



The Guidebook methodologies and challenges

Workshop on estimating emissions from small combustion and mobile machinery

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Outline

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Introduction

- › **Small combustion in the GB**
 - › **1A4a i Commercial and institutional plants**
 - › **1A4b i Residential plants**
 - › **1A4c i Plants in agriculture and forestry**
- › **Different technologies including engines. boilers. stoves and fireplaces**

Emission shares

- › **Small combustion and in particular residential plants account for a significant part of the national total emissions**
- › **Largest contribution to residential plants comes from appliances using solid fuels and/or biomass**

EU28 - 2011	NO _x	NMVOC	SO ₂	CO	TSP	PM ₁₀	PM _{2.5}	PAH
Commercial/institutional	2.1%	0.6%	1.9%	1.0%	0.7%	1.0%	1.1%	1.6%
Residential	4.3%	12.1%	8.5%	33.3%	20.0%	33.9%	43.9%	58.0%
Agriculture/forestry	1.0%	0.6%	1.0%	2.1%	1.3%	1.9%	1.6%	0.8%
Total	7.5%	13.3%	11.4%	36.5%	22.0%	36.8%	46.6%	60.4%



The GB methodologies

- › **Simple Tier 1 approach**
- › **More detailed Tier 2 approach**
- › **Small combustion installations subdivided into residential plants and other**



Tier 1 methodology

- › **Basic methodology only requiring fuel consumption matching the default EFs provided**
- › **EFs available for the four main fuel categories, i.e. solid fuels, gaseous fuels, liquid fuels and biomass**
- › **Activity data at this level will typically be available from the national energy statistics**
 - › **Important to ensure that untraded fuel (especially biomass) is included in the statistics**

Tier 2 methodology – EFs (1)

- › **For residential plants technology dependent EFs are available for:**
 - › **Solid fuels (fireplaces, stoves, advanced stoves, boilers)**
 - › **Gaseous fuels (fireplaces, boilers)**
 - › **Liquid fuels (stoves, boilers)**
 - › **Biomass (fireplaces, conventional stoves, energy efficient stoves, advanced/eco-labelled stoves and boilers, conventional boilers, pellet stoves and boilers)**
- › **The EFs for solid fuels are not updated and refers to early version of the GB**

Tier 2 methodology – EFs (2)

- › **For commercial/institutional and agriculture/forestry, technology dependent EFs are available for:**
 - › **Solid fuels (boilers (50 kW-1 MW), boilers (1 MW-50 MW), manual boilers, automatic boilers)**
 - › **Gaseous fuels (boilers (50 kW-1 MW) , boilers (1 MW-50 MW), gas turbines, gas engines)**
 - › **Liquid fuels (gas turbines, gas engines)**
 - › **Biomass (manual boilers, automatic boilers)**
- › **Most EFs for solid fuels are not updated and refers to early version of the GB**



Key challenges for tier 2

- › **Fuel consumption per appliance type!**
 - › **Number of appliances per type**
 - › **Fuel use per type of appliance**
 - › **Replacement rate between technologies**
 - › **Matching technologies to the default EFs in the GB**
- › **These data are rarely readily available but can be obtained through surveys and information from e.g. the manufactures/sellers of stoves and boilers and chimney sweeper organisations**



Survey as an approach (1)

- › **Since 2006, a biennial survey has been carried out in Denmark for residential wood combustion**
- › **The survey covers different subjects including**
 - › **Type of appliance(s)**
 - › **Age of the appliance(s) – technology level**
 - › **Fuel type (firewood vs. wood pellets)**
 - › **Annual average wood consumption**
- › **Type of appliances:**
 - › **A separation is made between manual boilers, automatic boilers, stoves and fireplaces**
- › **Age of appliances:**
 - › **Stoves are divided into four age classes with different EFs, boilers are divided into two age classes**



Survey as an approach (2)

› **Fuel type:**

- › **Wood pellet consumption is almost exclusively traded and therefore estimated with higher certainty**
- › **Important to clearly distinguish between firewood and pellet consumption**

› **Annual average wood consumption**

- › **Firewood consumption is covered by the survey – uncertainty introduced since many people do not know the precise wood consumption and sometimes have unrealistic answers**
- › **Survey results have improved due to improved guidance to the people carrying out the telephone interviews**



Cooperation with stakeholders

- › **Valuable knowledge exists with the manufacturers/sellers of appliances as well as chimney sweepers**
- › **The information received from these sources provides key knowledge on the replacement rates as well as important verification on the overall number of appliances and the split between technologies**

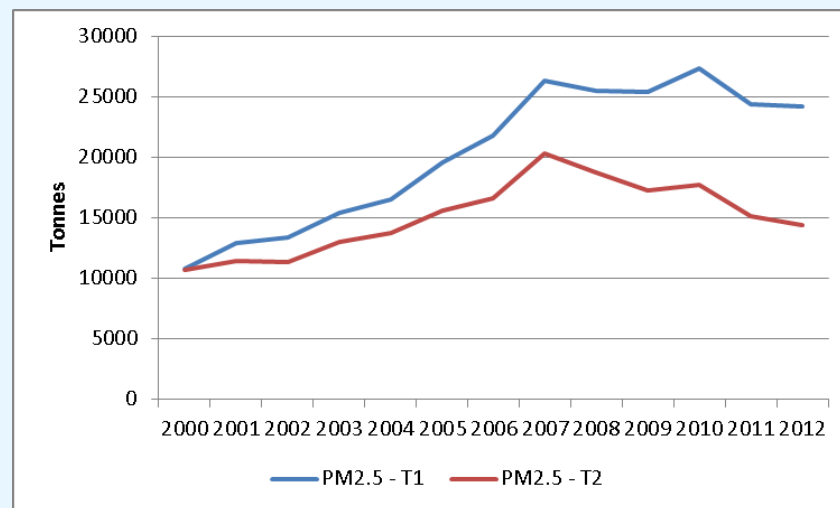
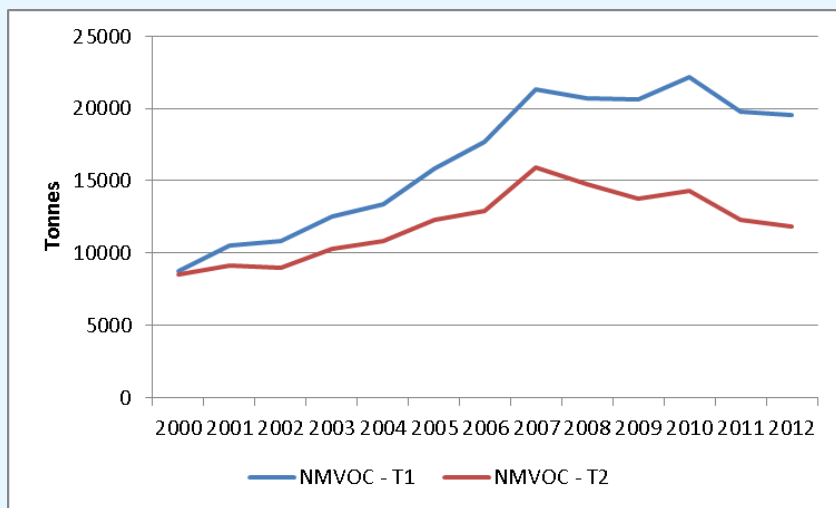


Matching technologies

- › **It can be challenging to match the combustion technologies reported in a national survey with the default EFs included in the GB**
- › **In the 2013 edition, the link between the technology descriptions in chapter 2 and the default EFs in chapter 3 was clarified**
- › **However, it is important to note that there can be special prominent national combustion technologies (e.g. masonry stoves), where the broad categories in the GB are not sufficient**

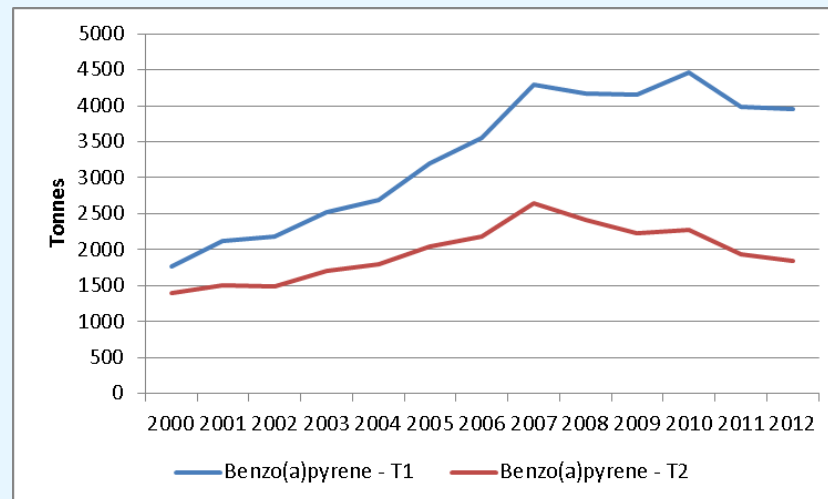
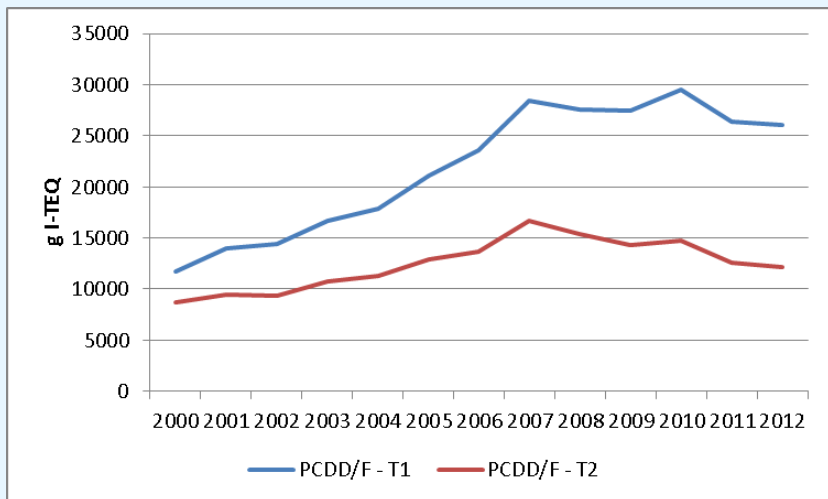
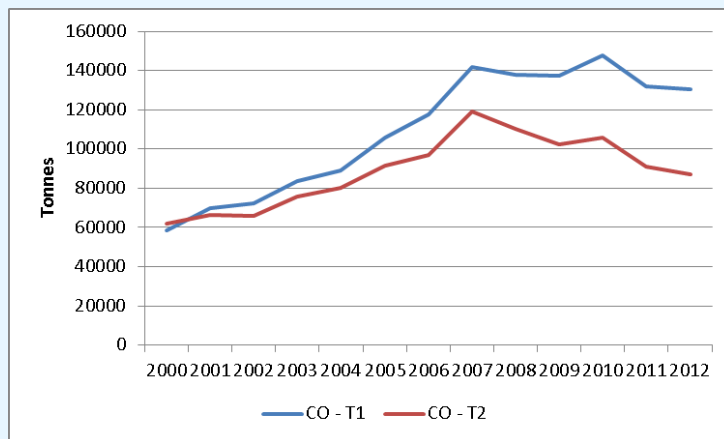
Comparison between Tier 1 and Tier 2

- › **Comparing the Danish methodology (Tier 2 using a mix of country specific and default EFs) for residential wood combustion shows the significant difference**





Comparison between Tier 1 and Tier 2





Conclusions (1)

- › **There are large benefits in accuracy by moving from a Tier 1 to a Tier 2 approach**
- › **Many countries have started to regulate emissions from small combustion appliances, which will only be reflected in the inventory when using a tier 2 approach**
- › **It can be difficult to acquire the necessary data to implement a Tier 2 approach**
 - › **Important with contact to stakeholders**
 - › **Surveys are in many cases the possible solution**



Conclusions (2)

- › **Important to correctly match national combustion technologies to GB EFs – alternatively use country-specific EFs**
- › **A lot of technological developments happening → frequent changes in EFs → requirement to continuously monitor new technologies penetrating the market and assign EFs accordingly**
- › **The EFs for solid fuels in the GB are not updated and should be used with caution if this is a major emission source**



Thank you for your attention