



IEA Bioenergy
Technology Collaboration Programme

Inventory of National Strategies for Reducing the Impact on Air Quality from Residential Wood Combustion

(2nd revised and extended edition 2025)

Summary Series

IEA Bioenergy: Task 32: 04/2025

Authors: Hans Hartmann, Christoph Schmidl, Sebnem Madrali, Thomas Nussbaumer, Peter Zotter, Morten Tony Hansen, Valter Francescato, Jaap Koppejan, Øyvind Skreiberg, Jonas Dahl, David L. Nicholls

Edited by: Hans Hartmann and Morten Tony Hansen

Summary of report

Download full report here: [#Link to full report#](#)

Reduction of air pollution is a major societal goal, and great efforts are currently undertaken. Over the last 30 years, significant progress has been made, but wood combustion remains a significant source of air pollution in the member countries of IEA Bioenergy, particularly for carbon monoxide (CO) and particulate matter (PM)-emissions.

When wood combustion emissions originate from private households, problems are most difficult to solve. There are many influencing factors: the applied conversion technology is numerous, types of wood fuels are many, and wood fuel quality varies in many aspects. Additionally, user practice and operational skills are highly variable, but they play an enormous role in affecting emission levels. For these reasons, pollutant emissions are highest in the residential sector. Consequently, small scale biomass appliances form the main focus in this report. In this area, policy makers or institutions that are responsible for air quality control must coordinate an unmanageable number of options for remedial actions. For such a challenging task, it can be helpful to draw inspiration from success stories from other regions.

Therefore, this recently updated and extended report compiles national approaches concerning emission reduction strategies in the field of residential wood combustion in selected IEA Bioenergy member countries. The information presented was gathered in a structured manner through a detailed questionnaire. Where possible, the report also provides direct access to the original sources of information via active weblinks. Decision makers are thus enabled to easily trace back all information and to strengthen their own strategy.

Ten countries contributed to the compilation of information: Austria, Canada, Switzerland, Germany, Denmark, Italy, The Netherlands, Norway, Sweden and USA. The report is structured into three major parts. Part 1 briefly shows some simple statistics on the current status of wood combustion in selected countries, Part 2 forms the main part of the report, here extensive information of relevant measures is compiled for each of the selected countries. This is done in

16 sub-chapters, e. g. on stove replacement strategies, regional restrictions for furnaces, tightening of emission limits, inspections of stoves or boilers, quality labels, teaching and informing, etc. Finally, in Part 3, the effectiveness of measures for reducing wood-based pollutant emissions are briefly evaluated and prioritized by each involved expert.

Here are some selected highlights:

- National replacement schemes for old stoves were implemented in Germany and in Denmark. But there were many regional and temporal replacement schemes, sometimes also on municipal level.
- To ban wood fuel use is a widely used approach. Such restrictions are applied in all involved countries, either as temporary or as permanent bans. Mostly they are implemented regionally. Sometimes a wood fuel ban is depending on actual immission conditions. Or the ban is communicated as a temporary measure which is based on critical weather conditions, such as the ‘Stookwijzer’ in The Netherlands.
- Tightening of emission limits have a long history in several countries, typically they become stricter over time. For example, in the last years, Austria and Germany have introduced more stringent emission limits three times. The European limits (Ecodesign-directive) have finally forced other European countries to implement them, even Non-EU countries like Switzerland and Norway have followed. In the USA, the emission limits for certified stoves and for hydronic heaters were also tightened in two steps.
- Public incentives for investment for new appliances have been quite common over the past years. For stoves it seems crucial, that any scrappage bonus is designed in a way where a further use of the old stove is effectively disabled (e.g. in Canada or Denmark). For boilers, subsidies are mostly not conditional, except in Germany, where a long-term subsidy program has paved the way for an advanced state of technology by introducing strict ambitious emission classes or obligatory technical features. In the USA, also the measure of tax credits was introduced for purchase and installation of new wood stoves.
- Regular on-site inspections are common in most of the involved countries for both wood stoves and wood boilers. In most cases the chimney sweeps are involved, but mostly they only visit the site to ensure operational safety. But in Austria, Germany, Switzerland, and Denmark the stove itself is also regularly checked for functioning and damages. In Germany, the authorized district chimney sweep is also obliged to instruct the stove owner every 3 to 4 years on the proper operation. And he also tests fuel moisture, and for wood boilers he does full performance tests with recurring CO- and PM emission measurements.
- There are numerous labels for advanced stoves/boilers, most of which are based on the results of type tests carried out by certified bodies. Only the German “Blue Angel” is based on a dedicated real-life test protocol.
- Public information campaigns are manifold covering a range of interesting approaches. Apart from brochures and websites there are online-courses for stove users (Canada and Germany), citizen-science trailers which invite stove users to practically experience the correct operation (Austria), teaching videos about stove operation are available (Switzerland, Germany), or scientists lead discussion forums about wood stove technology and use (Norway). In Sweden all small-scale wood burning appliances are mapped to assess large emission reduction potentials. In the USA, much technical information is also made available via web-blogs.