

Policies to Reduce Air Pollution from Household Heating



Coal stove with briquettes, Chengdu, China
Keren Su/China Span / Alamy Stock Photo



A Chinese worker collects coal stoves for recycling during a campaign to convert from coal to cleaner household heating options in Beijing and China's other northern cities.
Imaginechina Limited / Alamy Stock Photo

Risks and impacts of heating with polluting fuels

Residential heating with polluting fuels like kerosene, wood, and coal is common practice in many parts of the world [1]. Heating with coal is most frequent in parts of Eastern Europe and China and woodstoves are often used in Northern Europe, North America, and highland regions worldwide. Polluting fuels contribute to household and ambient (outdoor) air pollution. Cooking and heating with polluting fuels contributes to millions of deaths every year.

In 2014, the WHO introduced Guidelines for indoor air quality and household fuel combustion to encourage transitions to cleaner household fuels for residential cooking, heating, and lighting [2]. To help countries achieve the Guidelines, WHO developed the Clean Household Energy Solutions Toolkit (CHEST), which includes a Household Energy Policy Repository highlighting examples of policies supporting cleaner fuels and technologies [3]. The Repository features policies using a mix of approaches such as:

- **Bans on fuels or technologies**, prohibiting specific fuels, technologies, or activities either permanently or when ambient air pollution exceeds a threshold.
- **Public awareness campaigns** using air quality alerts that inform the public when air pollution exceeds a threshold and ask people to avoid actions like solid fuel burning. Other campaigns focus on burning wood more cleanly by using split, dry wood in well-maintained stoves with sufficient airflow.
- **Certification and labelling** policies that define standards based on efficiency or emissions. Labelling may be combined with bans on sub-standard technologies, or with awareness campaigns encouraging cleaner choices.
- **Upgrade policies** encouraging people to exchange older more polluting heating stoves with new certified options.
- **Financial incentives** including subsidies, rebates, or tax credits that lower the cost of cleaner options. These may be combined with awareness campaigns, certification, and/or upgrades. Incentives may also apply to “weatherproofing” (e.g. insulating and sealing air gaps).

Below we provide examples of policies included in the Repository that use these instruments to promote cleaner heating.

China

To address concerns about unhealthy air quality in major cities across China's northern provinces, China introduced policies including bans on residential coal burning and incentives to install electric heat pumps and other clean technologies [4]. Two years after implementation, the policies resulted in decreased fine particulate matter in the cities where they were implemented. One study estimates that this improvement in air quality would reduce hospitalisations and avoid 53,000 premature deaths [5].

However, the coal ban resulted in some inequitable outcomes: wealthier households eliminated coal use and experienced better indoor air quality, while worse-off households continued to use coal. Some also experienced higher heating costs, particularly in smaller cities that did not provide the same level of subsidies as larger municipalities [6].

Sweden

A public awareness campaign in Sweden known as “Light from the Top” sent brochures to households with guidance about how to light wood-burning stoves to avoid indoor emissions. Recommended steps include loosely stacking wood and properly managing airflow [7]. One evaluation of the program found 60% of people surveyed were familiar with the information campaign, and 73% of those respondents confirmed that they followed the guidance [8].

United States

The United States has implemented many programs to reduce impacts of residential heating with wood including wood-burning reduction programmes, air quality and emission limits, fuel quality standards, programmes that encourage or mandate removal of old woodstoves, emission standards and certification, bans of non-certified stoves, and restrictions on wood-burning devices in newly built homes [9]. One review found evidence that community-level adoption of EPA-certified stoves resulted in improved ambient air quality [10]. Another study found a ~28% drop in ambient PM_{2.5} and lower respiratory infections, bronchitis, and influenza in a rural community following the changeout of 1,100 stoves [11].

European Union

A 2015 European Union directive defines requirements for domestic stoves and heaters that have “significant environmental impact” [12]. The directive includes technology-dependent energy efficiency standards and emission limits for particulates, organic compounds, CO and NO_x. It also specifies how to measure and verify that standards are met. The directive gave member states several years to implement its guidelines and includes provisions specifying how to measure stove performance, periodically review technological developments, and change rules as needed.



Pellet stove and fuel used to heat a home in Northern Italy
Dino Fracchia / Alamy Stock Photo

Chile

Chile empowers municipal governments to implement plans designed to reduce air pollution from domestic wood heating [13]. The plans involve air quality alerts, stove upgrades, standards to ensure wood is dried before use, and weatherproofing. One study of three towns in Southern Chile found that weatherproofing had the largest impact on indoor air quality. Equipment upgrades were not as effective because many beneficiaries operated upgraded stoves with air supply reduced, which increases emissions [14]. Subsequent research found that educating users about maintaining airflow resulted in lower emissions [15].

Synthesis

- Policy-makers seeking to reduce the impacts of heating with solid fuels have a wide range of tools at their disposal including bans on fuels and/or technologies, technology standards and labelling, financial incentives and upgrade programmes to encourage uptake of certified appliances, and awareness campaigns.
- Equipment upgrades and weatherproofing have proven successful (US, China, Chile) but require consumer education campaigns in order to ensure new equipment is utilized properly.
- Bans are more effective if they are accompanied by sufficient financial measures incentivising uptake of cleaner fuels and technologies.
- There is some evidence that equipment upgrade resulted in improved ambient air quality (US, China) and reduced health impacts (US).
- Program implementers need to ensure that programs reach different income levels and do not exacerbate inequalities.

SOURCES CITED

- [1] <https://www.euro.who.int/en/publications/abstracts/residential-heating-with-wood-and-coal-health-impacts-and-policy-options-in-europe-and-north-america>
- [2] https://apps.who.int/iris/bitstream/handle/10665/141496/9789241548885_eng.pdf
- [3] <https://www.who.int/tools/clean-household-energy-solutions-toolkit>
- [4] http://www.gov.cn/xinwen/2017-12/20/content_5248855.htm
- [5] <https://doi.org/10.1016/j.enpol.2021.112205>
- [6] <https://doi.org/10.1038/s41560-019-0386-2>
- [7] <https://www.naturvardsverket.se/upload/stod-i-miljoarbetet/vagledning/forbranning/tand-i-toppen-broschyr-tryck.pdf>
- [8] <http://iccinet.org/woodstoves-and-cookstoves/>
- [9] <https://www.epa.gov/burnwise/strategies-reducing-residential-wood-smoke>
- [10] <https://doi.org/10.1016/j.cpped.2017.04.001>
- [11] <http://dx.doi.org/10.1136/oemed-2011-100394>
- [12] <https://ods.mma.gob.cl/calidad-del-aire/>
- [13] <https://calefactores.mma.gob.cl/>
- [14] https://www.researchgate.net/publication/297762846_Contaminacion_atmosferica_atacando_el_sintoma_no_la_enfermedad_Analisis_de_los_sistemas_de calefaccion_residencial_y_los_programas_de_descontaminacion_atmosferica_en_la_Region_de_Los_Rios
- [15] http://a2s.cl/nuevo/wp-content/uploads/2020/03/Reducing_Air_Pollution_through_Behavioral_Change_of_Wood-Stove_Users_Evidence_from_an_RCT_in_Valdivia_Chile_en.pdf

FOR MORE INFORMATION

Email householdenergy@who.int

WHO's CHEST Toolkit <https://www.who.int/tools/clean-household-energy-solutions-toolkit>

Visit the Repository at <http://householdenergypolicies.org/>



WHO/HEP/ECH/AQH/2022.2

© WHO 2022. Some rights reserved. This work is available under the CC BY-NC-SA 3.0 IGO licence.