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Pollution and solutions for Residential burning

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Winter in Copenhagen, DK

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Pollution in Copenhagen

- Just 16,000 wood stoves in Copenhagen (600,000 inhabitants) emit as much fine particles pollution in one winter as all traffic emit within ONE YEAR.
- Wood burning only covers 0.5 % of the energy consumption but emit 30 % of the fine particles.
- By replacing wood burning with district heating the emission of fine particles in

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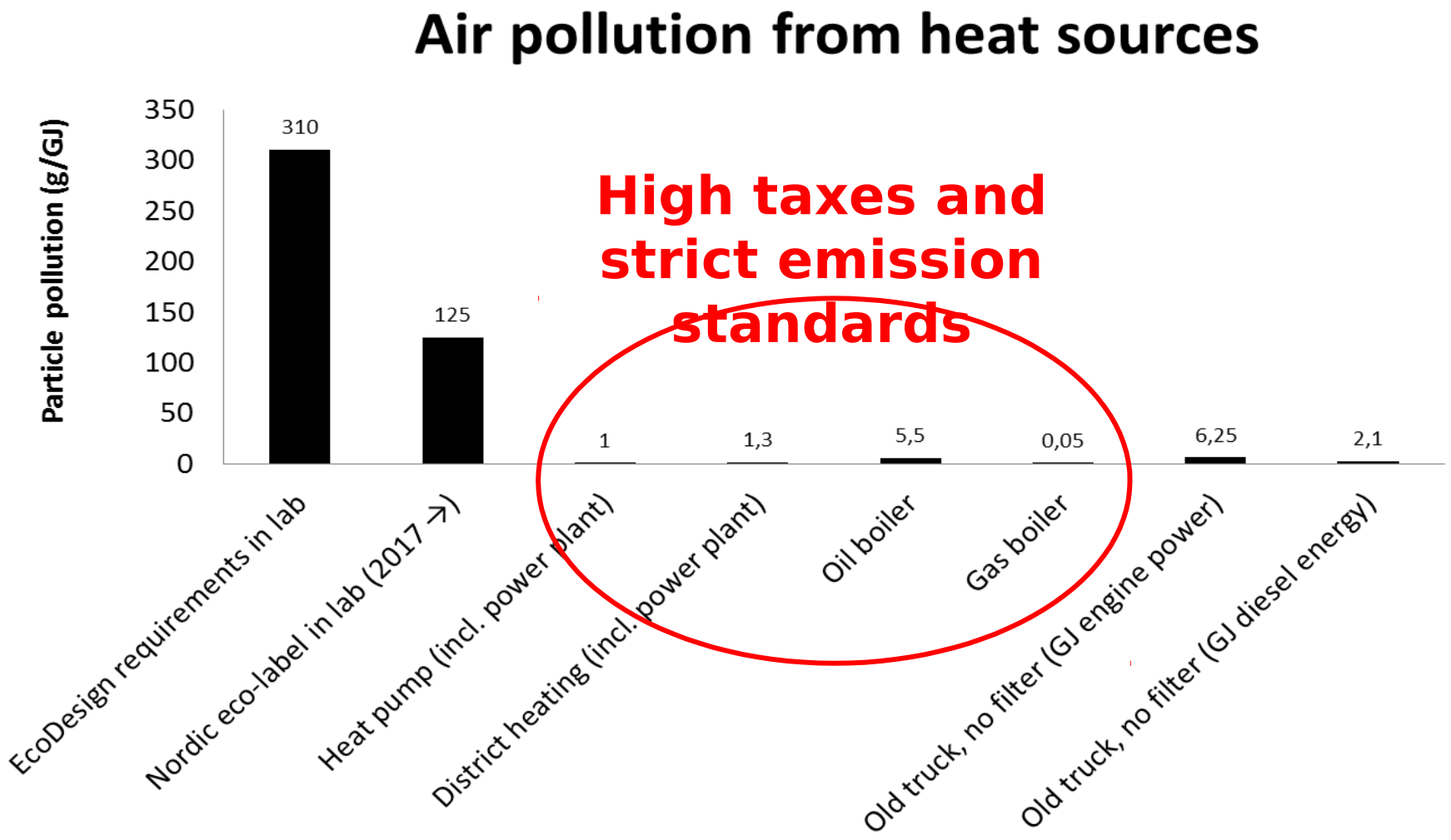
Emission factors



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Residential burning in EU

- Mainly wood (75%) burned in small stoves/boilers.
- Key source to outdoor/indoor air pollution with Black Carbon (BC, soot), $PM_{2.5}$, PAHs, VOCs and dioxins.
- Contribute significantly to premature mortality and morbidity as well as to climate change (BC).

  Health: woodsmokepollution.org/health-

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Problem in most EU states

		2015				2030			
		Fine particles		Black carbon		Fine particles		Black carbon	
		Ton	%	Ton	%	Ton	%	Ton	%
EU 27	Residential burning	654000	46%	152290	56%	454880	41%	111380	69%
	Road transport	149500	11%	63710	23%	95040	8%	10210	6%
	Other sources	608280	43%	57100	21%	566200	51%	39990	25%
Austria	Residential burning	6670	39%	2430	55%	4530	34%	1690	76%
	Road transport	3130	18%	1290	30%	2160	16%	160	7%
	Other sources	7290	43%	660	15%	6770	50%	380	17%
Belgium	Residential burning	17580	49%	2690	47%	15810	50%	2590	76%
	Road transport	3780	11%	1960	35%	1700	5%	190	6%
	Other sources	14430	40%	1030	18%	14100	45%	600	18%
Denmark	Residential burning	15610	67%	2000	54%	7060	55%	1070	67%
	Road transport	1620	7%	750	21%	930	7%	110	7%
	Other sources	6120	26%	920	25%	4890	38%	410	26%
France	Residential burning	89250	48%	26740	57%	44250	35%	15430	74%
	Road transport	27350	15%	12990	27%	15990	13%	970	5%
	Other sources	70070	37%	7390	16%	66270	52%	4290	21%
Germany	Residential burning	26860	26%	8240	44%	20870	26%	6620	67%
	Road transport	16700	16%	5790	31%	11820	14%	1070	11%
	Other sources	59450	58%	4690	25%	49290	60%	2240	22%
Hungary	Residential burning	16350	59%	2700	62%	10730	53%	1900	79%
	Road transport	2370	8%	1020	24%	1210	6%	150	6%
	Other sources	9130	33%	610	14%	8270	41%	370	15%
Poland	Residential burning	194770	79%	46040	86%	146830	76%	35080	93%
	Road transport	9570	4%	4460	8%	6090	3%	1020	3%
	Other sources	42900	17%	3060	6%	41660	21%	1550	4%

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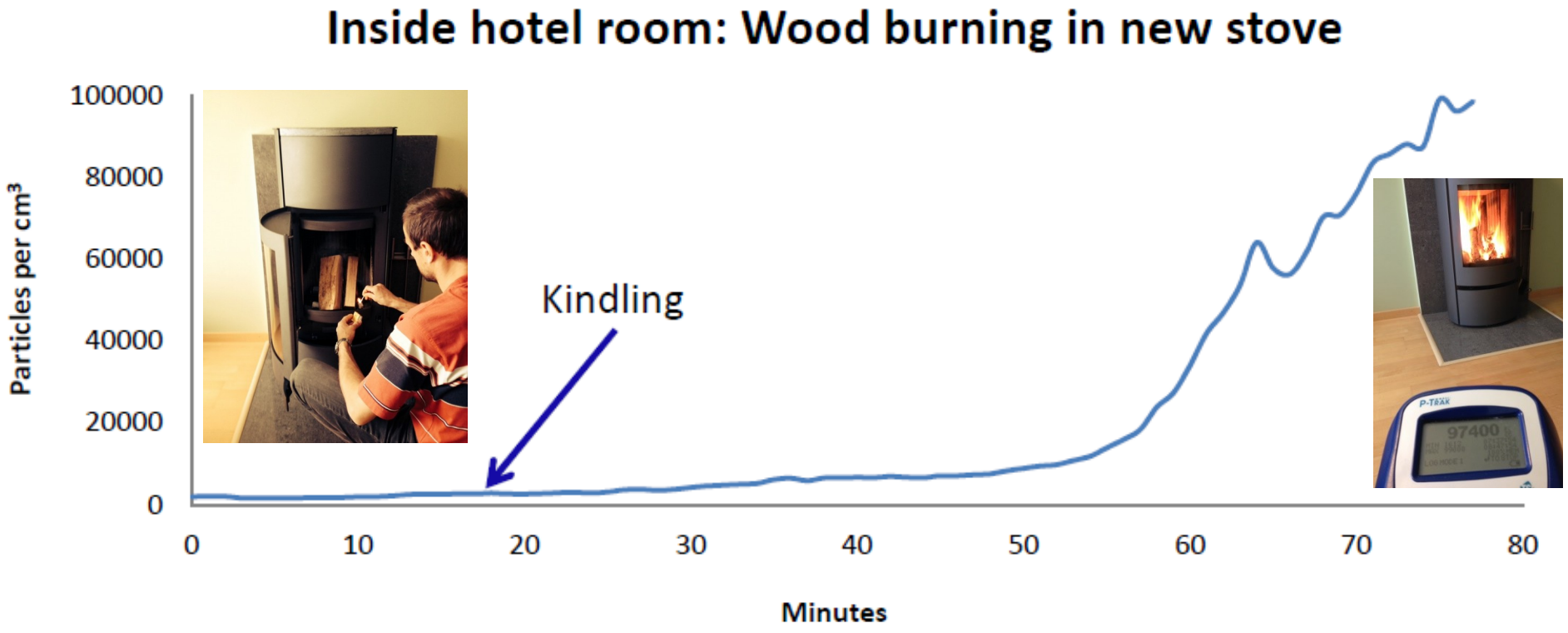
Indoor air pollution:
New stoves in Slovakia



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Indoor air pollution: Traditional stoves in Slovakia

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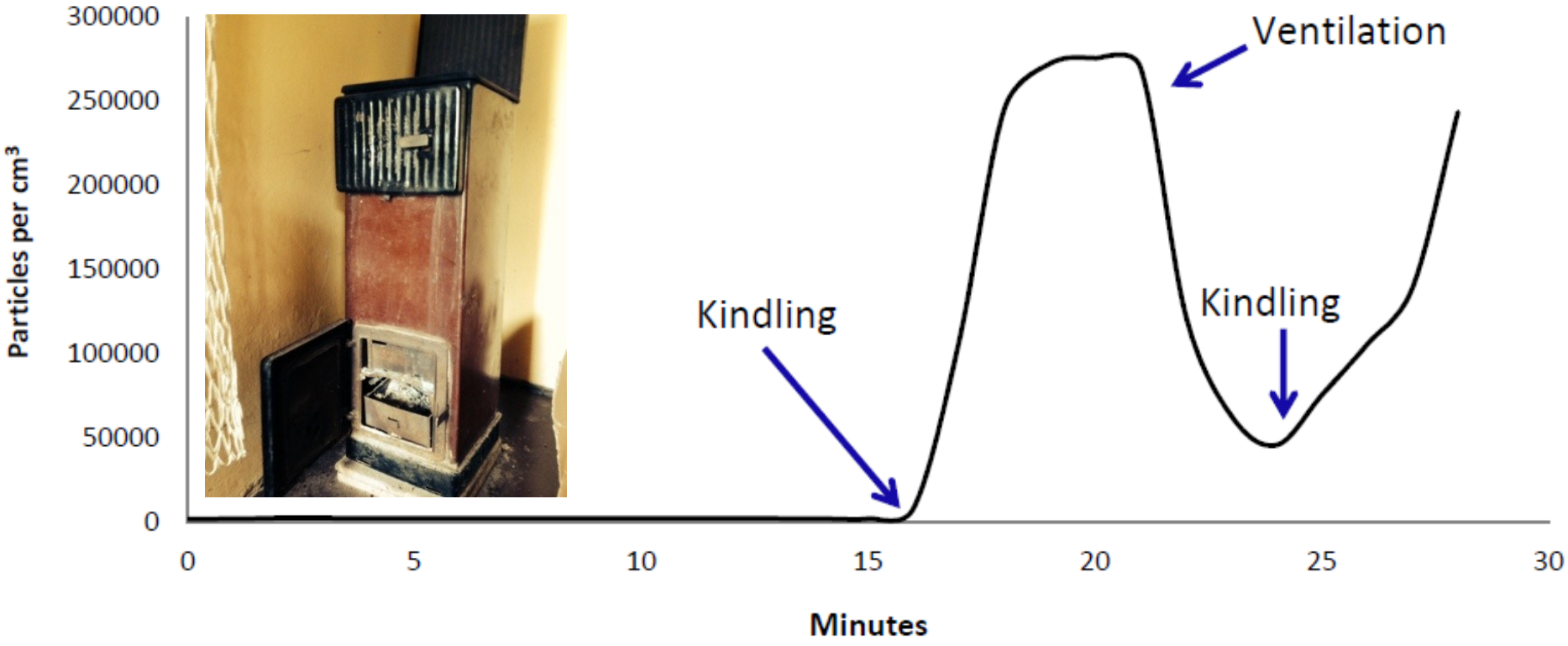
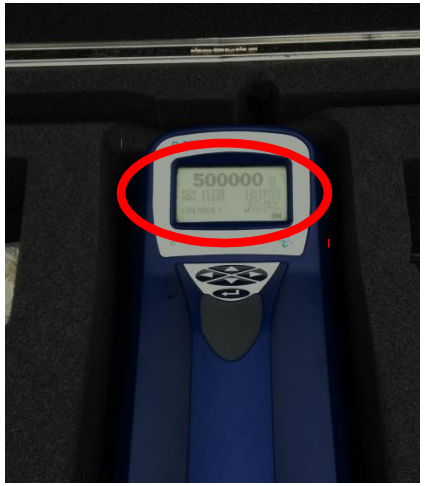
Inside garden house: Wood burning in old stove



High emissions:
New stoves vs. new trucks



Top: Before stove measurements.

Below: After 1 h measurements.

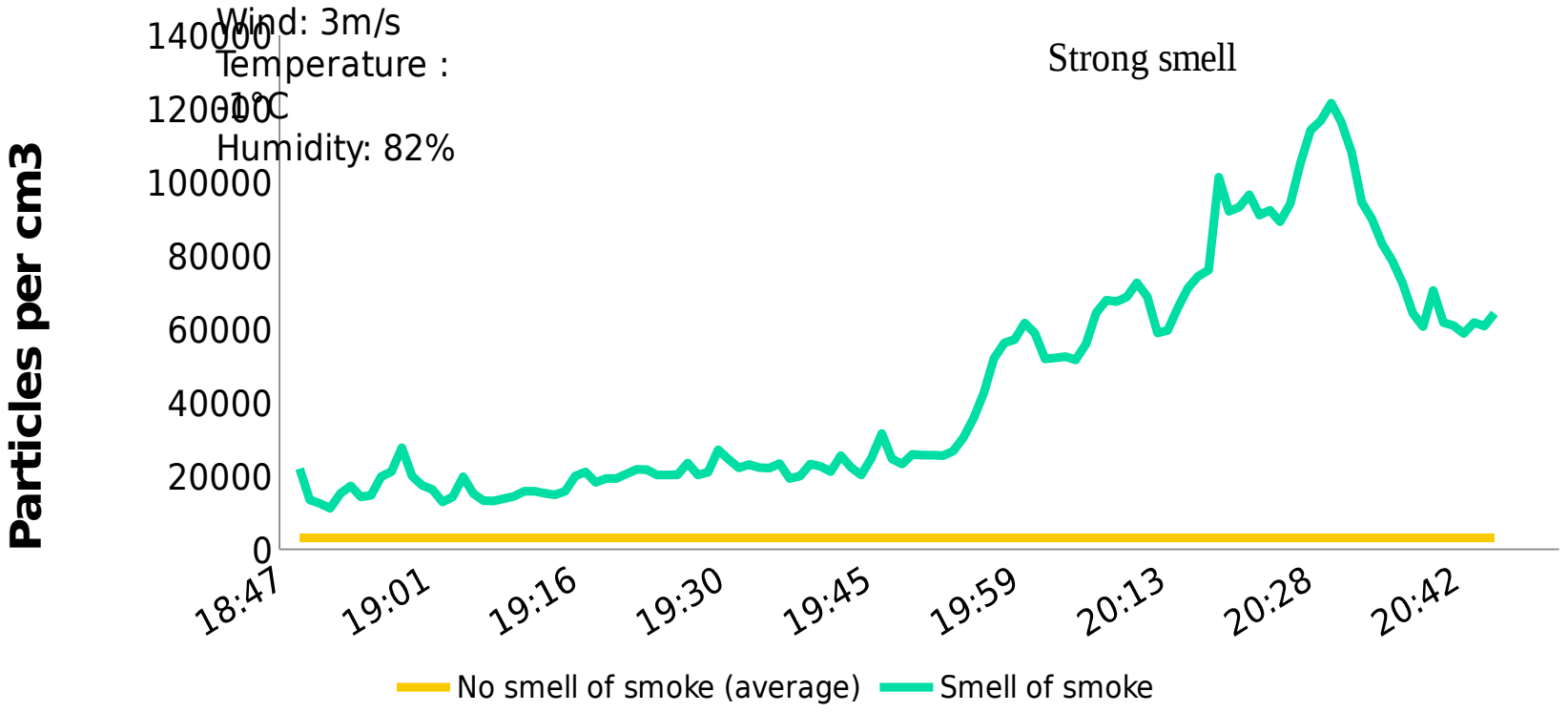
Conclusion:

New low-emission stoves cause much higher emissions (above 500.000 part/cm³) than new trucks with particulate filters

Outdoor air pollution

High residential pollution

Pollution in Engly society in Copenhagen



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What about the climate …

- Wood burning often replaces insulation or is done to create an cosy atmosphere No CO_2 benefit.
- If the same wood is used to replace coal at power plants the CO_2 benefit is much larger.
- Soot particles have a GWP of 900 (100 years) to 3.200 (20 years) eliminating the CO_2-benefit.

Technical solutions in the EU

- Better insulation
- Heat pumps
- District heating
- Wood pellet stoves/boilers
- New two-chamber stoves
- Electric fireplaces/Gas stoves

Reduction potential > 90%

(Air pollution control technology: Filters, etc. ?)

The solutions are ready – but not

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What should be done ?

- Strict emission limit values for new stoves/boilers.
- Financial instruments to promote:
  - Alternatives to residential burning.
  - Replacement of old stoves/boilers.
  - Filter installations, catalytic converters, etc.
- Laws to ban burning (cities) / promote alternatives.
- Much more information on health/climate

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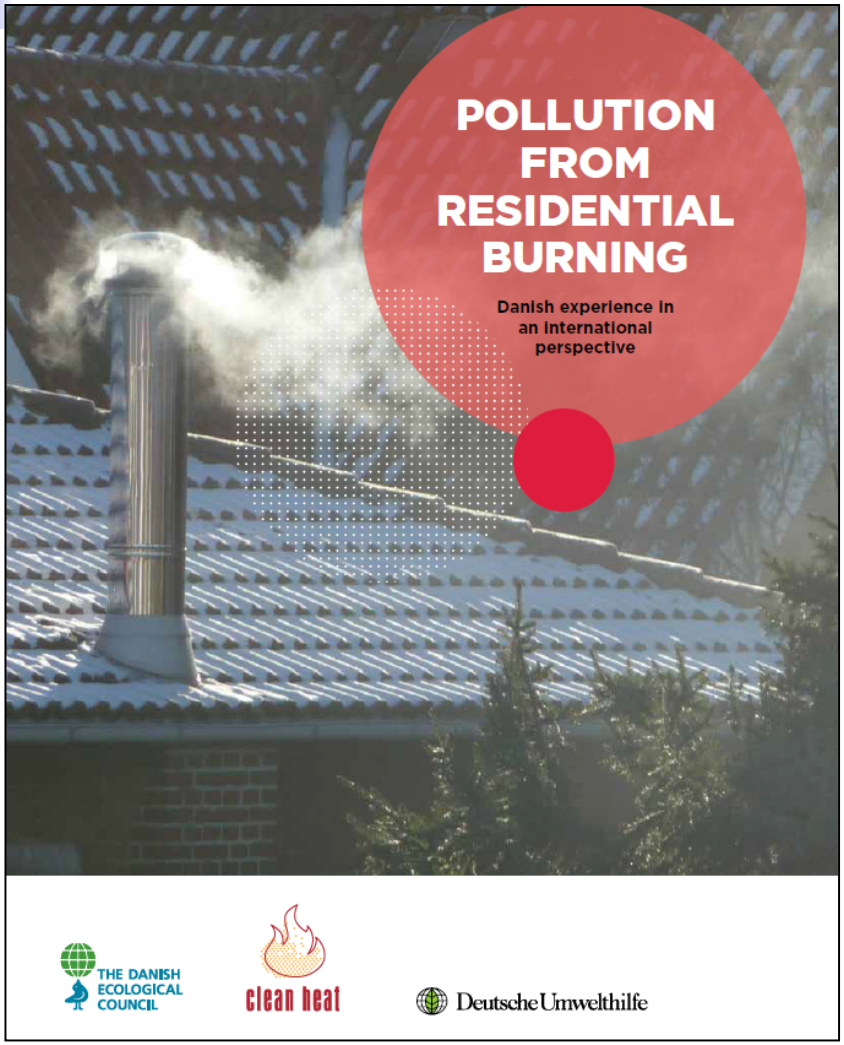
Publication and project



Project ***Clean Heat*** is supported by the LIFE program of the European Union.

www.clean-heat.eu

Project leaders:

Deutsche Umwelthilfe

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Questions