The Guidebook methodologies and challenges

Workshop on estimating emissions from small combustion and mobile machinery

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Outline

› Introduction

› The Guidebook (GB) methodologies
  › Activity data
    › Fuel use
    › Technology distribution
  › Emission factors
  › Problems and challenges

› Conclusions
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

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<td>1.9%</td>
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<td>Residential</td>
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<td>Total</td>
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<td>13.3%</td>
<td>11.4%</td>
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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