

The health perspective of wood burning in the Western Balkans region



Executive summary

Burning wood and coal for heating in the Western Balkans covers 42% of the region's heating demand – and this level is expected to rise by around 20%. The region's energy policies, largely governed by the Energy Community Treaty, which includes the EU's climate and energy legislative framework, favour this expansion of biomass burning.

While biomass burning is considered renewable and climate-friendly under these regional energy policies, there are serious health (and environmental) impacts that have been completely neglected. The practice emits particulate matter, black carbon, carbon dioxide, carbon monoxide and other pollutants linked to respiratory diseases and premature death. Some of these pollutants also contribute to climate change which in turn threatens people's health.

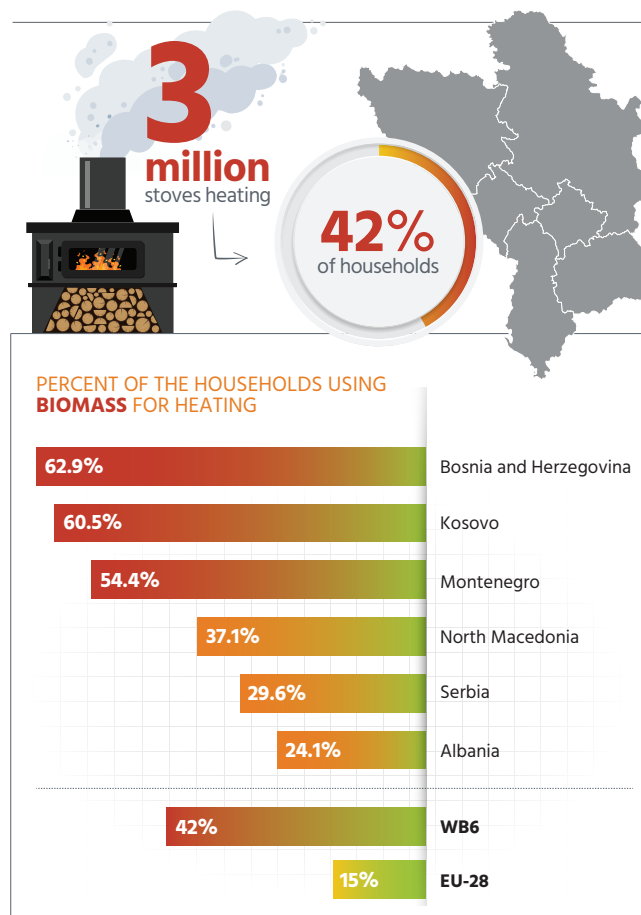
This briefing explores the public health threat of burning biomass in the Western Balkans, as a major contributor to air pollution in the region. It also explores technological improvements in stoves and counters claims that new stove technology can solve the pollution problem, in particular for indoor air quality. It presents evidence-based arguments on wood burning and scientific data to support decision-making as the Western Balkans and the EU shift to a carbon-neutral and healthy future.

Based on World Health Organization (WHO)'s guidelines for outdoor and indoor air quality, HEAL sets out short and long-term policy recommendations to reduce and ultimately eliminate air pollution from biomass stoves, as well as recommendations for health care professionals.



Wood burning in the Western Balkan region

Winters in the Western Balkans, a region with a population of around 17 million people, are cold and harsh, making residential heating essential for citizens. According to The Smarter Stoves Partnership project,¹ wood and coal are used for residential heating in 3 million stoves. The International Energy Agency estimates that biomass is by far the most important “renewable” energy source used for heating in the Western Balkans, covering 42% of the demand. Rural households account for 63% of total biomass consumption, and urban households account for 37%.²



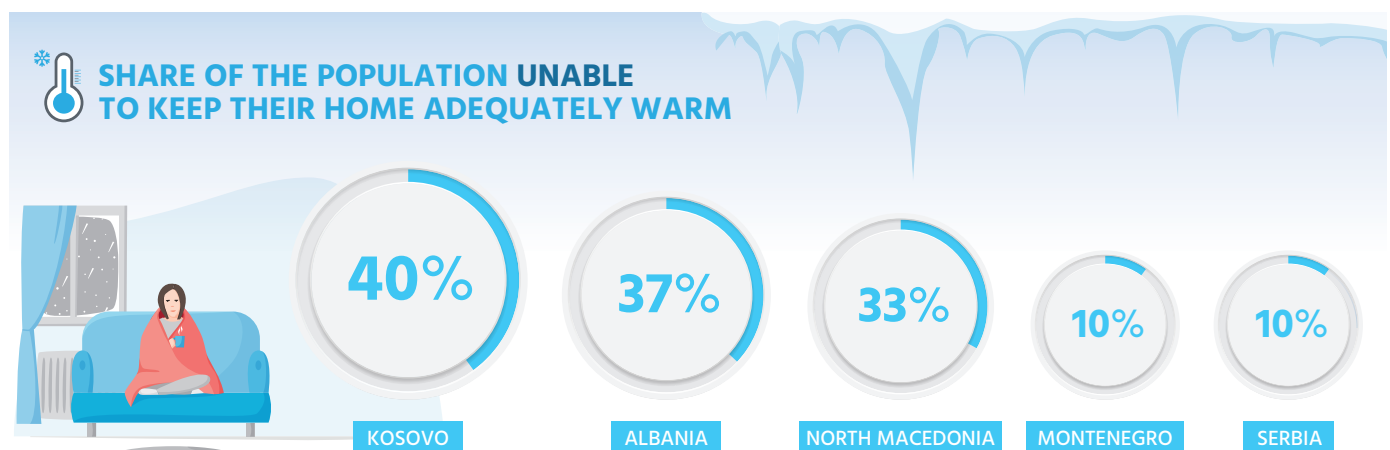
Wood and coal are locally available and often the most affordable of all fuels. Therefore, they offer (energy) security for people who in past decades have experienced a number of shortages, wars, and societal transitions.

The Western Balkan region is significantly more reliant on biomass for the purpose of heating households than the EU. This is especially the case with Bosnia and Herzegovina (62.9%) and Kosovo (60.5%). Another notable difference is seen in the consumption of fossil gas. Fossil gas accounts for 38% of total energy used for heating households in the EU27, while in the Western Balkans, it is only used in Serbian households to a modest degree (10.3%).³

In the EU, the use of solid fuels for heating is expected to persist, and probably even expand in the coming decades as a result of climate policies that favour wood burning. In the Western Balkan region, the same climate policies apply, since it is part of the Energy Community Treaty that fully includes the EU energy and climate legislative framework. An increased use of biomass for energy purposes could therefore drive about a 20% increase in biomass burning,⁴ including domestic heating where solid biomass is and will remain a pivotal fuel.⁵

Many households in the region keep biomass stoves as a ‘reserve’ option, in addition to primary heating sources which are often gas boilers. These stoves may be used if (recurring) economic hardship pushes people ‘over the edge’ into energy poverty. Reverting to heating with solid fuels such as discarded furniture, wood scraps, coal and waste is a response to economic difficulties in politically unstable situations.

Energy poverty is a major challenge for the Western Balkans, with a high share of the population unable to keep their home adequately warm. In Kosovo, 40% of the population are struggling to keep their homes warm, followed by 37% in Albania, 33% in North Macedonia, 10% in Montenegro and in Serbia; while the share in the EU27 is 8% on average.⁶



Wood burning: the health perspective

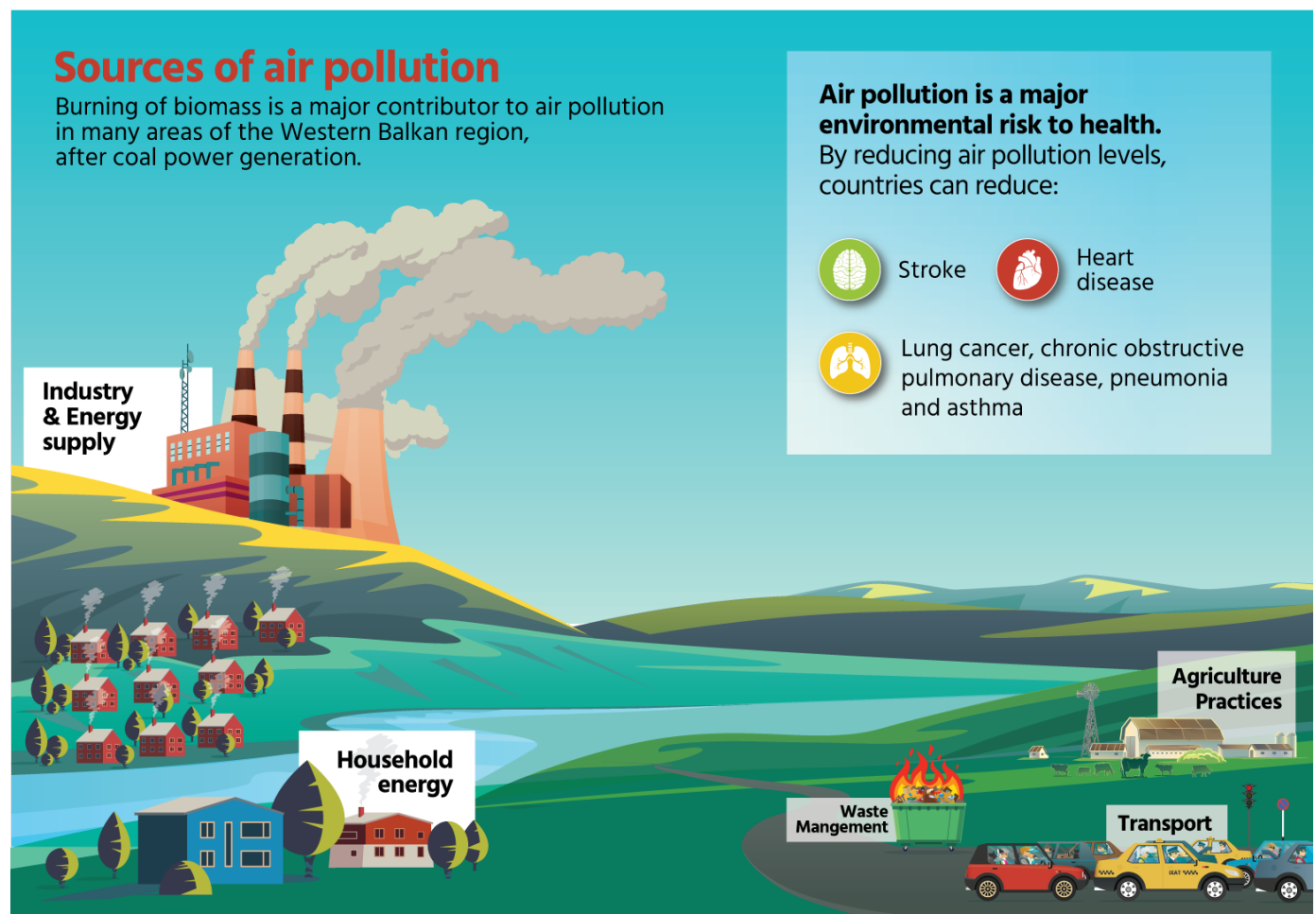
Biomass: the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste.⁷

The use of biomass for heat and power production has increased in the past decade. Wood is considered as a renewable and climate-friendly energy in most energy and climate policies, as well as providing energy security. But this approach faces a major challenge since its impacts on the health and environment are much larger than that of solar or wind.

The burning of biomass affects people's health and contributes to accelerated climate change. It is a major contributor to air pollution in many areas of the Western Balkan region, after coal power generation, accounting for around 50% of particulate matter (PM) pollution on a regional level. Burning wood puts pressure on people's health (and the environment) especially in urban settings where air pollution is already a significant challenge.

Burning wood and biomass in household stoves produces air pollution and greenhouse gases. Some of the main pollutants emitted when burning biomass are particulate matter (PM₁₀, PM_{2.5}), black carbon (BC), CO₂, CO, polycyclic aromatic hydrocarbons (PAHs), VOCs including CH₄, and other cancerogenic compounds.

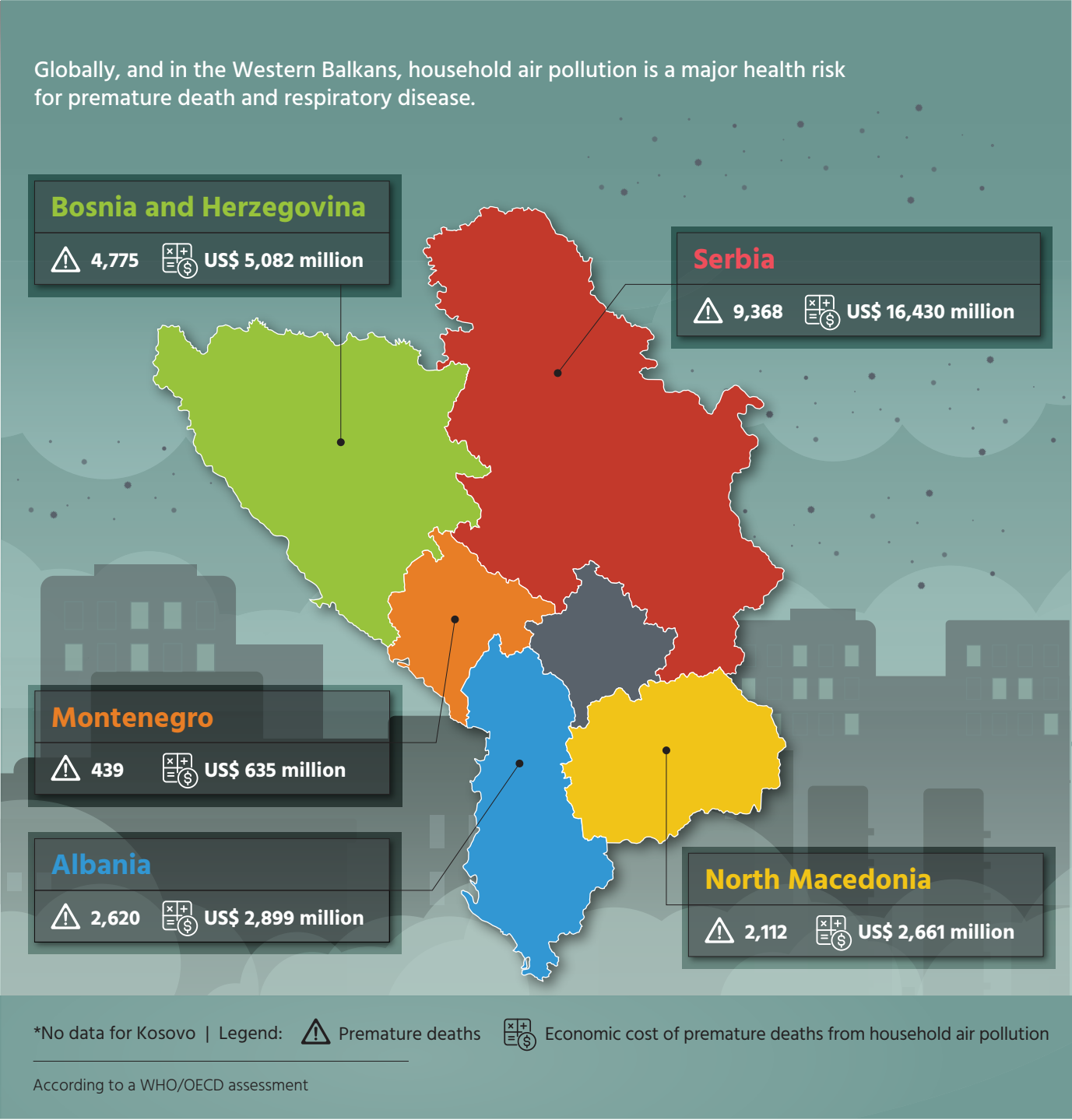
Particulate matter is a particular problem for health, but so too are other pollutants. For example, black carbon is thought to be a major contributor to the toxicity of PM_{2.5}. Greater BC exposure has been linked to premature mortality, poor cardiovascular health, and low birth weight, independent of particle mass.⁸



High levels of pollution are produced because most of the burning of solid fuels for residential heating takes place in devices that do not completely combust the fuel because of their low combustion temperature and other limitations. This results in high emissions per unit of fuel, including many products of incomplete combustion such as PM2.5 and carbon monoxide (CO), black carbon, etc.⁹

Wood burning also contributes to climate change – as wood is burned, its carbon is released back into the atmosphere. Burning wood emits more CO₂ than burning coal: 112,000 kg of greenhouse gas per TJ compared to coal’s 101,000 kg of greenhouse gas per TJ.¹⁰

The health burden of household air pollution in 2010 in the Western Balkan region¹¹



WHO: health guidelines on indoor and outdoor air pollution

There is a huge body of evidence on air pollution and health. Each year, hundreds of studies are published demonstrating the harm poor air quality does to health. The WHO regularly reviews all available research on air pollutants' impact on people's health. Based on this extensive, in-depth review of the scientific literature, it publishes guidelines for concentrations for selected air pollutants.

These guidelines are of a high methodological quality and are developed through a transparent, evidence-based review process. WHO guidelines can be considered the gold standard for evidence-based decision-making for health on air quality, as they have health protection at their core, based on the latest science.

Outdoor – ambient – air quality guidelines

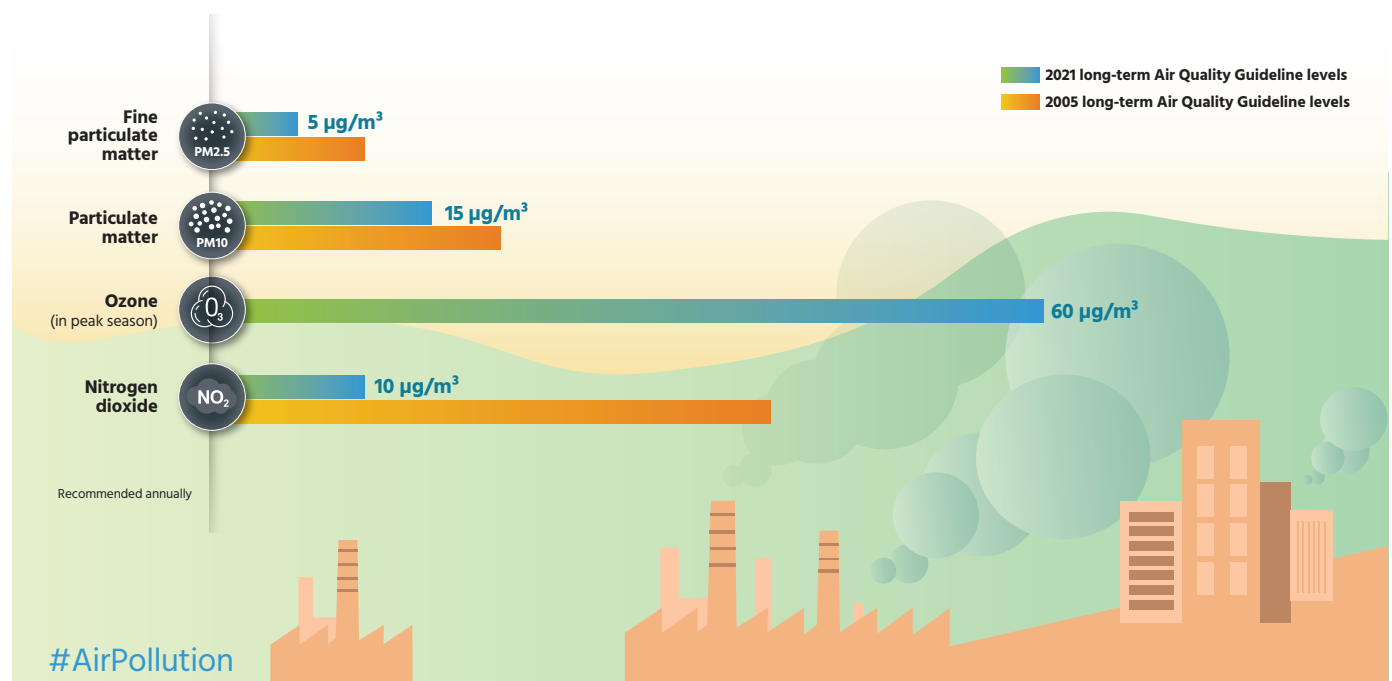
Ambient air pollution is the top environmental threat to health in the European region and globally, and one of the five main risk factors for non-communicable and chronic diseases.

Recent studies have pointed to children being particularly at risk of harm from polluted air, given that their lungs, heart, brain, respiratory, immune and nervous systems are still developing. Their health can already be affected before birth, with lifelong consequences.

In 2021, the World Health Organization (WHO), after a systematic review of the accumulated evidence, lowered the

recommended values for several pollutants, most notably for particulate matter PM_{2.5}, which causes the greatest health burden. For PM_{2.5}, a new annual concentration of 5 µg/m³ is now recommended; for nitrogen dioxide (NO₂), which has come under intense scrutiny in discussions on road transport and inner-city driving bans, a new annual concentration of 10 µg/m³ is now recommended.

In 2019, in the six Western Balkan countries, poor air quality caused over 30,000 premature deaths¹² and in the same year, air pollution in the Western Balkans contributed to up to 19% of total premature mortality and reduced life expectancy by up to 1.3 years.¹³



WHO AIR QUALITY RECOMMENDATIONS ARE STRICTER THAN 15 YEARS AGO

WHO Air Quality Guidelines set goals to protect millions of lives from air pollution

Indoor air quality guidelines

The WHO also issues guidelines for indoor air quality relating to household fuel combustion. They build on existing WHO air quality guidelines (AQGs) for specific pollutants and provide practical recommendations to reduce the health burden from fuel burning in homes.

The three most important WHO recommendations for indoor air quality when using biomass are:

Emission rate targets

Emission rates from household fuel combustion should not exceed the emission rate targets for PM_{2.5} and CO set by WHO. Reducing emission rates remains central to achieving WHO Air Quality Guidelines because pollutants generated in the home enter the ambient environment, contributing to outdoor air pollution exposures, and re-enter homes, exacerbating indoor pollution.

Improving woodburning technology: is this the answer?

There is some evidence that using a newer wood stove, using an ecologically-certified stove, or burning exclusively dry wood can be associated with lower household concentrations of PM_{2.5} and even more so of BC.¹⁴ But those changes can be cancelled out by the overall increase in the use of biomass burning for heating which directly increases the levels of PM pollution locally.

Moreover, studies have failed to find a consistent relationship between stove technology upgrades and indoor air quality improvements.¹⁵ Furthermore, stove exchange programmes may be limited by the cost of new technologies, the long service life of appliances once installed, user knowledge of how best to use the stoves and what kind of biomass would be less polluting.

That means replacing wood burning stoves is likely not to deliver on carbon reductions or anticipated health and climate co-benefits.

Neither 'improved' solid fuel stoves nor dry wood achieve indoor PM_{2.5} concentrations close to healthy air quality guidelines (probably due to infiltration of air pollution from outside environments).¹⁶

Eco certified stoves reduce outdoor pollution, but they are still polluting indoor air

When the stove is used, PM is higher. PM_{2.5} rises by 66.24% and PM₁₀ by 69.49%. This shows that PM is 'flooding' into indoor areas through normal use. PM 'flooding' incidents are associated with the number of fuel pieces used and length of the burn period.¹⁷

Policy during transition to technologies and fuels that meet WHO air quality guidelines

Governments and their implementing partners should develop strategies to accelerate efforts to meet new WHO air quality guidelines. Where intermediate steps are necessary, transition fuels and technologies that offer substantial health benefits should be prioritised.

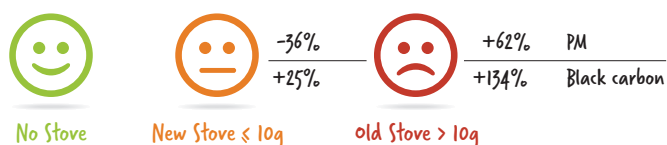
Good practice recommendation: securing health and climate co-benefits

Considering the opportunities for synergy between climate policies and health, including financing, we recommend that governments and other agencies developing and implementing policy on climate change mitigation consider action on household energy. We also recommend they carry out relevant assessments to maximise health and climate gains.



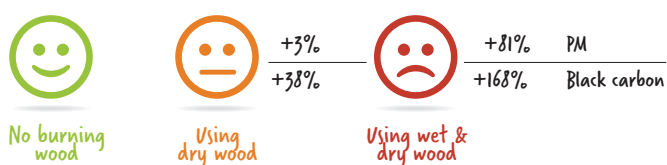
Even new stoves leak pollution indoors. Old stoves should be replaced after 10 years to reduce large pollution

Wood stove use is associated with higher concentrations of all pollutants. Black carbon is 25% higher in stoves ≤ 10 years old. BC is 134.9% higher in homes with stoves > 10 years old compared to homes without a wood stove.



Burning only dry wood decreases pollution in homes

Homes with stoves that burn only dry wood have lower concentrations of PM_{2.5}, BC, organic carbon, and potassium.



HEAL's recommendations: mitigating health effects and wood burning phase-out

For policy makers

SHORT-TERM



Establish a clear timeline and accelerate efforts to meet the latest WHO air quality guidelines indoors and outdoors. If necessary, make transitional plans that will deliver co-benefits for health and climate by reducing residential heating emissions. The implementation of these recommendations will also help secure additional benefits for society, development and the environment – including climate – that will result from wider access to clean, safe and efficient household energy.



Review the consideration of biomass as a renewable energy form. A nuanced classification of biomass and the exclusion of biomass from renewable sources such as solar or wind need to be in place. This will allow for better collection of the data on the magnitude of the health and environmental impacts of specific types of biomass and fuels and better support policy and decision-making.



Provide and encourage information sharing, training and other measures to ensure the best use of new technologies and fuels for the public and involve the health sector in these efforts.



Introduce intermediate steps to reduce emissions from biomass burning, such as improved stoves, promoting the use of dry wood and banning the burning of any other materials.

MEDIUM- AND LONG-TERM



Ensure a swift transition to healthy and zero-pollution energy options for households.



Include health and environmental impact assessments as an essential part of any intervention in the transition to carbon-neutral society, and to determine those heating options with the least health impacts.



Invest funds and time into non-polluting energy options for households and promote healthy energy.



Invest in interventions that are zero-pollution, contribute to energy efficiency and energy savings and have other co-benefits such as reducing energy poverty and improving the level of comfort and wellbeing.



Support the production of energy from renewable sources that can self-sustain households, such as self-production via solar or wind, heat pumps or geothermal.

For health professionals



Highlight the evidence and materials provided by the World Health Organization (WHO) on air quality, including the latest 2021 updated Guidelines on Ambient air quality¹⁸ and Guidelines on Indoor Air Quality,^{19, 20} to promote better local air quality and greater immediate public health benefits of reducing peak pollution in indoor and outdoor environments.



Engage in shaping public opinion and awareness on the polluting aspect of burning fuels, including biomass. This could be done publicly by engaging in public debates but also with health practitioners' raising awareness with their patients.

Endnotes

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HEAL's over 90 member organisations include international, European, national and local groups of health professionals, not-for-profit health insurers, patients, citizens, women, youth, and environmental experts representing over 200 million people across the 53 countries of the WHO European Region.

As an alliance, HEAL brings independent and expert evidence from the health community to EU and global decision-making processes to inspire disease prevention and to promote a toxic-free, low-carbon, fair and healthy future.

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