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Sectors and solutions – domestic solid-fuel heating

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Short to long term priorities and recommendations for domestic solid fuel air pollution reductions:

- Information and awareness raising campaigns addressing the public, politicians, municipalities etc. to foster behavioural changes and facilitate introduction of regulations (short timeframe; local and national governments, NGOs)

- Accelerating replacement of old stoves / boilers with lower / zero emission heating system (e.g. new stoves / boilers, district heating, solar, heat pumps) alongside insulation (medium to long-term; local and national governments)

- Introduce new ambitious legislation including emissions standards, mandatory regular inspection, instructions e.g. by chimney sweepers for proper operation etc. (medium timeframe; local and national governments, international bodies)

- Economic incentives (e.g. taxation of residential burning, public procurement) to reflect the polluter pays principle (medium timeframe; local, national government)

- Improvement of data basis to allow introducing cost effective measures and regulations (number, type, age, location of appliances, emission factors,….) (short timeframe / continuous work; national governments, international bodies)

Recommendations for UNECE Air Convention

- Develop a guidance document for proper operation of solid fuel stoves and boilers, replacement programs for old stoves and boilers, and further measures to reduce PM / BC emissions, especially economic instruments (UNECE Air Convention, TFTEI)

- Review and revise Table 12 of Annex X of the revised Gothenburg Protocol concerning emission limit values for new stoves by addressing testing protocols for BC and $PM_{2.5}$, and by reviewing and revising emission limit values, taking into account the development of BAT since 2012 (UNECE Air Convention, TFTEI)

- Guidance on undertaking voluntary performance labelling of new stoves using more stringent emission limit values under real life conditions for $PM_{2.5}$ and BC (UNECE Air Convention, TFTEI)

Background

The use of solid fuels for domestic heating and hot water in small combustion sources can cause high emissions of pollutants, such as fine particulate matter (PM_{10}, $PM_{2.5}$), Black Carbon (BC), SO_2, NOx, VOC and benzo(a)pyrene, with negative impacts on human health and the environment.

There is a long tradition of using solid fuels (coal and biomass) for heating in cold and moderate climate zones. However, in many countries, coal and wood as the main heat supply source have been gradually replaced by cleaner supplies for heat, including natural gas, district heating and electricity. Nevertheless, coal as well as wood still constitutes an important fuel for domestic heating in many areas, especially in rural regions. This is also due to social aspects in some countries whereas in some countries and especially cities stoves and fireplaces became increasingly popular for aesthetic reasons. In addition, some countries are actively promoting the use of biomass for heating as a climate policy measure to increase the share of renewable energy sources, which, however, neglect emissions of BC, an important short-lived climate forcer.

Overall, in 2005 biomass combustion in the residential sector accounted for 1.9% of total primary energy use in the EU-28, and coal combustion for 0.7%. Despite this small share in total energy consumption these sources caused 46% of total primary emissions of $PM_{2.5}$ in the EU-28 (biomass burning 36% and coal burning 10%), thereby outweighing emissions from the road transport by a factor of three. By 2030, the PRIMES 2016 REFERENCE scenario foresees for the EU-28 a 36% increase of biomass use in the household sector (inter alia due to enhanced renewable energy policies), while coal use is projected to decline by 42% (IIASA 2018)

In addition to these officially reported numbers there is an unknown amount of (illegal) waste burning in manual operated stoves, which might cause even more severe emissions of various pollutants.

Despite being such an important source for air pollution, the data quality for quantifying the emissions is rather weak compared to other sources such as traffic or industrial installations. This refers to almost all aspects relevant for emission calculations, i.e. the number, type and location of appliances, the types and amount of fuels and the emission factors. In addition, current taxation of fuels and heating systems do not account for their environmental impact.

Best practice examples are available throughout Europe of how to reduce the impact on air quality from domestic heating. Also, new technologies have been developed, which show considerably lower emissions compared to manually operated stoves, boilers and fireplaces. Nevertheless, these still emit much higher levels than low / zero emission sources such as district heating, geothermal energy or solar heating.

Conclusions

- Domestic solid-fuel heating is substantially contributing to air pollution on local and regional scales, and also has an impact on climate. It will remain so in future despite the overall sharp decline in energy related emissions.

- The domestic heating sector suffers from a low quality of data, which results in large uncertainties of the resulting emissions and the effectiveness of abatement measures.

- Climate policies are sometimes in contradiction to air quality problems; thus integrated strategies are required to tackle both environmental problems, taking into account the polluter pays principle.

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- A wide variety of emission abatement options, guide documents and best practice examples are readily available (see list of examples in the annex below).

Annex: Discussion on measures and instruments to reduce domestic solid-fuel heating emissions

Examples of readily available technical options

1. Replacement of open fireplaces and manual stoves with low / zero emission technologies after energy efficiency improvements (insulation, new windows,…)
2. Ban of specific types of fuels, specific types (most polluting) of stoves in specific geographic areas and / or for during specific periods
3. Mandatory regular inspection and chimney sweeping

Examples of readily available non-technical measures

1. Information campaigns for best practices in firing of existing stoves, boilers and fireplaces
2. Regulations for second hand stoves / boilers and their resale
3. Enforcement of (illegal) waste burning ban, illegal fuels
4. Guideline for strategic use of biomass
5. Support for replacing old stoves and boilers with low / zero emission technologies
6. Taxation of domestic heating, taking into account the polluter pays principle
7. Green public procurement (only BAT technology)

Examples of future work

1. Development of harmonized BC emission testing protocol
2. Improvement of the data basis