

# Residential wood burning: Particle pollution and solutions

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## Background

Residential wood burning is a dominating source of emissions of fine particles and black carbon in many European countries and in the EU as a whole. However, emissions and ambient air concentration (indoor and outdoor) of ultrafine particles from residential wood burning have not been investigated in details. Even though much new research suggests that these particles probably cause significant health effects and should be regulated by specific air quality limits.

## Purpose

The purpose of this study was to measure pollution with ultrafine particles from residential wood burning.

## Methods

Particles from residential wood burning were measured with ultrafine particle devices (P-Trak model 8525 Ultrafine Particle Counter). Particle size interval was 20-1,000 nm and measured in number of particles per cm<sup>3</sup>. Thereby the interval includes as well particles larger than 100 nm not considered as ultrafine. However, since far the majority of the measured particles are believed to be in the ultrafine size interval (< 100 nm), we refer to the particles measured in this study as ultrafine. One particle measurement was taken per second but minute averages were used in data treatment. Wind speed, humidity and temperature were measured outdoor with a WindMate-300.

Three types of measurements were conducted:

- 1) Emissions directly from the chimney.
- 2) Outdoor air quality in areas with smell of wood smoke.
- 3) Indoor air quality in houses with active wood stoves.

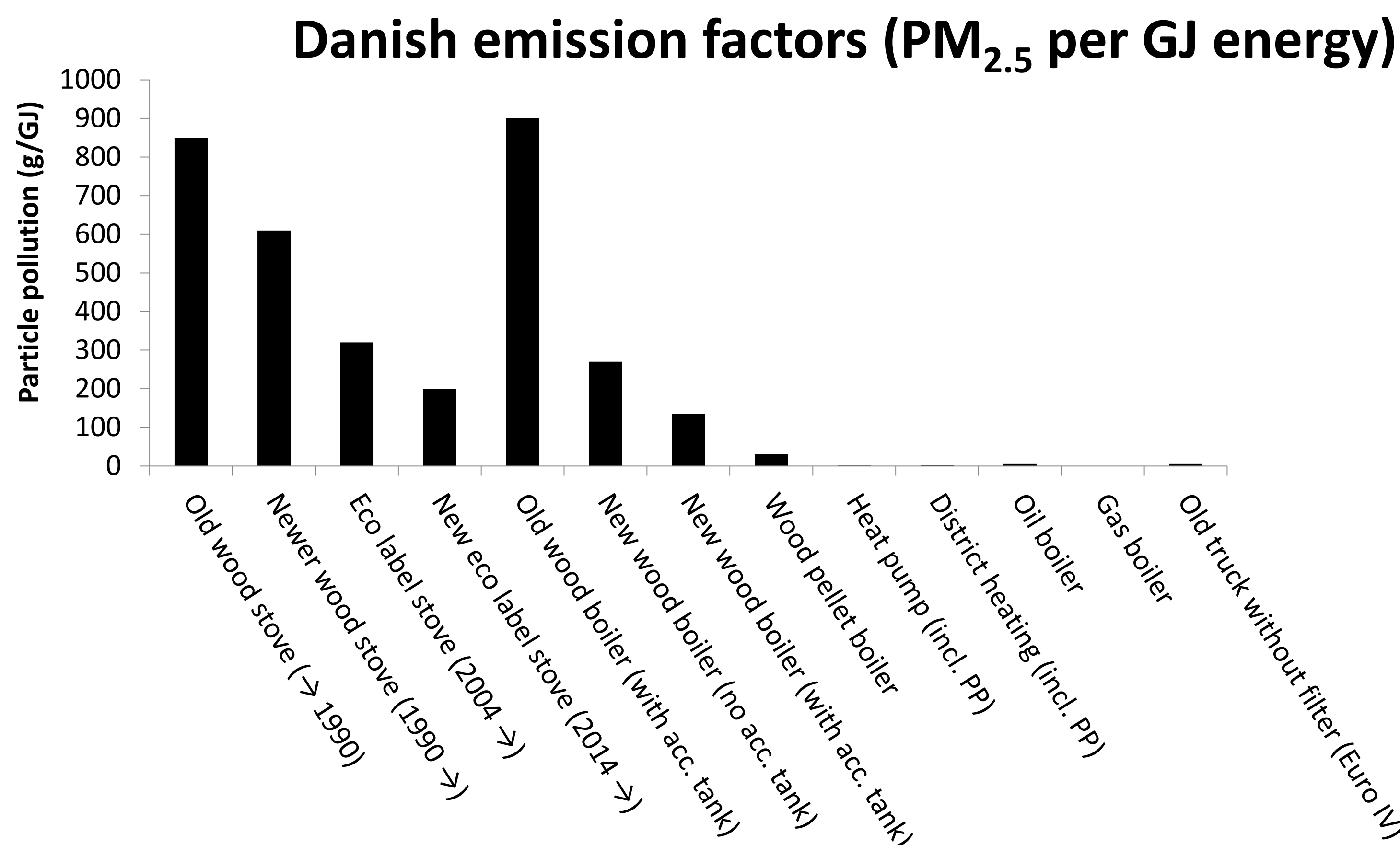
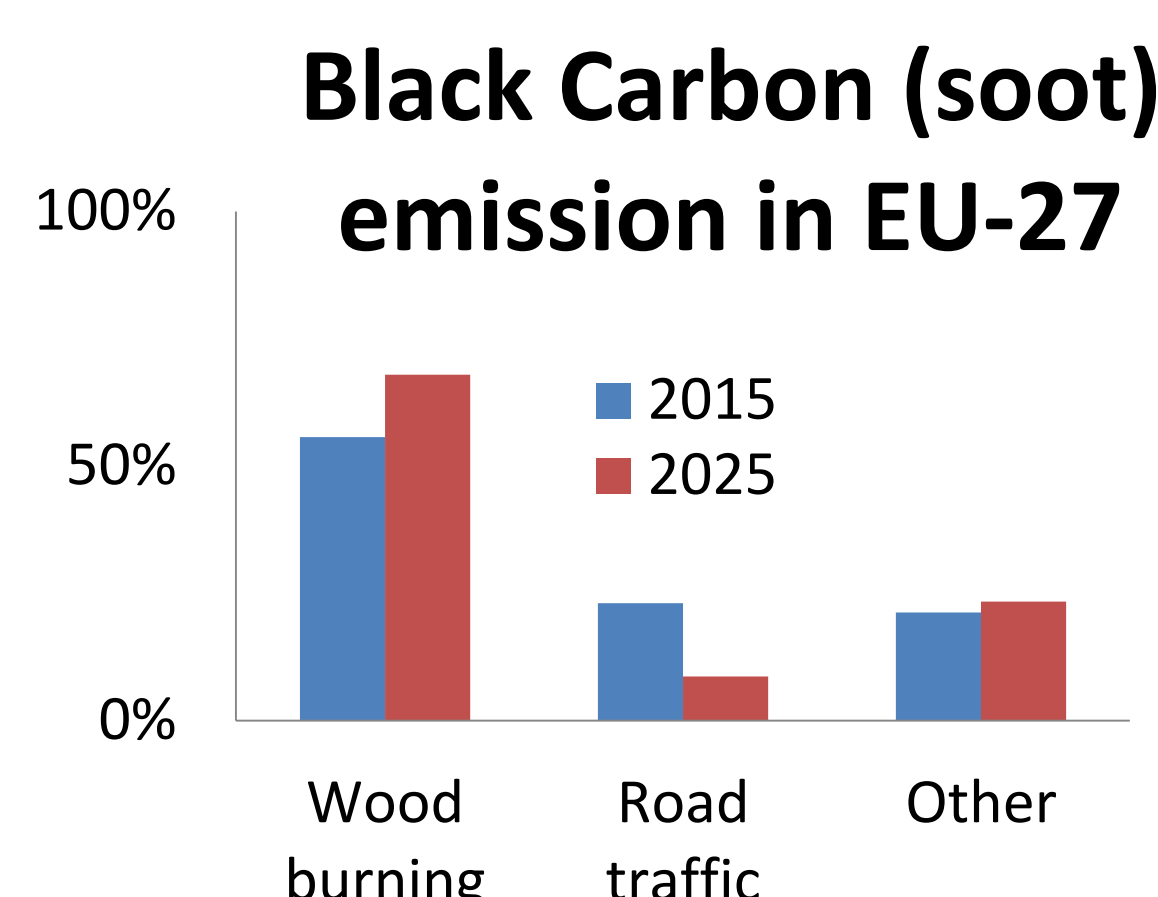
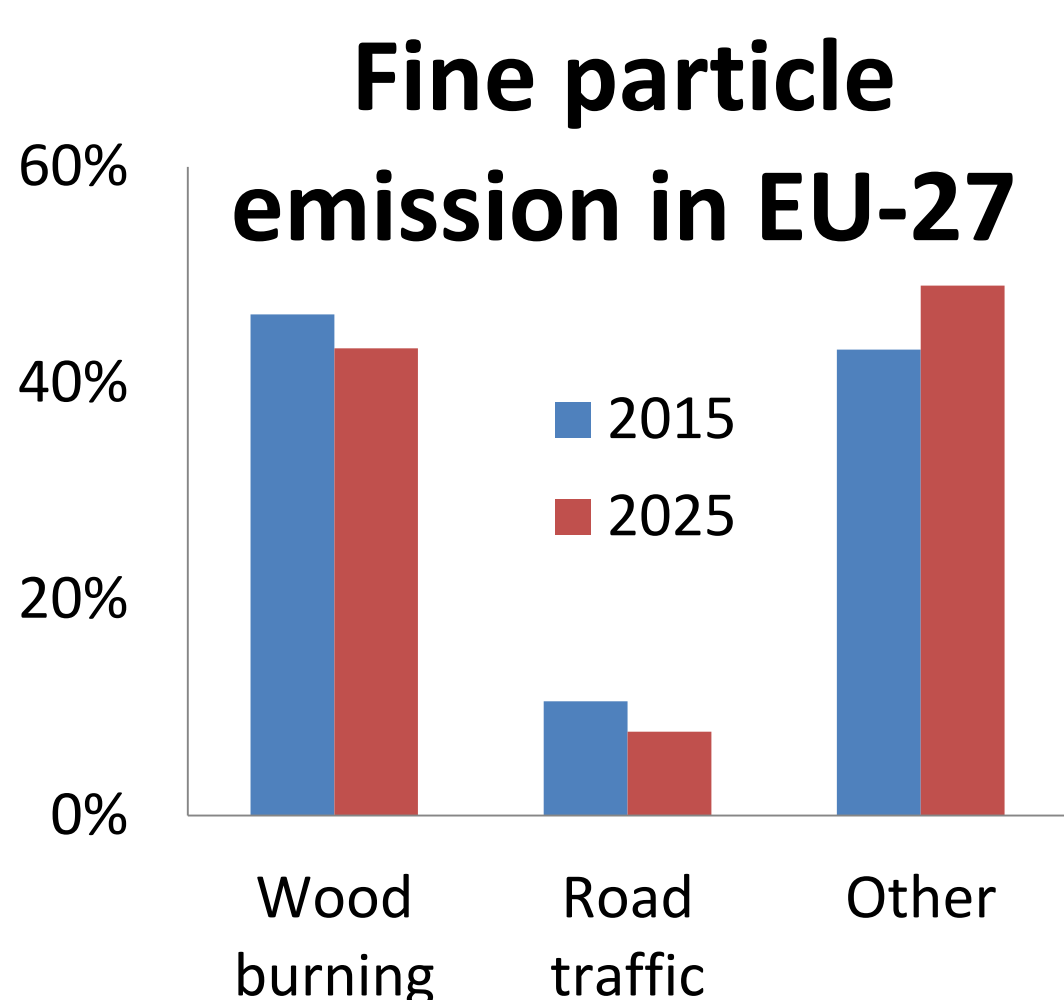
## Results

The emission measurements show that chimneys without any visible smoke connected to a new eco-labelled stove emit high levels of ultrafine particles even during optimal stove operation. The outdoor measurements show that the level of ultrafine particles from wood burning can be up to 50 times higher in residential areas with smell of wood smoke compared to spots in the same areas without the smell of wood smoke. The indoor measurements show that use of wood stoves can cause high indoor air pollution with ultrafine particles. Furthermore, indoor air in houses without stoves can be polluted with ultrafine particles from wood burning in outdoor air when opening windows.

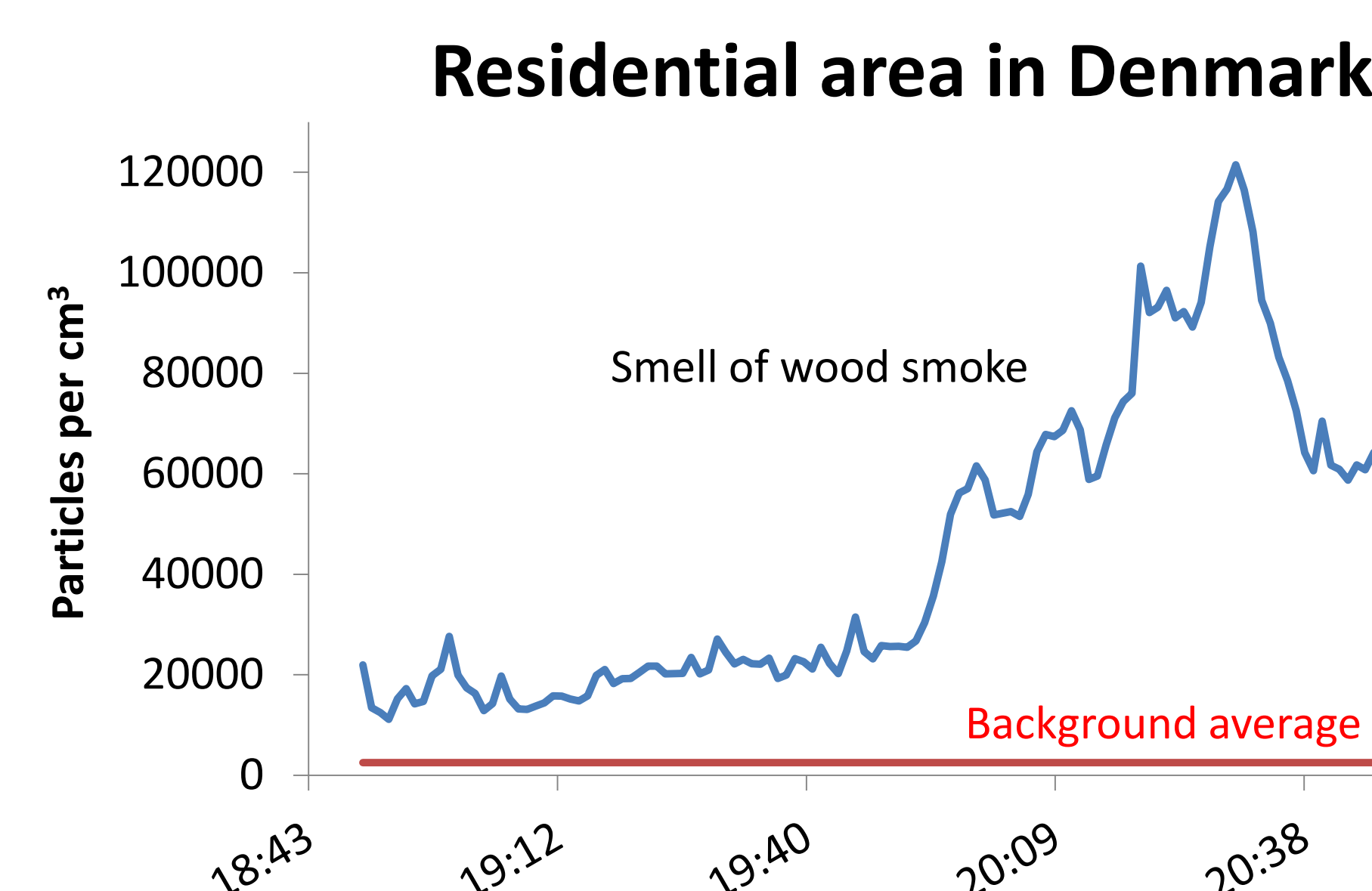
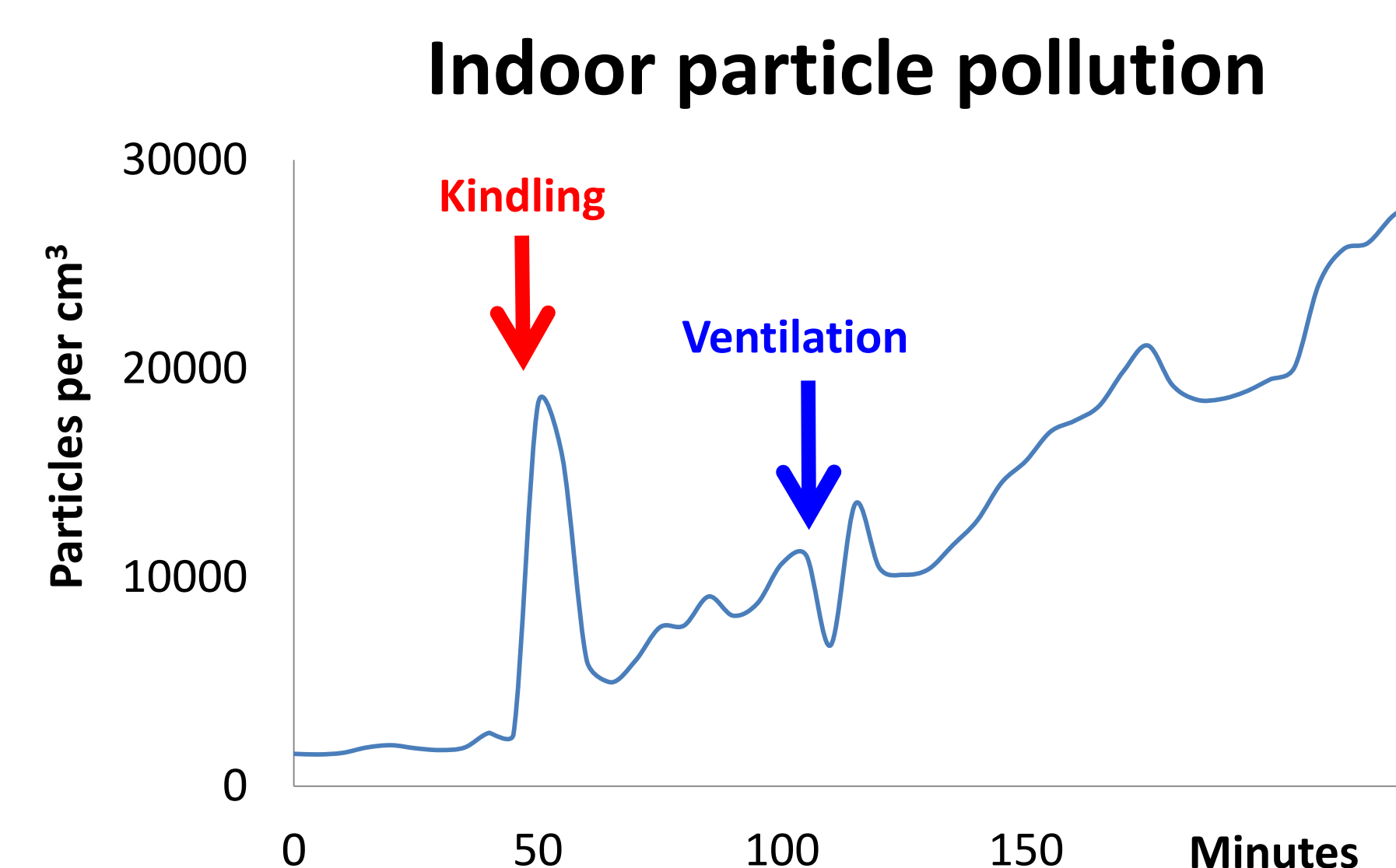
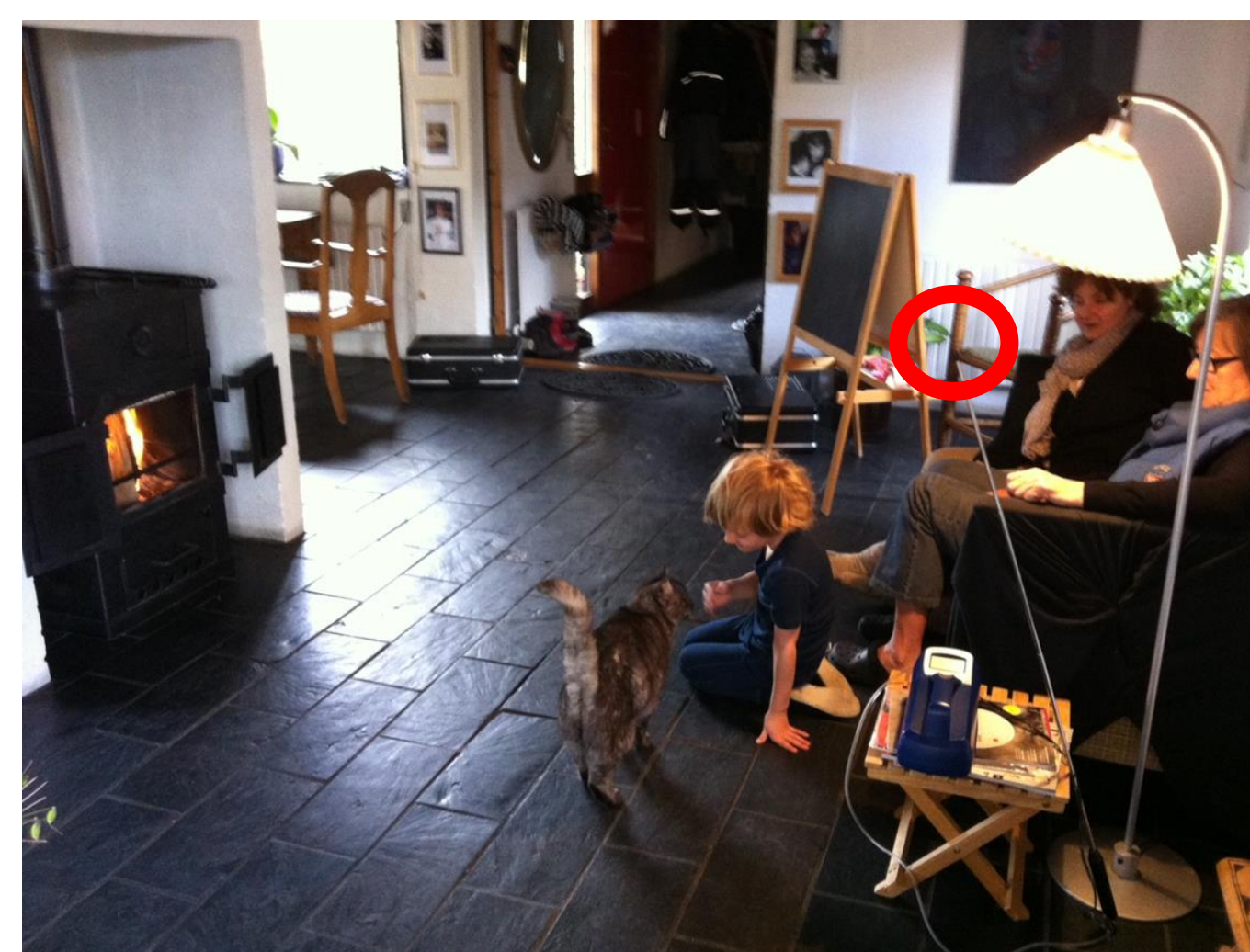
## Conclusion

Wood stoves are significant sources of pollution of outdoor and indoor air with ultrafine particles in many residential areas. Pollution from wood burning should be reduced by taxation, bans, filters, better stoves and general public information about optimal stove management, insulation and cleaner heat sources.

## Funders:



Even new low-emission stove under optimal operation pollutes above the upper detection limit (500,000 part/cm<sup>3</sup>)



## Further info:

Clean Heat web side: [www.clean-heat.eu](http://www.clean-heat.eu)

Danish Ecological Council: [www.ecocouncil.dk](http://www.ecocouncil.dk)

Deutsche Umwelthilfe: [www.duh.de](http://www.duh.de)

Climate Works Foundation: [www.climateworks.org](http://www.climateworks.org)

LIFE program of the European Union: <http://ec.europa.eu/environment/life/>

## Main author:

Kaare Press-Kristensen holds a master degree and a Ph.D. degree in environmental engineering from the Technical University of Denmark. His work is mainly focused on measurements of ultrafine particles from wood burning, road traffic, ships, aircrafts, non-road mobile machinery etc. His work considers emissions and ambient air concentrations and the connected risk to public health and work related exposure.

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