



Carbon-CAP

Consumption-based Accounting and Policy

Consumption-oriented climate policies

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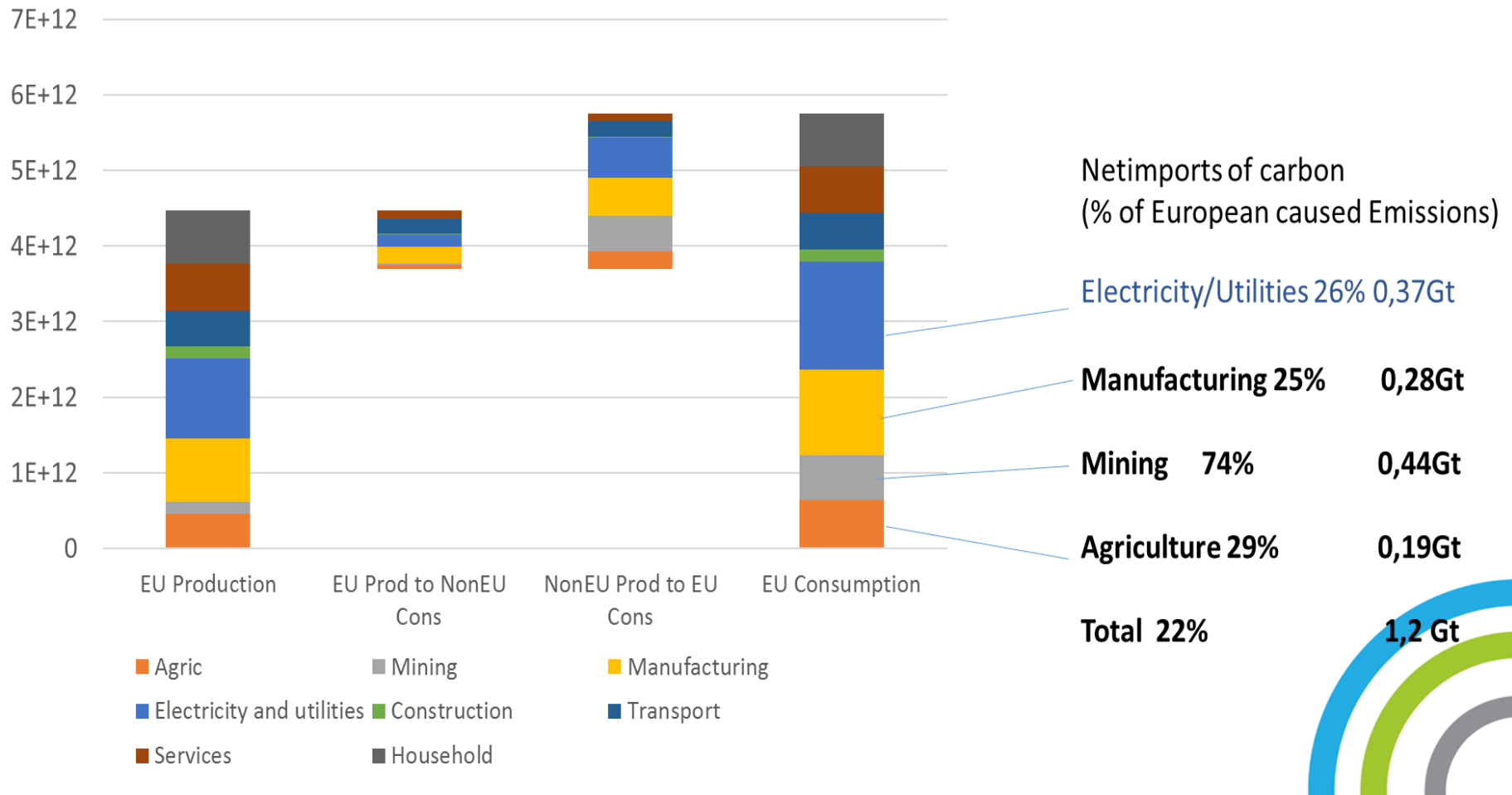
Consumption-based Accounting and Policy

Potential attractions of consumption-based policies

- **Cost effective** emission reductions ('resource efficiency')?
- Address the **wedge** between 'production' vs 'footprint'?
- Add **new tools** to the mitigation toolbox?
- Provide an **alternate approach to tackling industrial** emissions / get at 'rising importance / hard to treat ...'?
- *Harnessing the **political advantages** of aligning reduced consumption with lower expenditure?*
- ***Leverage emission reductions elsewhere** / create international participation incentives?*
- But consumption-based is *ambiguous* ..



EU carbon footprint by sector



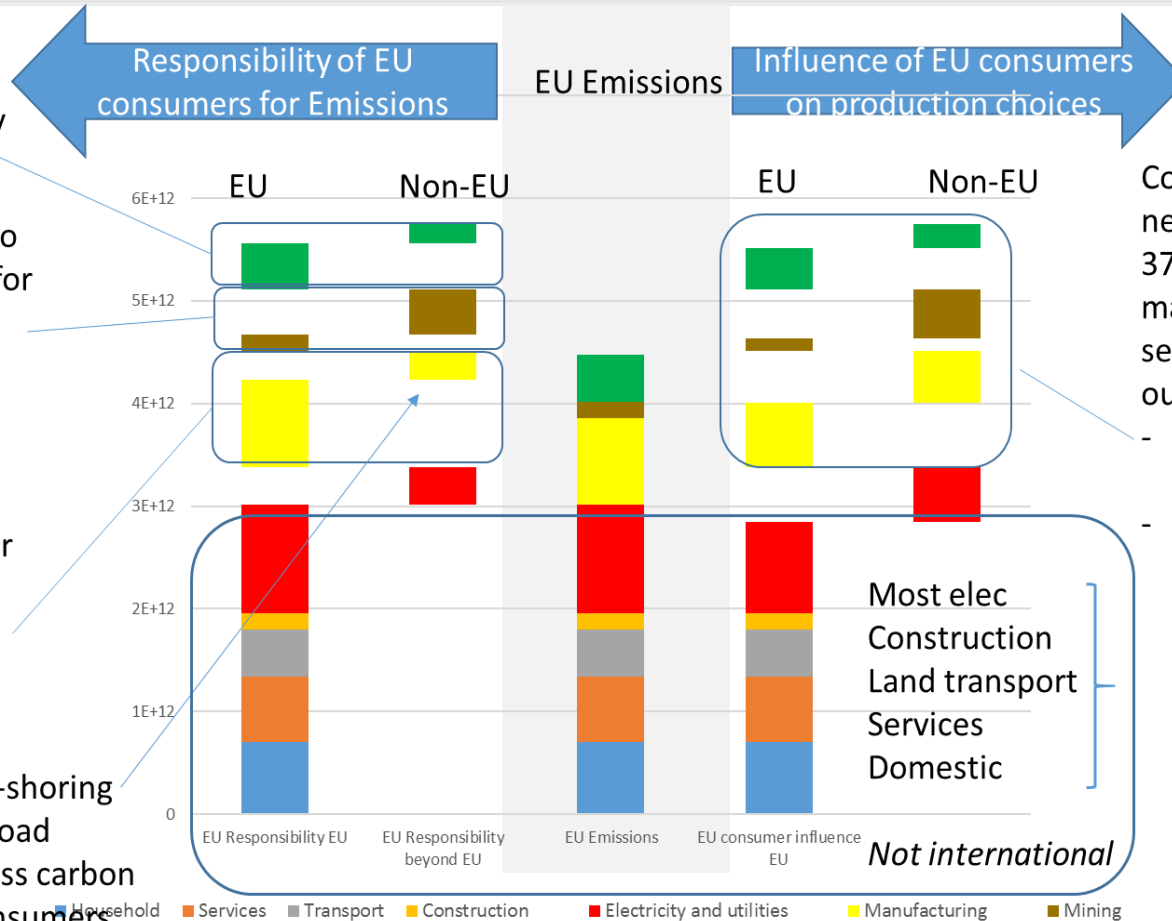
Influence imports, exports & domestic

Global emissions to feed European consumers exceed EU agri emissions by 29%.

Global emissions to extract resources for EU consumers exceed EU mining emissions by 75%

Global emissions to manufacture for EU consumers exceed EU manufacturing emissions by 25%.

Manufacturing off-shoring and/or growth abroad caused 1/3 of excess carbon footprint of EU consumers above EU emissions.



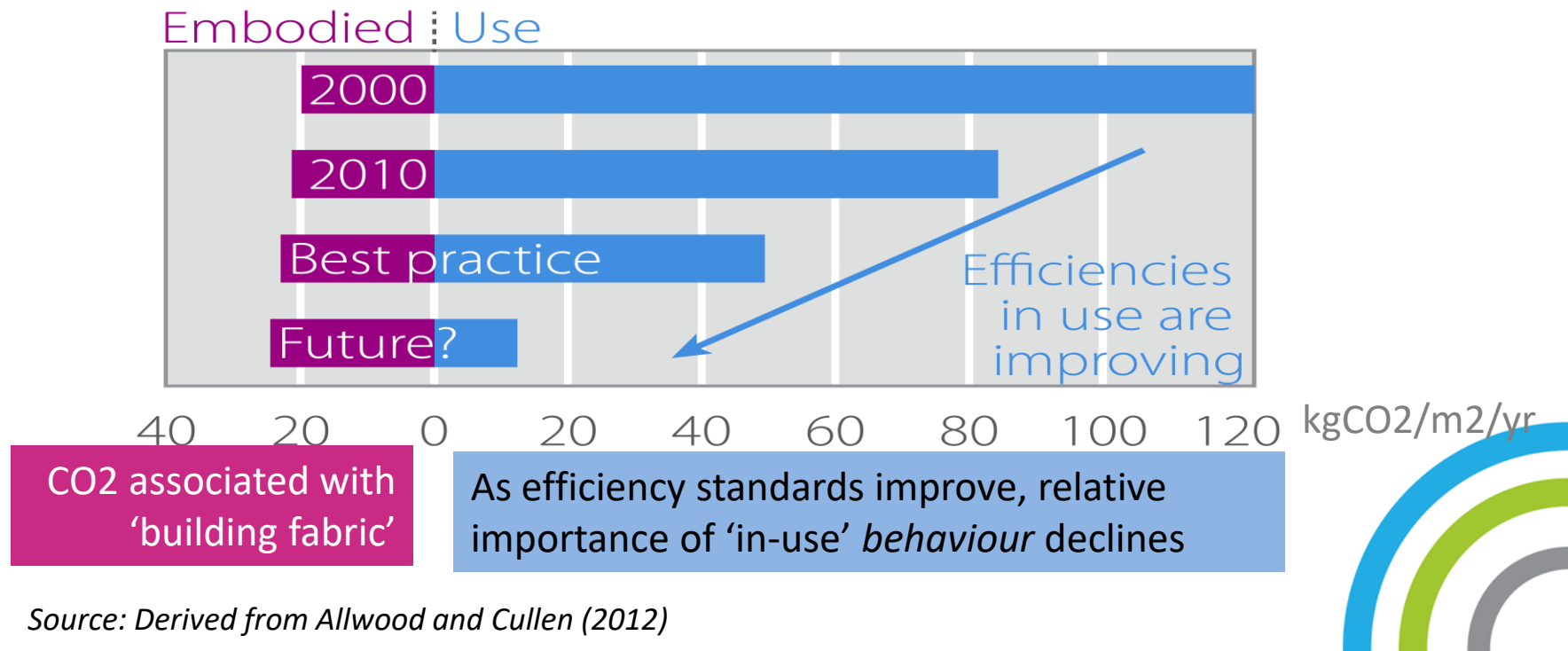
Consumer based policies are necessary, because 37% agri, 79% mining and 45% manufacturing emissions to serve EU consumers occur outside of EU.

- Not covered by EU production based policy
- Difficult to target with production policies alone.

* Power sector emissions still need to be allocated to sectors that use power

Overall importance of embodied carbon rising

Addressing consumption including 'embodied carbon' may require new / additional policies to tackle 'new horizons', eg beyond simple energy efficiency & supply-side (eg. power generation) choices



Source: Derived from Allwood and Cullen (2012)



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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' [6 instruments]	'Subsidy / cost –reducing' [5 instruments]
Enabling infrastructure & institutional	Mandatory metering; Infrastructure Improvements	Enabling recycling Enabling product sharing

Instrument Assessment & shortlisting (Report 5-2) 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) compatibility
- International political
- EU feasibility including 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



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	
Business emission agreements / allowances									
9	9	9	14	9	9	14	5	14	

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	

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
Product standards	Food; buildings fabric; consumer goods [& manuf]; textiles	Scope, legal / political



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

Instrument	Key sectors	Lower criteria scores in
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Rank robust in sensitivity test

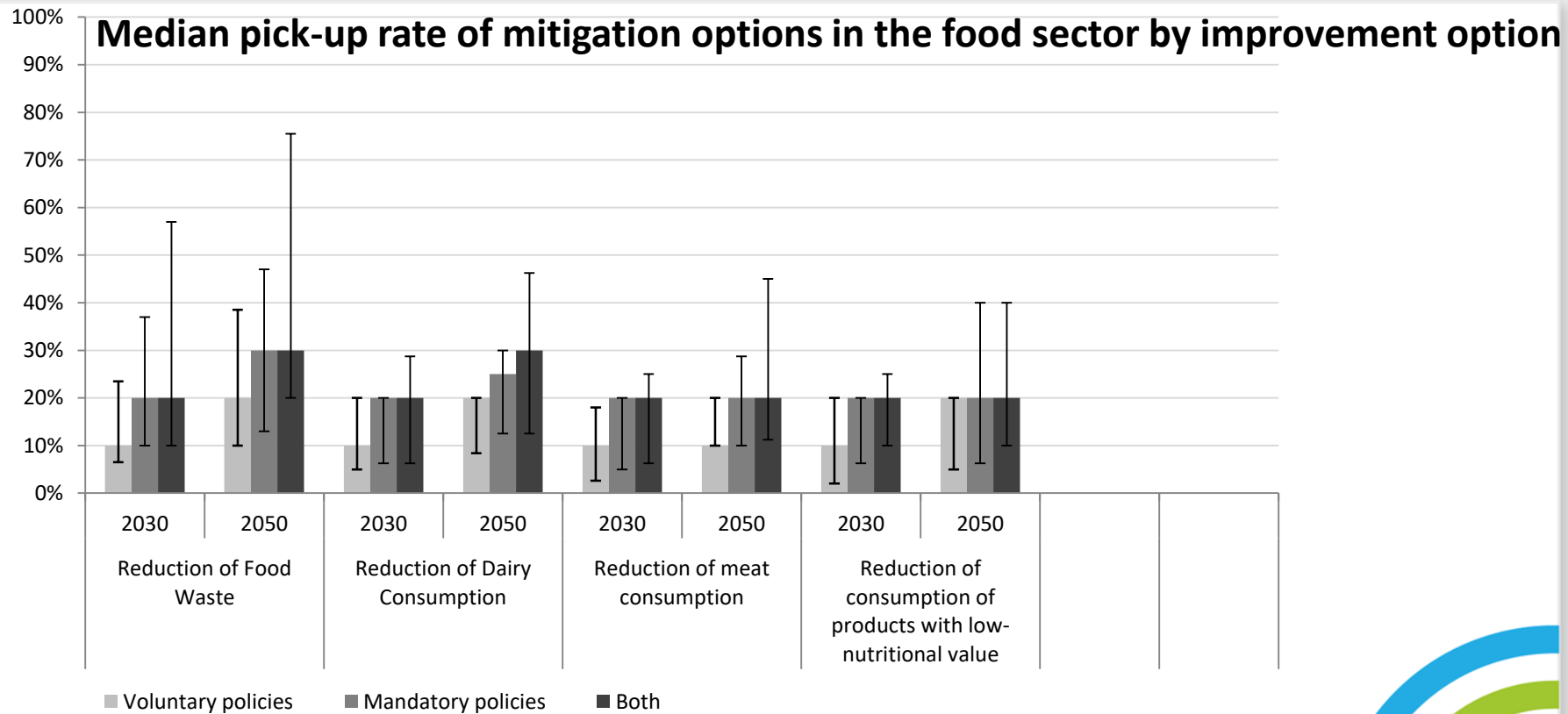
Public (inc cities) procurement	Buildings & transport	Scope; EU Admin
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Lower rank in sensitivity (lower scope / effectiveness)

** Indicates where design choices could enhance effectiveness*

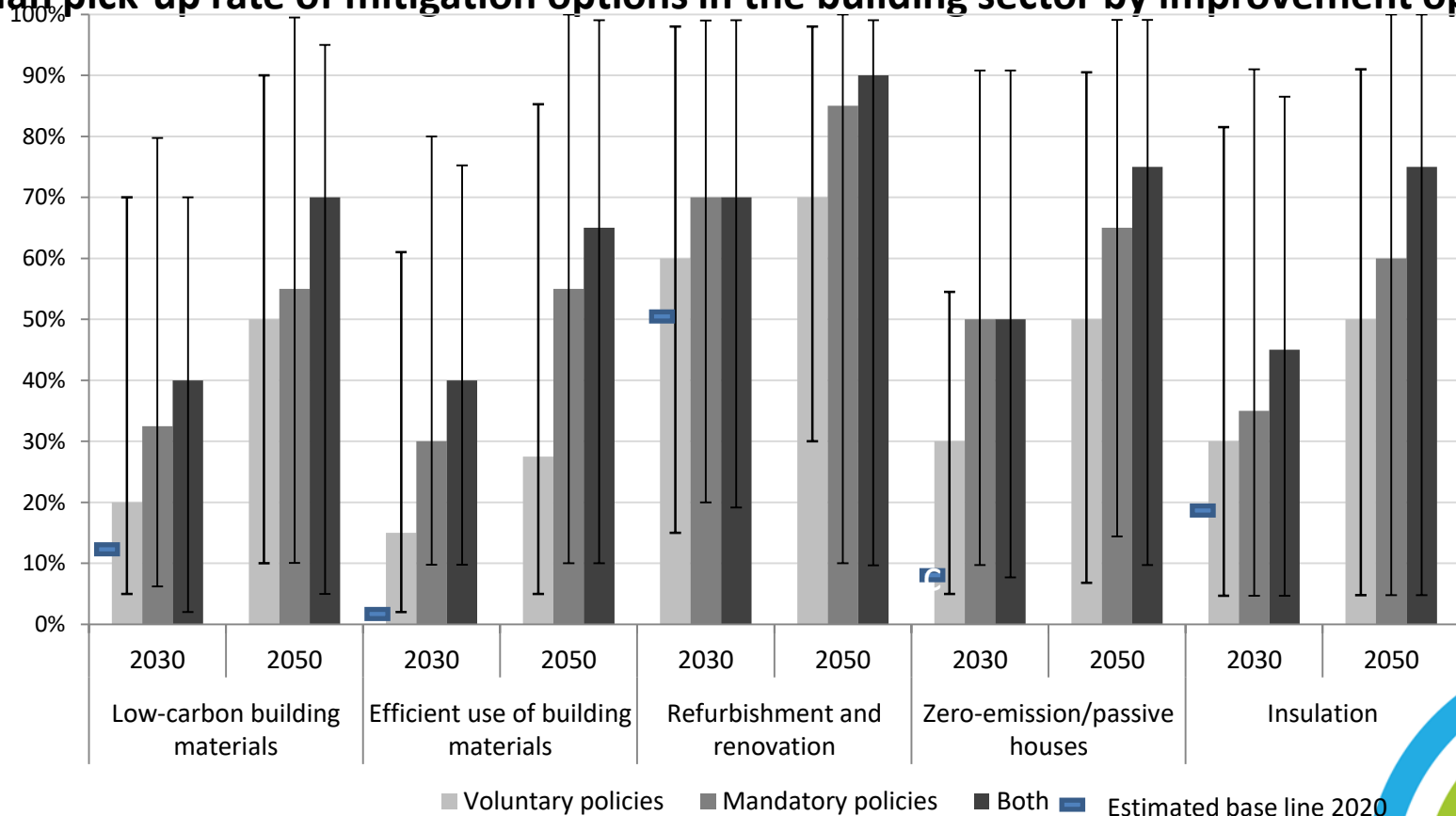
Environmental Goods and Services (Trade) Agreements*	Building fabric; consumer goods & machin / p&p / (vehicles)	Scope & Effectiveness; EU Admin & Implementation
Recycling requirements & waste targets / prices	Buildings fabric; paper & plastics; consumer goods & machinery	Scope & Effectiveness; EU Admin & Implementation
Voluntary agreements by trade associations	Vehicles; fuels; consumer goods & machinery	Effectiveness (1);
Business emission agree- ments or allowances*	Buildings fabric; paper & plastics; consumer goods & machinery	Scope & Effectiveness; EU Admin & Implementation

‘Pick up rates’ with policies: Food sector



‘Pick up rates’ with policies: buildings

Median pick-up rate of mitigation options in the building sector by improvement option



Based on survey among 123 experts and sector organisations, 18 responses.



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Concs. 1: Carbon in embodied trade

- Absolute amount of 'embodied carbon' in EU imports stabilised since financial crises (and overall EU footprint declined), but will still be a rising share as domestic decarbonisation proceeds
- The uncertainties around embodied carbon accounting do not preclude this data being relevant to policy discourse
- Some embodied imports unavoidable as it arises from mining operations which could not be conducted in the EU; significance of this reduced to extent that overall materials consumption is reduced
- Trade rules *not* the *dominant* restriction on tackling materials / embodied C, and could offer opportunities

Concs. 2: **Carbon consumption policy**

- Wide variety of potential policy instruments:
 - No single instrument dominates (but see rankings)
 - Mutually reinforcing packages of instruments required for significant impact
 - Both policy instruments and the policy packages would vary significantly by sector
 - Consumption-based policies do offer some new opportunities to leverage emission reductions
 - Attention to embodied carbon in both domestically produced and imports may also provide a way for richer consumers to help fund emission reductions abroad
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Concs. 3: The wider picture

- Maintaining both production and consumption carbon accounts would aid discussion about interdependencies in emissions abatement policies
 - ... may broaden the policy toolbox, especially as domestic decarbonisation with the usual instruments proceeds
 - and may also flag possibilities in relation to new international financial sources
 - The NDCs in the Paris Agreement are indeed ‘nationally determined’ and pay almost no attention to embodied carbon; there is a case for 2020 revisions to expand the scope to include international carbon flows which would be essential for any “well below 2 deg.C” ambition
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Ccap Scenario development anchored around packages for big sectors – many options

	In-use + Quantity & composition impacts		In-use + Component carbon-intensity impacts	
	Requires modelling of EU consumption volumes and impact on traded volumes of products and materials (no direct impact on 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	Consumer & Govt	Business
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 improvement (e.g. EV charging, HS trains)	Reg standards (e.g. 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]
Transport – fuel choice (all transport modes)	Technology list / (labels) for FlexiFuel vehicles Preferential finance [or VED tax reduction] for Flexifuel vehicles	Reg standards on FlexiFuel vehicles Fuel QA standards	Fuel (electricity and liquids) carbon-intensity labelling at fuelling/charging points Subsidy [or fuel excise duty	Carbon fuel intensity standard [/ Ban on high-carbon (e.g. tar sands) liquid fuels]

But ... a cautionary note

- The sheer complexity of trying to translate
 - diverse policy packages
 - multiple improvement options
 - From micro to macro at regional + global scale over time
-Is daunting. Decided to focus on *EU* implementation of *three biggest* end-use sectors:
 - Buildings
 - Food
 - Transport
- *Materials* a significant intermediate vector substantially captured in first and third of these





Carbon Cap 'proof of concept' modelling for the chosen sectors but infeasible to address whole arena

If adopted by	In-use and Quantity focus Lower energy use / products use less energy-intensive materials	Full carbon intensity Lower energy use / products use materials made in less carbon-intensive ways
EU only (share of materials consumption c 15-20%?)	Domestic impact limited by underlying scale of outsourcing & as power sector decarbonises further) EU consumers reducing rest-of-world CO2 through reduced materials consumption	Domestic impact limited unless EU industry innovates lower-carbon products that sell internationally EU consumers reducing Chinese / rest-of-world CO2 through preferential buying of products / materials made in less carbon-intensive ways <i>=> Limited leverage, companies may 'reshuffle' lower carbon products to EU consumers</i>
EU + eg. China (share of materials consumption c 40-50%?)	Bigger combined domestic impact & 'lightweighting' innovation EU+Chinese consumers reducing rest-of-world CO2 through reduced materials consumption	Bigger combined domestic impact & innovation (including low-C production) effects EU+Chinese consumers reducing rest-of-world CO2 through preferential buying of products / materials made in less carbon-intensive ways <i>=> Much enhanced leverage, far less scope to 'reshuffle' high carbon products elsewhere</i>



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Instrument	Key sectors	Lower criteria scores in
Rank robust in sensitivity		
Labelling	Buildings fabric; consumer goods; maybe transport	Effectiveness; EU Admin & implementation
Lower rank in sensitivity (lower scope / effectiveness)		
Information Campaigns	Building fabric; consumer goods & machin / paper & plastics / (vehicles)	Scope & Effectiveness; EU Admin & Implementation
Ranking and award campaigns	Buildings fabric; paper & plastics; consumer goods & machinery	Scope & Effectiveness; EU Admin & Implementation
Sector trade body standards	Vehicles; fuels; consumer goods & machinery	Effectiveness (1);
Minimum price limits	Buildings fabric; paper & plastics; consumer goods & machinery;	Scope & Effectiveness; EU Admin & Implementation

Instrument combinations to reach different decision/makers in supply chain

Impact on:	Consumption Volume		Emissions intensity	
	Product / service volume	Component volume	EU	Global
Manufacturing industry	Reduced product volume or shift towards less energy-intensive materials		Shift towards materials made with lower carbon production techniques	
Retail and supply chain management	Concern with procuring and marketing less energy-intensive products		Concern with procuring and marketing products made in less carbon-intensive ways, eg. Sourced with renewable energy	
Final private consumers	Information / concern with the direct carbon / energy and materials intensity of consumption habits		Information / concern with the actual carbon consequences of consumption choices including sourcing of materials in purchased fuels or products	
Public sector consumption	Influence employee business-related energy consumption, exert procurement pressures over energy or materials intensity of products or service providers		Exert procurement pressures over carbon intensity of purchased energy and goods	