Energy poverty - possible solutions

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What’s worse than being poor?

• Being poor and sick … or poor with sick children …

• Indoor and outdoor air pollution from wood/coal stoves make people and their children sick … this maintains their poverty and bad life quality.

• Energy poverty is not just about staying warm in the winter … it is about staying warm without getting sick.
Hungary ...
Slovakia …
Clean air - daytime ↔ polluted at night

Day: No wood burning
Evening: Wood burning

3-4,000: Rather clean air
More than 50,000: Very polluted air

Air pollution from wood burning is a huge health issue
New stoves (EU Ecodesign from 2022)

Conclusion:
New low-emission stoves cause much higher emissions (above 500,000 part./cm³) than new trucks with particulate filters (below 1,000 part./cm³).

Top: Before stove measurements.
Below: After 1h measurements.
High particle emission from new stoves

Particle emission (g PM$_{2.5}$ per GJ house heating)

- Residential heat pump: 0.7
- Electric heating: 2.1
- Hydrogen boiler: 2.9
- Natural gas boiler: 0.1
- Oil boiler: 6.9
- New wood pellet boiler: 60.8
- New Ecodesign wood stove: 310
- District heating, heat pumps: 0.8
- District heating, hydrogen: 3.5
- District heating, oil: 3.1
- District heating, gas: 0.1
- District heating, coal: 6.3
- District heating, wood: 12.5
A simple calculation

• A new wood stove fulfilling the EU EcoDesign regulation will (ideally) emit around 5 g PM$_{2.5}$ pr. kg wood burned.

• The new WHO guideline is 5 microgram PM$_{2.5}$ per m$^3$.

• Burning 1 kg of wood will pollute (at least) 1,000,000 m$^3$ of completely clean air to the air quality guideline
  – An area of air covering 100,000m$^2$ up to 10m height!

• How polluted are residential areas in Bulgaria?
Outdoor air becomes indoor air

• Air inside older houses are replaced several times per hour with … outdoor air …

• If outdoor air is polluted with toxic smoke from wood and coal burning … indoor air gets polluted.

• Furthermore, wood/coal stoves can emit significant amounts of toxic particle pollution directly to the indoor environment … this pollution can spread to the entire house (unless doors are are closed).
Indoor air pollution (Slovakia): Old stove

Inside garden house: Wood burning in old stove

Particles per cm³

Ventilation

Kindling

Minutes

0 5 10 15 20 25 30
Indoor air pollution (Slovakia): New stove

Inside hotel room: Wood burning in new stove

Particles per cm³

Minutes

Kindling
Indoor air pollution (Denmark)

Indoor air pollution from wood stoves

Ultrafine particles per cm³

- Eco-label stove I
- Eco-label stove II
- Older stove
- Avg. of most polluted street in DK (rush hour)

Time (Minutes)

Ignition

Firewood added
Solutions

• Financial support for better insulation.
• Affordable district heating in cities.
• Financial support for heat pumps outside cities.
• Financial instruments to get rid of stoves/boilers.
• Laws to ban stoves/boilers in district heating areas.
• MORE information on adverse health effects.

… This will make people less sick reducing poverty, and benefit both the population and society.
More information

Free publications: https://rgo.dk/frontpage-english/air-pollution/

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www.clean-heat.eu
Questions

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