



IEA Bioenergy
Technology Collaboration Programme

IEA Bioenergy

Task 32

Strategies for reducing the impact on air quality from residential wood combustion



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Expert round table discussion on “Strategies for Reducing Air Pollutants from Wood Combustion in Stressed Regions”
Fairbanks, Oct. 5th, 2023

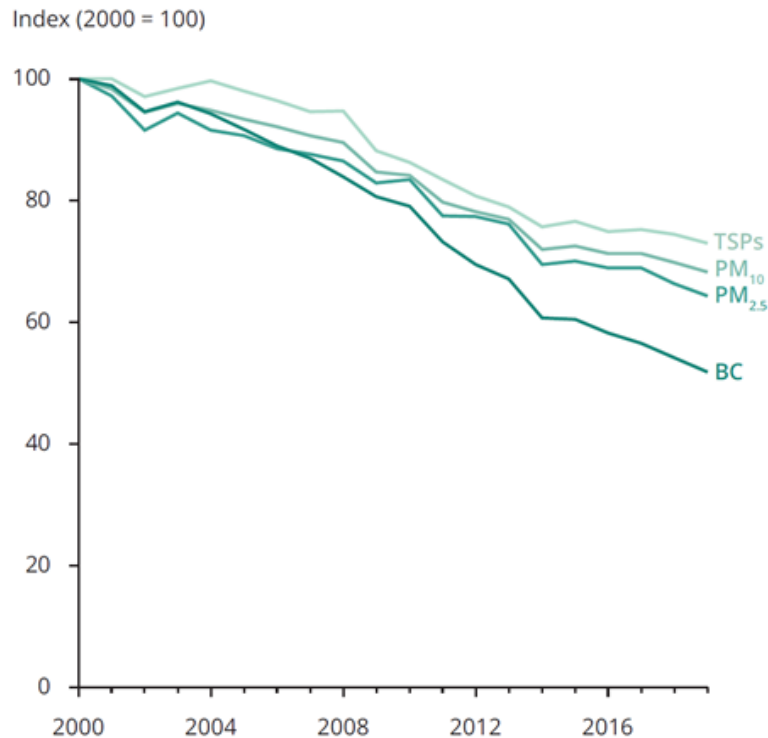
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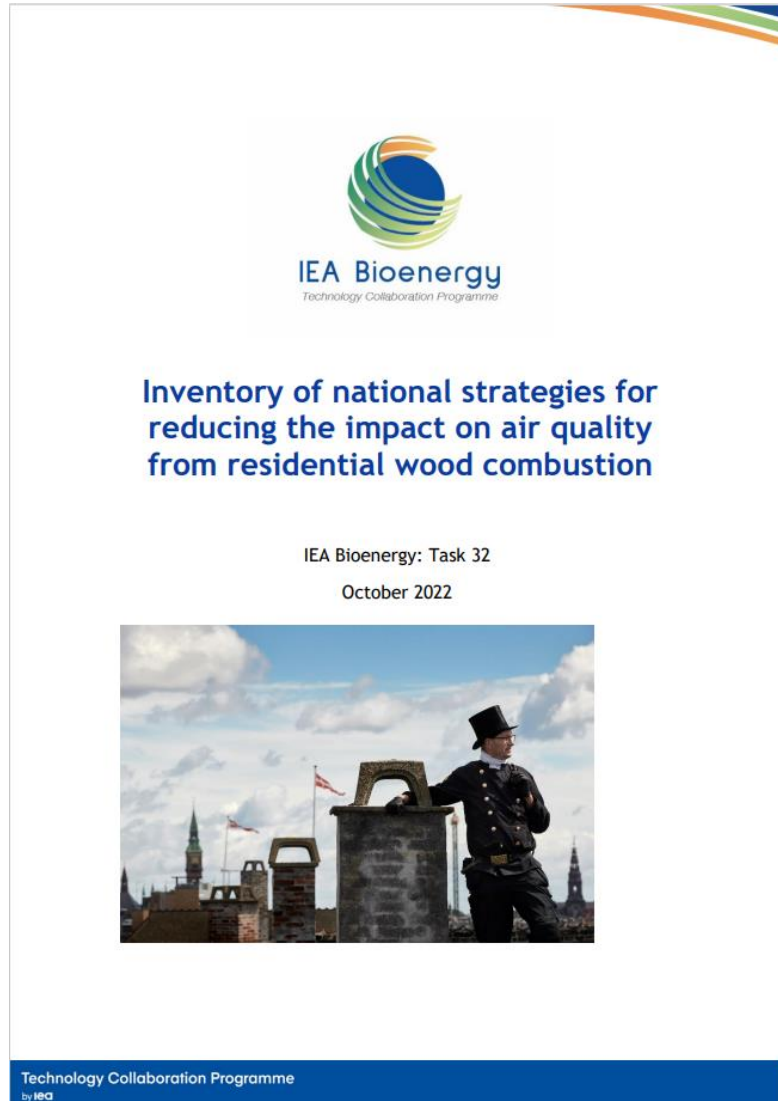
by IEA

Background: PM emission trend (in Europe)

Particulate Matter(PM)-Emissions



Recent report by IEA Bioenergy



https://task32.ieabioenergy.com/wp-content/uploads/sites/24/2022/10/NationalStrategies_Report-final.pdf

Goals and scope

- To learn from approaches concerning emission reduction strategies in the field of wood combustion in IEA-member countries
- Provide an inventory of possible measures
- To compile a report on national approaches.
Countries involved: Austria, Canada, Switzerland, Germany, Denmark, Italy, The Netherlands, Norway, Sweden
- *Scope:* Residential heating
- *Target group:* decision makers and experts involved in emission abatement from wood combustion

It was not the goal to assess the actual effectiveness of the measures!

The 15 areas looked at in the study

- Replacement strategies and expiration dates for appliances
- Regional bans for biomass fuels
- Tightening of general emission limits for biomass combustion
- Public financial support schemes
- Other indirect regulatory measures (taxes, fees, building standards...)
- Inspections of boilers, stoves, fuel or ash
- Forced shutdown of appliances
- Impact through regulations for chimneys
- Particle precipitation devices in residential sector
- Catalyst application in residential sectors
- Fuel certificates or labels
- Stove or boiler certificates or labels
- Specific information campaigns on clean use of wood fuels
- Activities of fuel-, stove- and boiler industry towards lower emissions
- R&D activities

Replacement strategies

“Is there any regional or national replacement schedule of older wood stoves or wood boilers, or does their permission expire at a fixed date or age?”

Country	AT	CD	CH	DE	DK	IT	NL	NO	SE
Reply	no	yes*	no	yes	yes	yes	no	no	no

* Frequently combined with incentives

Example from Italy:

Expiration dates: In the 4 regions which have signed the “Po basin agreement”, two deadlines were effective:

from 15.10.2018:

- only appliances with more than “2 Stars” can continue to be in operation,
- only appliances with more than “3 Stars” can be installed,

from 01.01.2020:

- only appl. with more than “3 Stars” can continue to be in operation,
- only appl. with more than “4 Stars” can be installed.

Replacement strategies (2)

Further examples:

CD: The City of Vancouver restricts the use of unregistered appliances in most urban areas of the region after 2025. They need to meet emissions criteria (By-law 1303) to become eligible for registration.

DE: There is an obligation for stove replacement if recently tightened emission limits are not met, this applies to stoves that are older than 1975, 1985, 1995 and 2010 (to be replaced by in 2014, 2017, 2020 and 2024, respectively).

DK: The replacement is triggered by the change of ownership plus the fact that a stove was built before 2003.

Tightening of emission limits

“Was there a tightening of emission limits for biomass burning appliances since 2010?”

Country	AT	CD	CH	DE	DK	IT	NL	NO	SE
Reply	yes	yes	yes	yes	yes	yes	yes	yes	yes

Example from Switzerland:

Emission limit values for placing space heaters on the Swiss market (at 13 % O₂)

	OAPC-Appendix 4 [14] (until Dec. 2021)		European Ecodesign Directive 2009/125/EG (from Jan. 2022)	
	CO [mg/m ³]	TPM [mg/m ³]	CO [mg/m ³]	TPM [mg/m ³]
Residential cookers	3,000	90	1,500	120
Central heating cookers	3,000	120	1,500	120
Fire places	1,500	75	1,500	40
Pellet space heaters	500	40	300	20
Storage heaters	1,500	75	1,500	40

Inspection of appliances

Preceding chapter-question:

“Does a system of regular on-site inspections for wood combustion appliances exist?”

Country	AT	CD	CH	DE	DK	IT	NL	NO	SE
for wood stoves	yes	yes*	yes	yes	yes	yes	no	yes	yes**
for wood boilers	yes	yes*	yes	yes	yes	yes	no	yes	yes**

*not on regular basis **only for safety issues

Example from Germany:

- ✓ Regular stove inspections performed by the “authorized chimney sweep of the district”: 2 times in 7 years
- ✓ This includes: safety issues, technical stage of stove, conformity rules, fuel moisture measurements, etc.
- ✓ Boiler inspections (≥ 4 kW) include on-site CO- and TPM-measurements every 2 years
- ✓ Inspection rules and owner instructions follow purpose-created National Standards
- ✓ There are 5 different approved flue gas inspection devices available for chimney sweepers.



Portable PM emission measurement:
Afriso STM 225, Wöhler SM 500, Testo 380; MRU FSM 3

Public financial support schemes

Preceding chapter-question:

“Is or was there any subsidy or financial incentive for installing an appliance? (can be municipal, regional, or national subsidy)”

Country	AT	CD	CH	DE	DK	IT	NL	NO	SE
for wood stoves	yes*	yes	no	yes	yes**	yes	yes*	yes	yes
for wood boilers	yes	yes	yes	yes	no	yes	yes	yes	yes

*not * only for pellet stoves **only scrappage bonus

Example from Germany (for wood boilers <100 kW):

The German “MAP” Program (>15 years duration):

- Introduction of generally stricter PM/CO emission classes (for eligible boilers)
- Requirement for installing heat buffer storages with defined volumes
- Bonus payments for special technological features:
 - boilers with integrated or retrofit ESP’s which defined minimum efficiency
 - boilers with integrated or retrofit condensing units
 - bonus for hybrid systems (combinations with solar-thermal or heat pumps)

MAP was the main trigger for the development of low-cost ESP’s and today’s broad availability of condensing wood boilers in Central Europe.

Regional restrictions (bans) for biomass fuels (temporary/permanent)

Preceding chapter-question:

“Are or were there any regional bans for the use of wood stoves or wood boilers?”

Country	AT	CD	CH	DE	DK	IT	NL	NO	SE
for wood stoves	yes	yes	yes	yes	yes	yes	yes	yes	yes
for wood boilers	yes	no	yes	yes	yes	yes	yes	no	no

Examples for temporary bans:

AT: City of Graz: wood stove use is banned when PM_{10} concentration $> 75 \mu\text{g}/\text{m}^3$ over 3 days.

DE: City of Stuttgart: “comfort stoves” when weather forecast is unfavourable and a PM_{10} -immission $> 50 \mu\text{g}/\text{m}^3$.

NO: City of Bergen: ban for room heaters older than 1998, and for all open fireplaces.

CD: City of Vancouver: temporary ban for certain calendar days (stoves not allowed from May 15th to Sept. 15th).

NL: “Soft” fuel ban, the “Stook alert”: at critical weather a spread of information tries to discourage users to use their stoves (via/radio/email).

Regional restrictions (bans) for biomass fuels (temporary/permanent) (2)

Examples for permanent bans:

CH: Canton of Geneva: New wood stoves are not anymore permitted in zones with high air pollution.

IT: City of Milan, no more new installations of heating plants <3 MW, older plants with than 10 years must shut down their operation (due to excessive PM+NO_x immission).

DE: Numerous municipalities introduce preventive bans for wood stoves implemented in the development plan of a municipality (often to force house builders to purchase district heat).

DK: City of Lejre: In special development areas new houses cannot be built with chimneys.

Information and training

Preceding chapter-question:

“Are there any relevant public campaigns concerning correct use of wood fuel in residential heating?”

Country	AT	CD	CH	DE	DK	IT	NL	NO	SE
for wood stoves	yes	yes	yes	yes	yes	yes	yes	yes	yes

Examples

CD: Fraser basin council “Wood smoke course” (online).

DE: Stove drivers licence (voluntary teaching course).

CH: Teaching videos about correct ignition of a stove.

DK: Videos with celebrities giving heating instructions.

IT: Video on “five golden rules of good wood combustion”, also on Radio/TV.

AT: “Citizen-science” trailer to demonstrate proper combustion in a road show.

NO: Researchers from SINTEF lead discussions forums and online-workshops.

SE: Instruction videos for stoves. All small-scale wood burning appliances are also mapped to assess specific emission reduction potentials

NL: Comprehensive information packages, along with the “stook alert”



Labeling of products (certificates)

Preceding chapter-question:

“Are there any stove or boiler certificates used, referenced or obligatory?”

Country	AT	CD	CH	DE	DK	IT	NL	NO	SE
Answer	yes	yes	yes	yes	yes	yes	no*	yes	yes

* only certificates for installers and trade persons

Examples of labels for wood stoves:

AT: “Umweltzeichen”

IT: “ariaPulita” Label

Scandinavia (DK, NO, SE): Nordic Swan Label

DE: DIN_{plus} Label, HKI_{cert} Label.

In DE: latest labels released are: TÜV Label, Blue Angel Label

Features of the Blue Angel Label for room heaters (since 2020):

- novel real-life testing procedure (includes the cold start, partial load, ...)
- Emission limits are strictest can practically only met with integrated ESP and/or a catalyst
- An automated air control is required.



Conclusions

- The report is a catalogue of possible measures and how differently they are implemented.
- An impact assessment was not made!
- But: individual favourites were asked from each of the IEA experts.

- My personal favourites:
 - Inspections of boilers, stoves, fuel or ash
 - Tightening of general emission limits for biomass combustion
 - Advanced stove certificates or labels

Outlook

- Report will be updated in 2024
- A contribution from the US will be added.
- An additional measure might be added: «*Market surveillance of stoves*»

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Thanks for listening !

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