

Are we 'misusing' the missing data?

*Comments about residential sector data and
examples of their use*

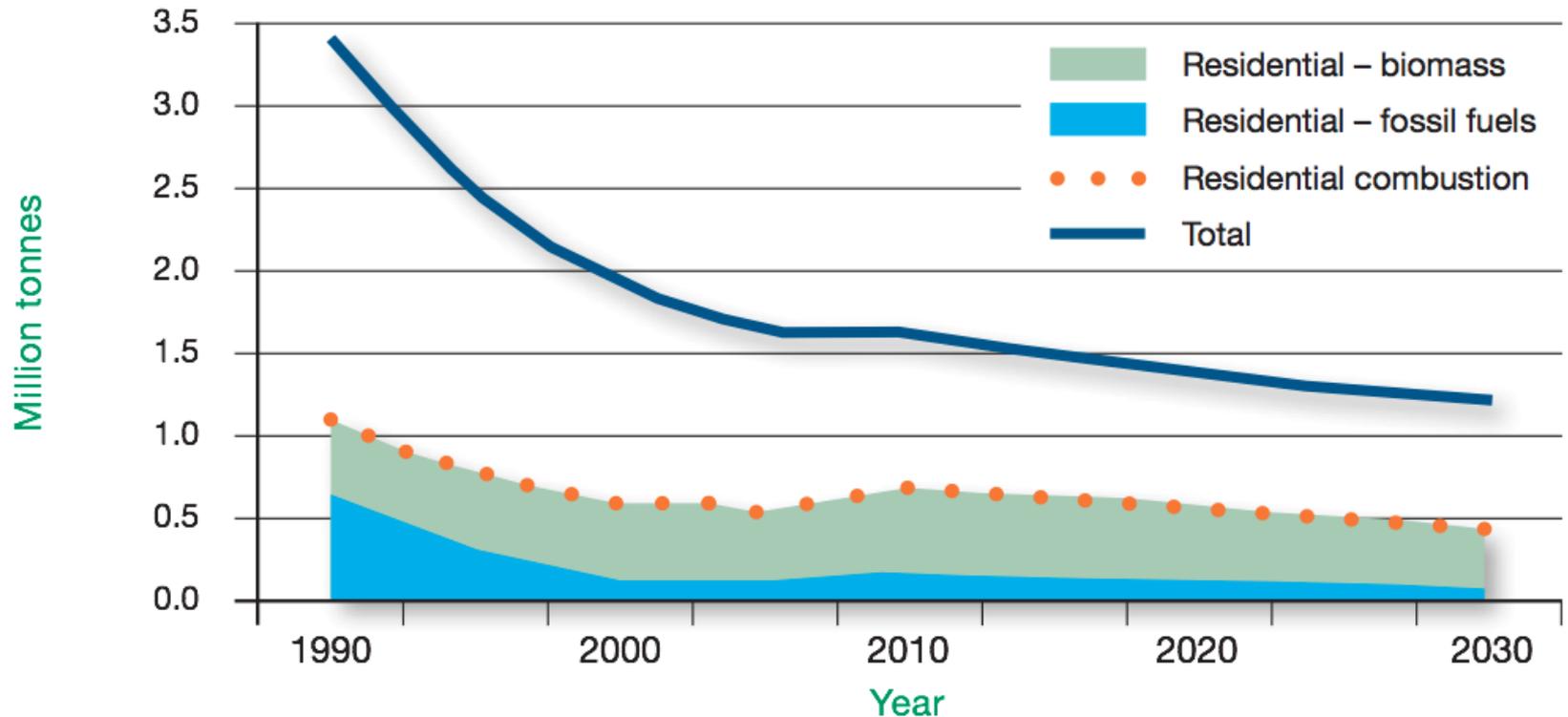
Zig Klimont
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Snowmass, CO, US, July 22, 2015

It is not only cooking stoves in developing world



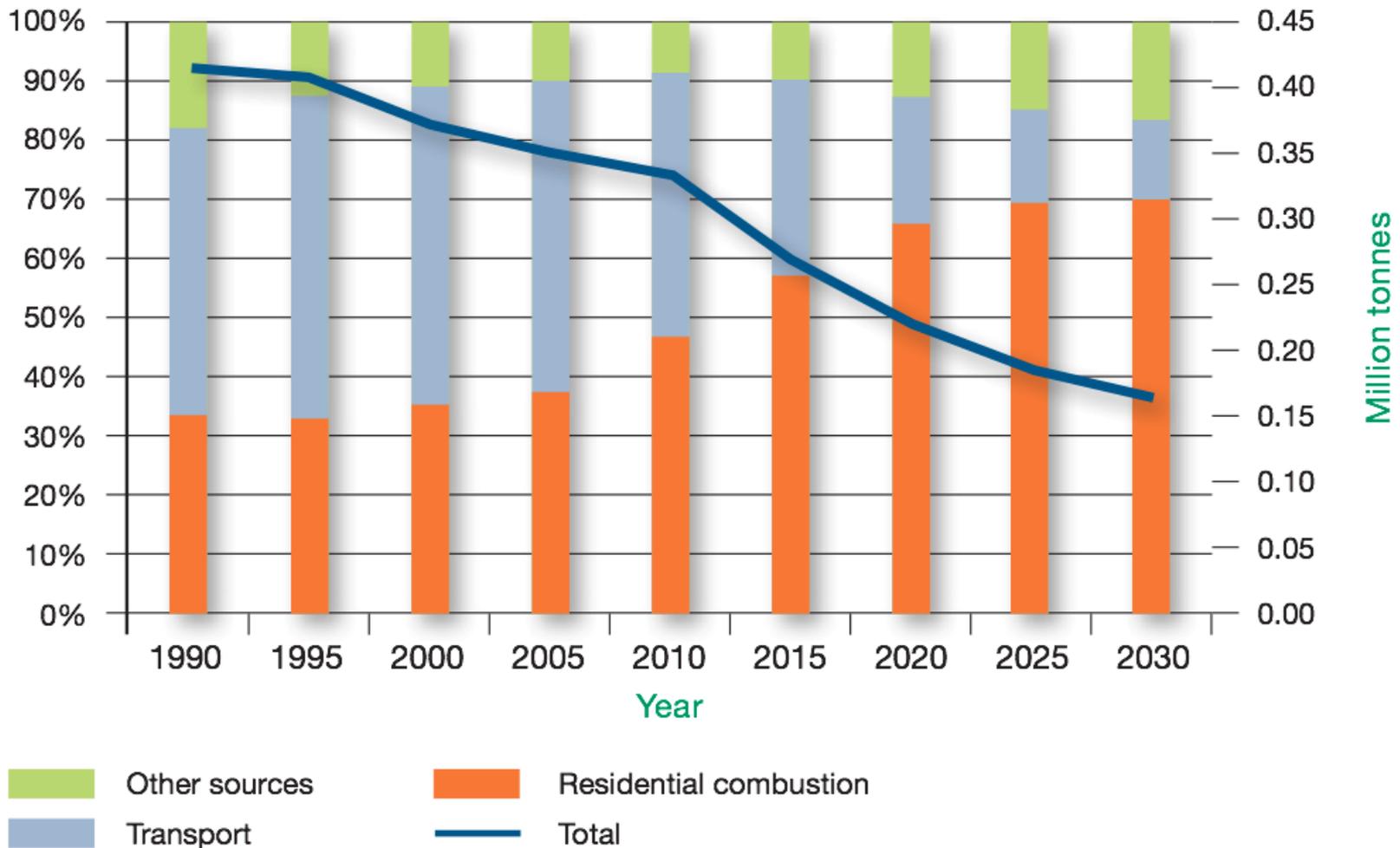
Emissions of PM2.5 from residential combustion in the EU-28; *Source: WHO (2015), GAINS*



Notes: EU-28 is countries belonging to the EU after July 2013; current legislation scenario as in Amann et al. (2014), using the Greenhouse Gas and Air Pollution Interactions and Synergies (GAINS) model (Amann et al., 2011).

Source: reproduced with permission from the International Institute for Applied Systems Analysis (IIASA).

Emissions of BC from key sources in the EU-28; *Source: WHO (2015), GAINS*



'Facts' about data used in the models

- IEA biomass use statistics are widely used
 - Often criticized for too high numbers in developing world; *recomendation* - use where possible and available alternative/national/peer reviewed research sources
 - In some developed countries IEA underestimates fuelwood use for heating; some info available to correct for that, e.g., Denmark, Italy, Canada

New estimates of fuel wood use and PM emissions in Europe

H.A.C. Denier van der Gon et al. (2015), ACP

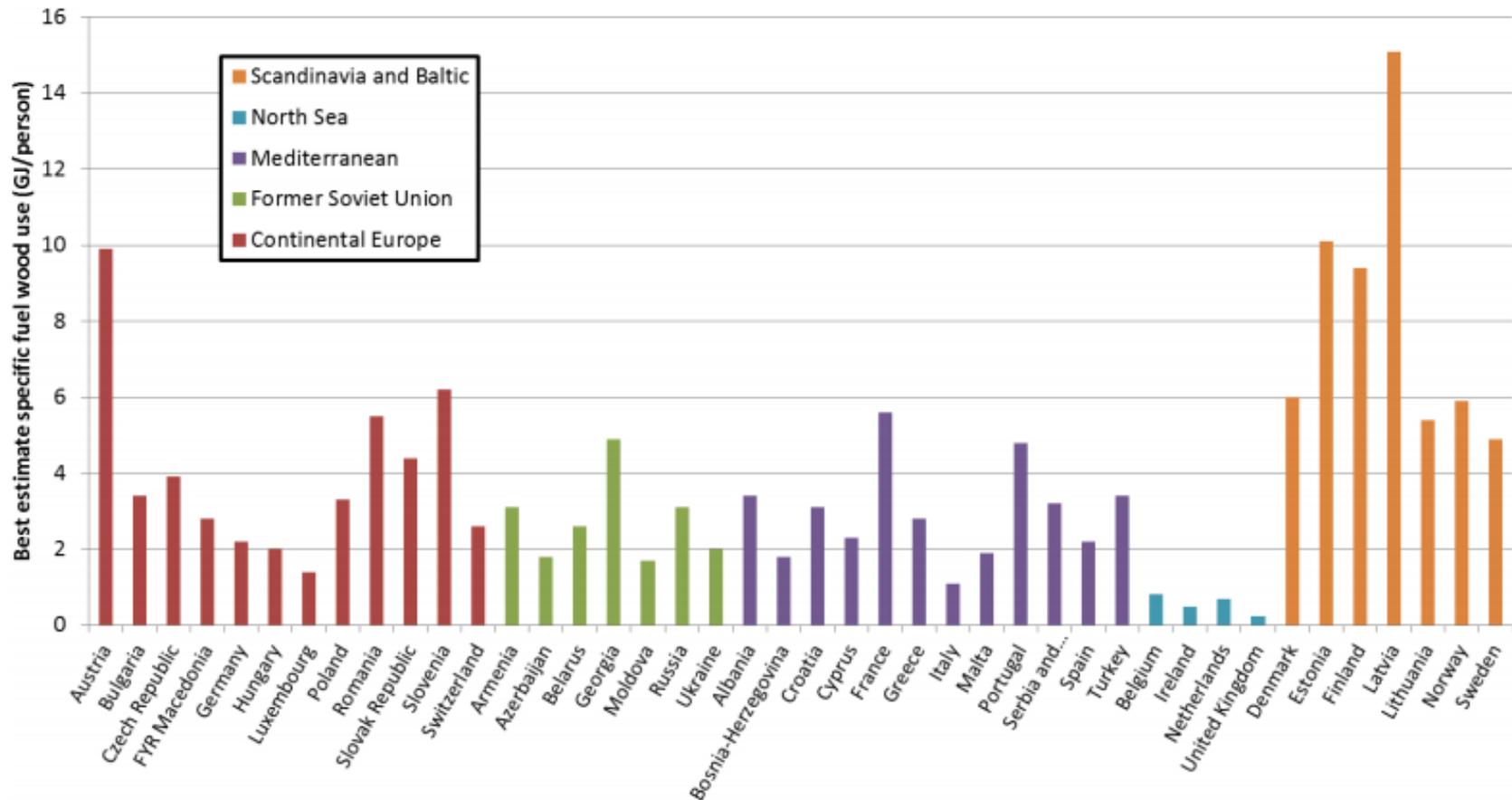
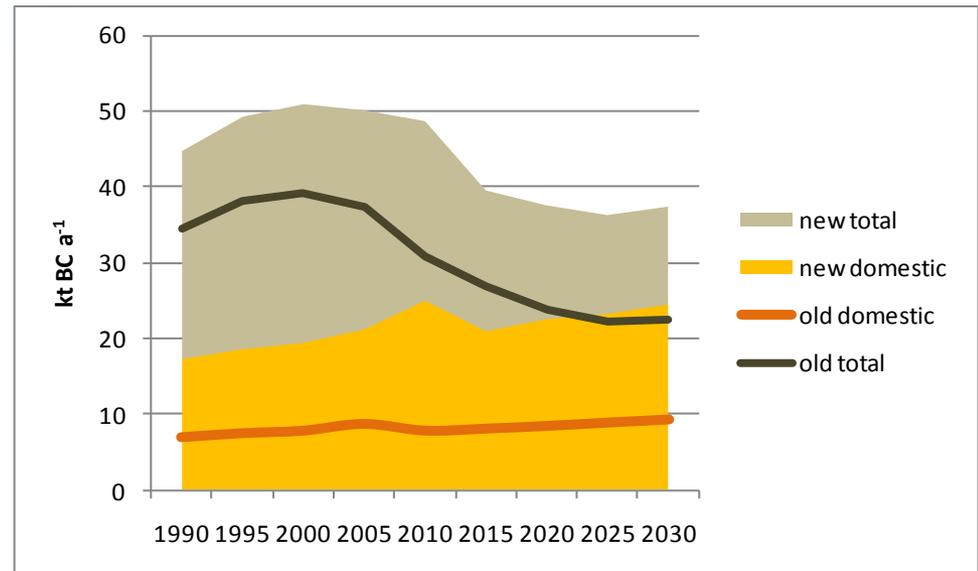
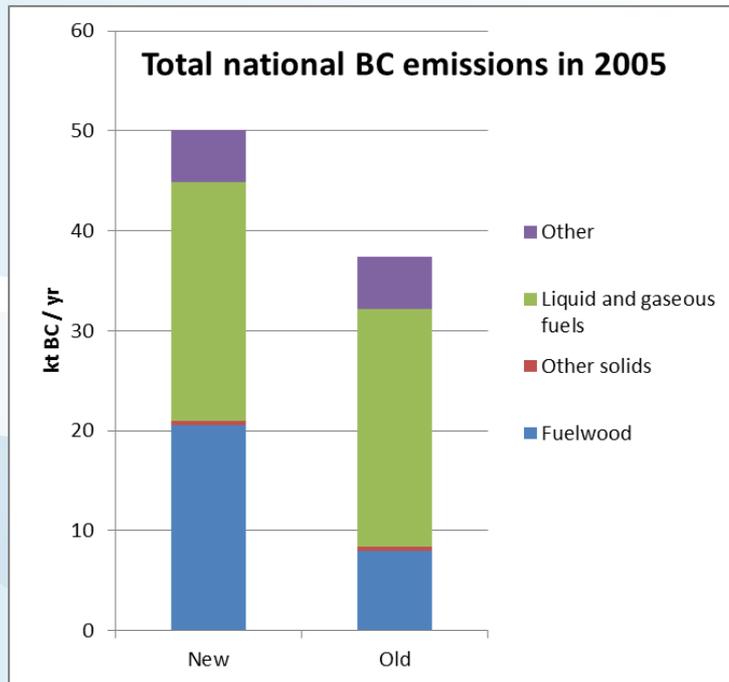


Figure 2. Estimated specific fuel wood use (in GJ person⁻¹) in UNECE Europe grouped by region.

Implications of the revision of the Canadian domestic sector for BC emissions

Source: GAINS ECLIPSE V4a



- Base energy data and projections; IEA, 2011
- Fuelwood use and installation structure was adapted following the national data

New estimates of fuel wood use and PM emissions in Europe

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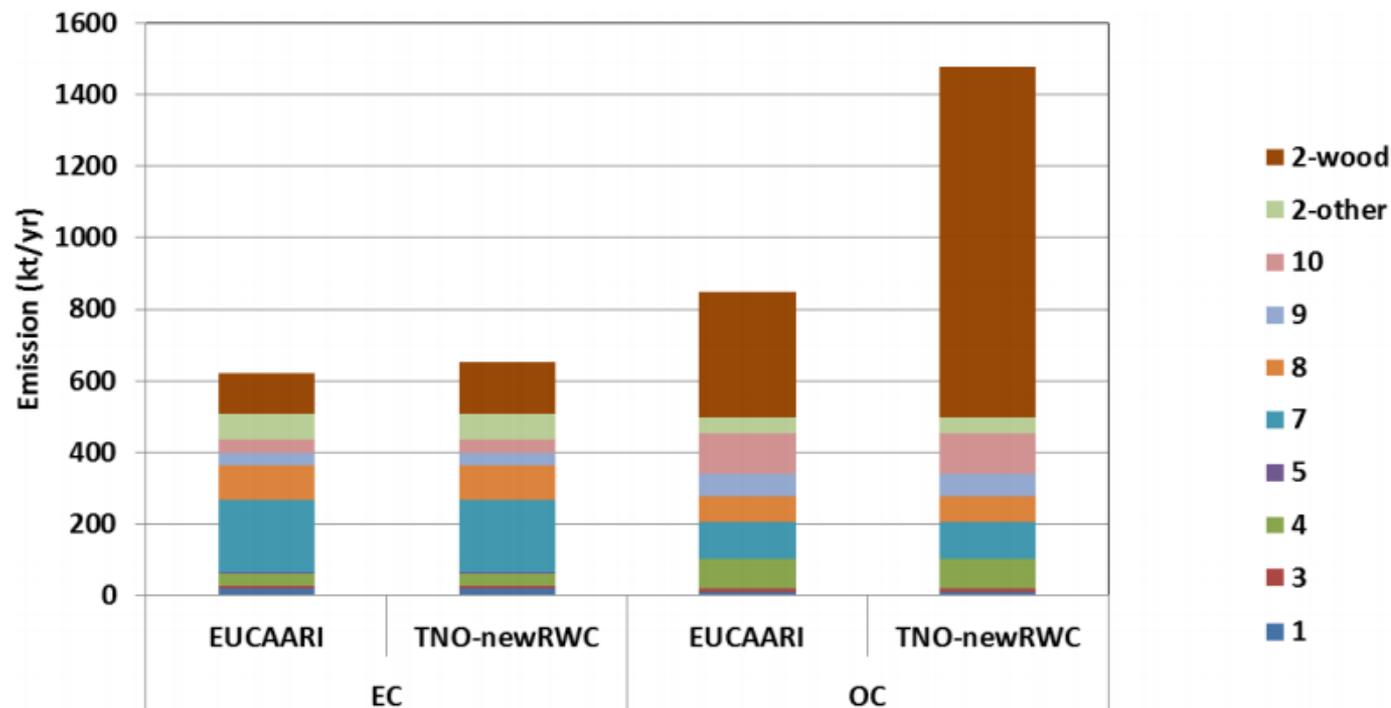


Figure 1. PM_{2.5} EC and OC emissions (tonnes) for UNECE-Europe in 2005 for each source sector (see Table 1) (excluding international shipping) according to the EUCAARI inventory and the TNO-newRWC.

New estimates of fuel wood use and PM emissions in Europe

H.A.C. Denier van der Gon et al. (2015), ACP

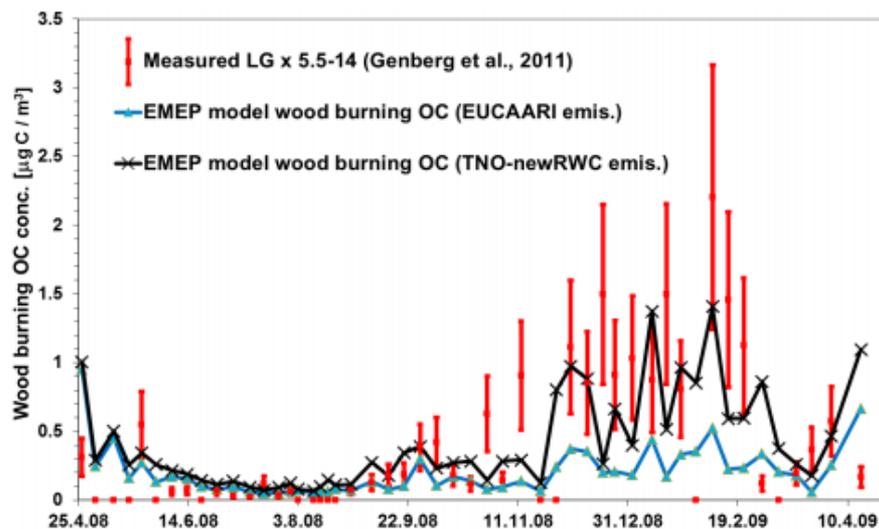


Figure 9. Comparison of EMEP MSC-W model-predicted OC ($\mu\text{g}(\text{C}) \text{m}^{-3}$) from biomass burning (bbOC) (including OC from both residential wood combustion and open vegetation fires) to bbOC estimated from levoglucosan concentrations at Vavihill (southern Sweden). Blue bars: model calculated bbOC with the EUCAARI emission inventory; black: model bbOC with the revised TNO-newRWC emission inventory. Red bars show the measurement-estimated bbOC range (lower limit: $5.5 \times$ the measured levoglucosan concentration, upper limit: $14 \times$ levoglucosan; the estimated range for the bbOC/levoglucosan ratio, 5.5–14, is taken from Szidat et al., 2009).

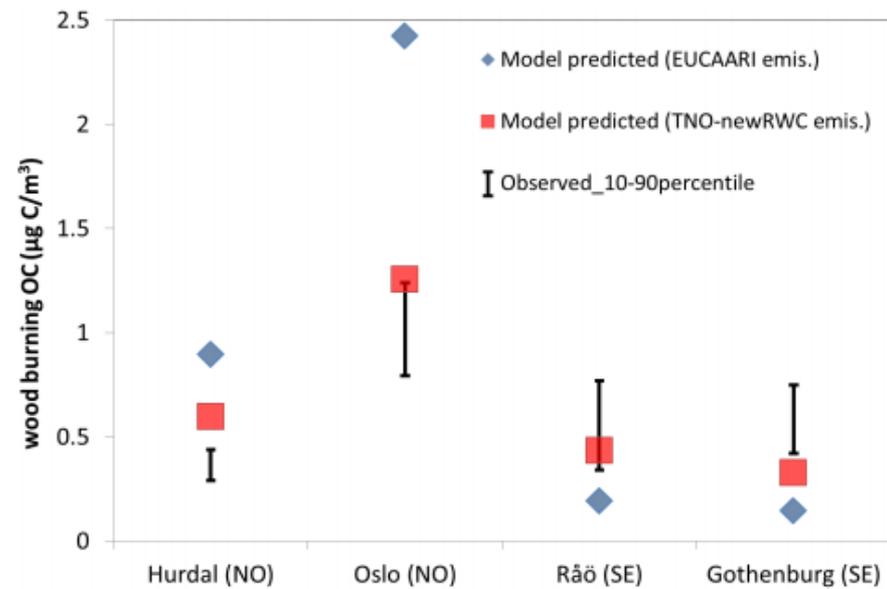


Figure 10. Comparison of model calculated OC ($\mu\text{g}(\text{C}) \text{m}^{-3}$) from wood burning (residential combustion + open vegetation fires) to source-apportionment data from measurement campaigns during winter in Norway (SORGA, 1–8 March 2007, Yttri et al., 2011) and Sweden (GÖTE, 11 February–4 March 2005, Szidat et al., 2009).

'Facts' about data used in the models

- Often ambiguous definition of split between cooking and heating stoves (in some regions distinction not possible);
- Some models use fairly detailed split of residential heating; boilers, stoves, fireplaces, but data scarce...even worse when it comes to the actual technology used
- Sustainability of fuelwood supply often ignored; how much do we know about it?

Residential/Commercial fuel consumption structure in the GAINS model

Table 1.

Fuels	Non-specific	Open pit	Fireplace	Stove [*]	Small boiler		Medium boiler	
					Manual	Auto	Manual	Auto
Gaseous fuels	•							
Liquid fuels	•							
Charcoal	•							
Coal				•	•	•	•	•
Biofuels								
- Fuelwood		•	•	•	•	•	•	•
- Agr. Residue		•		•		•		•
- Dung		•		•				

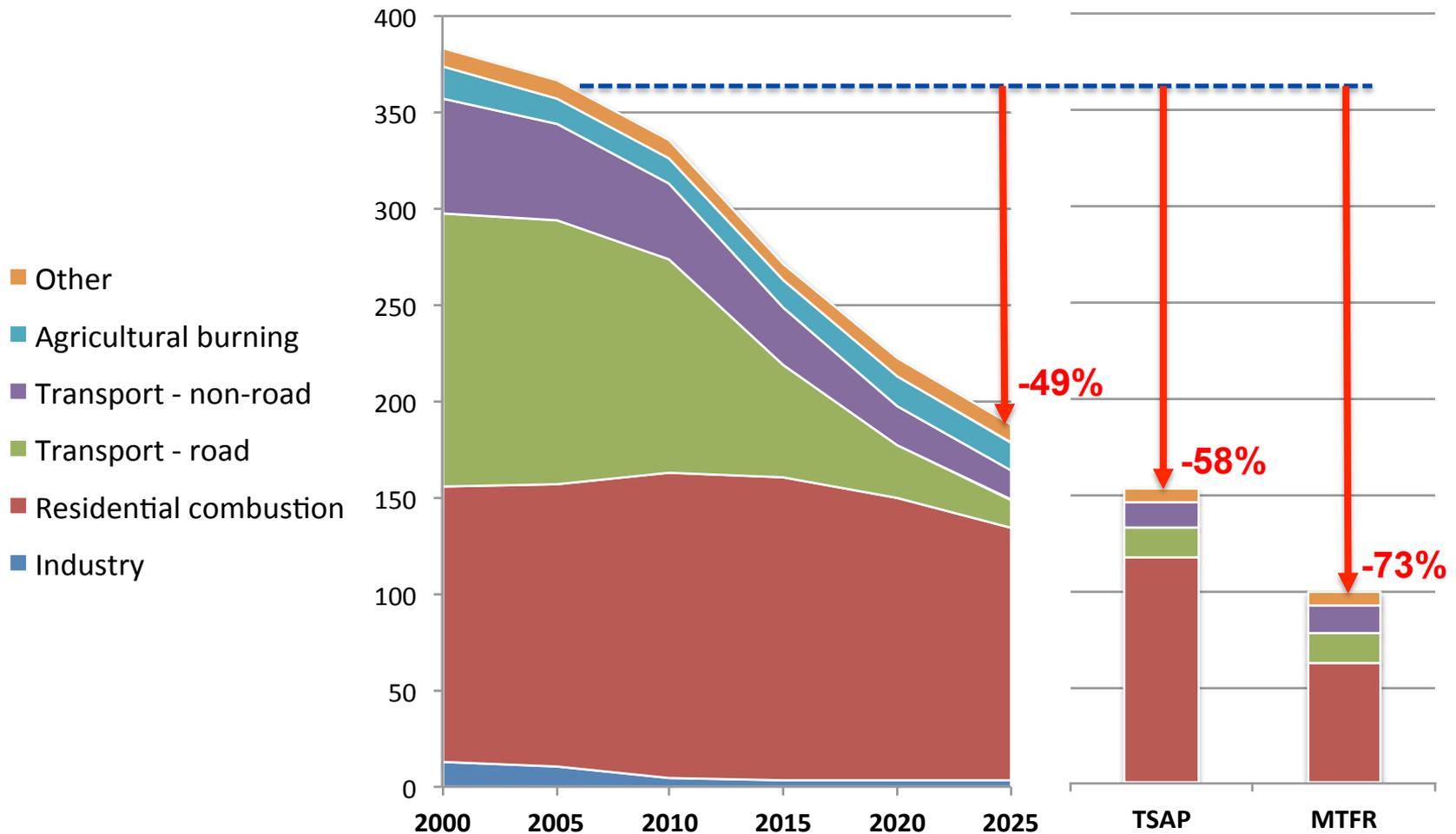
* - distinguishing cooking stoves and heating stoves as separate categories

Mitigation measures in Residential/Commercial sector in the GAINS model

Table 2. Simplified matrix of combustion technology-control option since some options are not available for specific fuels.

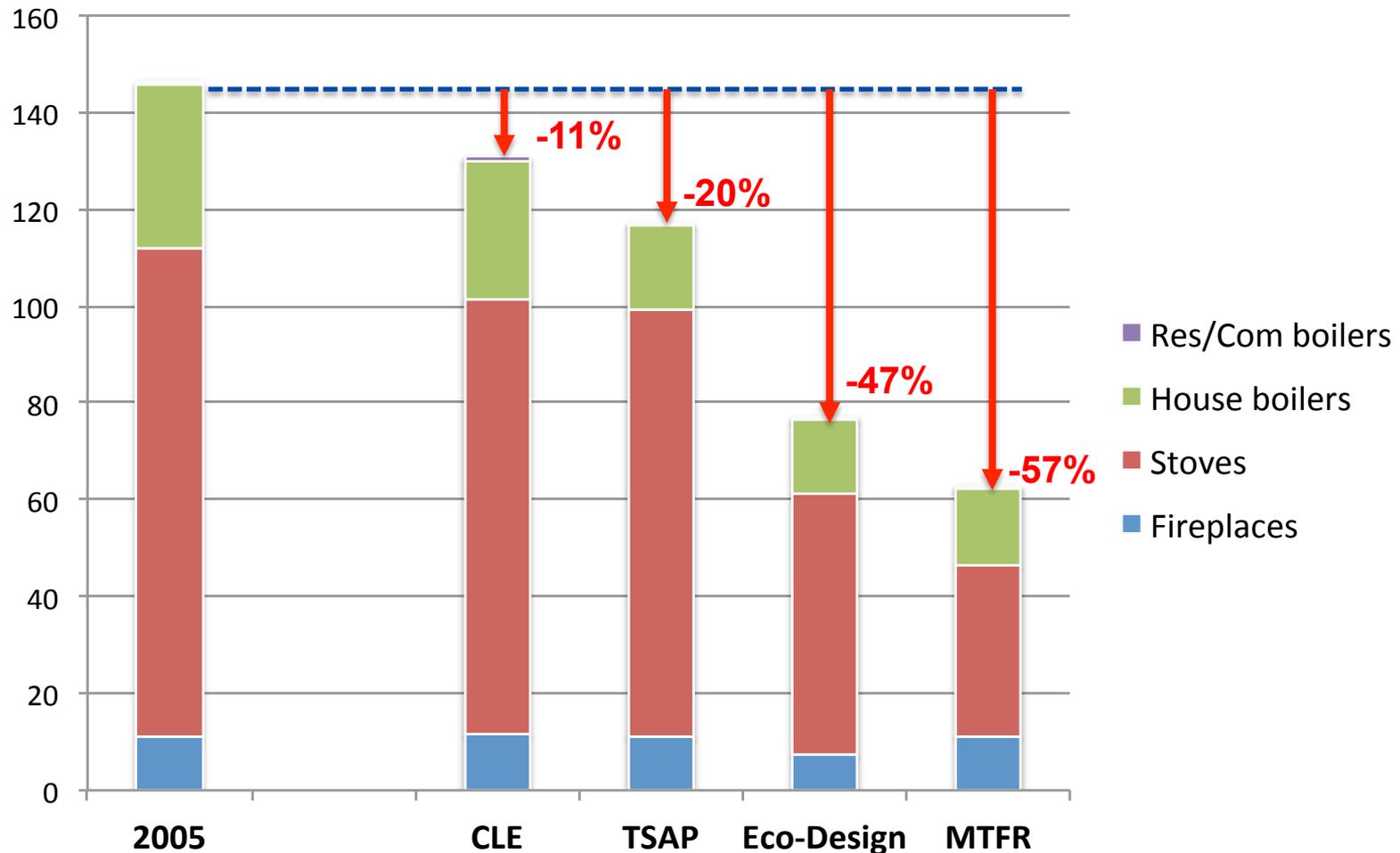
Control options	Non-specific	Open pit	Fireplace	Stove		Small boiler		Medium boiler	
				Cooking	Heating	Manual	Auto	Manual	Auto
Improved	•		•	•	•	•			
New			•	•	•	•			
Coal briquettes				•	•				
Fan stove				•					
Pellets					•	•	•	•	•
Cyclon								•	•
ESP					•	•	•		•

Impact of current and planned legislation on BC emissions in the EU28, kt



Source: IIASA – GAINS model runs during TSAP work (2013)

Potential to reduce BC in the EU-28 by 2025 via introduction of *Eco-design*, kt

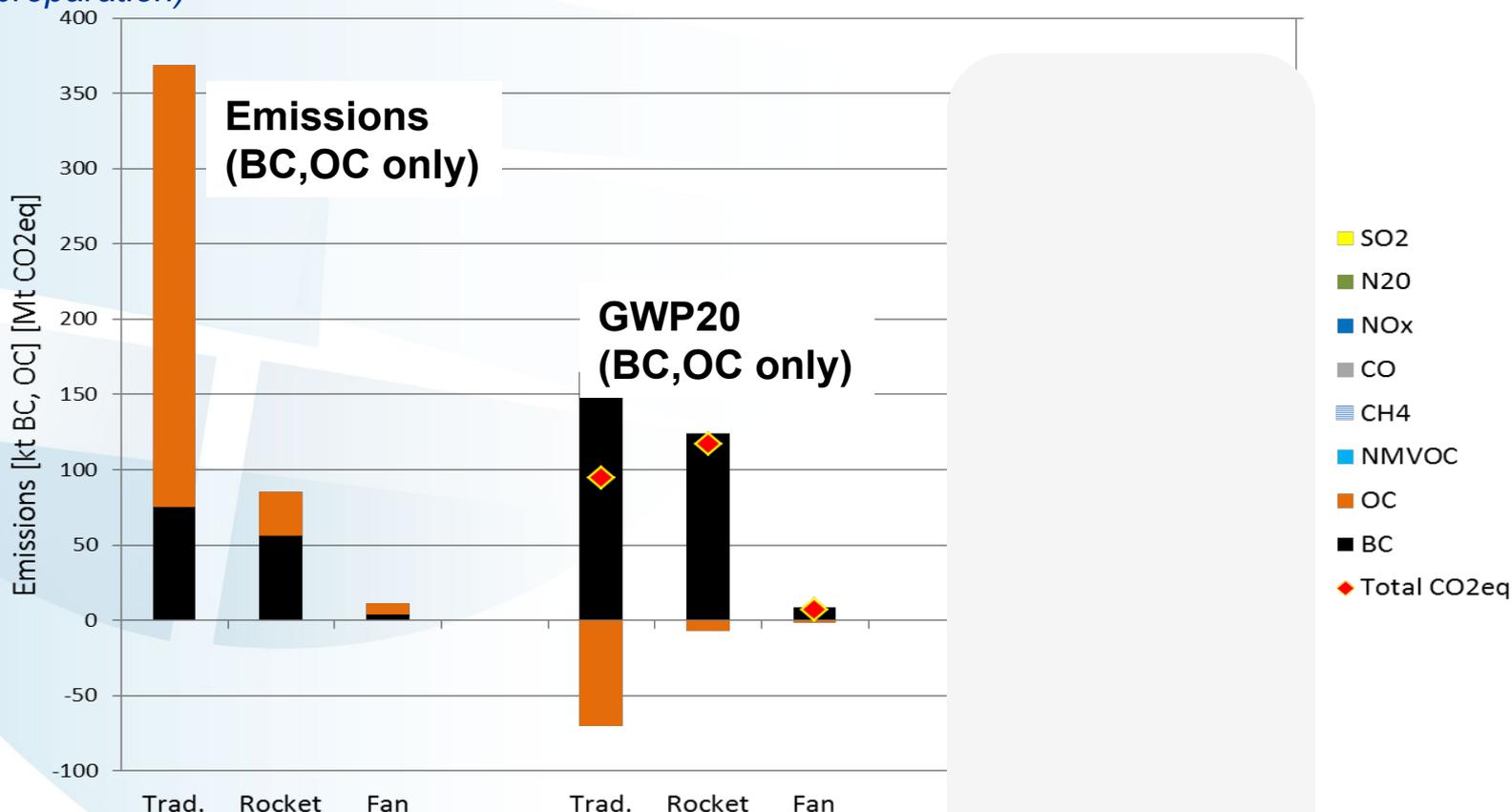


Source: IIASA – GAINS model runs during TSAP work (2013)

It matters which stoves are going to 'make it'*

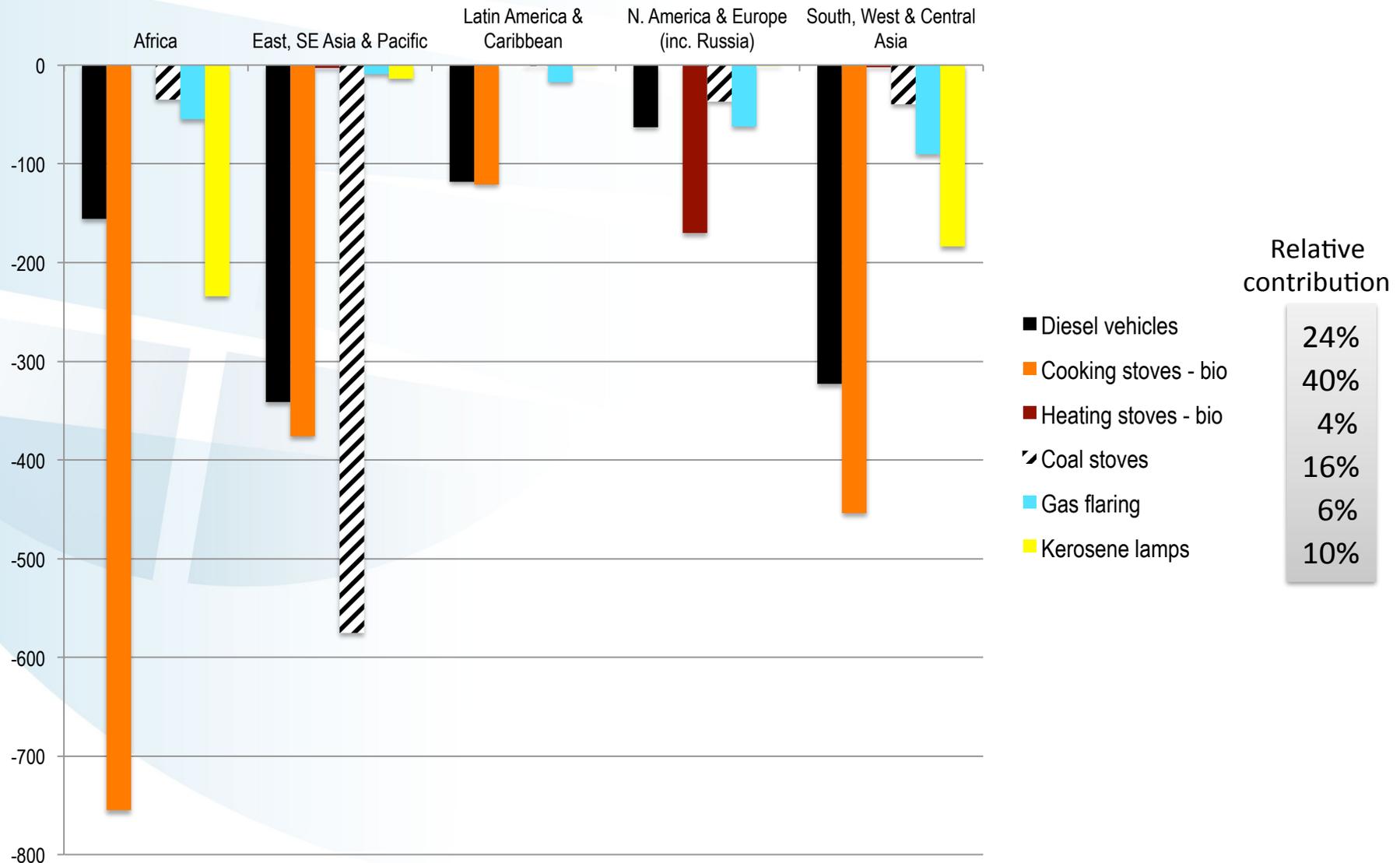
Importance of considering all pollutants

Example: Fuelwood cooking stoves (fuel efficiency improvement considered), India; Klimont et al (in preparation)



* The GWP20 is used for demonstration purpose. While the choice of GWP (100 years) would not change the conclusion about the selected measures the shown here CO_{2eq} emissions were not used in the analysis, i.e., the emissions of various pollutants for specific measures were put directly into the climate model.

Regional distribution of mitigation by key measures (about 90% of the whole potential) [kt BC by 2030]



Source: Klimont et al. (in preparation) GAINS model; ECLIPSE V5 scenario

Final thoughts

- Consultation meetings with national experts of the EU-28 countries helped to improve fuel use structure
- Lack of comparable information for most of the world
- Where can we get help?
- How to connect better available info so that a more homogenous, regionally and globally, dataset could be built?