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Residential heating with wood and coal:

health impacts and policy options in Europe and North America

Abstract

Residential heating with wood and coal is an important source of ambient (outdoor) air pollution; it can also cause substantial indoor air pollution through either direct exposure or infiltration from outside. Evidence links emissions from wood and coal heating to serious health effects such as respiratory and cardiovascular mortality and morbidity. Wood and coal burning also emit carcinogenic compounds. The results presented in the report indicate that it will be difficult to tackle outdoor air pollution problems in many parts of the world without addressing this source sector. A better understanding of the role of wood biomass heating as a major source of globally harmful outdoor air pollutants (especially fine particles) is needed among national, regional and local administrations, politicians and the public at large.

Keywords

AIR POLLUTION
BIOMASS
HEALTH POLICY
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Abbreviations and definitions[1]

BC	black carbon
BTU	British Thermal Unit
CCME	Canadian Council of Ministers of the Environment
CH_4	methane
CI	confidence interval
CO	carbon monoxide
CO_2	carbon dioxide
COPD	chronic obstructive pulmonary disease
CSA	Canadian Standards Association
DALY	disability-adjusted life-year
EC	elemental carbon
EC JRC	European Commission Joint Research Centre
EPA	United States Environmental Protection Agency
EU	European Union
GAINS	Greenhouse Gas and Air Pollution Interactions and Synergies [model]
GBD	Global Burden of Disease (Study)
HEPA	high-efficiency particulate air
IIASA	International Institute for Applied Systems Analysis
LPG	liquefied petroleum gas
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
NSPS	new source performance standard
OC	organic carbon
PAH	polycyclic aromatic hydrocarbon
PM	particulate matter
$PM_{2.5}$	PM with an aerodynamic diameter of less than 2.5 micrometres
PM_{10}	PM with an aerodynamic diameter of less than 10 micrometres
SO_2	sulfur dioxide
VOC	volatile organic compound

biomass	biodegradable products, waste and residues from agriculture, forestry, fisheries and related industries, as well as the biodegradable fraction of industrial and municipal waste
fossil fuel	carbon rich fuel other than biomass, including anthracite, brown coal, coke, bituminous coal and peat
hydronic heater	wood-fired boilers, often located outside the building (in a shed, for example) from which the heat is being generated and then circulated into the building as heat source
solid fuel	a fuel that is solid at normal indoor room temperatures, including biomass and coal
solid fuel boiler	a device with solid fuel heat generator(s) that provides heat to a water-based central heating system, with heat loss of <6% of rated heat output to its surrounding environment
solid fuel local space heater	an open fronted or closed fronted space heating device or cooker that uses solid fuels to emit heat by direct heat transfer with or without heat transfer to a fluid
woody biomass	biomass originating from trees, bushes and shrubs, including log wood, chipped wood, compressed wood in the form of pellets, compressed wood in the form of briquettes and sawdust

1 All definitions are taken directly or adapted from the draft European Commission Directive on requirements for solid fuel boilers (available at: http://ec.europa.eu/transparency/regcomitology/index.cfm?do=Search.getPDF&7YrbbCuiY/4ycAKX8F1akuCXCT-kEMvjCaXWhWTT3prm5SVAw47eF02NzJJLXFBE77kGvLzo2Pu5uyjPyPE0HGhn1Yyu8a5hceFqN5ixnqYI=, accessed 4 February 2015)

Executive summary

Wood, coal and other solid fuels continue to be used for residential cooking and heating by nearly 3 billion people worldwide at least part of the year, including many in Europe and North America. Residential heating with wood and coal is an important source of ambient (outdoor) air pollution; it can also cause substantial indoor air pollution through either direct exposure or infiltration from outside. The specific magnitude of the problem varies greatly by geography, prevalence of solid fuel use and the technologies used.

Across Europe and North America, central Europe is the region with the highest proportion of outdoor particulate matter with an aerodynamic diameter of less than 2.5 micrometres ($PM_{2.5}$) that can be traced to residential heating with solid fuels (21% in 2010). Evidence links emissions from wood and coal heating to serious health effects such as respiratory and cardiovascular mortality and morbidity. Wood and coal burning also emit carcinogenic compounds. Each year 61 000 premature deaths are attributable to ambient air pollution from residential heating with wood and coal in Europe, with an additional 10 000 attributable deaths in North America.

Measures are available to reduce emissions of solid fuels for residential [illegible] fuels) and use of more efficient heating technologies (such as certified fireplaces or pellet stoves) can reduce the emissions from residential wood and coal heating devices. Educational campaigns may also be useful tools to reduce emissions from residential solid fuel heaters. Furthermore, filters may reduce health effects from indoor air pollution.

Existing regulatory measures include ecodesign regulations and labels in the European Union (EU) and technology-based emission limits in the United States of America and Canada. Financial fuel switching and technology change-out incentives – as well as targeted "no burn" days and ecolabelling – are other tools available to policy-makers.

Given the substantial contributions to air pollution from residential heating with solid fuels, it will be difficult to tackle outdoor air pollution problems in many parts of the world without addressing this source sector. Nevertheless, the use of solid fuels for heating is expected to persist and probably even expand, especially within the EU, in the coming decades as a result of climate policies that favour wood burning. Better alignment is therefore needed between climate and air pollution policies in many countries. Information campaigns – especially those that increase knowledge about the [illegible]