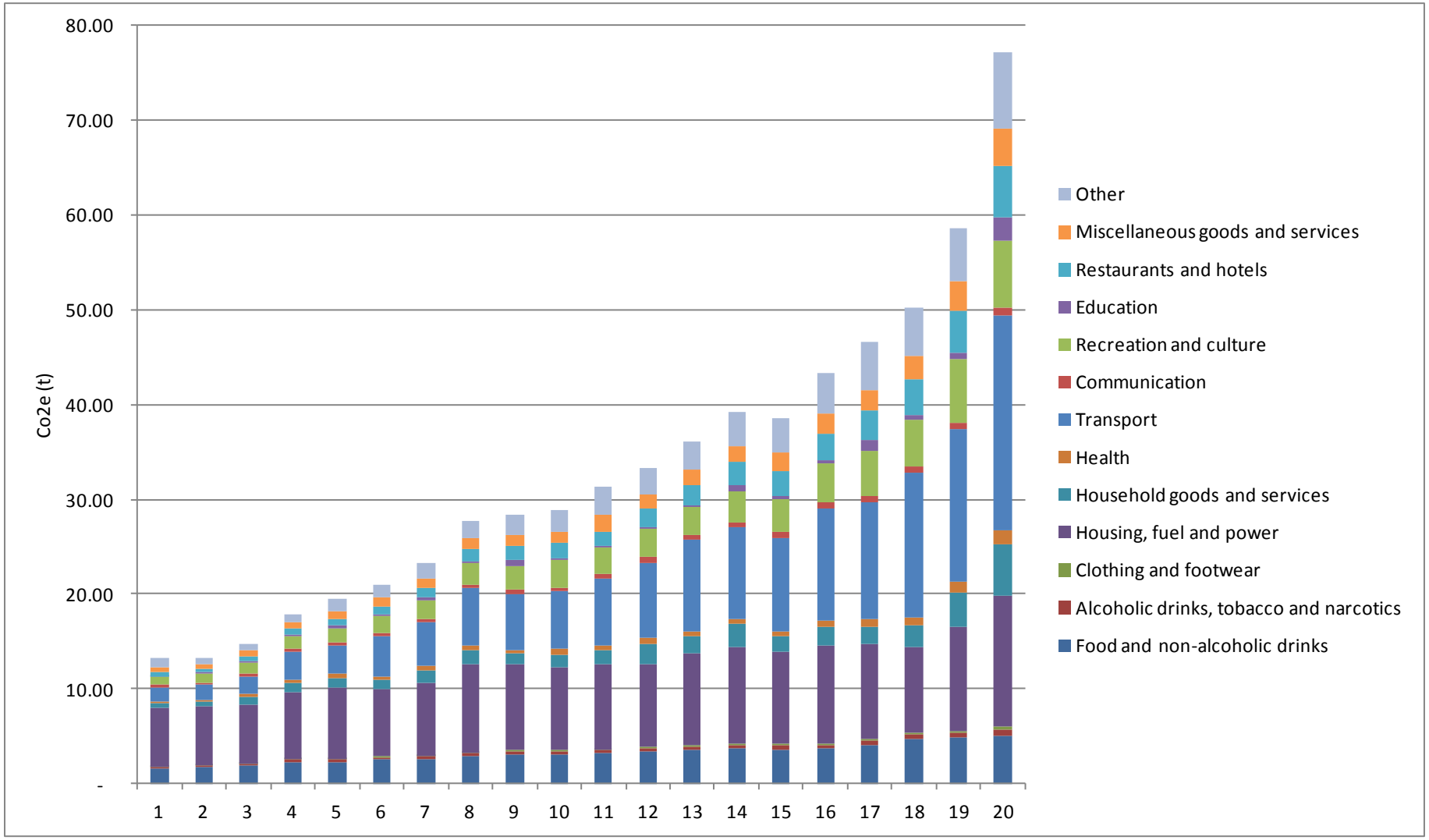

Source: Updated results documented in Feng et al, 2011

Policy Responses

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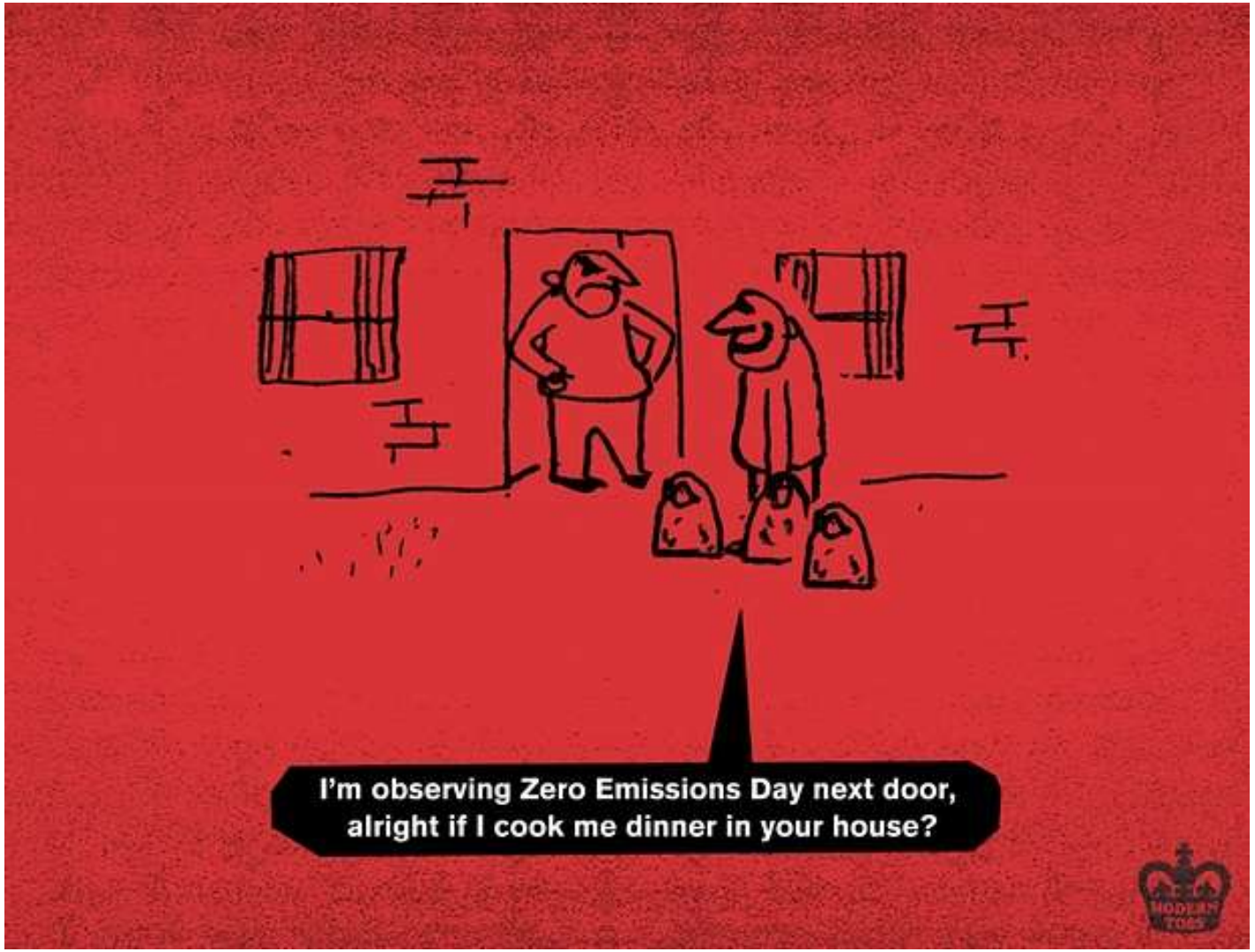

Source: The Guardian

Future Consumption Emissions

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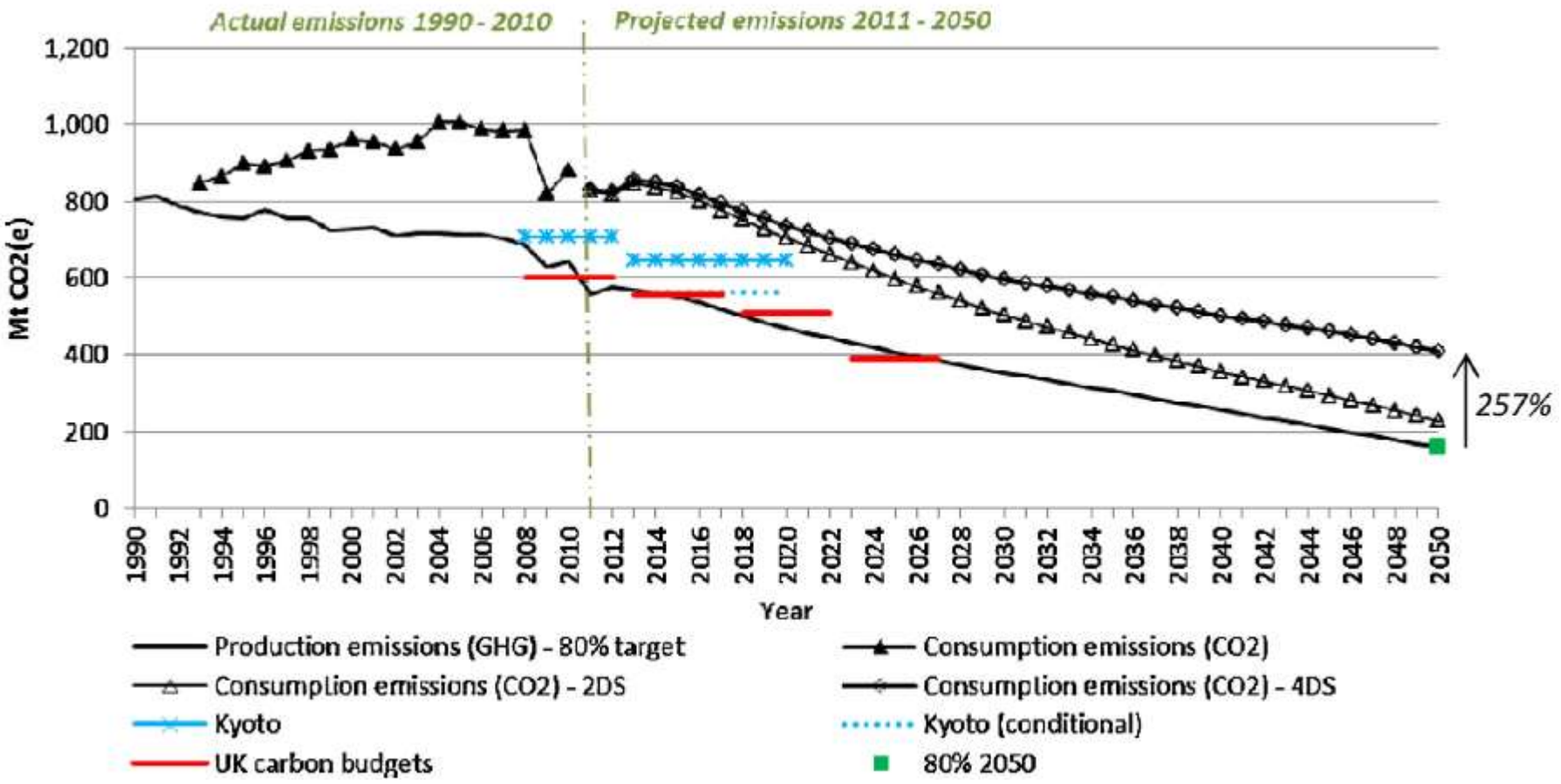

Source: Scott and Barrett, 2015

Integration into targets

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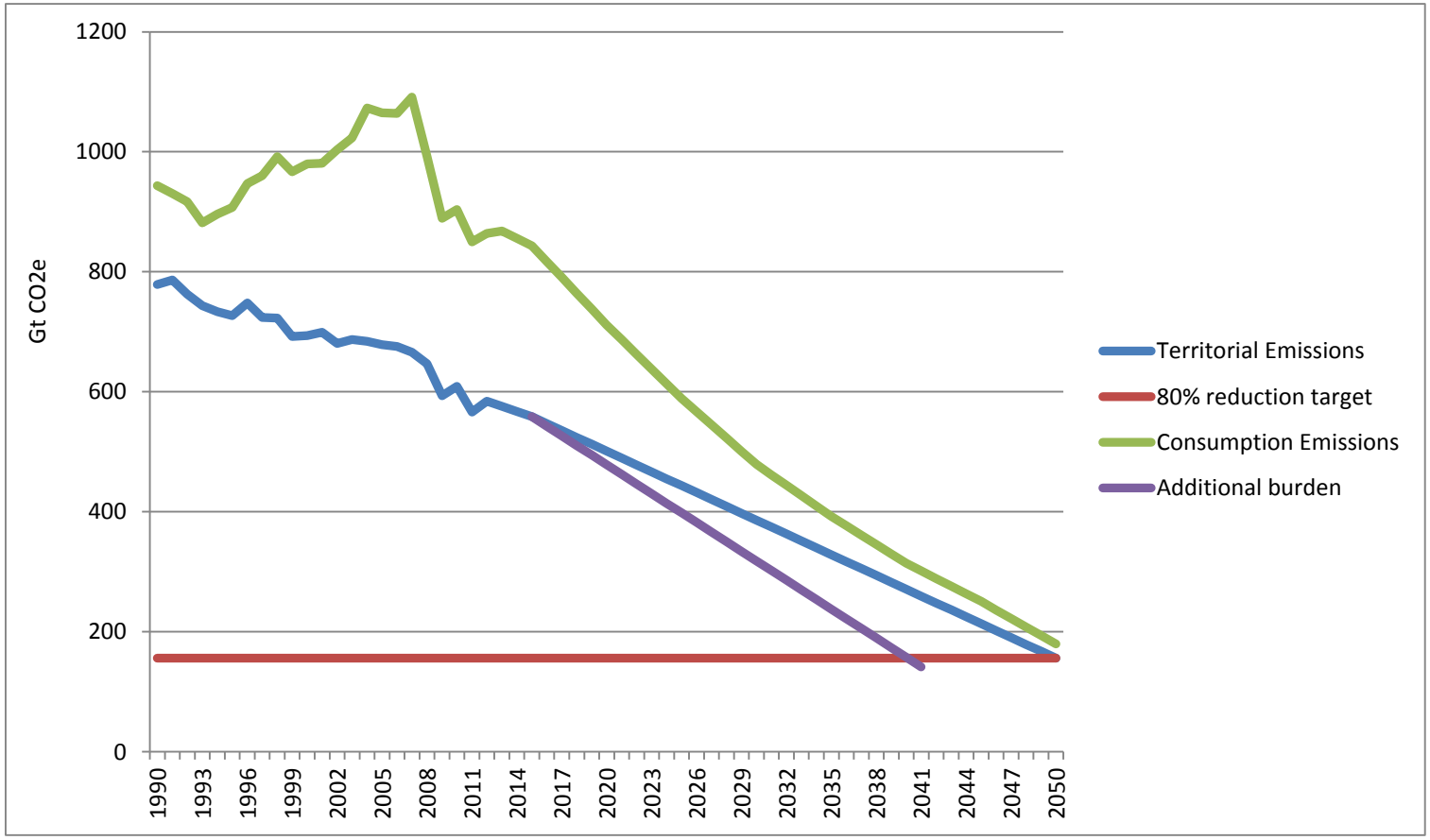

Source: Barrett et al, 2015a

Border Carbon Adjustments

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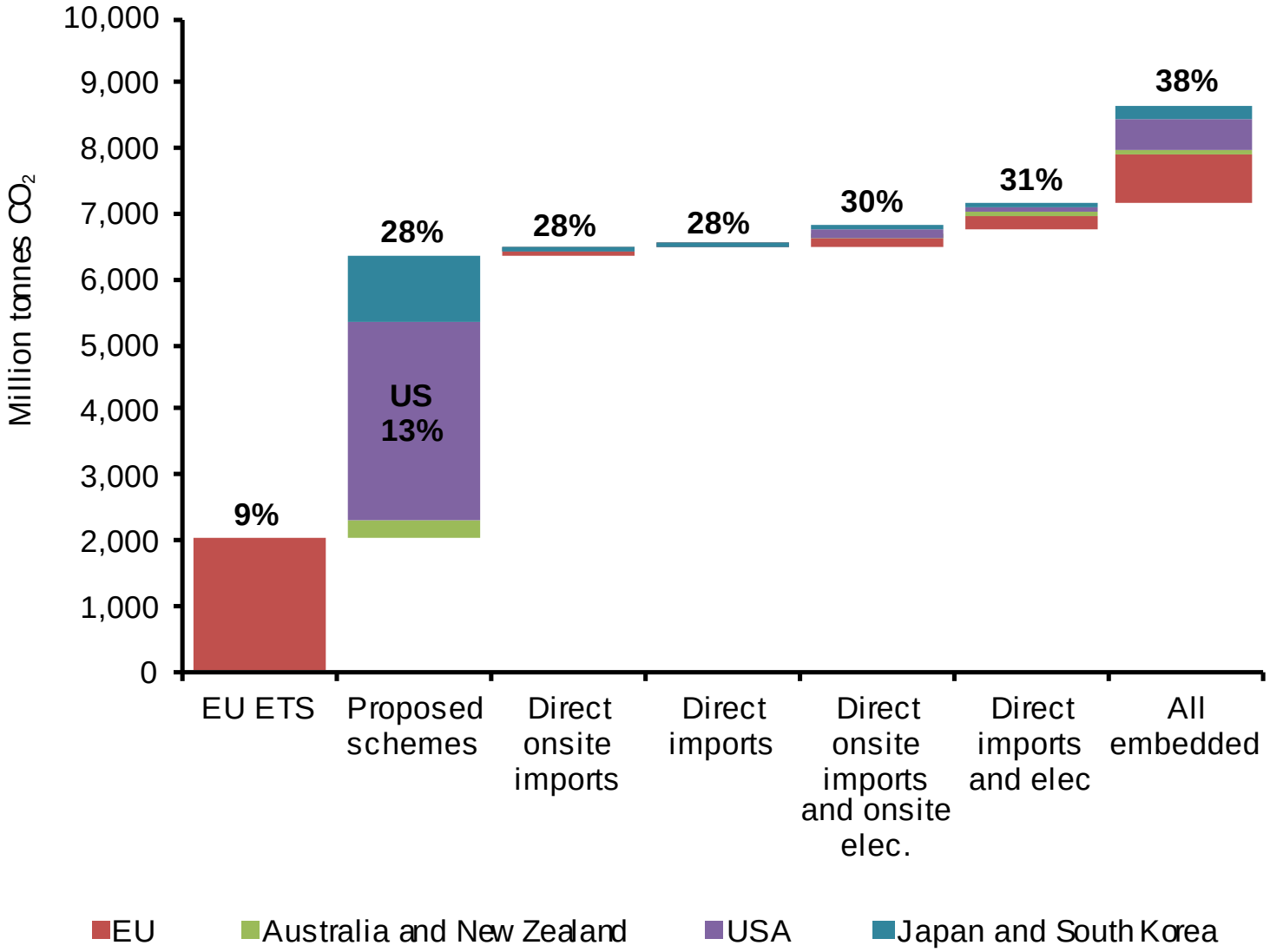

Source: Barrett et al (2010)

Energy Flow through the UK economy

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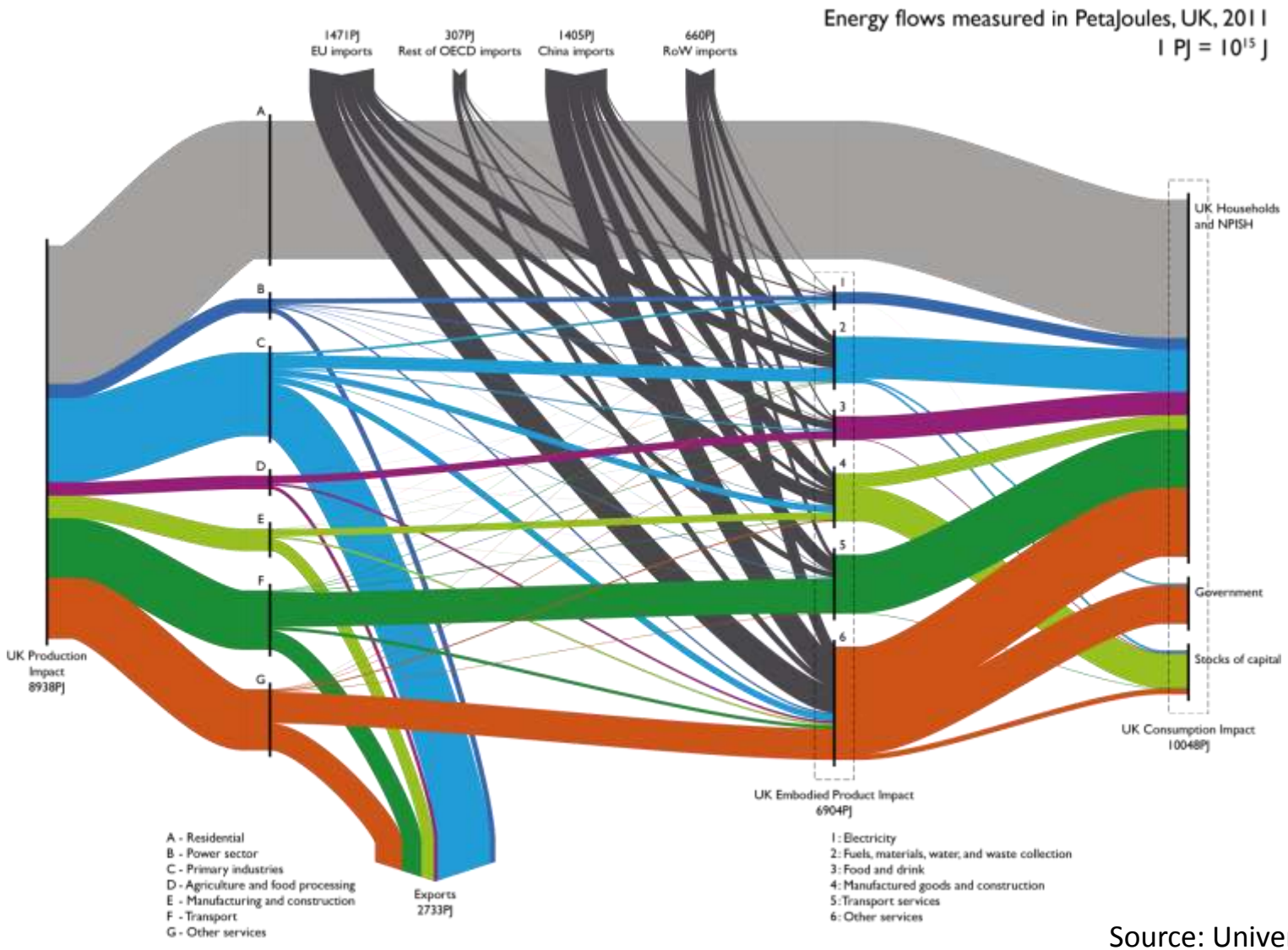

Source: University of Leeds

Domestic policy options

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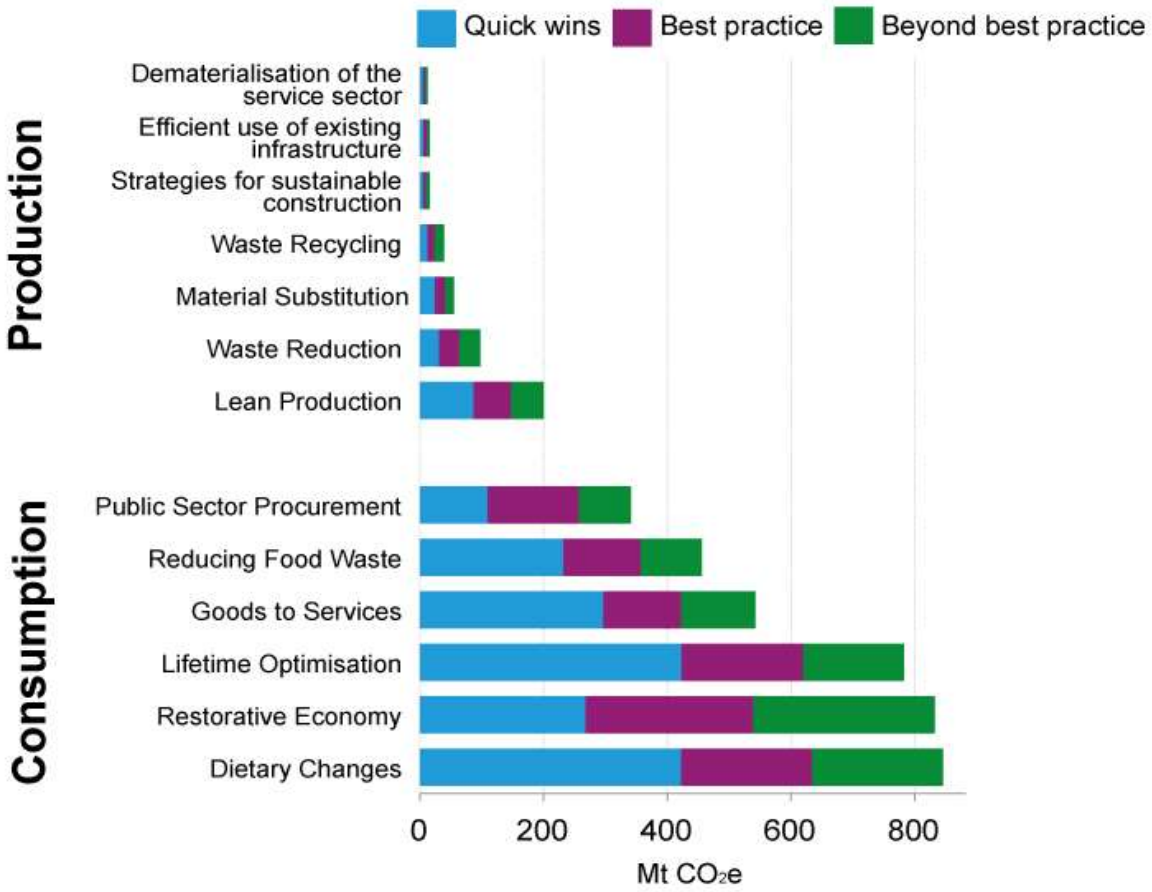
Mitigation Options

Consumption-based responses offer greater reductions in GHG emissions than production-based responses



Barrett and Scott(2012)

Additional Policy Options

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Economy wide approach

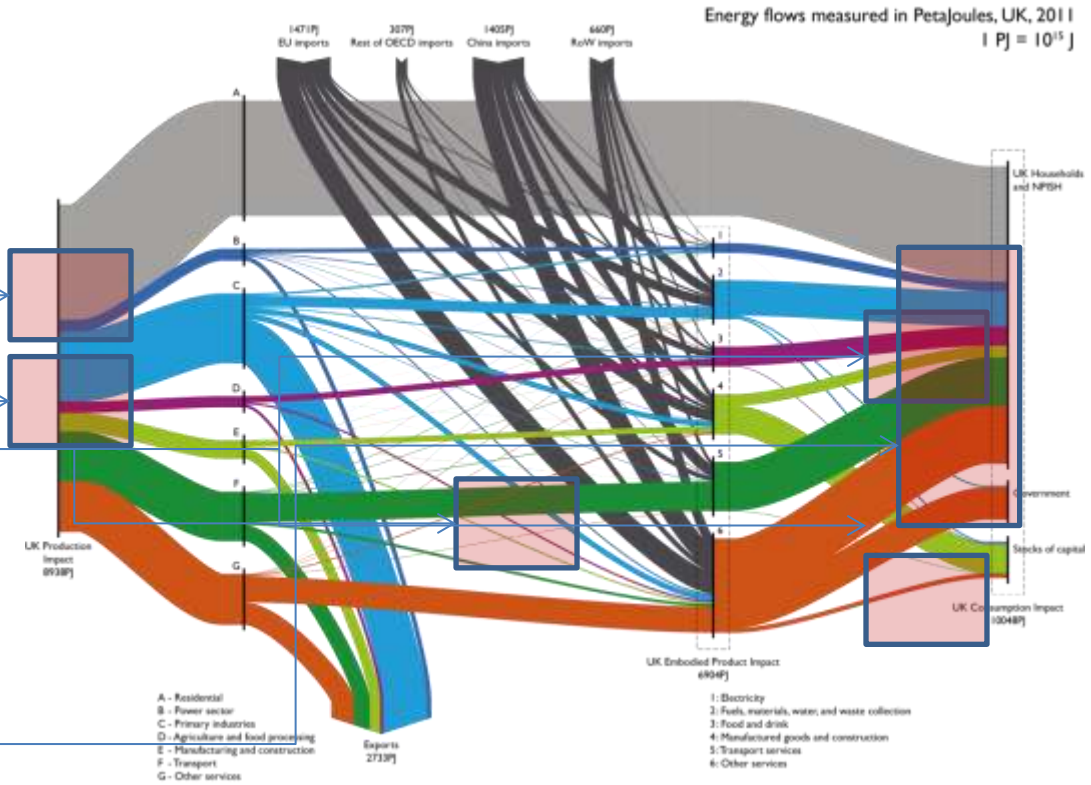
- Materials tax
- Energy demand target and tax / market

Sector response

- Construction (NIPs, Allowable Solutions)
- Vehicles (Weight regulations, VAT exemptions)

Consumer solutions

- Mandatory warranties
- Goods to services



References and other useful publications

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- Barrett, J., Peters G., Wiedmann T., Scott K., Lenzen M., Roelich K., C. Le Quéré (2013) Consumption-based GHG Emission Accounting: a UK case study. Climate Policy, Vol 13., No.4., 451-470.
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- Scott K., Barrett J. Baiocchi G., Minx J. (2009) Meeting the UK climate change challenge: The contribution of resource efficiency, published by Waste Resources Action programme (WRAP).
- Wiedmann T. and Barrett J. (2013) Policy relevant Applications of Environmentally Extended MRIO Databases – Experiences from the UK. Economic Systems Research, 25:1, 143-156.

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Consumption based options to reduce GHG emissions and their potential effectiveness

Leiden University, CML: Joao Rodrigues, Valentina Prado, Sebastiaan Deetman, Ester van der Voet
NTNU: Dan Moran, Richard Wood
WU: Karin Schanes, Stefan Giljum, Friedrich Hinterberger, Hanspeter Wieland (WU)

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CarbonCap: consumption based approaches to reduce GHG emissions, in addition to already existing policies targeting mainly production sectors

- Addressing different actors
- Targeting “footprint” emissions rather than territorial emissions
- Being effective outside EU as well as within

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Identification and assessment of consumption oriented improvement options:

1. Hotspot analysis to identify important contributing consumption categories
2. Identification of improvement options
3. Calculation of potential effectiveness of improvement options

Avoiding duplicating already existing policies

- Discussion on scope

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Hotspot analysis

To make a long story short:

- Footprint emissions:
  - Person transport, especially cars
  - Space heating
  - Food
  - Consumer electricity use
- Excluding use phase emissions:
  - Construction work
  - Motor vehicles
  - Machinery and equipment
  - Furniture
  - Food products
  - Plastics, chemicals
  - (Other) metal products

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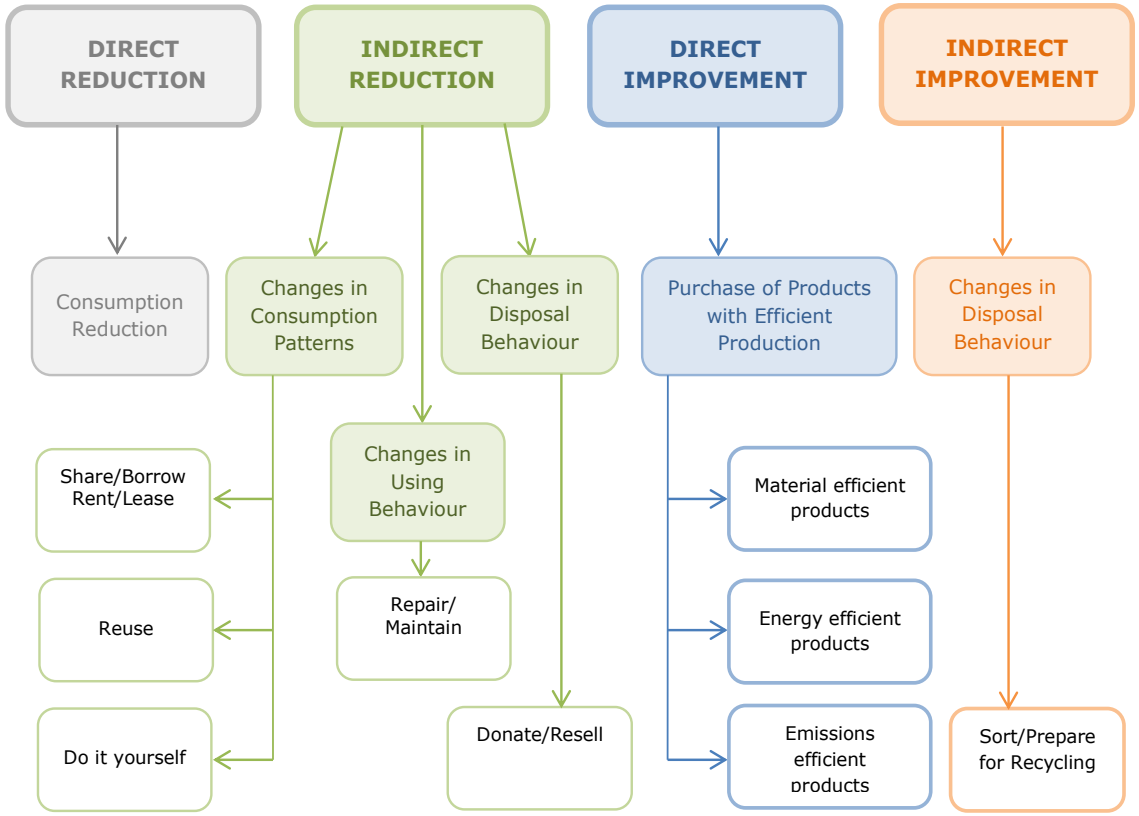
Identification

Framework for identification of improvement options



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Identification

Mitigation Strategy	Sub-strategy	Option	References
CONSUMPTION REDUCTION		Reduce living space per capita.	
PURCHASE OF PRODUCTS WITH EFFICIENT PRODUCTION	Material efficient products	Select higher recycled content products and materials (e.g. reclaimed bricks, higher recycled content blocks, locally recycled aggregates)	Gao et al. (2001), Blengini (2009), Thormark (2002); Thormark (2006)
		Use hybrid construction (e.g. timber and steel)	Saadah and AbuHijleh (2010)
		Select materials with lower carbon intensities (e.g. cement substitutes such as PFA or sustainably-sourced timber) instead of concrete or steel	Gong et al. (2012), Guardigli et al. (2011), Salazar and Meil (2009), Monahan and Powell (2011)
		Use renewable building materials, e.g. adobe, straw bale, hemp-lime.	Shukla et al. (2009), Sodagar et al. (2011), Swan et al. (2011), Ip and Miller (2012)
		Low energy buildings instead of self-sufficient (zero operating energy) buildings	Ramesh et al. (2010)
		Select materials with lower transport-related carbon emissions (e.g. locally-sourced aggregates)	
	Energy efficient products		
	Emissions efficient products		
CHANGES OF CONSUMPTION PATTERNS	Sharing/borrowing/swapping/ leasing/renting	Co-Housing or shared (office) spaces	
	Reuse	Reuse construction materials	BIOIS (2011), Cooper and Allwood, (2012), Kay and Essex (2009), Prognos (2008)
	Do it yourself		
CHANGES OF USING BEHAVIOUR	Repair/Maintain	Major refurbishment and renovation of residential and commercial buildings.	
		Household small scale refurbishment and renovation of residential buildings	
	Donate/Sell		
CHANGES OF DISPOSAL BEHAVIOR	Sort/Prepare for recycling (Take-back schemes, bring to waste collection service, recycling center)	Separate construction waste for recycling	BIOIS (2011), Prognos (2008),

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Identification

Result: Longlist of improvement options

113 improvement options in the following categories:

- Transport
- Building
- Food
- Electronics
- Textile
- Paper
- Plastics
- Furniture
- Chemicals
- Machinery

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Assessment

Next step: assessment of improvement options on their potential to reduce GHG emissions

Twofold approach:

1. Quickscan: quick-and-dirty assessment of all 113 options to identify the most promising ones

2. Detailed analysis: using the results of the quickscan to select a number of options to assess in detail

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Assessment

Quickscan:

Translate 113 options in terms of MR-EE-IO model EXIOBASE

- Final demand reduction
- Efficiency improvements in the processes of the supply chain: changes in coefficients
- Changes in the supply chain: changes in structure

Calculate impacts on GHG emissions

Maximum implementation, no rebound effects, no side-effects on other environmental impact categories: “clean” input for next stage of analysis in CarbonCAP

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Assessment

Result Quickscan:

Large table with improvement options

- Not 113 but 84: excluding overlaps and options beyond EXIOBASE
- Emission reduction capacity for individual options ranges from 6.5% to 0.0%

- Total emission reduction potential: 5.3E12 kg CO2-eq, equalling 67% of EU footprint emissions …
- … of which about half within and half outside EU territory

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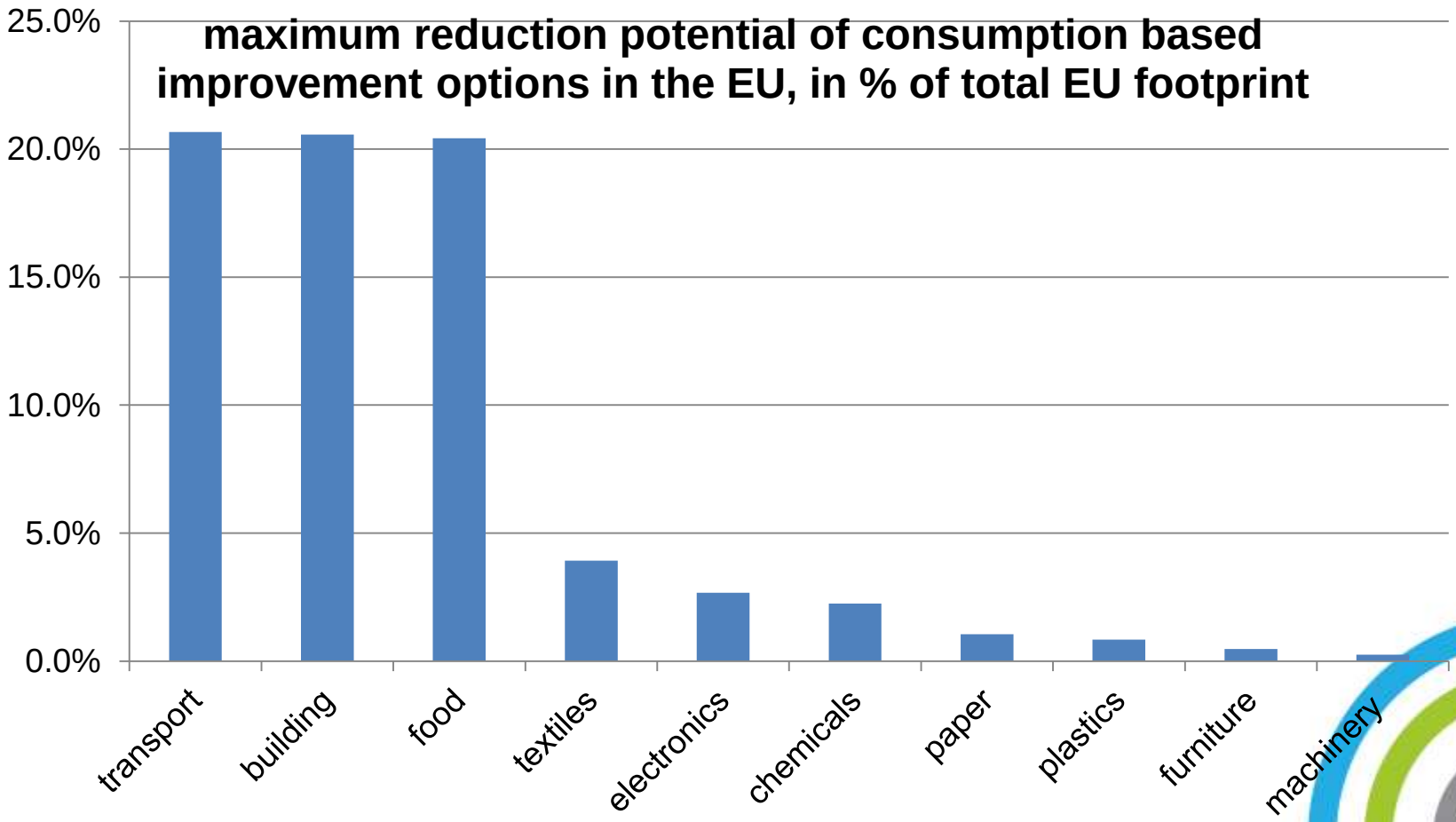

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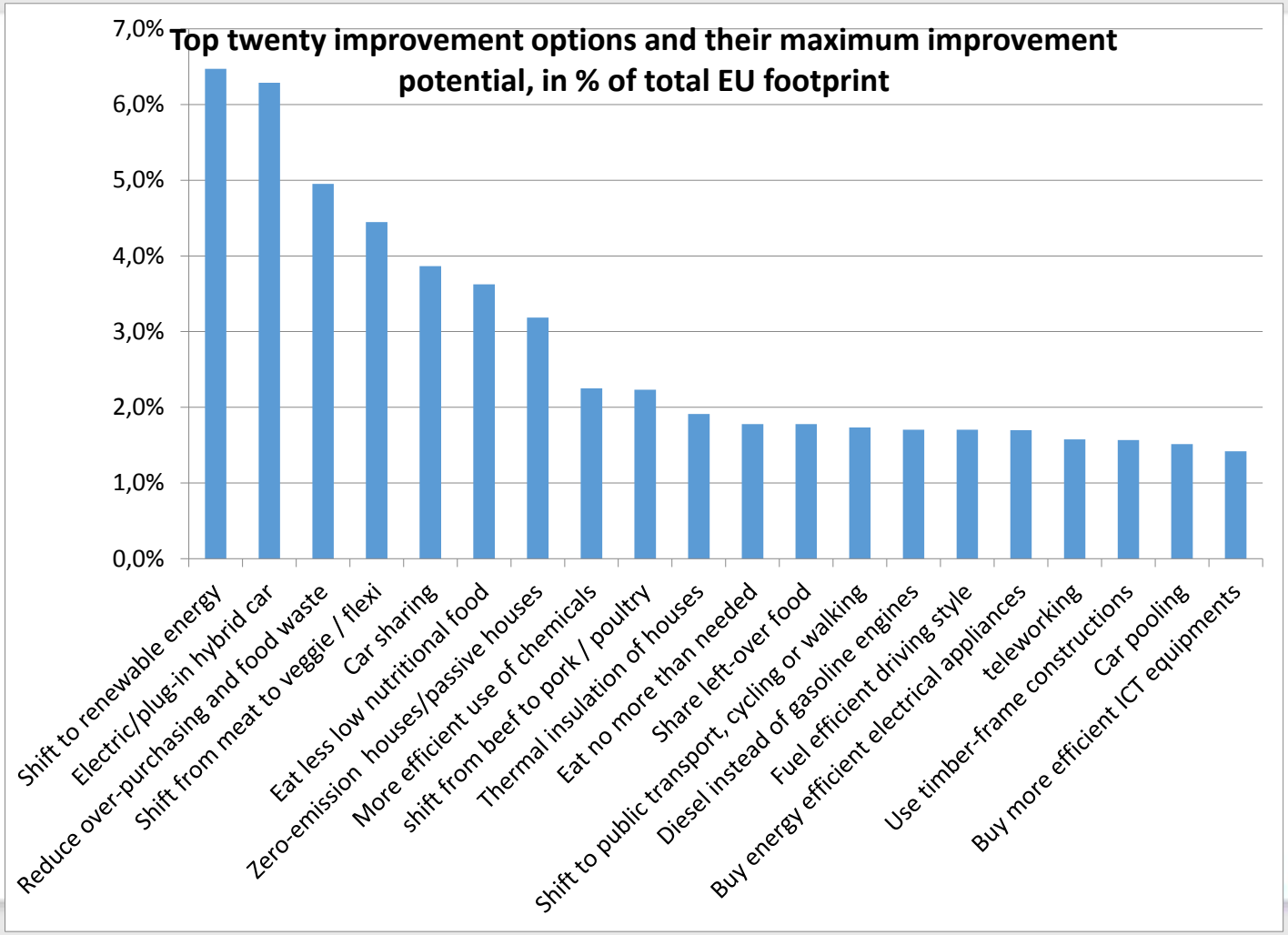
Assessment



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Assessment

Detailed analysis

Options from transport, building, food

- Modifications in structure and coefficients based on literature
- Country specific inputs, country specific results
- Hybrid LCA
  - more detail in sectors
  - full hybrid analysis using EXIOBASE as background system

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Assessment

Sector	Improvement option
Building	Zero emission houses / Passive houses
Building	Thermal insulation of houses
Building	Reduction of room temperature by 2 degrees C
Building	Timber instead of steel and concrete frameworks for houses
Building	Teleworking
Transport	Car pooling
Transport	Reduced number of cars per household
Transport	Shift from cars to public transport
Transport	Lighter cars
Transport	Cars from recycled materials
Transport	Electric cars
Transport	Hydrogen fuel cell cars
Transport	Reduced air travel
Food	Consume fewer foods with low nutritional value
Food	Shift from meat to veggie / flexi
Food	Reduce consumption of dairy products
Food	Reduce overconsumption of food in general

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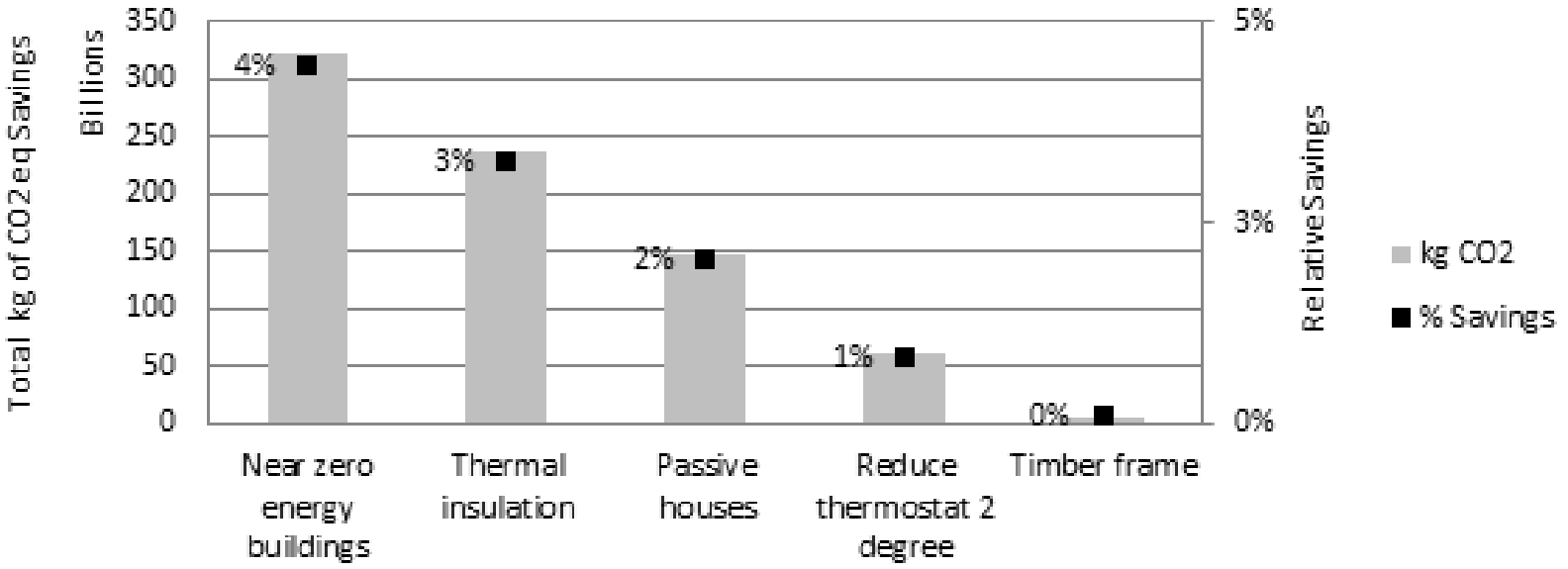
Assessment

Improvement options in building: country specific inputs, country specific results



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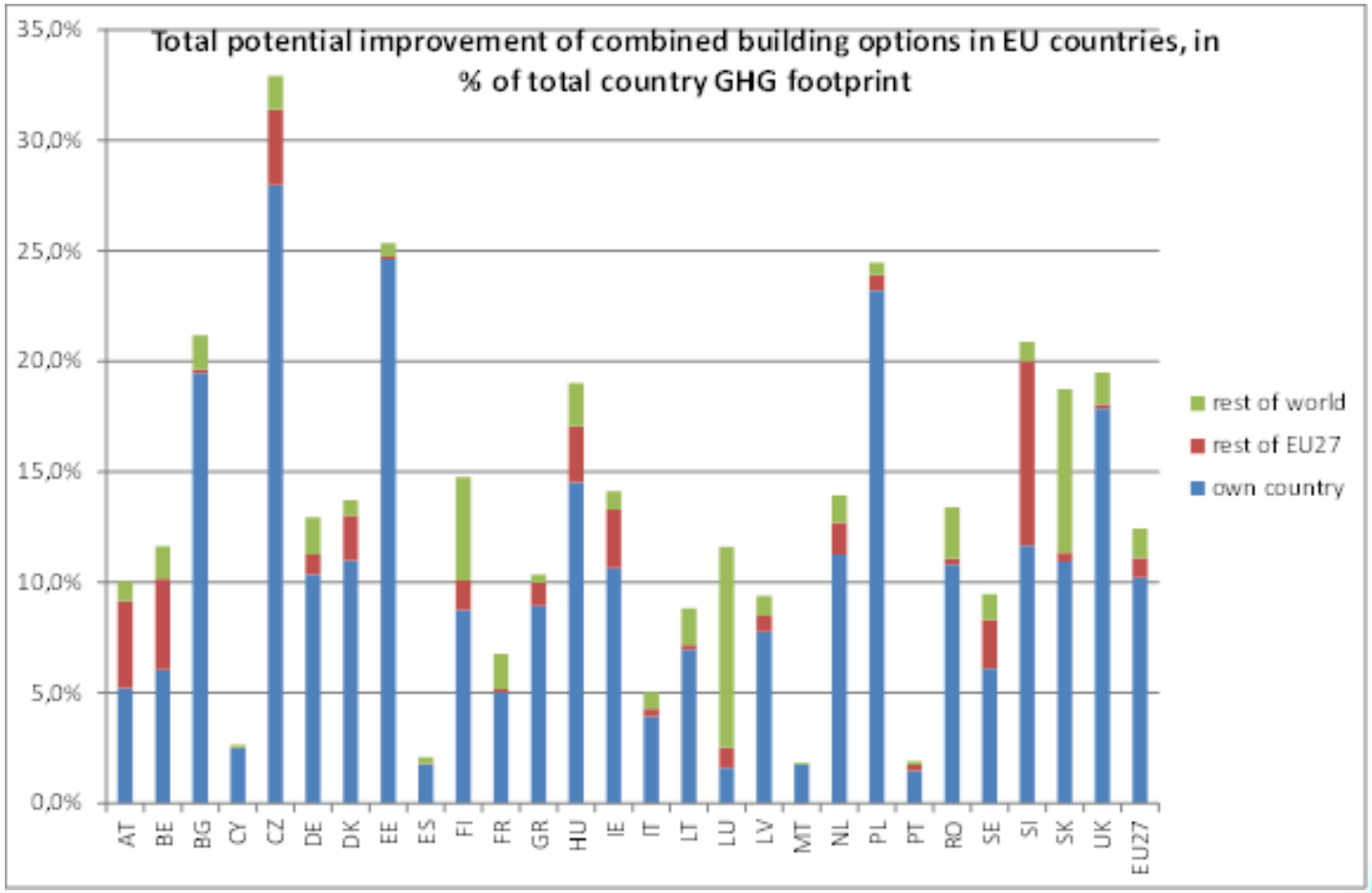
Assessment



Carbon-CAP
Consumption-based Accounting and Policy

Assessment

Improvement options in transport:

- Hybrid LCA at microlevel
- Scaling up using EXIOBASE
- Country specific outputs, sector specific outputs

- Still unfinished

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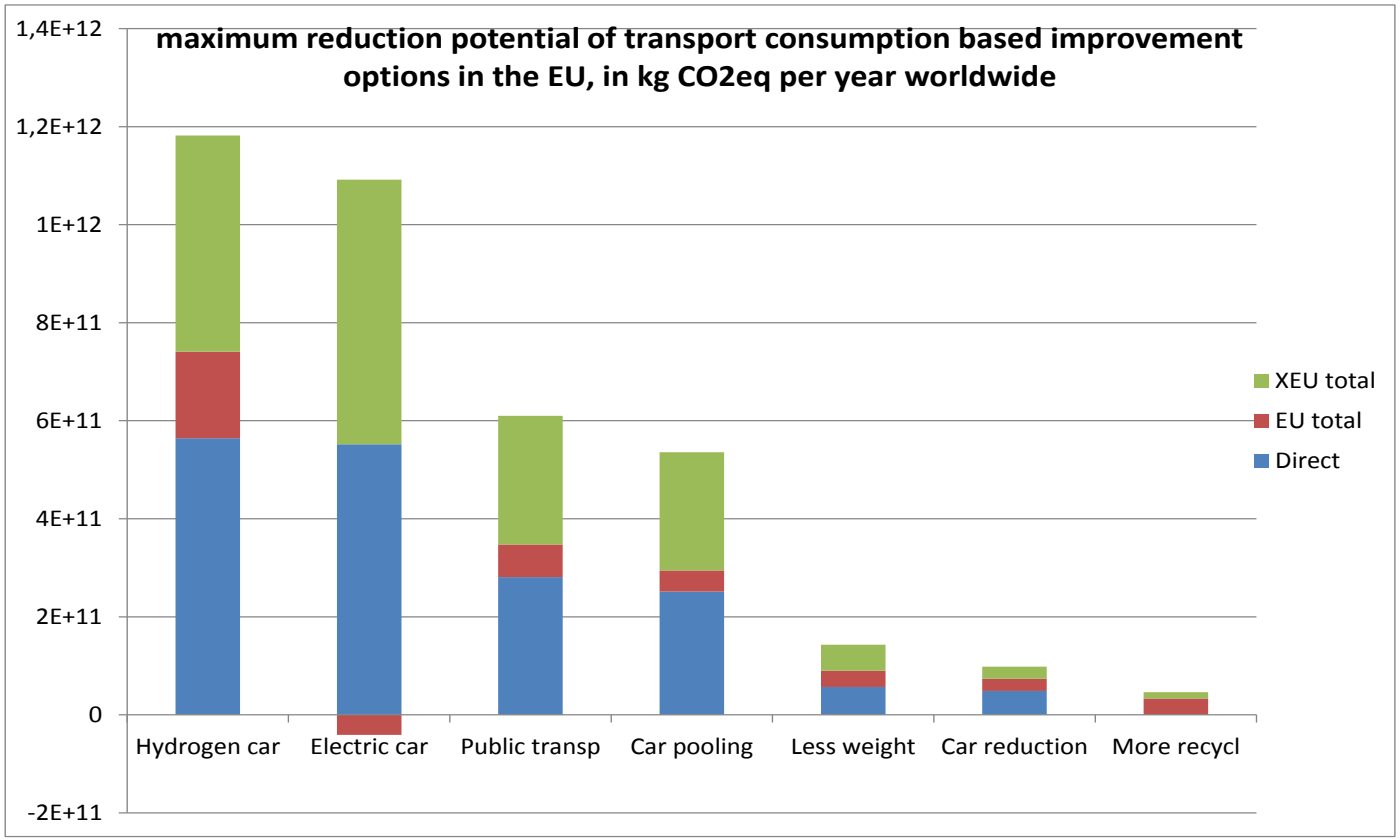
Consumption-based Accounting and Policy

Assessment

Macro-level result



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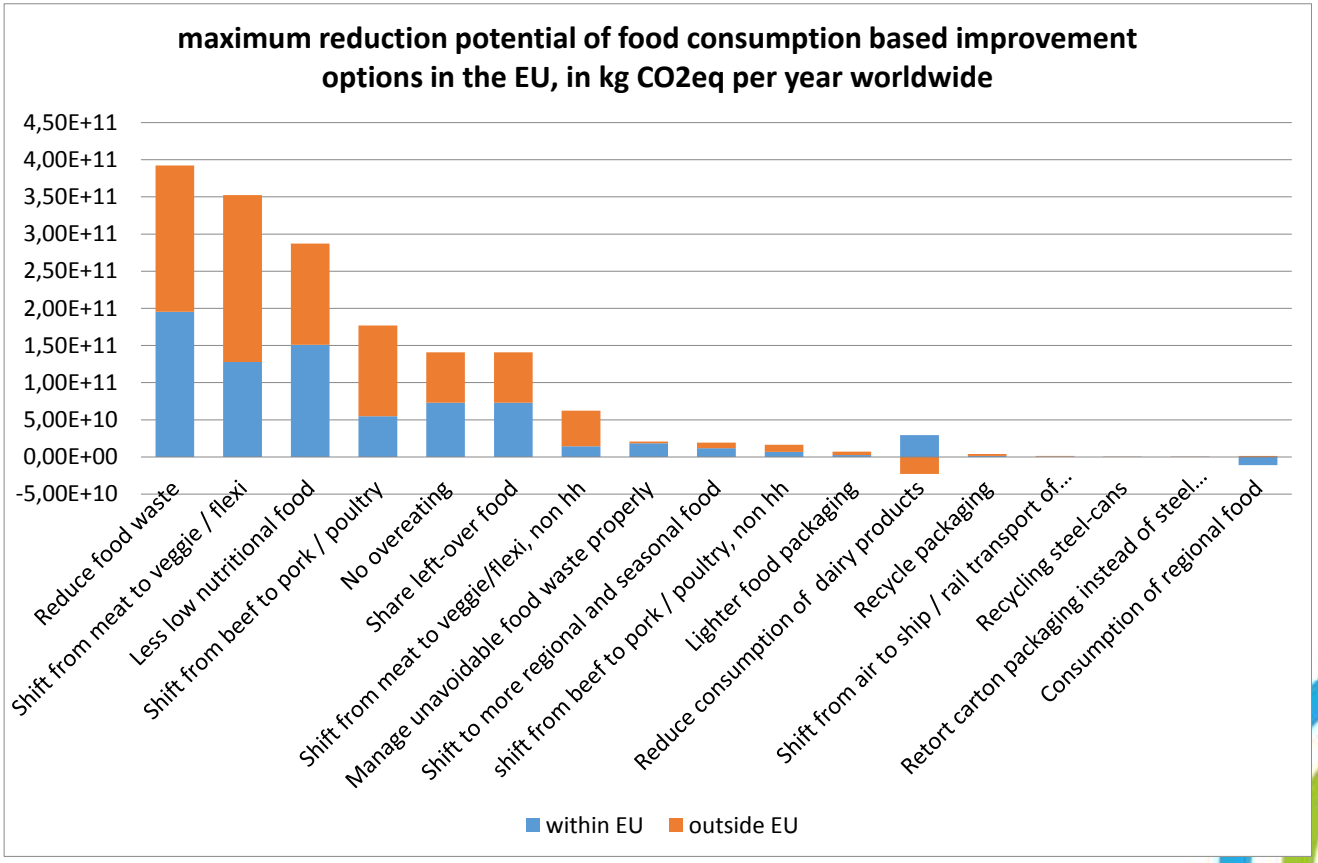
Assessment

Improvement options in food: detail in agricultural products affected



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Conclusions

Conclusions

- Large potential for consumption based GHG reduction, especially in transport, building and food
- Includes realising almost half of improvements outside EU territory
- Needs to be corrected for uptake rates and rebound effects; environmental side-effects not included
- Detailed analysis provides additional information

DIW BERLIN

Sebastian Petrick

Barriers to implementation of consumption-oriented carbon mitigation options

Starting point

Consumer-oriented improvement options to reduce embedded emissions:

substantial (theoretical) potential

vs.

limited actual pick-up

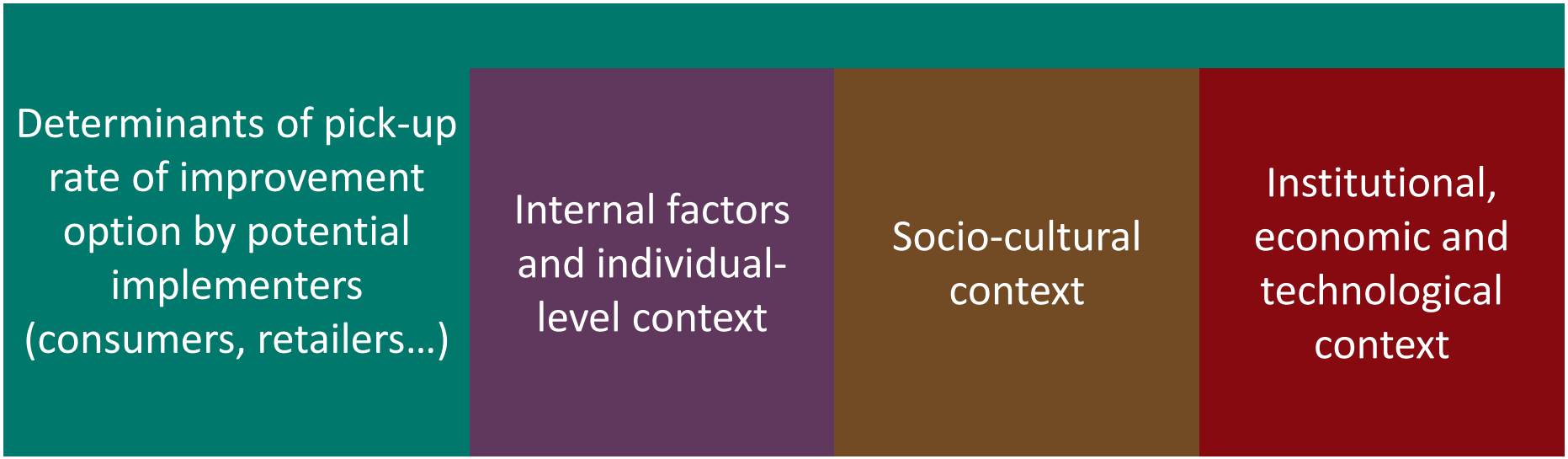
→ What are challenges and barriers hinder the pick-up of consumer-oriented carbon mitigations options?

- behavioural
- social
- institutional
- economic
- …

→ Which policy measures are suited to adress these barriers (next session)

→ What pick-up can we expect in the future, relative to today

Barriers to pick-up – overview



Barriers to pick-up

Determinants of pick-up rate of improvement option by potential implementers (consumers, retailers…)	Internal factors and individual-level context			
	Preferences, intentions and attitudes Extent to which potential implementers of improvement option are willing to implement, also based on influence of heuristics and biases that stimulate/ prevent implementation	**Habits** Extent to which potential implementers overcome habits that prevent the adoption of an improvement option, and/or develop new habits to adopt the improvement option	**Knowledge, competence and information** Extent to which potential implementers of improvement option are aware and informed about improvement option	**Identity and social status** Extent to which social identity of the potential implementer stimulates or prevents, and social reference group rewards or sanctions implementation of improvement option (social and personal norms and values)

Barriers to pick-up

Determinants of pick-up rate of improvement option by potential implementers (consumers, retailers…)

Socio-cultural context

Identity and social status
Extent to which social identity of the potential implementer stimulates or prevents, and social reference group rewards or sanctions implementation of improvement option (social and personal norms and values)

Socio-demographic characteristics
Extent to which external socio-demographic characteristics of potential implementer necessitate implementation of improvement option

Barriers to pick-up

Determinants of pick-up rate of improvement option by potential implementers (consumers, retailers…)

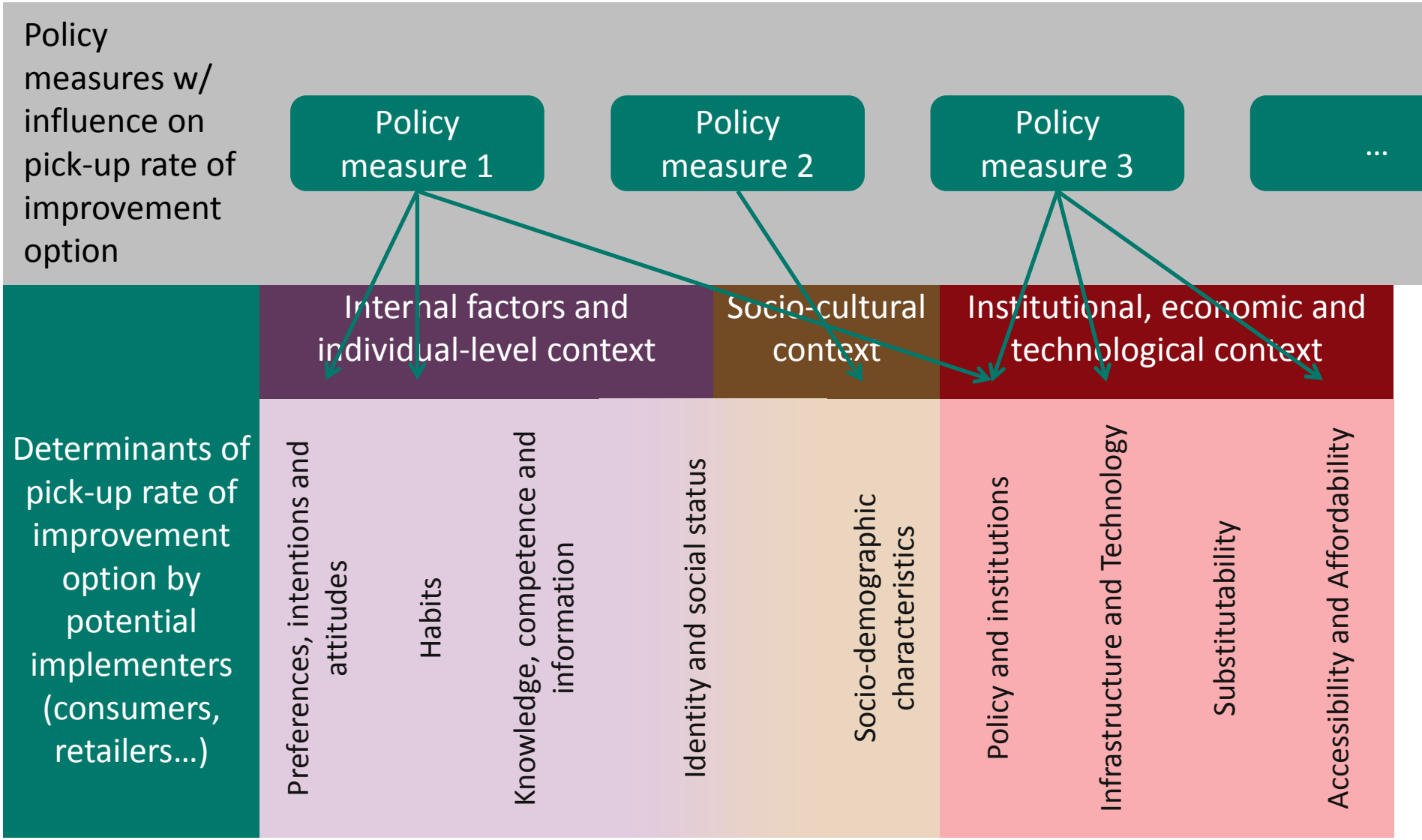
Institutional, economic and technological context

Policy and institutions
Extent to which the regulatory and institutional framework prevents/stimulates implementation of improvement option

Infrastructure and Technology
Extent to which the necessary infrastructure and technology for implementation of the improvement option is available

Substitutability
Degree to which improvement options meets the functional level of conventional options and users' expectation

Accessibility and Affordability
Extent to which potential implementers are able to readily acquire and use the product (price, availability and convenience)


Policy measures w/ influence on pick-up rate of improvement option
Policy measure 1
Policy measure 2
Policy measure 3
...
Internal factors and individual-level context
Socio-cultural context
Institutional, economic and technological context
Determinants of pick-up rate of improvement option by potential implementers (consumers, retailers…)
Preferences, intentions and attitudes
Habits
Knowledge, competence and information
Identity and social status
Socio-demographic characteristics
Policy and institutions
Infrastructure and Technology
Substitutability
Accessibility and Affordability

Alternative building materials – individual level context

Preferences, intentions and attitudes	Habits	Knowledge, competence and information
• Negative perception of and prejudices towards alternative materials (e.g. fire-resistance of timber) • Focus on operational emissions • Lack of awareness, environmental aspects found to play a minor role in most consumer decisions	• Slow adaptation by risk-averse communities that are used to conventional methods • Established practices • Time constraints incentivise familiar copy-paste designs	• Lack of reliable and comparable information on new materials • Unfamiliarity with alternative materials • Inability to use the technology (e.g. moderate use of wood in Southern Europe)

Alternative building materials – socio-cultural context

Identity and social status (social and personal norms)	Socio-demographic characteristics
-	-

Alternative building materials – institutional, economic and technological context

Policy and institutions	Infrastructure and Technology	Substitutability	Accessibility and Affordability
• Existing building codes • Lack of established standards, design guides, tools, standardised details • Small industries cannot compete against established industries' economics of scale	• Supply chain limitations	• Functionality of alternative materials (e.g. fire-resistance of timber)	• Higher costs of new materials • Increased insurance costs • Uncertainty premium on new options by intermediaries • Local availability of materials and technology • Cost of additional training and research • Shortage of specialist skills

Reduction of food waste – individual level context

Preferences, intentions and attitudes	Habits	Knowledge, competence and information

	• Culinary repertoire is relatively fixed
	• Strong resistance against new recipes (waste cooking)
	• Provisioning is highly routinized
		• Lack of environmental awareness:
		  • the quantity of food waste generated individually,
		  • the environmental problem that food waste presents, and
		• Lack of awareness of financial benefits efficient food use
		• Lack of food storage skills – food spoilt in preparation
		• Lack of supply knowledge – consumers do not know what food they have available
		• Lack of location knowledge – consumers do not know where to locate food items
		• Lack of knowledge about food safety hygiene and durability of food products

Reduction of food waste – socio-cultural context

Identity and social status (social and personal norms)	Socio-demographic characteristics
• Perception that wasting food is the norm • Concerns about healthy and 'proper' eating drives the purchase of too much (perishable) fruits and vegetables which are later disposed. • 'Good' provider identity: Desire to be a 'good' parent, 'good' partner or 'good' host leads to overpurchasing	• Household size: single households tend to waste more, larger households wasting less per person than smaller households • Household composition: households with children tend to waste more than households without children • Age: young people tend to waste more than older people • Gender: when women are responsible for grocery shopping they tend to waste more than when men or both are responsible. • Family income: lower food loss in low-income than in high-income households (perception of price signal)

Reduction of food waste – institutional, economic and technological context

Policy and institutions	Infrastructure and Technology	Substitutability	Accessibility and Affordability
• Special offers and multi-buy offers lead to over-purchasing (e.g. BOGOF) • Emotional neutralization: Food lost its identity, seems to be just another product among others, no seasonality, no context to the producer	• Large supermarkets- Food thrown away is highest when people exclusively shop in large supermarkets • Packaging (oversized, non-resealable) • Insufficient date marks, storage or freezing guidance on-pack		• 'Cheap' food may erode its perceived value. • Prioritization of volume sales over value by food industry.

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Consumption- based Carbon Accounting

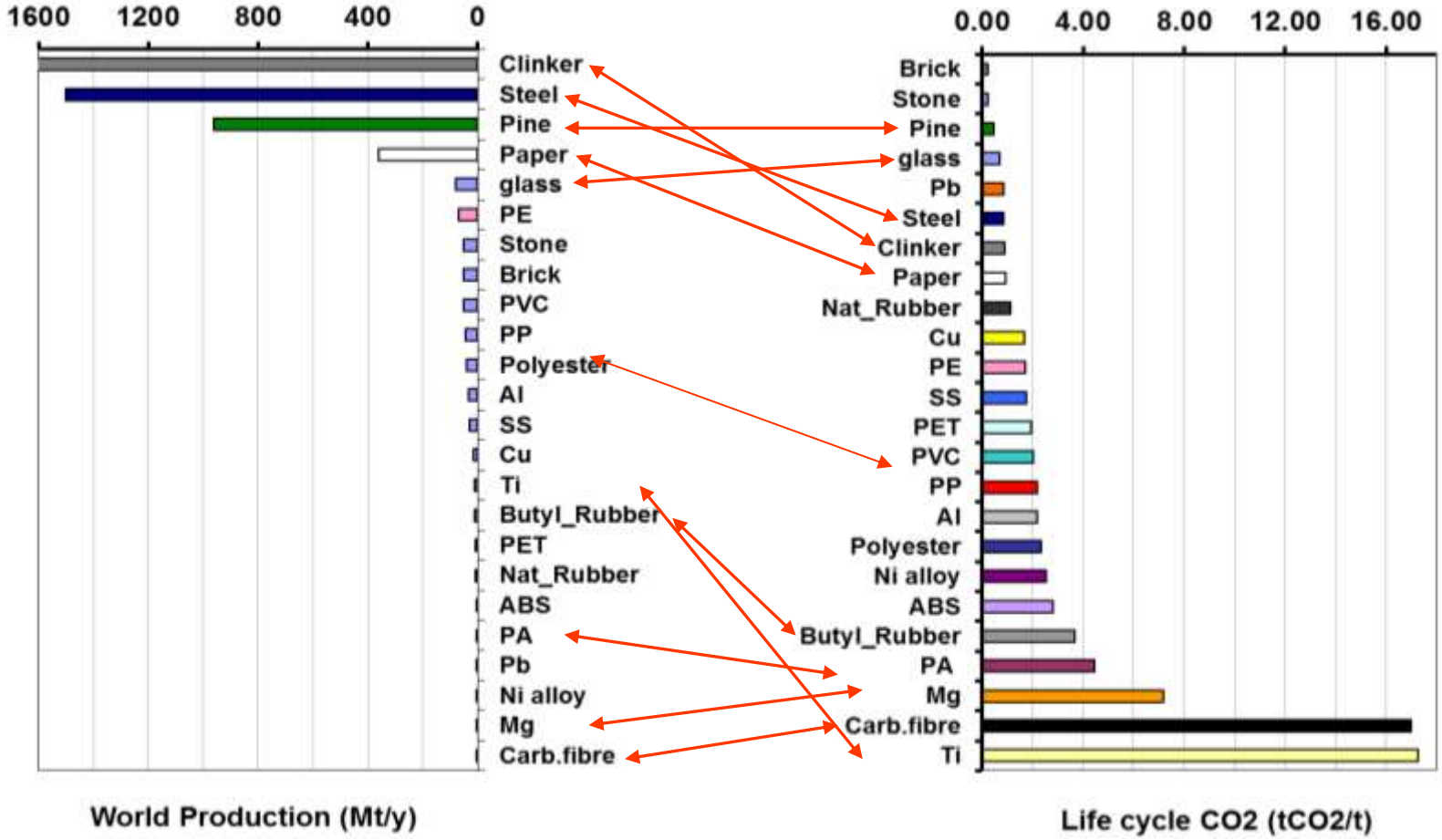
Business Perspective

Carl De Maré, Vice President,
Head of emerging technology development

Consumer-Oriented Improvement options

- Opportunities
  - Create awareness for material choice at the moment of purchase of a product (cfr. Food awareness of the ingredients)
    - Enduser is responsible for the material consumption. However product designers are selecting in most cases the materials.
  - Introduce “Life Cycle” Principles in the material choices as part of “Circular Economy”
  - Create an appropriate instrument for manufacturing industry to reduce its GHG Footprint
    - EU : Cap & Trade instrument can function for the energy sector, but ETS is not the appropriate instrument for Materials and Manufacturing Industry.
  - Opportunity to launch the development of “Green Bio-based Products”
    - Ex. Low Carbon Plastics do not get an “incentive” where today there is a strong incentive for Low Carbon Fuels
- Conclusion : since the start of the project, we could promote this idea and get a lot of support for this idea.

Important to consider Life Cycle CO2 at the moment of design of a product



Source : Elaboration on M. Ashby materials and the Environment

Consumer-Oriented Improvement options

- European Case : Existing Instruments for transition to low carbon economy

	Energy Sector	Manufacturing
EU ETS cap & trade	Cost pass through	-No level playing field - Sectorial differences
Renewable Energy Directive	Mandatory use of Bio-Fuels Incentive schemes for Renewable power (with cost pass through to all consumers) Car : g CO2/km target	-No incentive for Bio-based products vs Fossile Carbon based - Designers are pushed to wrong material use
Circular Economy		- No concept available yet but opportunity to fix the unwanted effects from ETS and RED

Consumer-Oriented Improvement options

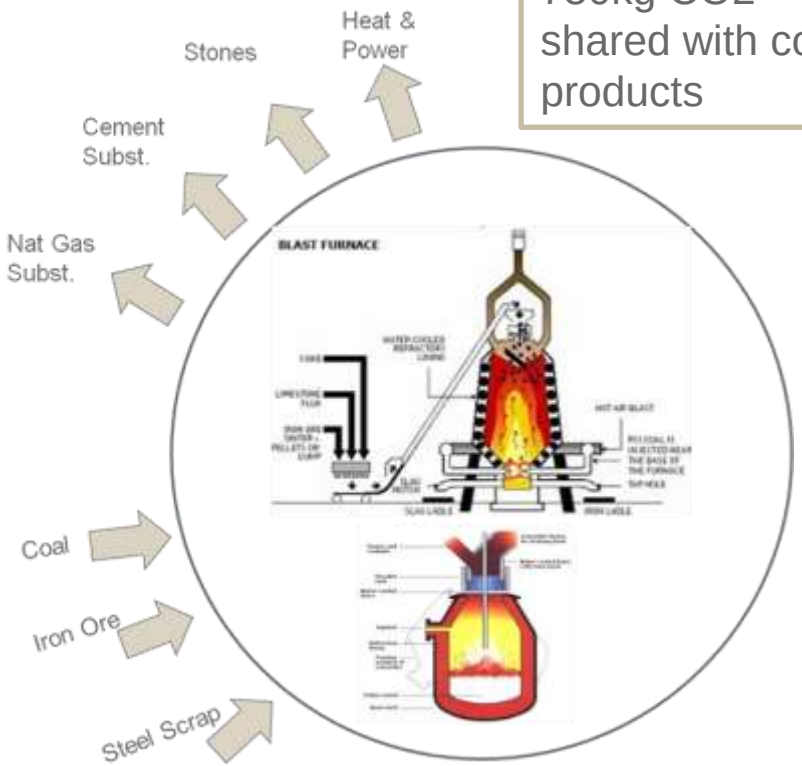
- Challenges
  - Need to implement for majority of the materials
    - Reason : designers have always options to select materials
  - Need to based on “Life Cycle” Principles to promote future re-use and also to include future disposal penalty
    - Need to look from end product backwards into the value chain where ETS benchmarks are looking from the upstream into the value chain
    - Carbon consumer tax is thus fundamentally different to what is known. Will need a lot of effort to explain the difference with the existing benchmarks
  - Carbon based tax need to be **simple, but transparant**.
    - **One figure** on the material independent on how or where the material is produced. Figure should reflect the “average” carbon effect of the material in use. Is this realistic in case of large carbon efficiency differences between regions?
  - Challenge is mainly on the carbon related tax in the imported products
    - How to make a simple system based on types of materials used in the products? Can the border declaration statistics which are available already today be sufficient?
- Conclusion : Major challenges
  - will be the acceptancy due to confusion with the already existing ETS benchmarks
  - Transparant and simple system for the imports/exports that is not disturbing the level playing field.

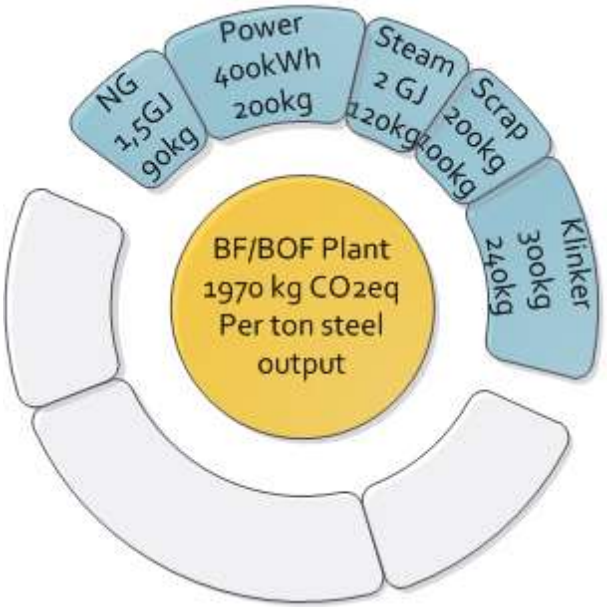
Carbon based tax – Key principles

- Look from end products upwards into the value chain
- Promote the “Circular Economy” :
  - share the carbon for “co-produced” products
  - Include the carbon content of the product in case of end of life disposal by combustion possible (difference between plastics and carbonates)
- Use the average carbon effect of the material in use at that moment

Carbon based consumer tax – Promote carbon sharing by co-production of materials

750kg CO2 shared with co-products





BOF/BF	
D	C
-1970	+750

2t CO2/t steel carbon use

1,2t CO2/t Steel (incl. by-product)

ISO Standard exists to share the carbon (LCA)

ArcelorMittal

Stones

Heat & Power

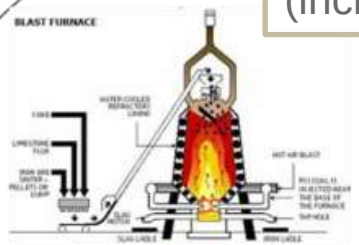
Cement Subst.

Nat Gas Subst.

Coal

Iron Ore

Steel Scrap



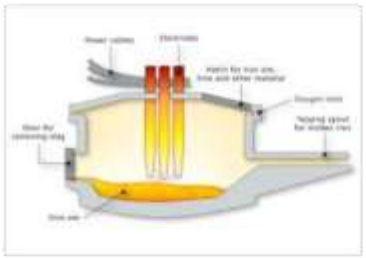
1,2t CO2/t Steel (incl. by-product)

“Fresh Steel”

0,4 CO2/t Steel

Power

Steel Scrap



Steel in Use

Consumer Tax : based on average material in use

End of Life Steel

90% is recovered after 40 years

Value Chain Yield Losses can be eliminated

Take only the carbon related to the effective used material in the end product is possible as

-in case of scrapping material that is recycled => effect is included in the “average bathtub”
-In case of combustion at the end of life => effect is added to the product based on the LCA

Conclusion : a system with liabilities which comes due in case of disposal or sales to end-consumer, but which are cancelled in case of recycling the materials as stockfeed is feasible and will simplify the system

View from a business perspective

- "Consumption based carbon tax" **won a lot of momentum** during the last 6 months (business level, political level)
  - Link with the threath for industry by the EU ETS reform as proposed
  - Link with the EU Circular Economy (opportunity to propose a new concept)
- System can work when it is **simple** and **transparant**
  - Only 1 figure for each material
    - including recycling/end of life disposal/combustion avoids complex system to compensate for yield
    - Independent on where/how each material is produced, but need to reflect the average material in use to make it transparant
  - Sharing carbon in co-production based on the LCA standards creates more cross-sectorial/circular material use
  - Only remaining question : can we be sure that at customs the import liability can be easily implemented for end-products without distortion of level playing field between regions or betrween materials

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Consumption-oriented policy instruments

Carbon-CAP Stakeholder meeting

Geneva

8 Oct 2015

Carbon-CAP
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Context: new challenges

… may require new / additional policies to tackle 'new horizons', eg beyond simple energy efficiency & supply-side (eg. Power sector) choices

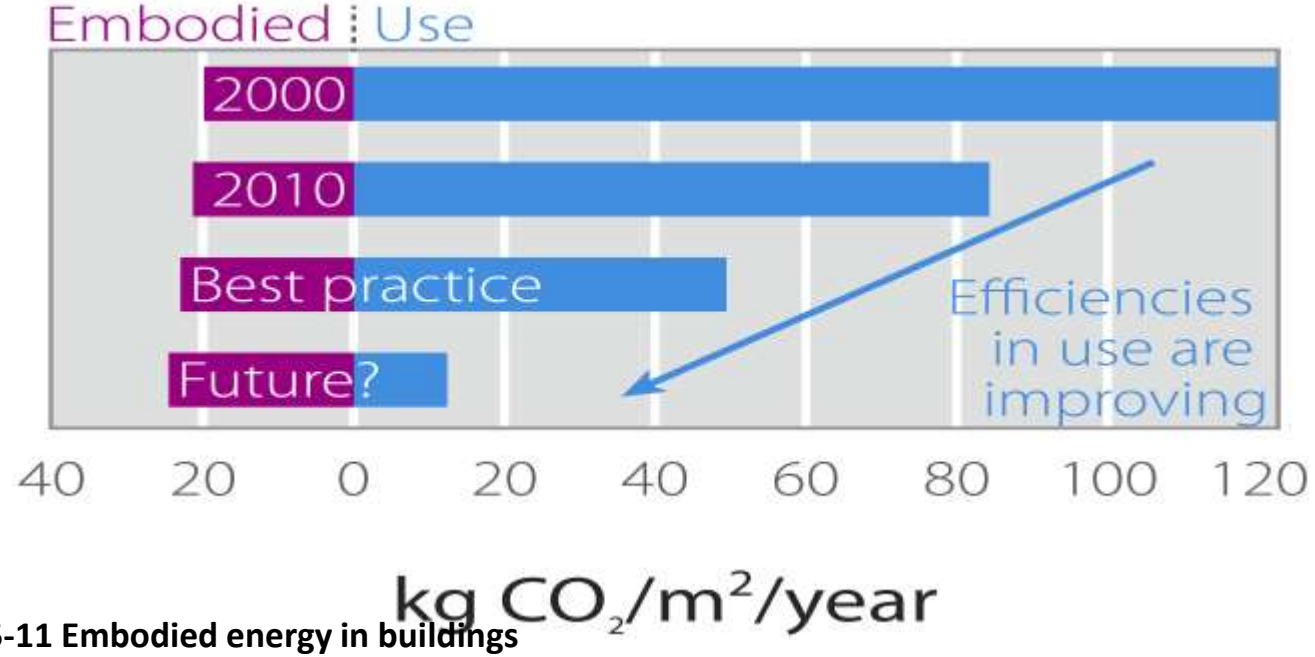

Figure 5-11 Embodied energy in buildings
Source: Allwood and Cullen (2012)

Emissions Scope / Options Interactions Matrix	S1: Direct emissions	Scope 2: Energy conversion (eg refineries, power generation)			Scope 3: Energy / GHG input to non-energy goods (eg. Steel, cement, beef)		
	Volume	Volume	GHG Intensity		Volume	GHG Intensity	
			EU elec & refineries	Electricity & fuel imports		EU production	Imported goods
Buildings & product efficiency ("more energy-efficient cars / appliances .")	*	*			?		
Modal / in-use choices ("less driving" / floor area / better maintenance etc)	*	*					
Alternate fuels (eg. Electric /hybrid vehicles, biofuels / bioenergy)	*	(-)			?		
"Less cars in the fleet" / goods in the house etc (WP6 'Direct reduction')					*		
"Cars / goods with longer life" (WP6 'indirect reducn')	?				*		
Low carbon elec/fuels footprint			*	(*)		*	(*)
Low carbon goods – composition					*		
Low carbon goods – component intensity					*	*	(*)

- **Direct intended impact**
- **- Likely negative indirect impact**
- **? Indirect impact of uncertain sign**
- **(*) Intended impact if emissions / footprinting data extend beyond EU borders**

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Generated 'long list' of 33 policy instruments for consideration *classification matrix*

Class	'Mandatory'	'Voluntary'
Informational	Product labels Approved technology lists Graduated tax on adverts	Information campaign Product location at sale Ranking and awards campaigns
Regulatory / administrative	8 instruments	6 instruments
Economic / financial	'Externality / Cost-raising' [5 instruments]	'Subsidy / cost –reducing' [5 instruments]
Enabling infrastructure & institutional	Mandatory metering Infrastruct. Improvements	Enabling recycling Enabling product sharing

In principle: Matrix of 33 instruments x 9 end-use sector – applications

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Methodology for assessment

Assessment applied six criteria:

Potential impacts criteria:

- Scope (theoretical footprint coverage)
- Effectiveness (rough degree of consumer response)

Feasibility criteria:

- Distributional impacts & flexibility to accommodate
- Legal (national and international) compatability
- International political
- EU feasibility inc administrative & implementation

*Scores in range **1-3***
Combined as product to yield compound score (multiplicative not addition)

Does not take account of the "process" elements that may also affect legitimacy

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Scoring translation table

N. of Scores 3	N. of Scores 2	N. of Scores 1	**Ccap Compound Result**	Geometric mean
6	0		**45.6**	3
5	1		**30.4**	2.8
4	2		**20.3**	2.62
5	0	1	**15.2**	2.5
3	3		**13.5**	2.45
4	1	1	**10.1**	2.34
2	4		**9.0**	2.29
3	2	1	**6.8**	2.19
1	5		**6.0**	2.14
4	0	2	**5.1**	2.08
0	6		**4.0**	2

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Results: Administrative & Regulatory instruments

2. Regulatory and Administrative instruments

Mandatory

	Transport		Food	Buildings			Paper & plastics	Textiles	Consumer goods & machinery
	Vehicles	Fuels		Fabric	Heat	Elec			
Regulatory standards	9	9	3	14	5	3	6	6	14
Licenses	4	4	2	6	2	2	6	4	6
Government procurement	9	9	9	9	9	9	9	9	9
Recycling requirements	9	0	5	14	0	0	14	9	14
Product ban	1	1	1	2	1	1	2	1	2
Waste targets, requirements and/or prices	9	0	5	14	0	0	14	9	14
Deposits / refunds on purchased goods	7	0	2	0	0	0	10	10	10
Limits on percentage ownership or use	1	0	0	1	0	0	0	0	1

Voluntary

	Transport		Food	Buildings			Paper & plastics	Textiles	Consumer goods & machinery
	Vehicles	Fuels		Fabric	Heat	Elec			
Sector trade body standards	9	9	3	9	5	5	9	6	14
Business emission agreements	9	9	9	14	9	9	14	5	14
Supply chain procurement requirements	20	20	14	20	14	14	20	20	20
Voluntary agreements by trade organisations	15	15	7	10	10	10	10	10	15
Extension of product lifetime	4	0	3	9	0	0	6	0	6

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Results: Economic and Financial instruments

3. Economic and financial instruments

"Externality" pricing
(Consumer cost-raising)

Transport		Food	Buildings			Paper & plastics	Textiles	Consumer goods & machinery
Vehicles	Fuels		Fabric	Heat	Elec			
C-intensive materials charge								
14	0	7	20	0	0	20	14	20
Carbon embodied charge								
5	3	1	7	2	2	3	2	5
Product user fees								
6	6	0	9	3	3	0	0	9
Waste targets, requirements and/or prices								
9	0	5	14	0	0	14	9	14
Minimum price limits								
6	6	3	9	3	3	9	6	9

Subsidy / incentives
(Consumer cost-reducing)

Transport		Food	Buildings			Paper & plastics	Textiles	Consumer goods & machinery
Vehicles	Fuels		Fabric	Heat	Elec			
Subsidy								
9	14	7	9	9	6	0	5	9
Deposits / refunds on purchased goods								
7	0	2	0	0	0	10	10	10
Product tax incentives								
6	6	6	6	6	6	0	3	6
Trade Env Goods and Services agreements - eg tariffs								
14	14	9	14	0	0	14	14	14
Preferential finance terms								
9	9	0	9	5	5	0	0	9

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Top scoring (20) in at least 2 sectors

Instrument	Key sectors	**Lower criteria scores in**
Rank robust in sensitivity		
Approved technology lists	All 20 except food, heat & electricity sourcing (14)	Scope; International political
Supply chain procurement	All 20 except food, heat & electricity sourcing (14)	Scope; International political
Carbon intensive materials charge	Building fabric; consumer goods / manuf / paper & plastics / (vehicles)	Effectiveness; EU Admin & Implementation
Infrastructure improvement	Transport vehicles & fuels; building fabrics	Scope; distributional
Lower rank in sensitivity		
Product location at sale	Food; buildings fabric; consumer goods [& manuf]; textiles	Scope & effectiveness

Second rank (14/15) in at least 2 sectors

Instrument	Key sectors	**Lower criteria scores in**
Rank robust in sensitivity		
Regulatory Standards	Buildings fabric; consumer goods & manuf. (Transport sectors score 9)	Legal; International political
Lower rank in sensitivity (lower scope / effectiveness)		
EGS trade Agreement	Building fabric; consumer goods & machin / paper & plastics / (vehicles)	Scope & Effectiveness; EU Admin & Implementation
Recycling requirements & waste targets / prices	Buildings fabric; paper & plastics; consumer goods & machinery	Scope & Effectiveness; EU Admin & Implementation
Voluntary agreements by trade associations	Vehicles; fuels; consumer goods & machinery	Effectiveness (1);
Business emission agreements	Buildings fabric; paper & plastics; consumer goods & machinery;	Scope & Effectiveness; EU Admin & Implementation

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Does ranking aggregates scores risk being *too prescriptive?*

- Eg. Carbon embodied charge scores 7 for buildings materials

	Transport	*Transport* Fuel choice	Consumer goods & machinery	Food	Buildings Building materials	Buildings Heat demand	Buildings Power demand	Paper and plastics	Textiles
Scope	3	3	3	2	3	2	2	2	2
Effectiveness	3	2	2	2	3	2	2	2	2
Distribution & Flex	2	2	3	1	3	2	2	3	2
Legal	2	2	2	2	2	2	2	2	2
International Polit	2	2	2	2	2	2	2	2	2
EU Admin	1	1	1	1	1	1	1	1	1

Aggregate sector views: of the big sectors, food footprint hardest to tackle

		Transport		Food	Buildings			Paper & plastics	Textiles	Consumer goods & machinery
		Vehicles	Fuels		Fabric	Heat	Elec			
Viability weightings = 0.5		6.9	4.8	4.5	7.9	3.6	3.5	5.3	5.4	7.6
Viability weightings = 1		9.2	6.4	5.5	11.1	4.3	4.1	7.5	7.4	10.7

.. Suggest Vehicles, Buildings fabric and Consumer goods / machinery to have most promise for new policy action

Scenario development to be anchored around sector packages – eg. transport

	Volume & composition impacts		Component carbon-intensity impacts	
	Requires modelling of EU consumption volumes and impact on traded volumes of products and materials (no direct impact on energy production methods outside EU)		Involves modelling impacts on energy production methods outside EU (e.g. changing incentives on tar sands, biofuels and electricity generation mix used for industrial electricity)	
EU Actors:	Consumer & Govt	Business (manufacturing and retail)	Consumer & Govt	Business (manufacturing and retail)
Transport – Road Vehicles full scope carbon	Technology list / (labels) Recycling requirements Govt procurement User fees (e.g. on weighted power/weight ratio) Subsidy (e.g. on EVs) Infrastructure	Reg standards (e.g. weighted power/weight ratio) Waste targets Sector trade body standards C-intensive materials charge EGS on 'environmental vehicles'	Information campaign, awards Vehicle embodied carbon labelling Govt procurement	Vehicles sector supply chain procurement agreement (materials sourcing) [Carbon embodied charge]

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Consumption-based Climate Policy Instruments: Interactions with Trade

Carbon-CAP expert workshop, 8 October 2015, Geneva, Switzerland

Sonja Hawkins, International Centre for Trade and Sustainable Development (ICTSD)

ICTSD
International Centre for Trade and Sustainable Development

GLOBAL PLATFORM ON CLIMATE CHANGE, TRADE & SUSTAINABLE ENERGY
www.ictsd.org

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Trade analysis

1. WTO provisions and case law

2. Spillover effects on trade

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Why trade?

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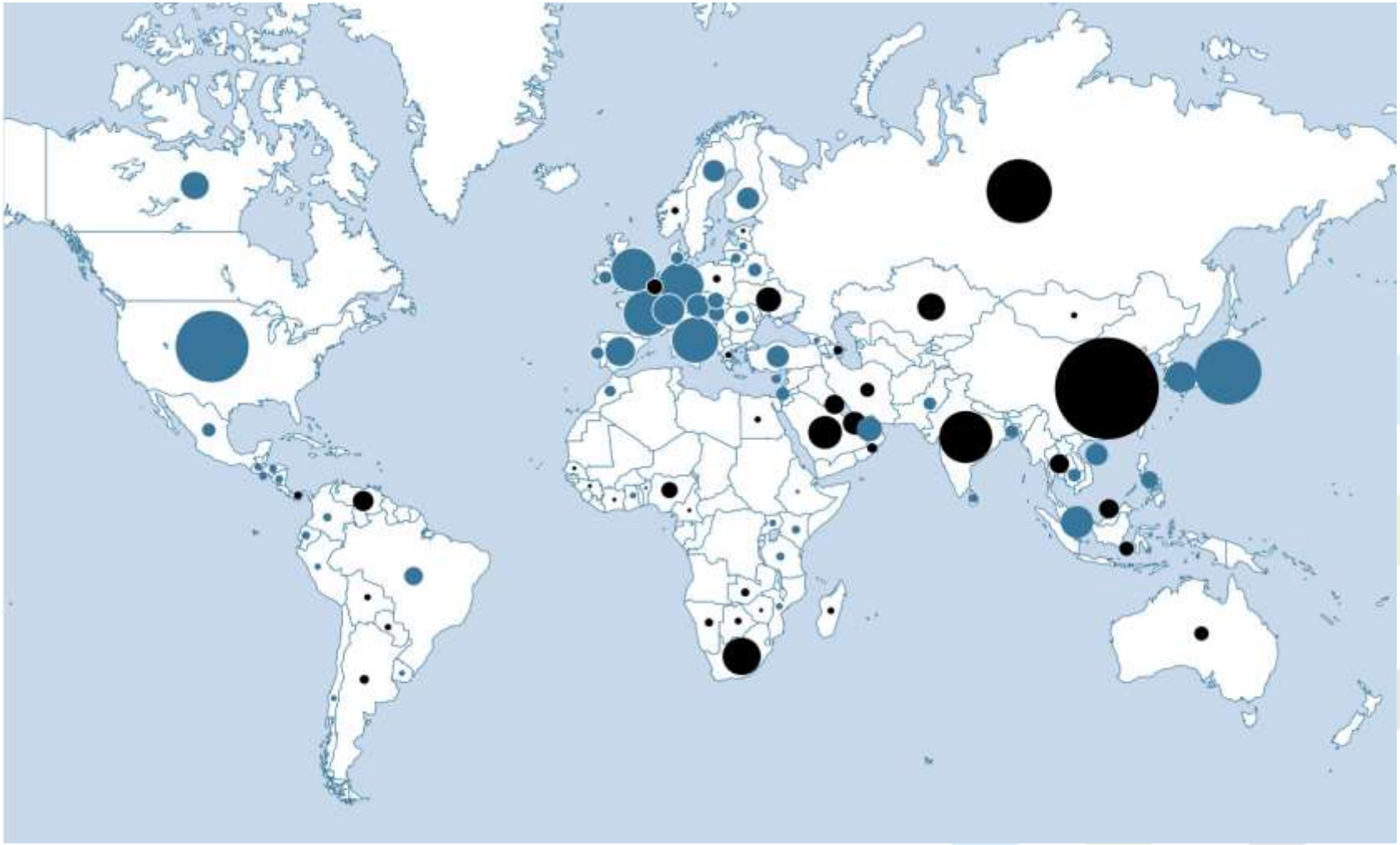
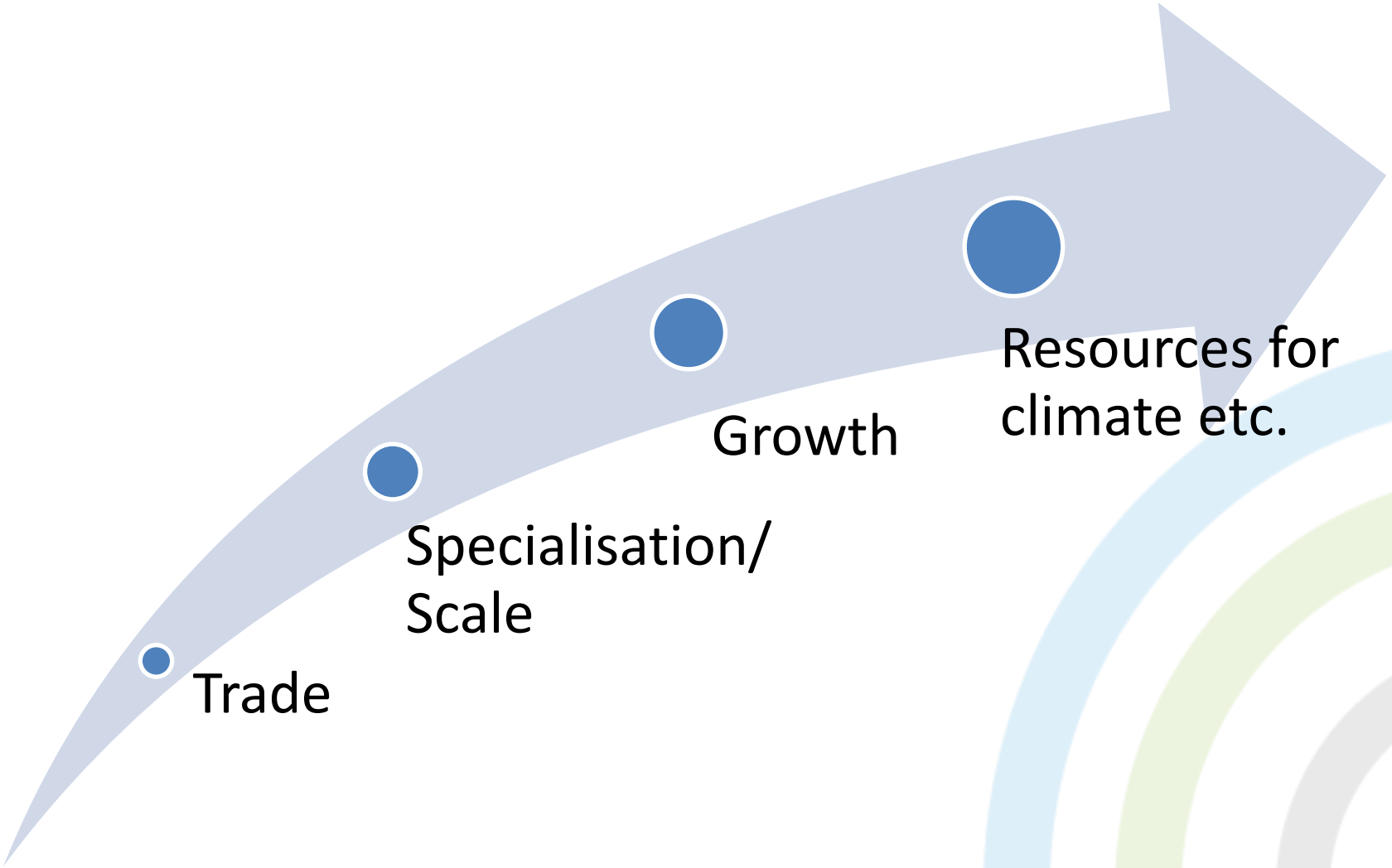
Addressing consumption emissions is crucial…



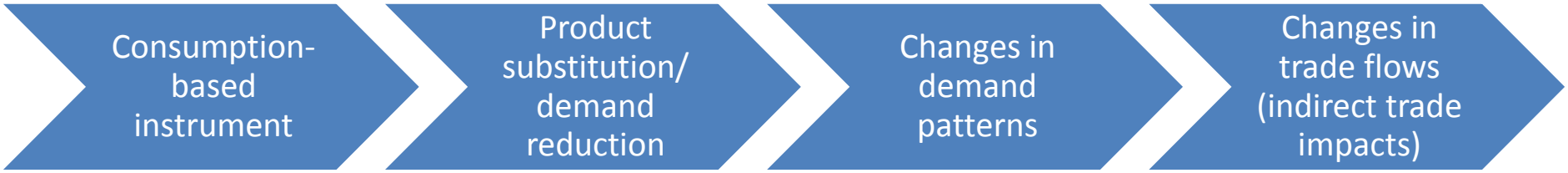
Source: Copyright Global Carbon Atlas, www.globalcarbonatlas.org

…But so is considering the trade impacts

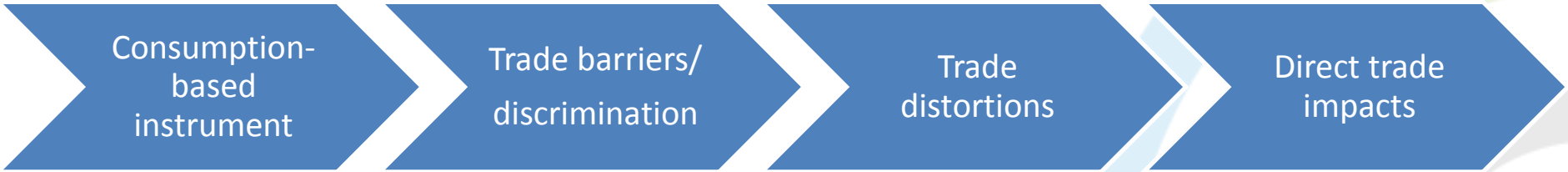


Direct and indirect trade impacts

Indirect trade impacts



Direct trade impacts



Indirect trade impacts

Waste/Recycling instruments

- Reduction in waste-related emissions & material demand input

Infrastructure improvements

- Demand reductions

Product location

- Product substitution

Information campaigns

- Demand reductions/product substitution

Benchmarked carbon-intensive charge

- Demand reductions/product substitution
- Domestic and imported products/benchmarked!

Direct trade impacts (1)

Product bans/Ownership limits

- Prevent/limit market access

Regulatory standards

- Potential market access barriers

Carbon labels

- Potential market access barriers
- Methodological bias/misleading labels → risk of trade distortions

Trade body standards

- Possibly de facto mandatory → market access barriers
- Methodological bias/misleading certifications → risk of trade distortions

Direct trade impacts (2)

Supply chain requirements

- If large outlets: possibly de facto mandatory and restrict market access
- Methodological bias → risk of trade distortions

Carbon embodied charge

- Based on trail of embodied emissions
- Methodological challenges → risk of trade distortions

Subsidies

- Change relative prices of low- and high-carbon products
- Risk of discrimination → risk of trade distortions

Government procurement/Approved technology lists

- Selection criteria may be discriminatory → risk of trade distortions

Carbon-CAP
Consumption-based Accounting and Policy

Consider potential trade impacts…but do not rule out instruments:

- Just a risk indication
- Careful design and implementation can limit adverse trade impacts
- Affect domestic and imported products
- Can create trade opportunities

Carbon-CAP
Consumption-based Accounting and Policy

Thank you for your attention!

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Session 3: Consumption-based policy instruments for a more effective climate policy mix
Comments from an international trade perspective

Ludivine Tamiotti

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WTO: A framework for advancing sustainable development

Objectives	Living standards, full employment, using the world's resources sustainably & protecting the environment
System of rules	Policy space for necessary trade-related measures for legitimate objectives such as the environment, subject to conditions aimed at avoiding hidden protectionism
Institutions & Monitoring Mechanisms	Ensure predictability, monitor implementation & enable action if measures impact on trade
Enforcement Mechanism & WTO Case Law	Confirms a balance between Members' right to take trade related environmental measures & the rights of other Members under WTO rules
Core Mission of Trade Opening	Leads to more efficient allocation of natural resources, stimulates growth and raises income levels, improves access to green technologies

CLASSIFICATION OF POTENTIAL CONSUMPTION-BASED POLICY INSTRUMENTS WITH EXAMPLES (HAWKINS, CRAWFORD-BROWN AND GRUBB)

Class	Mandatory	Voluntary
Informational	- Product labels - Approved technology lists	- Information campaign - Preferential location of low-carbon products at point of sale
Regulatory/ administrative	- Regulatory standards - Product ban - Extension of product lifetime - Licences - Government procurement - Recycling requirements	- Sector trade body standards - Supply chain procurement requirements - Shop product choice
Economic/financial	- Carbon-intensive products charge - Minimum price limits - Deposits/refund mechanisms	- Subsidy for purchase of low-carbon products
Enabling infrastructure / institutional	- Mandatory metering of consumed goods	- Enabling product sharing - Enabling recycling - Infrastructure improvements

Carbon Measures and Relevant WTO Rules

Key policy instrument	Key objective	Key WTO Agreement
Technical requirements, e.g. Product/production specifications, voluntary/mandatory, characteristics/ performance, labelling	Improve resource use & reduce pollutants, e.g. for energy efficiency	TBT Agreement
Price & market mechanisms, e.g. carbon taxes, ETS	Internalize env'tal costs, e.g. for GHG emissions	GATT
Support programs, e.g. R&D, fiscal, price and investment measures	Promote development & deployment of green technologies	SCM Agreement

Key Characteristics of Technical Requirements

Emissions/ energy efficiency standards and regulations can be…

Based on design	Based on performance
Defining products	Defining processes
Mandatory	Voluntary
Public	Private

Environmental effectiveness

Measurement tools

- Increase in energy efficiency of products, e.g. electrical equipment
- Behavioural changes of consumers and manufacturers

Relevant WTO rules

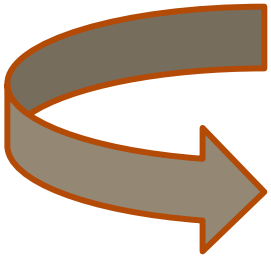
Agreement on Technical Barriers to Trade / GATT

Key principles include

- Non discrimination
- Avoidance of unnecessary trade barrier
- Harmonization

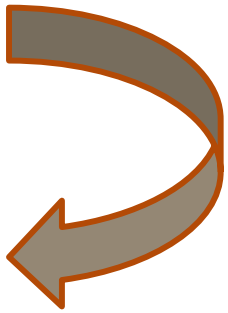
Policy Space for Carbon Measures related to Trade

WTO jurisprudence has confirmed that WTO rules do not trump environment, as long as…



several carefully crafted conditions are respected…

which seek, among other things, to ensure that green measures are not applied arbitrarily and not used as disguised protectionism.



Transparency, Monitoring & Enforcement Mechanisms of the WTO

The WTO is a *repository* for trade-related policy information and a forum for deliberations

Members *inform* each other about new or forthcoming trade-related measures

- Technical requirements
- Sanitary and phytosanitary measures
- Subsidies
- Agriculture measures

Transparency, Monitoring & Enforcement Mechanisms of the WTO

Example...

Technical Barriers to Trade Agreement

1 in 4 notifications related to the environment

1/3 of specific trade concerns related to the environment

International Co-operation on Green Economy Measures

The WTO Committee on Trade and Environment is the right forum to foster international co-operation on trade-related environmental measures

Discussion includes climate related topics: carbon labelling, footprinting, fossil fuels, energy efficiency…

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