Estonian Environmental Research Centre

PMx and B(a)P reduction plans from the RWC sector

M. Maasikmets¹,⁴, H. Keernik¹,²,³, E. Teinemaa¹, H-L. Kupri¹,³

¹Estonian Environmental Research Centre;
²Tartu Observatory;
³Tallinn University of Technology;
⁴Estonian University of Life Sciences.
Emissions from the RWC

- About 2/3 of total PM, POP and PAH emission in Estonia is attributed to residential wood combustion (RWC)
- In order to reduce GHG emissions the use of biomass in energy production has been favored, which in turn has led to elevated PM, POP and PAH levels from the biomass burning
Wood logs and wood chips account >90% of the fuel used for residential heating.

Typical masonry heaters (hand made) are used in >50% of Estonia's residential households.

Majority of households are still equipped with old type batch fuelled masonry heaters.

In addition to wood, people also tend to burn packaging waste in their stoves, which influences local air quality and can harm the technical condition of the stove and chimney.

Emissions from the RWC
Source apportionment

- In Tartu (2nd largest town) the levels of PM2.5 have been constantly high during cold season and B(a)P levels are in cold season above 1 ng/m³.
- In residential areas and near traffic roads, highest PMx concentrations have been measured.
- Are there additional sources beside traffic and residential heating?
- In order to plan reduction measures, the overview about the contribution of different sources is needed.

PM chemical speciation and source apportionment were used.

Photo by Jaak Nilson
Sampling sites and main sources

- Data from construction (heated area in m² and heating system) and cadastral (cadastral coordinates) registry was used.
- Typical energy consumption in Estonian residential houses is 200-300 kWh/m²
PMF analysis using ACSM dataset

BBOA ~ 5 – 20%
SOA ~ 63 – 82%
B(a)P in RWC area

- Temperature, °C
- B(a)P µg/m³
- Yearly limit value

54th WGSR, Geneva
B(a)P vs BC_{wb}

BC_{wb}, \mu g/m^3

B(a)P, ng/m^3

- BC_{wb}
- B(a)P
- B(a)P yearly limit value

r^2 = 0.88
Plastic burning tracers

Significant correlation between:
- TA and BC_wb $R^2 = 497^{**}$
- TEMP and BC_wb $R^2 = 332^{**}$
- TEMP and TA $R^2 = 184^*$

** correlation is significant at the 0.01 level (2-tailed)
* correlation is significant at the 0.05 level (2-tailed)
Further steps

- Action plan is currently under preparation and negotiations with local municipality are taking place
  - Lack of experience
- PMx and B(a)P reduction from the residential sector is not an easy task
  - People are very sensitive about this topic
  - Guidance documents about the cost-effective reduction measures are missing - so far project based approach has been used
Further steps

- Emission reduction from the RWC sector can not be achieved **only** by replacing the old heaters with the new ones
  - The key factor is the end-user
  - Household insulation
- Continuous awareness raising campaigns (incl. chimney sweepers), about the proper wood usage in heaters, have to be conducted
- People like masonry heaters better than factory made heaters
  - Certification of potters and chimney sweepers according to the environmental standards?
Conclusions

- Elevated levels of PMx and B(a)P are mainly related to the local emissions from the residential heating
  - Nevertheless the share of the regional pollution can be remarkable
- 5 main factors were identified
- So far emission reduction from the RWC sector is using project based approach – there are no established guidance documents
- Closer and coordinated co-operation with UNECE countries could take place
Thank you for your attention!
marek.maasikmets@klab.ee