

Wuppertal Institute
for Climate, Environment
and Energy

Evaluation of Energy Saving Measures in the Transport Sector

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Evaluation of Energy Savings in Transport

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The Directive on Energy End-Use Efficiency (ESD)

- The ESD sets an indicative target for EU MS to achieve 9% annual energy savings by 2016 from energy services and other energy efficiency improvement (EEI) measures.
- But until now, a common methodology on how to measure and evaluate these savings has not been developed .
- The set of common and harmonised evaluation methods developed by the EMEEES project will enable the MS to report EEI activities and their impacts in a common way and with a harmonised accounting system.
- Consequently, the methods designed by EMEEES will help the MS to prove to the Commission the fulfilment of the indicative cumulative annual energy savings target of 9 percent by 2016.

The Project ,Evaluation and Monitoring for the EU Directive on Energy End-use Efficiency and Energy Services (EMEEES)‘

Objectives:

- support the implementation of the EU Directive on energy end-use efficiency and energy services, ESD (2006/32/EC)
- develop harmonised methods for evaluation of energy savings
(20 bottom-up and 15 top-down methods)
- build trust in methods and hence in savings evaluated
- develop a template for national energy efficiency action plans
- provide practical advice and support for the European Commission
- provide platform for exchange:
www.evaluate-energy-savings.eu



The EMEEES Consortium

21 partners
well-experienced
in evaluation of
energy savings

Project partner	Country
Wuppertal Institut for Climate, Environment, Energy (WI)	DE
Agence de l'Environnement et de la Maitrise de l'Energie (ADEME)	FR
SenterNovem	NL
Energy research Centre of the Netherlands (ECN)	NL
Enerdata	FR
Fraunhofer-Institut für System- und Innovationsforschung (FhG-ISI)	DE
SRC International A/S (SRCI)	DK
Politecnico di Milano, Dipartimento di Energetica, eERG	IT
AGH University of Science and Technology (AGH-UST)	PL
...sterreichische Energieagentur Österreich Austrian Energy Agency (A.E.A.)	AT
Ekodoma	LV
Istituto di Studi per l'Integrazione dei Sistemi (ISIS)	IT
Swedish Energy Agency (STEM)	SE
Association pour la Recherche et la Développement des Méthodes et Processus Industriels (ARMINES)	FR
Electricité de France (EdF)	FR
Enova SF	NO
Motiva Oy	FI
Department for Environment, Food and Rural Affairs (DEFRA)	UK
ISR University of Coimbra (ISR-UC)	PT
Dong Energy	DK
Centre for Renewable Energy Sources (CRES)	GR

The National Energy Efficiency Action Plans

Transport-related energy efficiency improvement (EEI) measures in the Member States' plans due in 2007 for the implementation of the ESD (exemplary categories)

⇒ **EMEEES developed two case applications of bottom-up methods presented here, for:**
1 vehicle energy efficiency
2 modal shifts;
plus one for eco-driving
 ⇒ www.evaluate-energy-savings.eu

	Vehicle Efficiency		Modal Shifts	
	Taxes on car acquisition/ownership	Fleet emission limits	Infrastructure improvement (rail, bicycle)	Price incentives for modal switch
Austria				
Belgium				
Bulgaria				
Cyprus				
Czech R				
Denmark				
Estonia				
Finland				
France				
Germany				
Greece				
Hungary				
Ireland				
Italy				
Latvia				
Lithuania				
Luxembourg				
Malta				
Netherlands				
Poland				
Portugal				
Romania				
Slovakia				
Slovenia				
Spain				
Sweden				
UK				

A Four Steps Calculation Process (Bottom-Up)

+ number of participants or units

+ double counting, multiplier effect, + other gross-to-net correction factors (e.g. free-rider effect)?

+ timing and lifetime, + performance degradation (?)

Step 1: unitary gross annual energy savings (in kWh/year per participant or unit)



Step 2: total gross annual energy savings (taking into account the number of participants or units, in kWh/year)

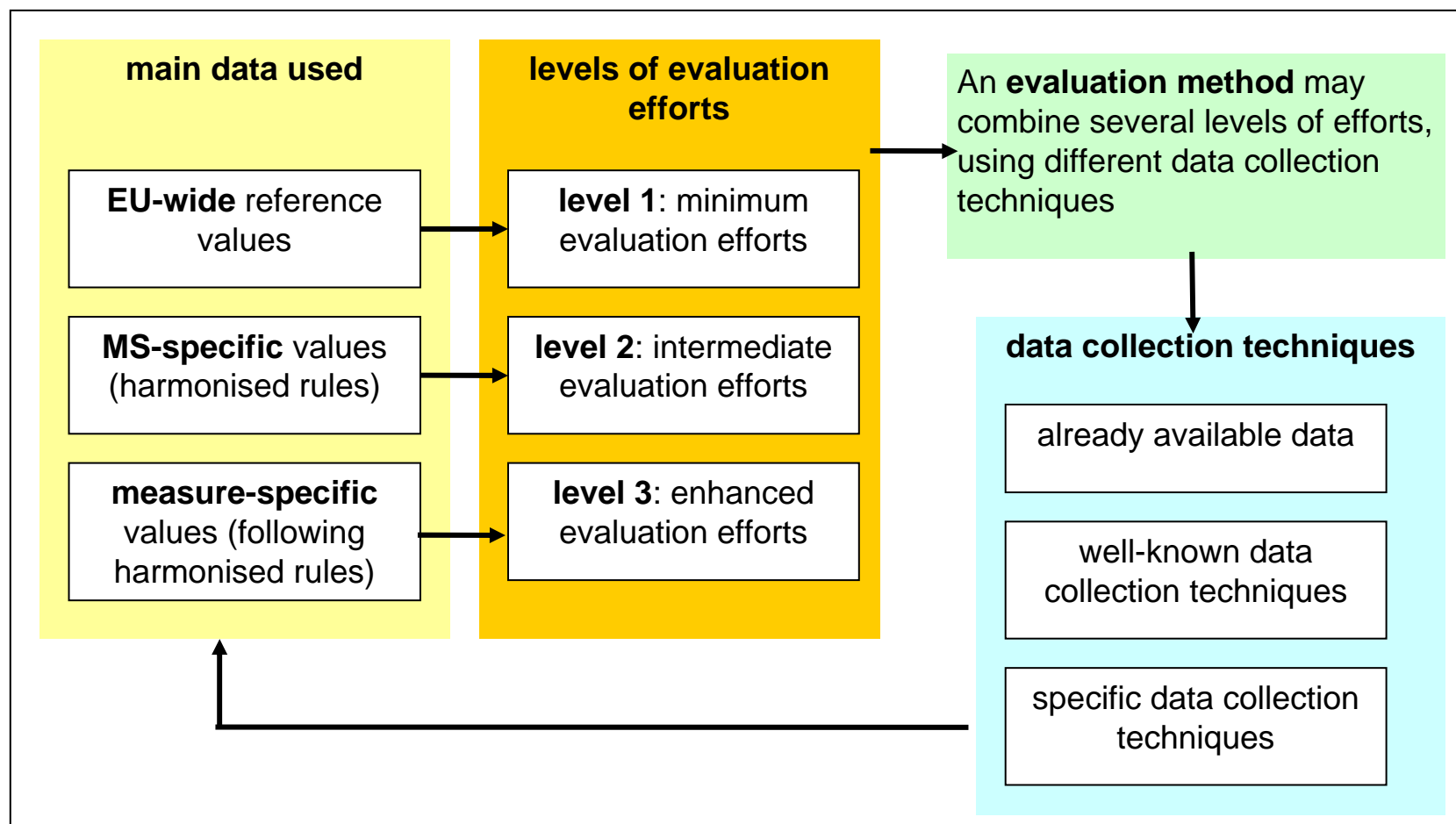


Step 3: total ESD annual energy savings in the **first year** (taking into account double counting, multiplier effect, and other gross-to-net correction factors (e.g. free-riders) ?, in kWh/year)



Step 4: total ESD annual energy savings achieved in the year 2016 (in kWh/year, taking account of the timing of the end-use action, its lifetime and eventual performance degradation)

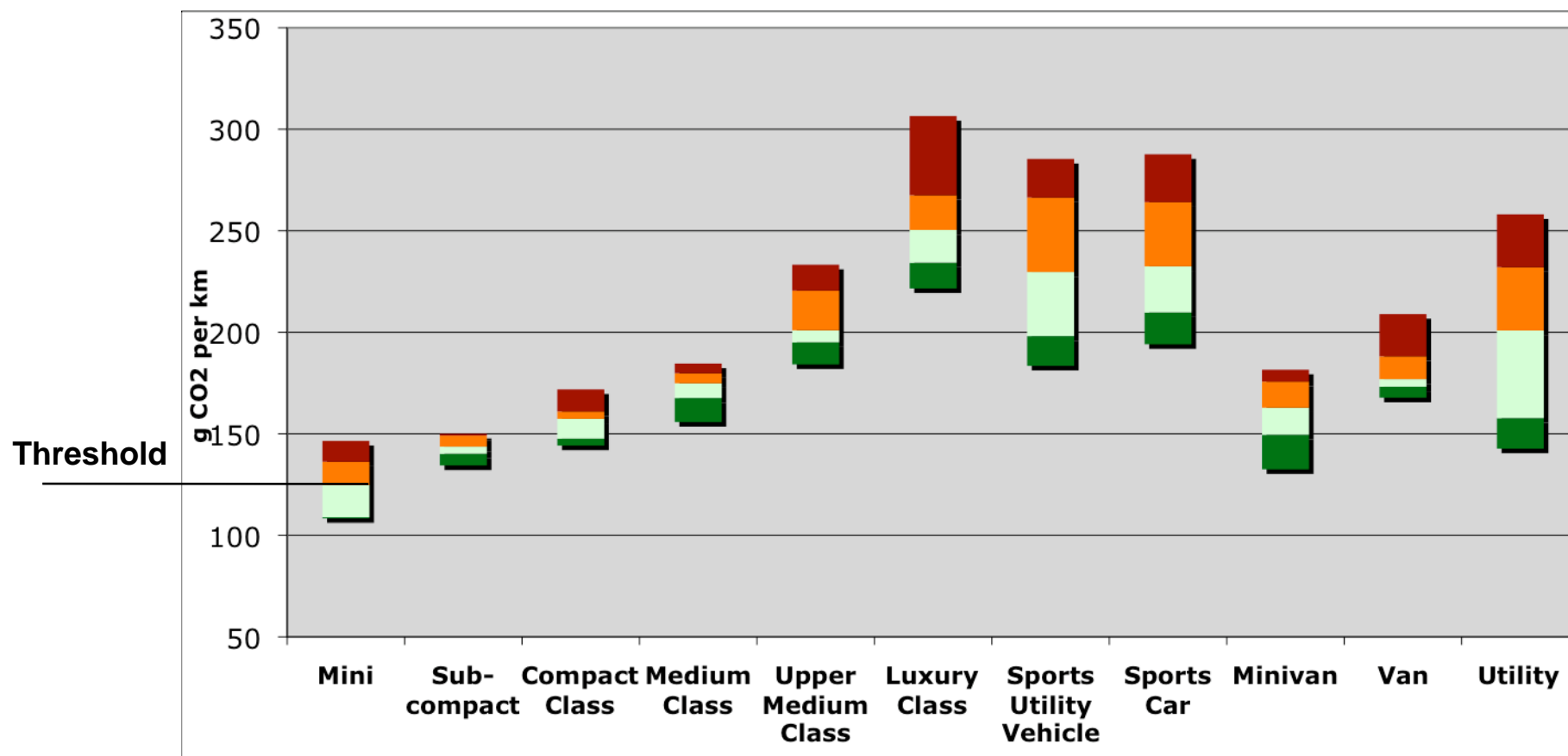
Bottom-Up Calculation – three levels of effort



A Four Steps Calculation Process (Bottom-Up)

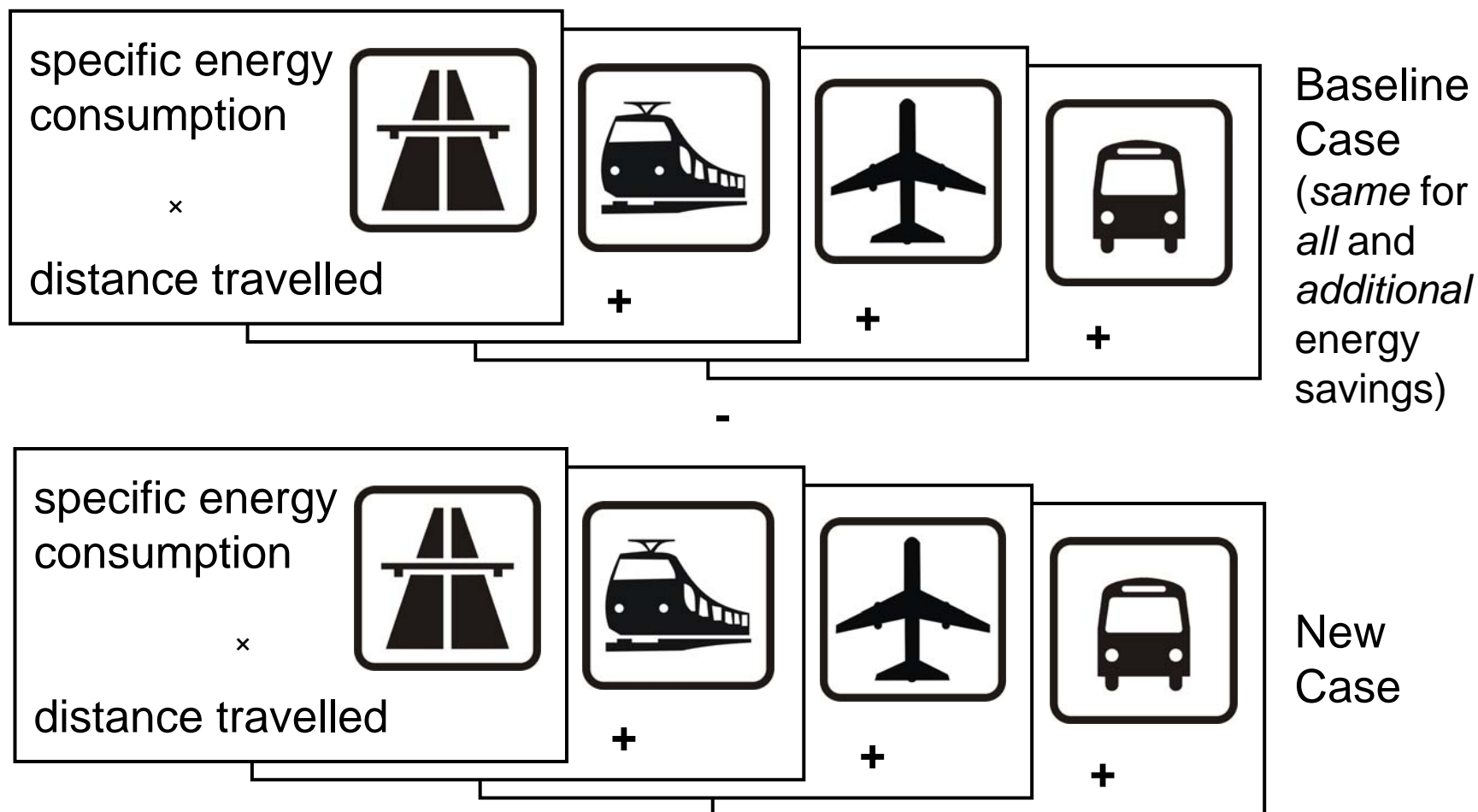
Step 1: Vehicle energy efficiency:

measures promoting energy-efficient vehicles until Cars Directive in force;
measures promoting most energy-efficient vehicles thereafter



A Four Steps Calculation Process (Bottom-Up)

Step 1: Modal shifts in passenger transportation



A Four Steps Calculation Process (Bottom-Up)

Step 1: Modal shifts in passenger transportation

Energy consumption considered

Passengers transported

- important long distance modes (train, passenger car, plane)
- level 2&3: transport modes of minor importance (motorcycle, bus)
- baseline case and EEI measure case

Rebound effects/leakage

- changed total annual distances travelled
- changed occupancy levels

Energy consumption not considered

Remaining transport system

- freight transport
- local transport systems and modes
- connections/lines not affected

Rebound effects/leakage

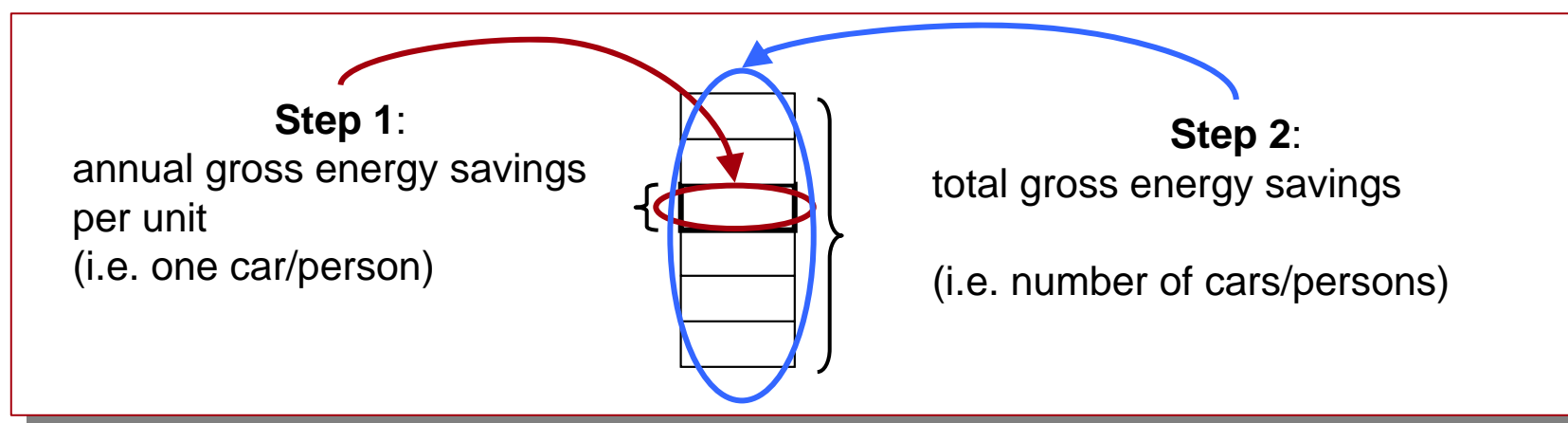
- construction and material
- well-to-tank activities
- changed vehicle speed

A Four Steps Calculation Process (Bottom-Up)

Step 2: total gross annual energy savings

“How many persons bought an efficient car?”

“How many persons switched the transport mode for how many km?”



$$ES_{tga} = ES_{uga} \times \text{Number of efficient cars/persons switching the mode}$$

A Four Steps Calculation Process (Bottom-Up)

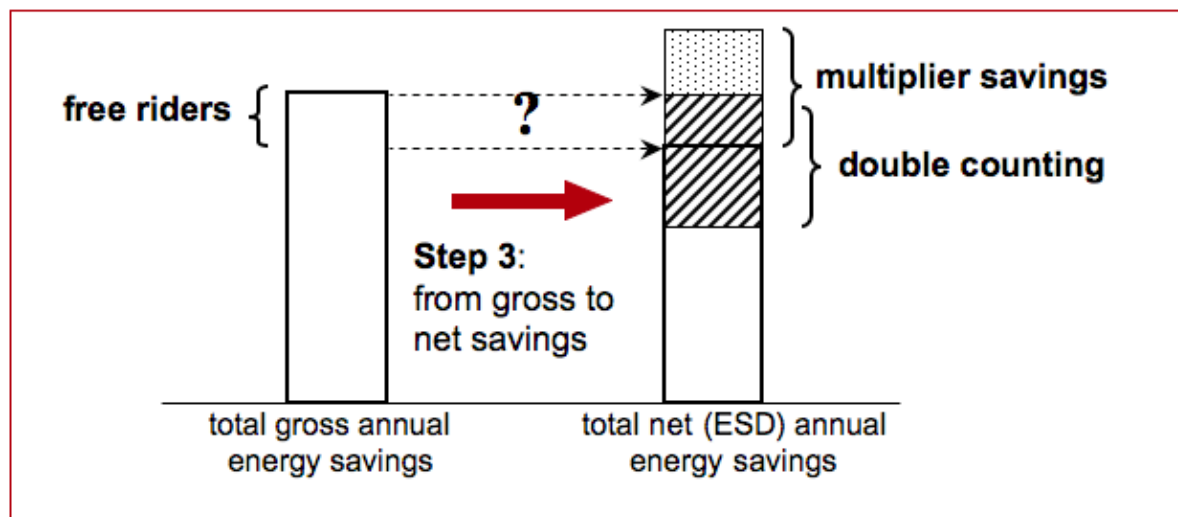
Step 3: total net annual energy savings

Example for Free Riders: People wanted to buy an energy-efficient compact car anyway

Example for Multiplier Savings: Due to a financial incentive, manufacturers accelerate the market launch of efficient cars. Consequently, more efficient cars are being sold

Example for Double Counting:

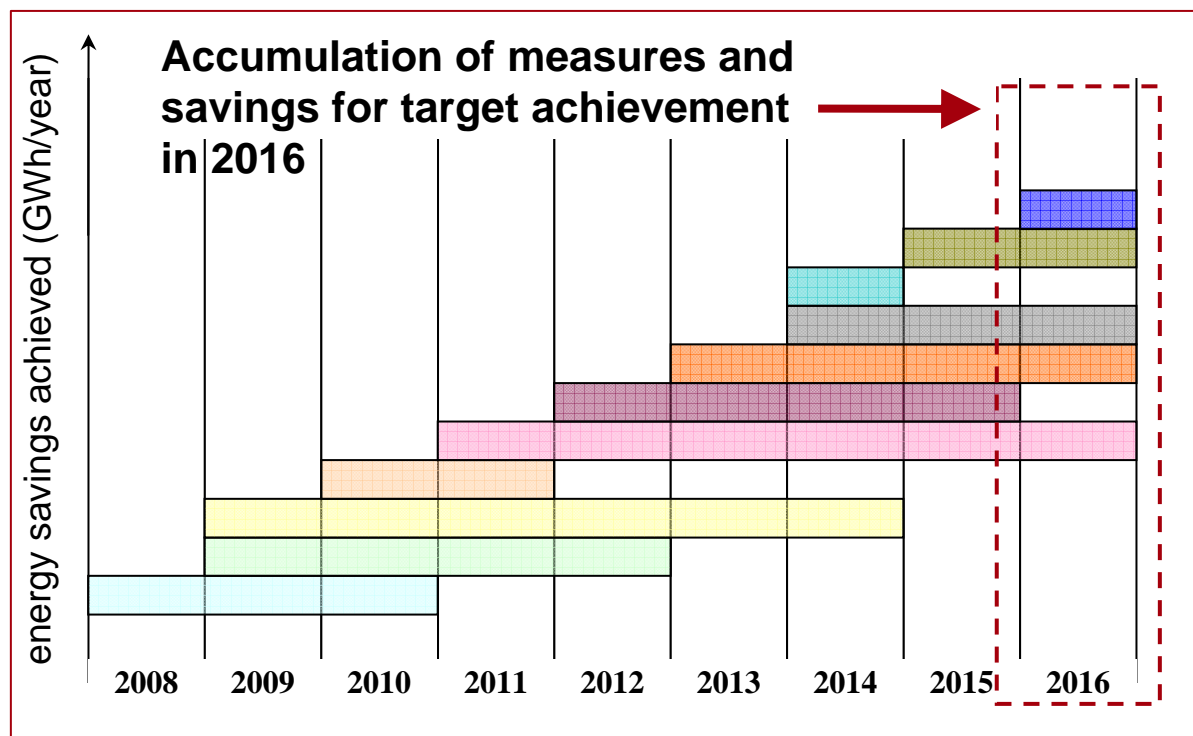
A number of measures aims at improving the efficiency of cars



A Four Steps Calculation Process (Bottom-Up)

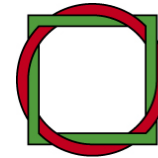
Step 4: energy savings lifetime

- Vehicle energy efficiency: average lifetime of cars at deregistration
- Modal shifts: CEN WS 27 Agreement: 2 years for measures aiming at changing behaviour. Potential solution: confirm longer lifetime by regular surveys; Later, when enough experience, adapt defaults



Data Collection

Value required	Type of evaluation	Effort	Certainty
Energy consumption of efficient and inefficient cars	Analysis of registration statistics and manufacturers' data	medium	high
	Survey	high	high
Average energy consumption of cars	Top-down indicators	low	high
Energy consumption of planes and trains	Direct measurement	medium	high
	Top-down indicators	low	medium
Occupancy levels of planes and trains	Operators' statistics	medium	medium
Occupancy levels of cars	Top-down indicators	medium	medium
	Survey/literature	high	high
Annual distance travelled of efficient cars	Top-down indicators	low	medium
	Survey/literature	medium	high
Annual distance travelled of persons	Survey	high	high
	Own assumptions	low	medium
Number of cars	Registration statistics	low	high
Number of persons (passengers etc.)	Survey	high	high
	Passenger counts	medium	medium
Free rider coefficient Multiplier coefficient Double counting factor	Survey	high	high
	Own analysis	medium	medium
	Own assumption	low	low



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Thank you for your attention !

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For further information
please visit our websites:

www.evaluate-energy-savings.eu

www.wupperinst.org