



Challenges facing Energy Efficiency Policy Instruments

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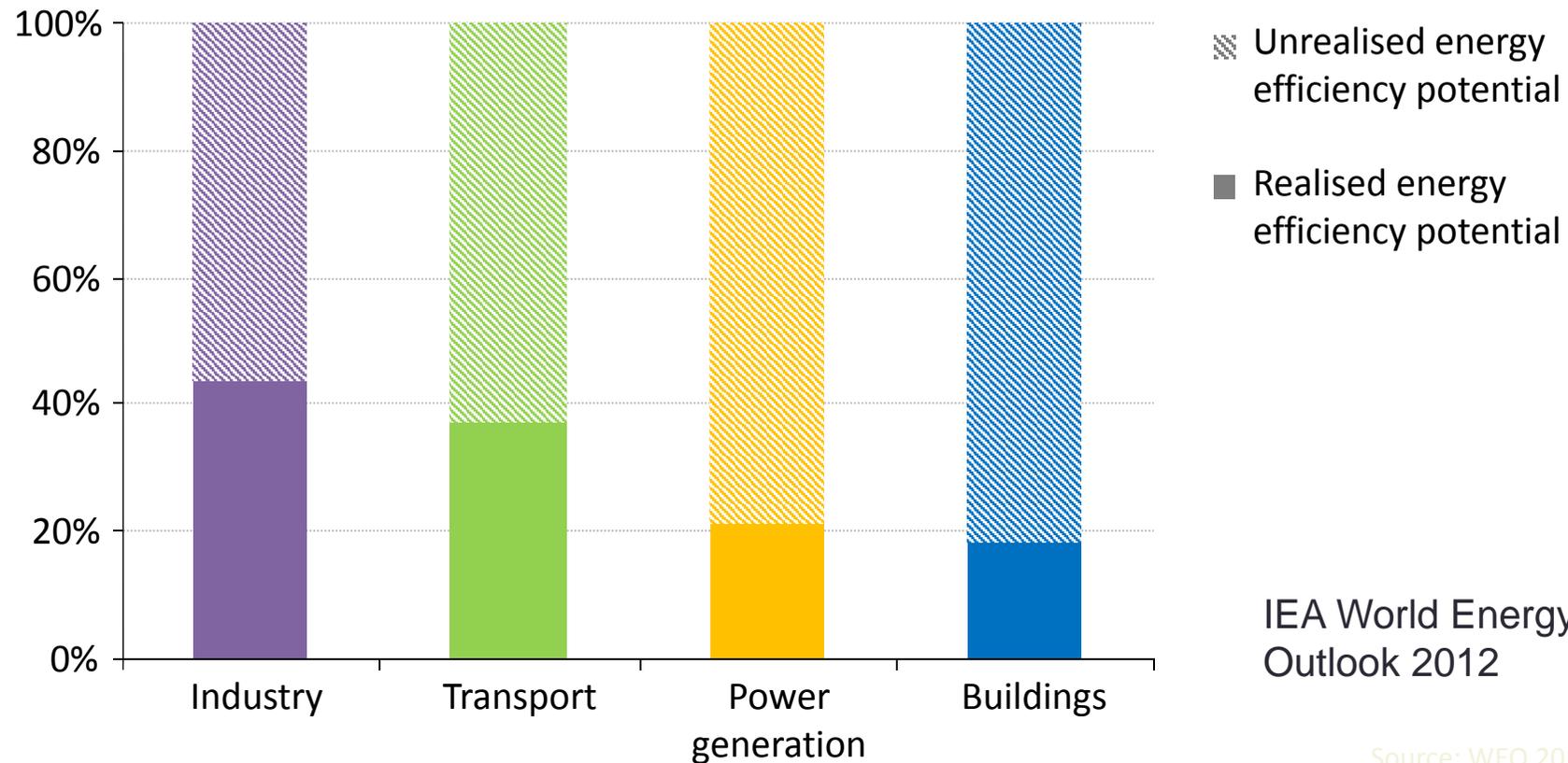
Outline



- Sectoral barriers and gaps
- Experience with EE policy instruments in:
 - Buildings
 - Industry
 - Transport
- Rebound effect
- Summary

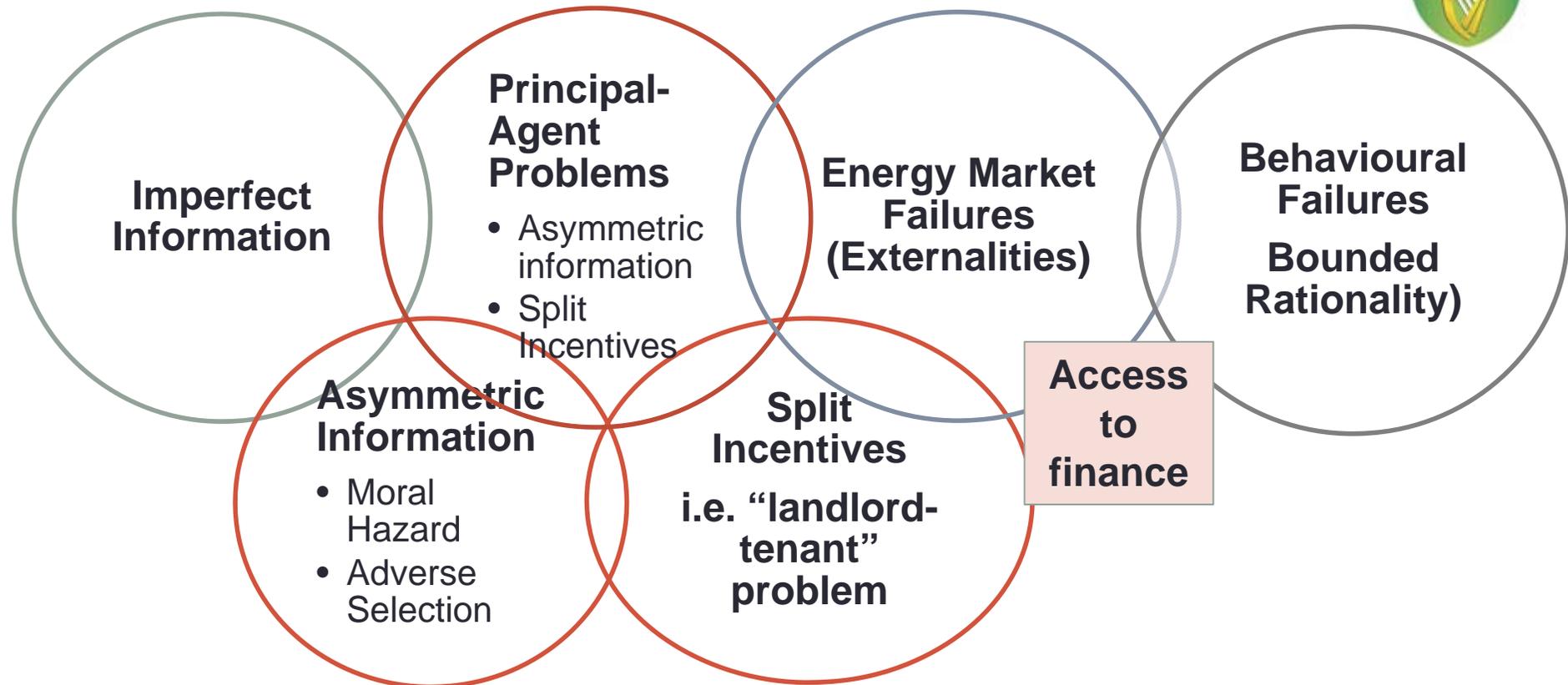


Huge unrealised potential in EE



2/3 of the economic potential to improve energy efficiency remains untapped in the period to 2035

Market failures in EE



- Price important for removing certain barriers, e.g. negative externalities
- However, informational failures and principal-agent problems can prevent price signal from reaching consumers

What are the policy options?



- Ultimate goal: sustainable market for EE investment involving private actors
- Main policy categories:
 - **Regulations/standards** – mandates, energy performance standards
 - **Information measures** – energy performance labelling, education, awareness, training
 - **Economic Instruments** – prices and taxes, grants, loans, tax relief (subsidies), trading + *carbon pricing*
 - **Financial and contractual arrangements** – PACE ESCO markets, public procurement contracts



Energy efficiency policy justified in the presence of carbon pricing?



- Can carbon pricing address barriers to energy efficiency, making other policy measures redundant?
- What is the impact – the interactions with CO₂ pricing, the costs, and effectiveness - of energy efficiency policies?
- Examination of evidence from two buildings subsectors - residential appliance electricity use and buildings heating and cooling energy use
- Conclusions:
 - Several market failures (split incentives, information, finance) acting as barriers to energy efficiency not addressed by carbon pricing
 - Policies addressing EE likely to interact with carbon pricing



Policy instruments for EE

Policy category	Buildings	Industry	Transport
Regulations and standards	Energy performance codes	Electric motor performance standards	Fuel economy standards
Information	Energy certification	Energy audits	CO2 labelling
Economics instruments - finance	Subsidies: tax incentives, grants, cheap loans for EE retrofit	CO2 Emissions trading schemes, tax incentives	Subsidies for efficient vehicles; CO2-based vehicle taxes
Other		Voluntary Agreements Energy Management schemes Utility obligation schemes	

Buildings



Issues:

- Most energy in residential buildings in EU used for space heating
- Principle-Agent problems: 48% of space heating in residential buildings in US
- 1% replacement rate in EU => 80% current buildings still here in 2050

-> **Key Challenge:** Renovate building envelope of existing buildings

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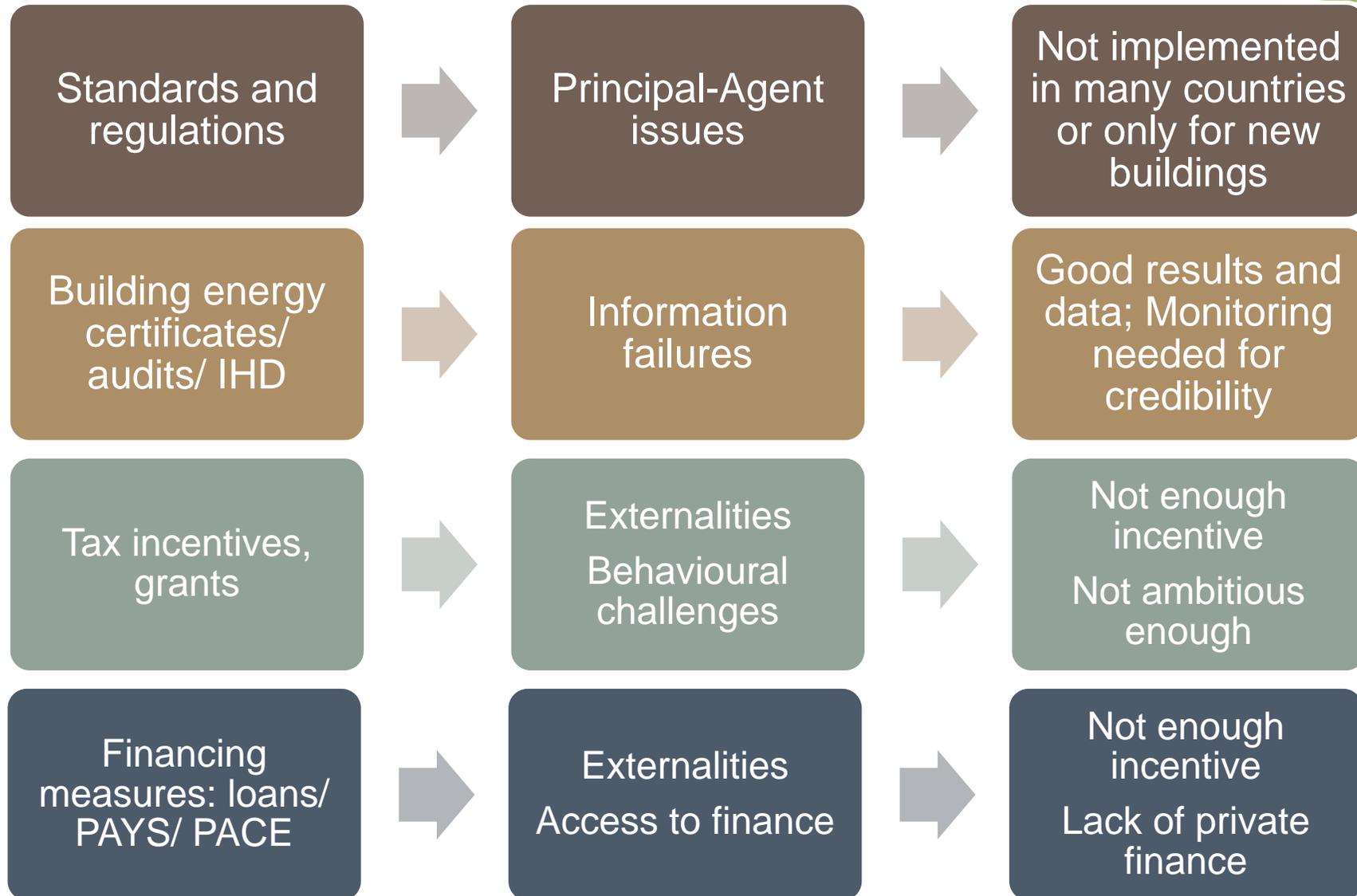
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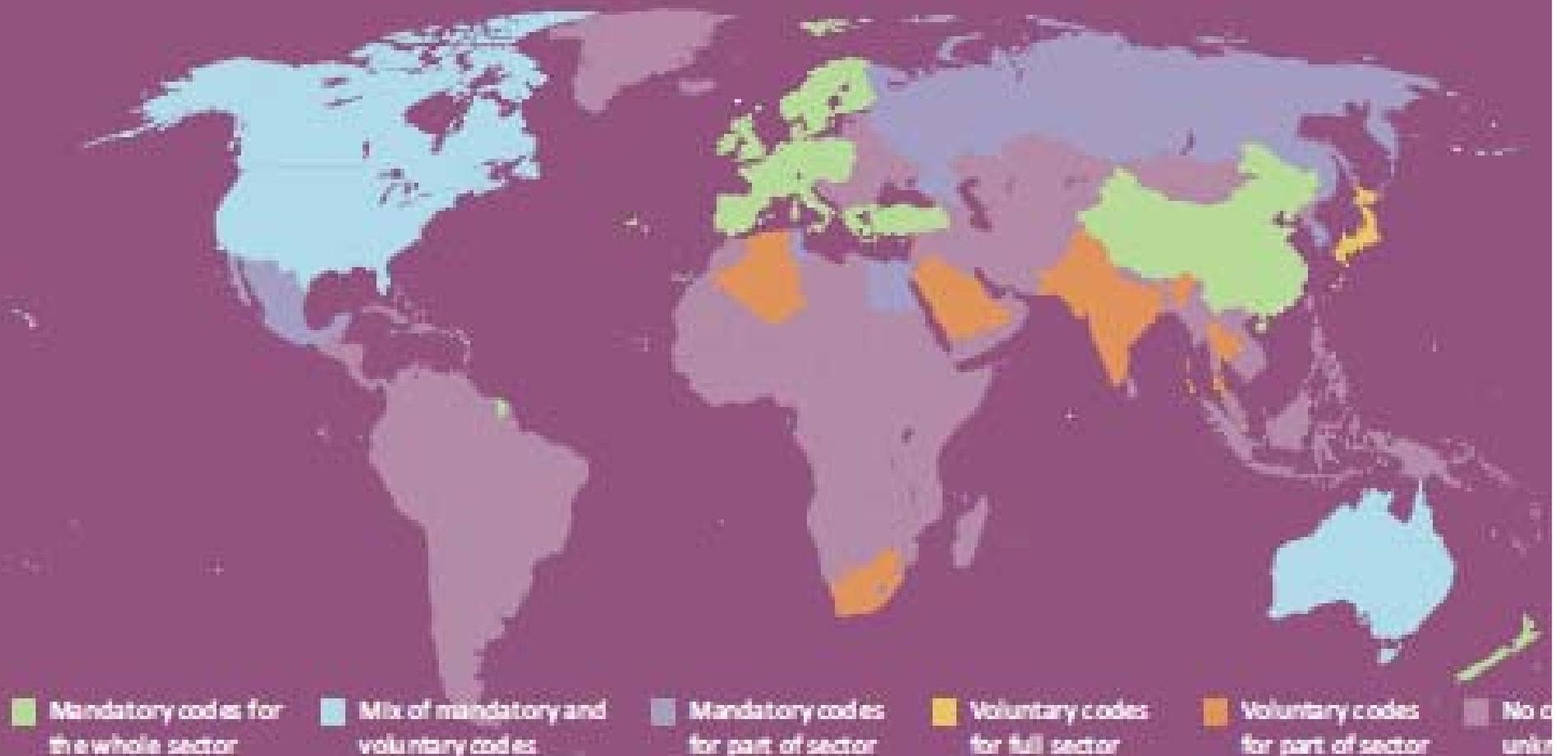
How are we doing...Buildings



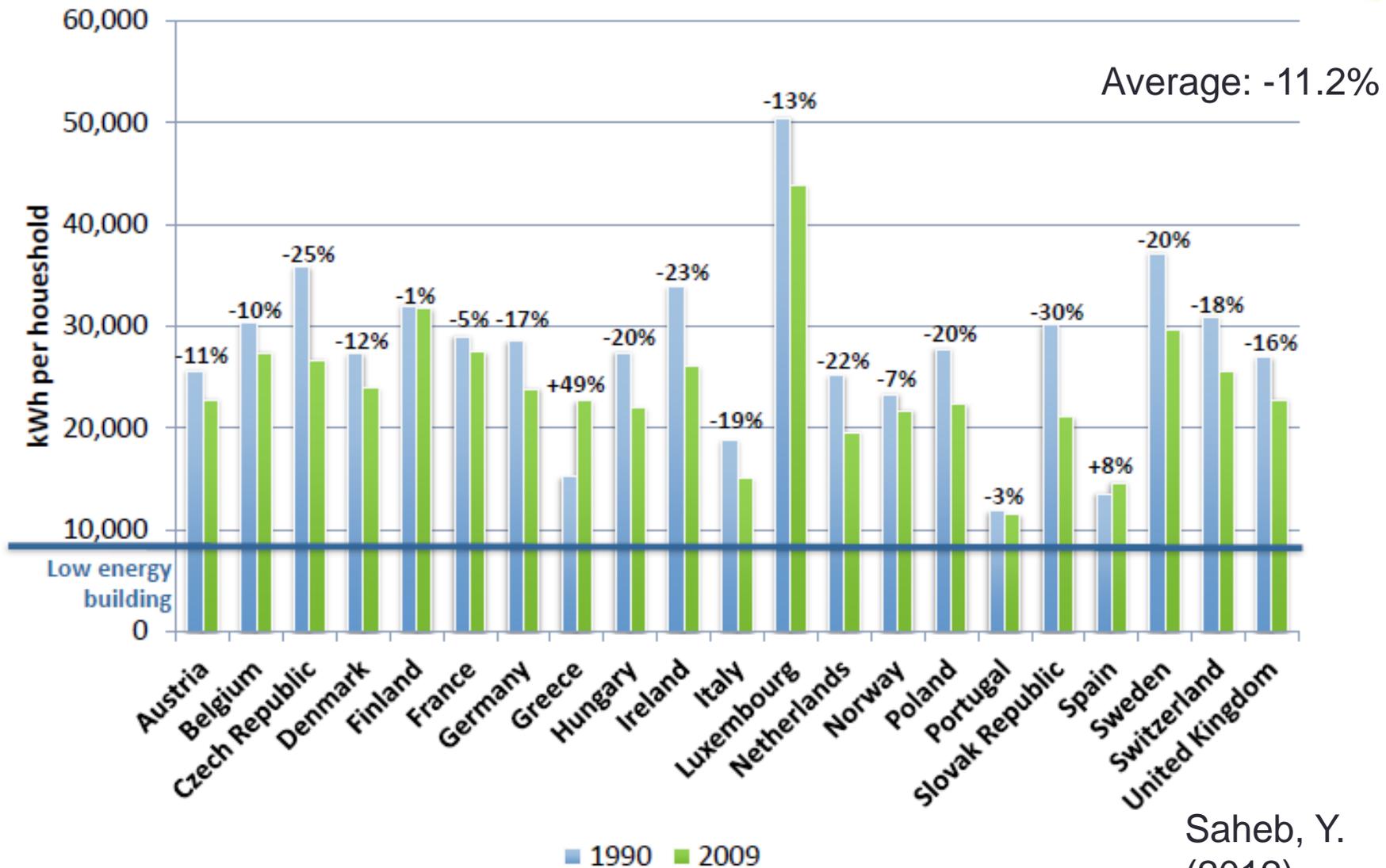
Building Codes



3.28 Global building code implementation and stringency



Change in household energy consumption – European countries



Saheb, Y.
(2012)

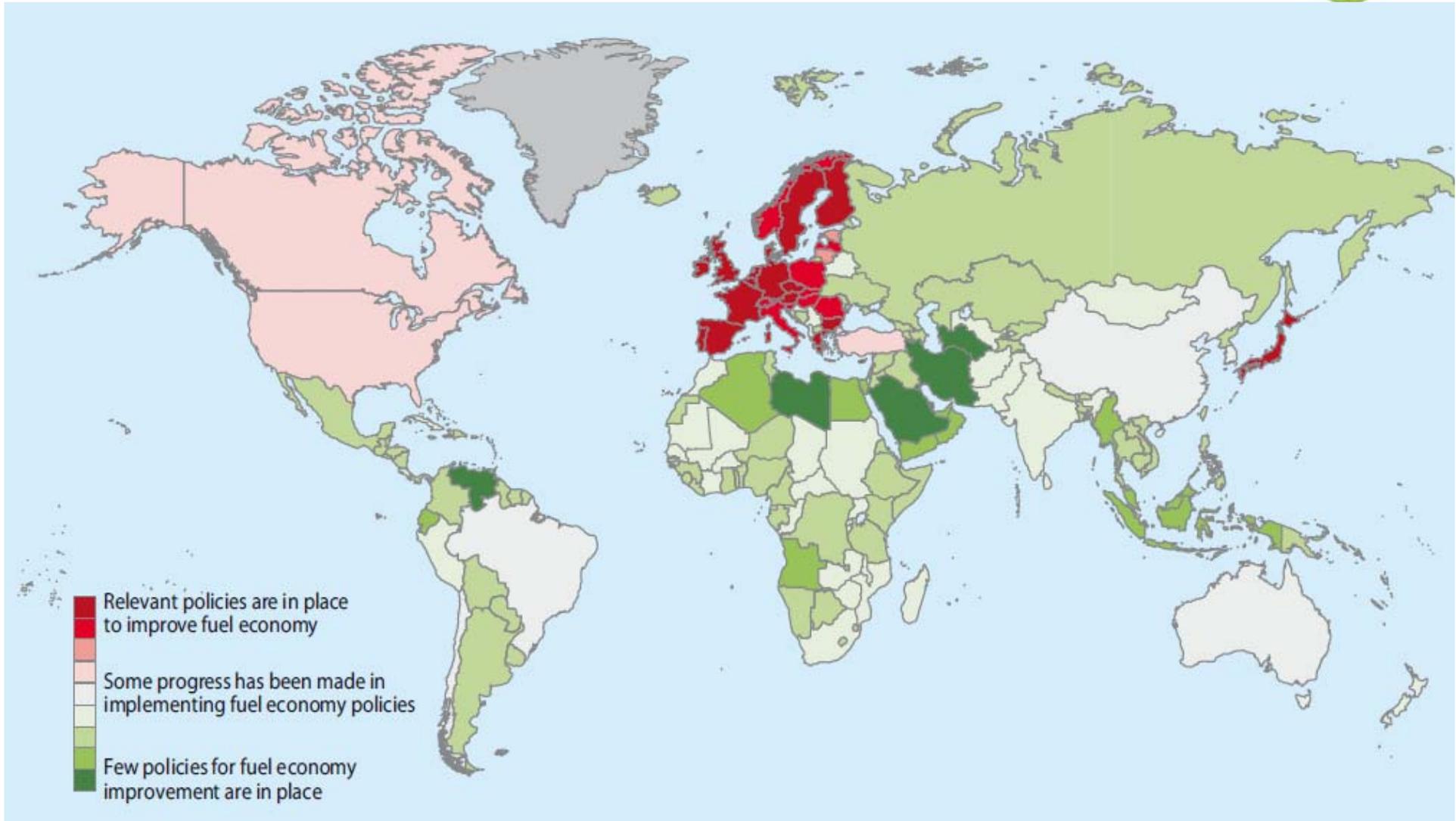
Transport



- 24% global energy consumption
- **Main challenge:** Use of road combustion engine vehicles (passenger cars and heavy-duty vehicles)
- Passenger car numbers rising but becoming more efficient
- Fuel economy Labelling + Standards + Incentives
- Most popular policy = Fuel economy standards
- Challenges:
 - Policies mainly target new passenger cars
 - Use of vehicles crucial
 - Core issue land-use planning not addressed
 - Alternatives to oil difficult in short-term
 - Rebound effect

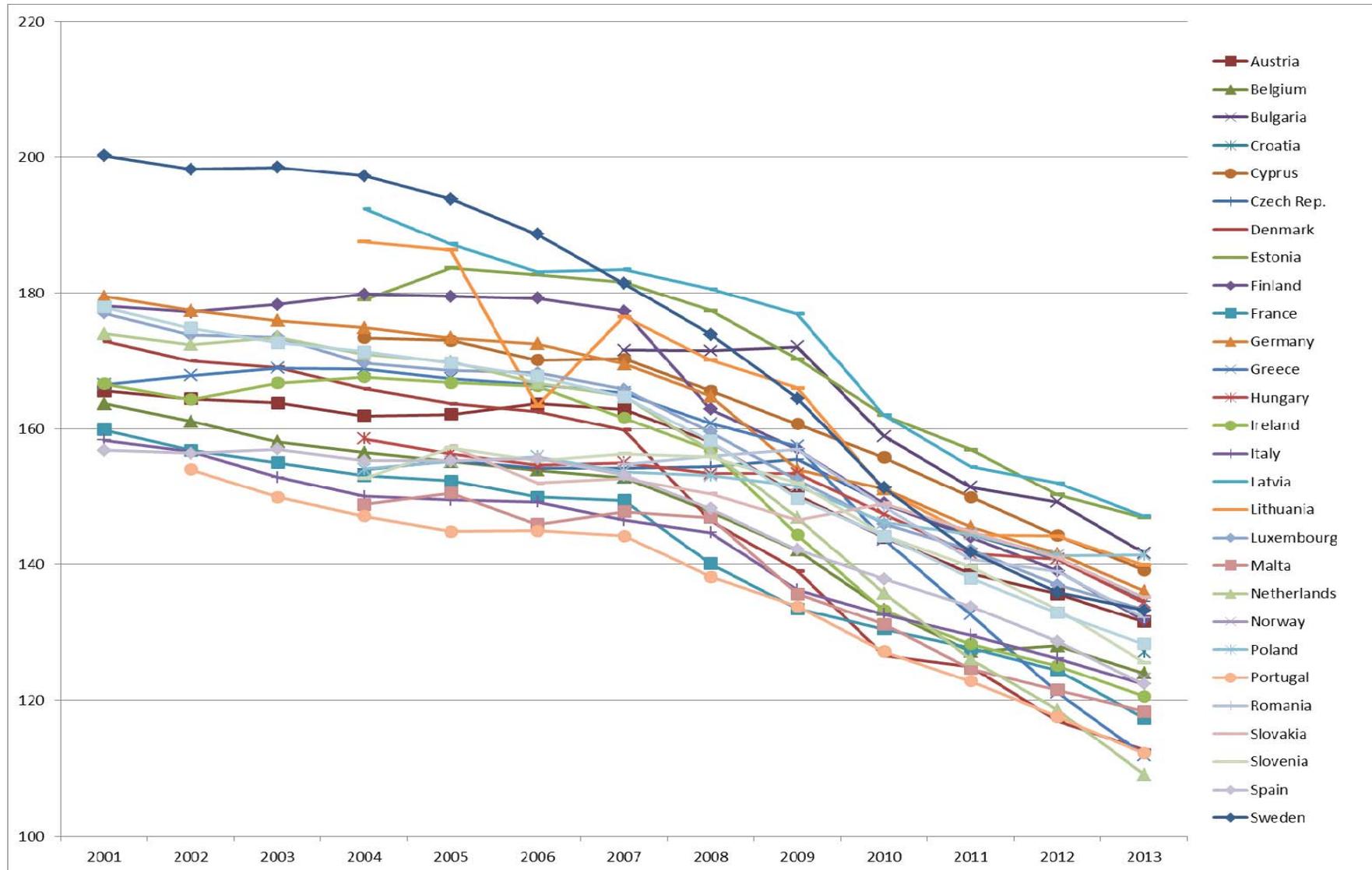


Fuel economy readiness index 2010



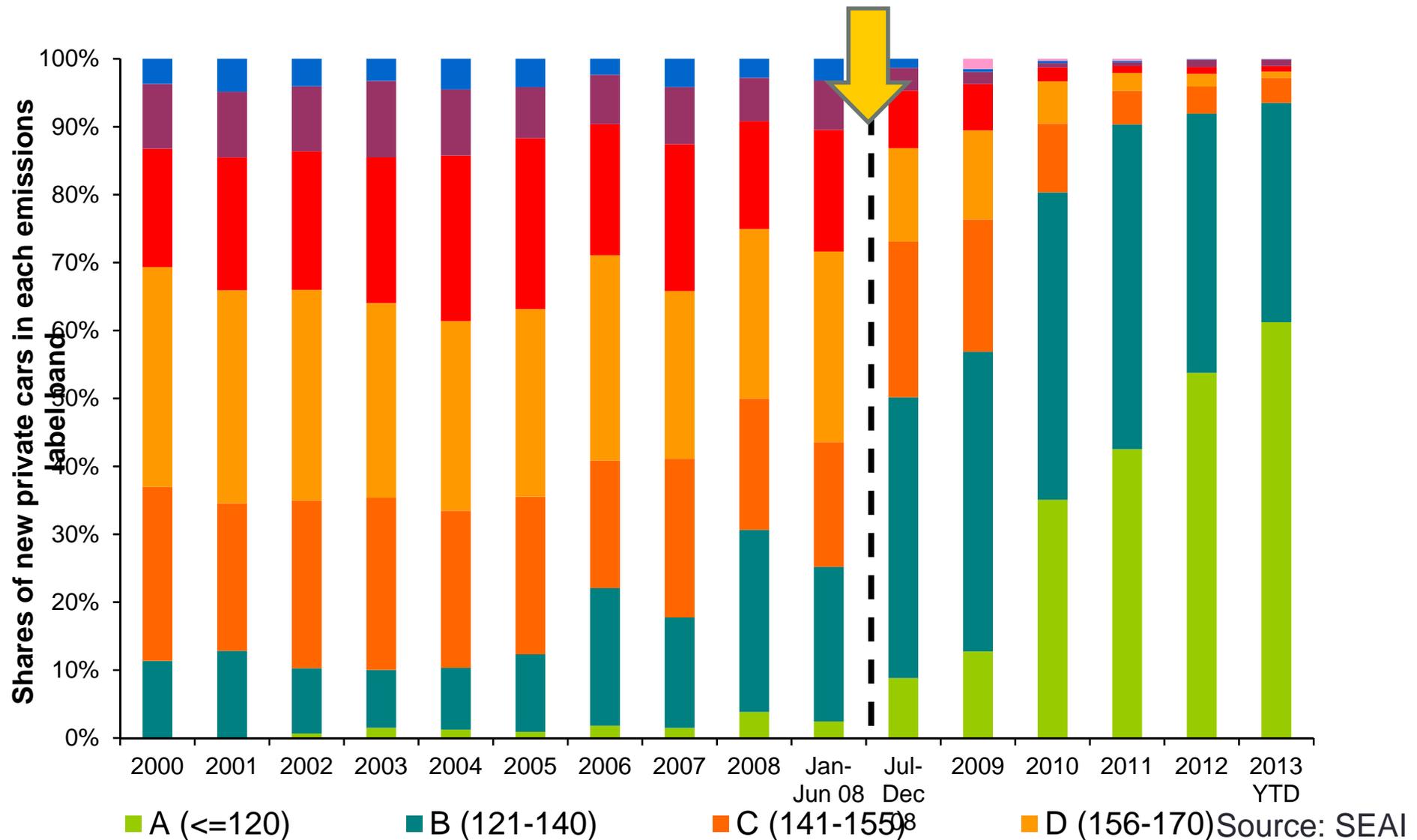


EU cars CO2 emissions VA -> Regulation

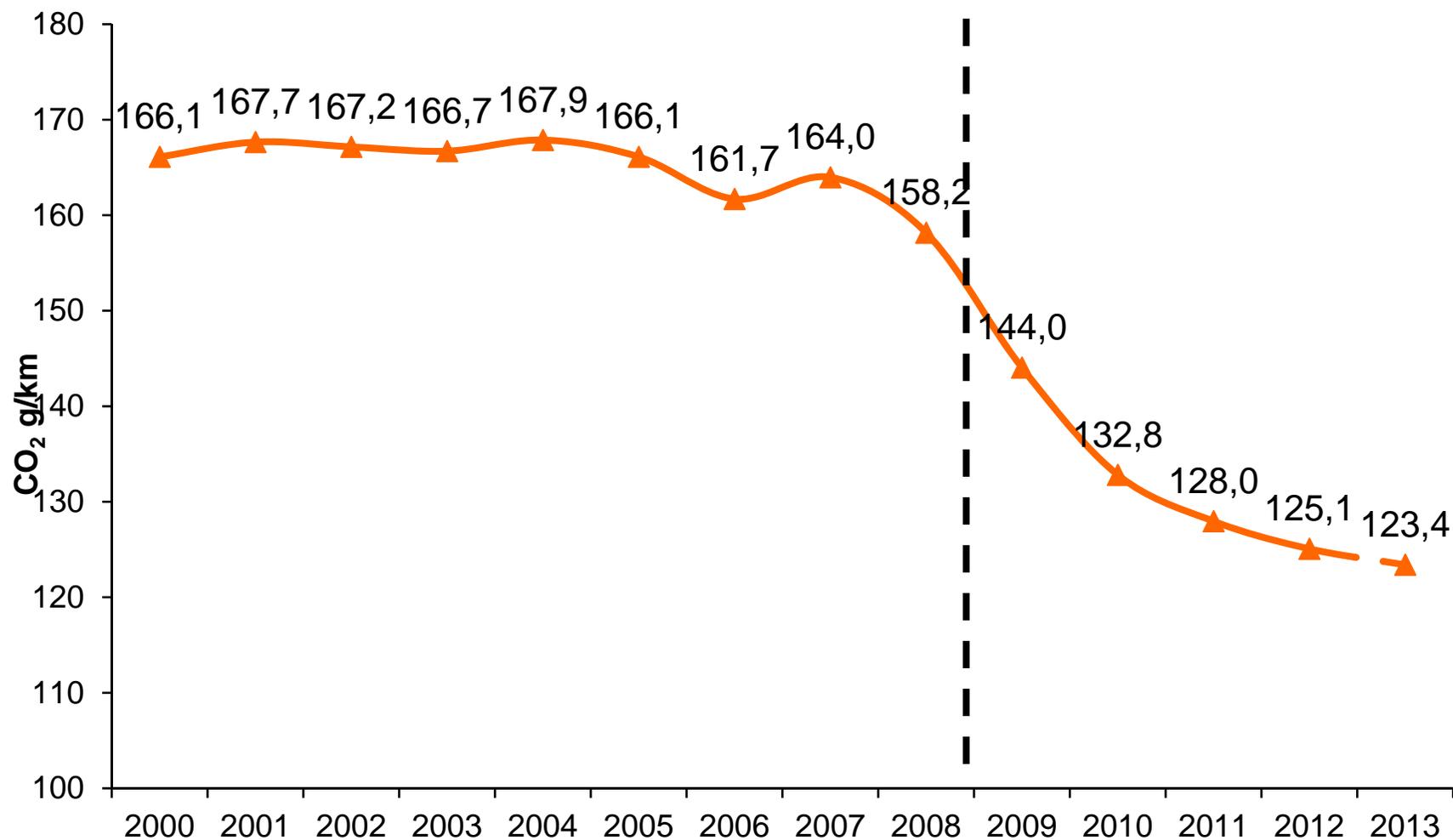


Policy example: Ireland CO₂ vehicle tax

New passenger car sales by emissions band



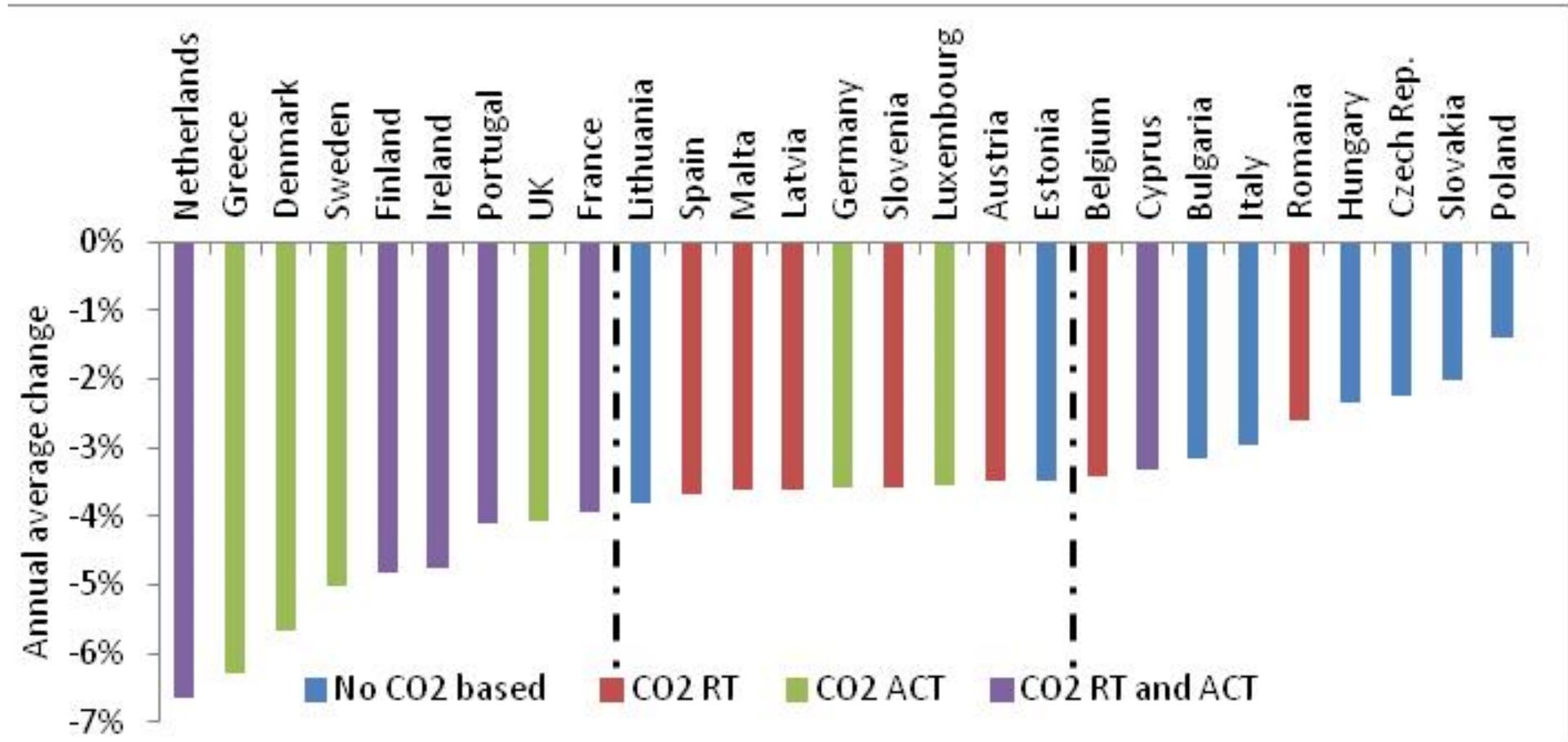
CO₂ emissions of new passenger cars Ireland



Source: SEAI



Car taxes and EU MS CO₂ Emissions



Industry

- One third final energy consumption globally
- Higher share in developing countries and continuing to grow
- Many cost-effective EE measures possible
- Large co-benefits – 2.5 value of energy savings
- Main barriers:
 - Split incentives,
 - Inertia,
 - Uncertainty,
 - Access to finance

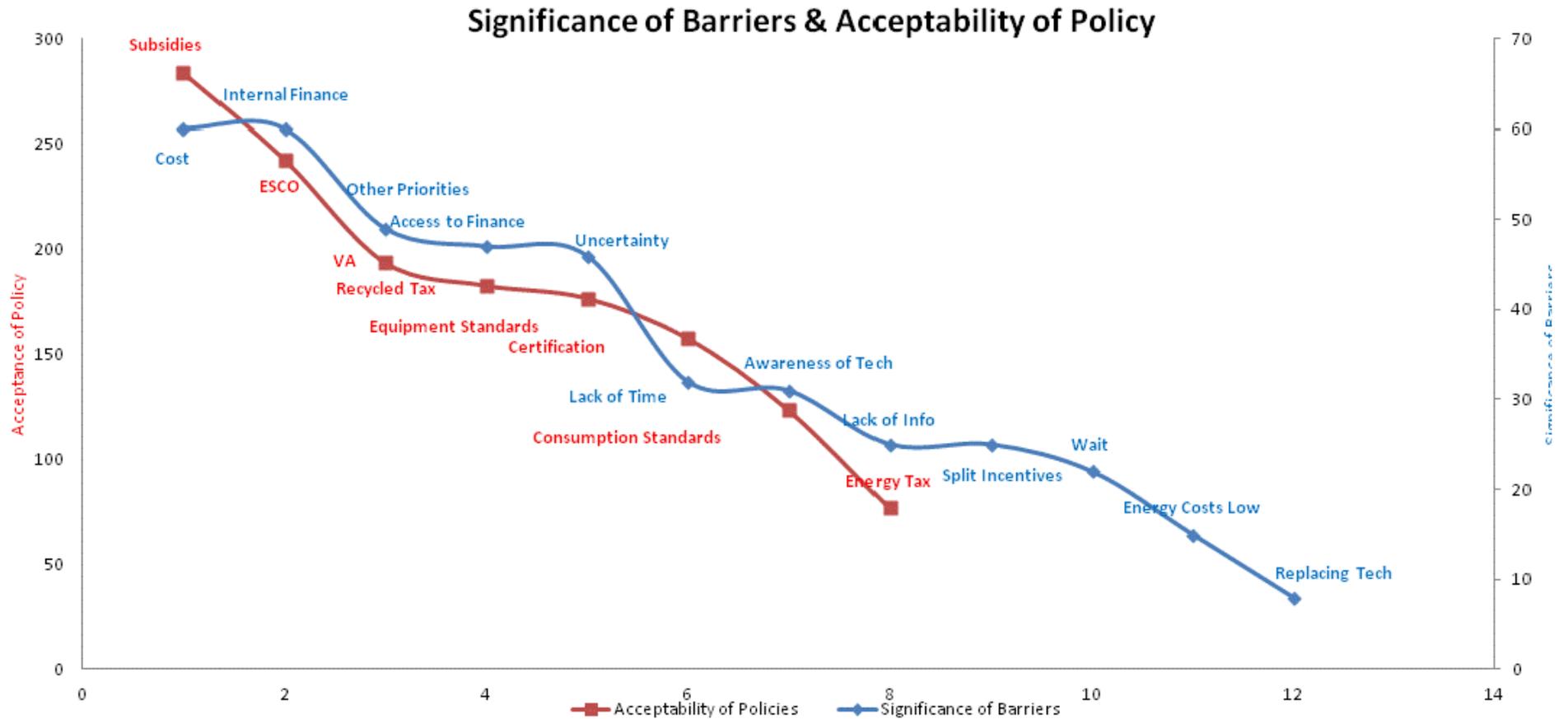


Policies for Industrial Energy Efficiency



- Challenge: heterogeneous nature of industry makes policymaking difficult
- Main policies:
 - Energy audits: many countries
 - Voluntary agreements: Ireland, Sweden and Denmark
 - Energy Management Programmes: Australia, Japan, Korea
 - Mandates/targets: China, Korea
 - Emission/Energy Trading schemes: EU, India
 - Tax incentives: UK, Netherlands, Belgium, Canada
- Key concerns:
 - Competitiveness effects (if prices increase)
 - But savings should offset additional investments
 - Need to ensure balance between consumer and industry cost burden

EE Policy acceptability in Retail Sector



Dixon O Mara and Ryan (2015)

The rebound effect – a hot topic

- What is it? When consumer behaviour or producer adjustments offsets the intended savings of energy efficiency policies (the takeback effect)
- Real effect but also red herring

-> Are rebound effects positive or negative for energy efficiency policy and the economy generally?



Efficiency dilemma? ...impossible.

Source: Burns & Potts,
RMI

How big is it?

Estimates of microeconomic rebound effect

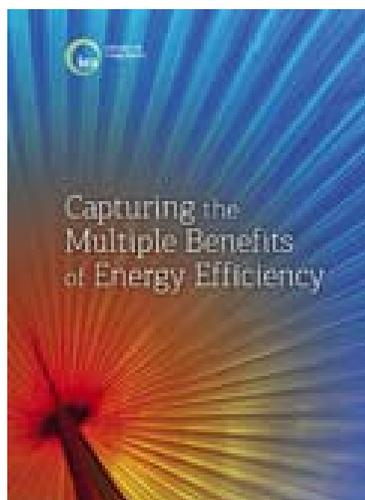


Energy Service	Range of Estimates	Best Guess	Degree of Confidence (Notes)
Automotive transport	5-87%	10-30%	HIGH (Unmeasured in these studies are changes in automotive attributes, particularly heavier vehicles and more powerful engines.)
Space heating	1.4-60%	10-30%	MEDIUM (Unmeasured in these studies are increases in the space heated and an increase in thermal comfort.)
Space cooling	0-50%	1-26%	LOW (Unmeasured in these studies are increases in the space cooled and an increase in thermal comfort.)
Water heating	<10-40%	??	VERY LOW (Unmeasured in these studies are reports of increased shower length or purchase of larger water heating unit.)
Other consumer energy services	0-49%	<20%	LOW

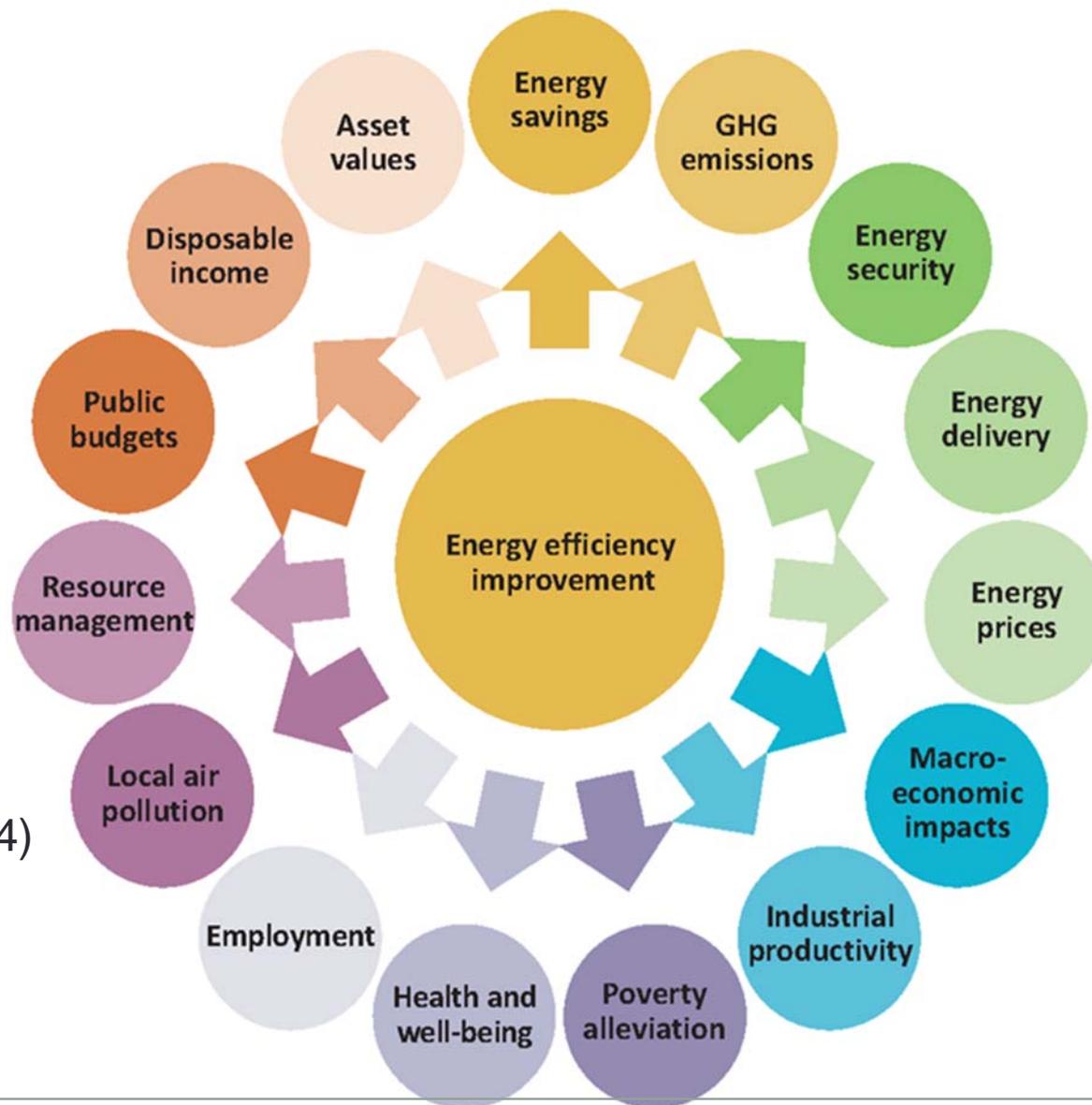
Source: UK ERC (2007)

Gillingham et al. (2014) review: 20-40% in developed and developing countries

Energy Efficiency generates multiple benefits



IEA (2014)

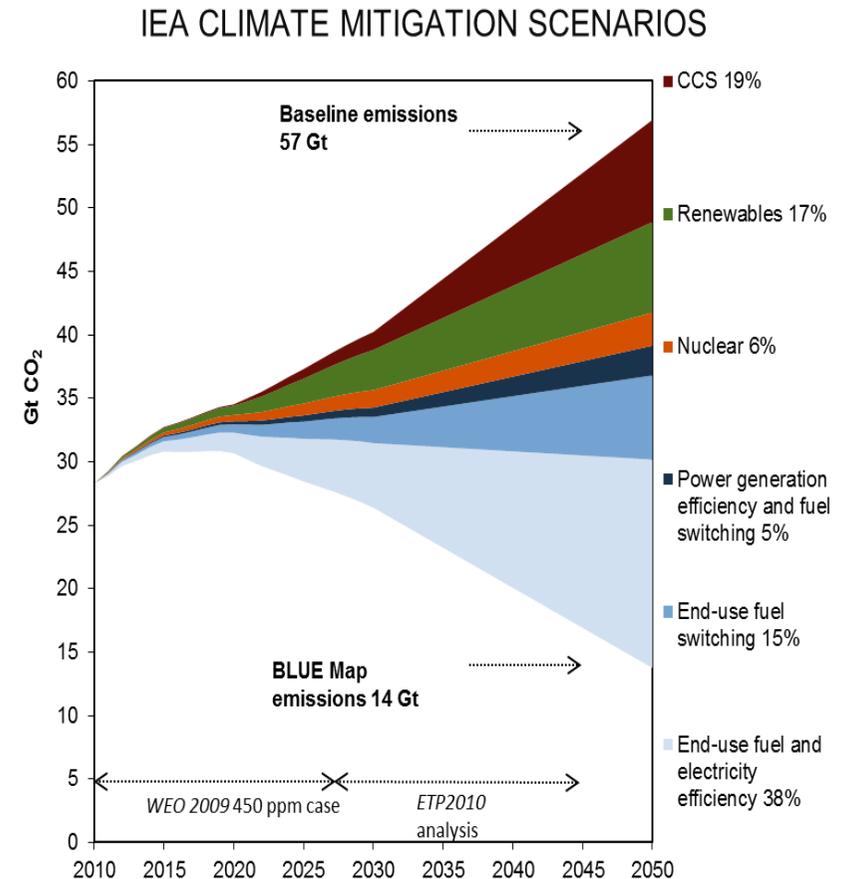


“Rather than consider the rebound effect as a deterrent from passing energy efficiency policies, policymakers should include those welfare gains in the tally of benefits of a policy.” (Gillingham et al. 2014) *The Rebound Effect and Energy Efficiency Policy*.

Why rebound effect matters



- Adjusting for rebound may reduce the assumed contributions of energy efficiency to climate change mitigation
- Targets and goals (e.g., 20-20) may be harder to meet
- Abatement curves may need to be adjusted, and the order of mitigation may change

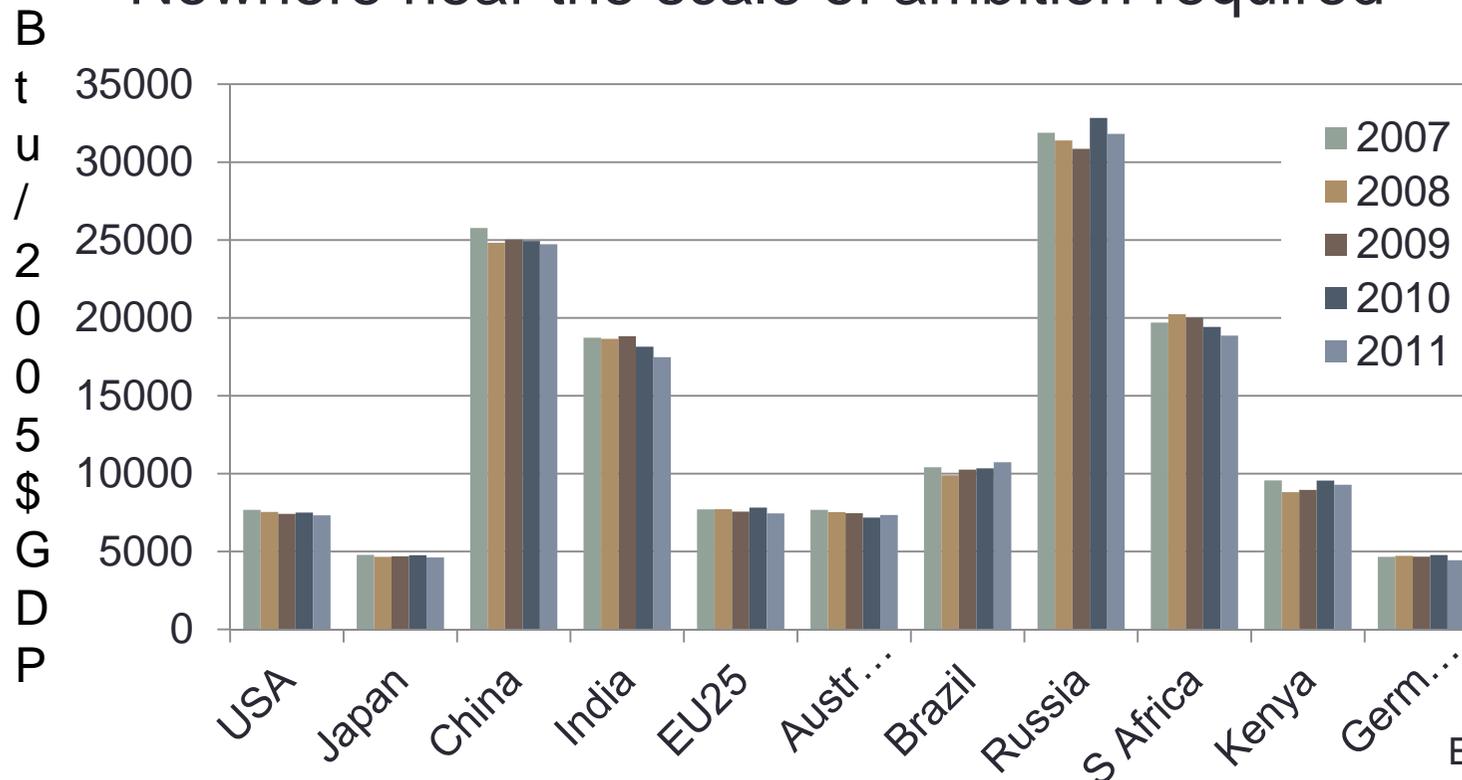


SOURCE: Thomas Kerr, IEA. Based on World Energy Outlook 2009 and Energy Technologies Perspectives 2010 reports.



Summary

- Examples of policies taking effect everywhere to support improvements in energy efficiency
- More ex-post analysis and data needed
- Nowhere near the scale of ambition required



**On average
less than 1%
annual
reduction in
energy
intensity....**



Areas for further research

- Data collection
- Energy efficiency policy research:
 - Better understanding of consumer behaviour with empirical data and other fields
 - Buildings: policy design work on what is possible to achieve extensive, ambitious EE renovation of building stock; how to finance? Behavioural economics, empirical data.
 - Transport: more focus on analysis of HGVs, land-use planning solutions
 - Industry: better data on policy implementation; ex-post analysis of programmes; co-benefit information, ie productivity examples;
- Policy interaction research:
 - Carbon pricing and energy efficiency policies
 - Renewable energy targets, emissions trading schemes and energy efficiency policy/measures
 - Energy system integration demand side responses to grid challenges (capacity value, curtailment, targets)
- Research on the rebound effect:
 - Macroeconomic rebound effect
 - Developing country rebound effect
 - Estimating multiple benefits of energy efficiency – utility of rebound effects
 - Analysis of policies likely to maximise positive multiple benefits yet minimise carbon emissions



Thank-you

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