

FUEL OF THE POOR

HOUSEHOLD USE
OF **FIREWOOD** IN
CENTRAL AND
EASTERN
EUROPE

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by Habitat for Humanity (HfH)

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TABLE OF CONTENTS

1. Introduction	1
2. Firewood in the energy mix	4
3. Drivers of firewood use	6
a. Access	6
b. Flexibility and autonomy	6
c. Affordability	7
d. Voluntary choice	7
4. Housing conditions and energy poverty	8
a. Access to basic infrastructure and amenities	11
b. Housing quality and energy efficiency	11
c. Affordability and energy prices	12
5. Heating devices and systems	14
a. Single space heaters	17
b. Central Heating	19
c. The future of biomass heating technologies	20
6. Environment and health	21
a. Emissions and pollution	21
b. Wellbeing	22
c. Forestry	22
7. Recommendations	23
a. EU level	23
b. National and local level	25

Introduction

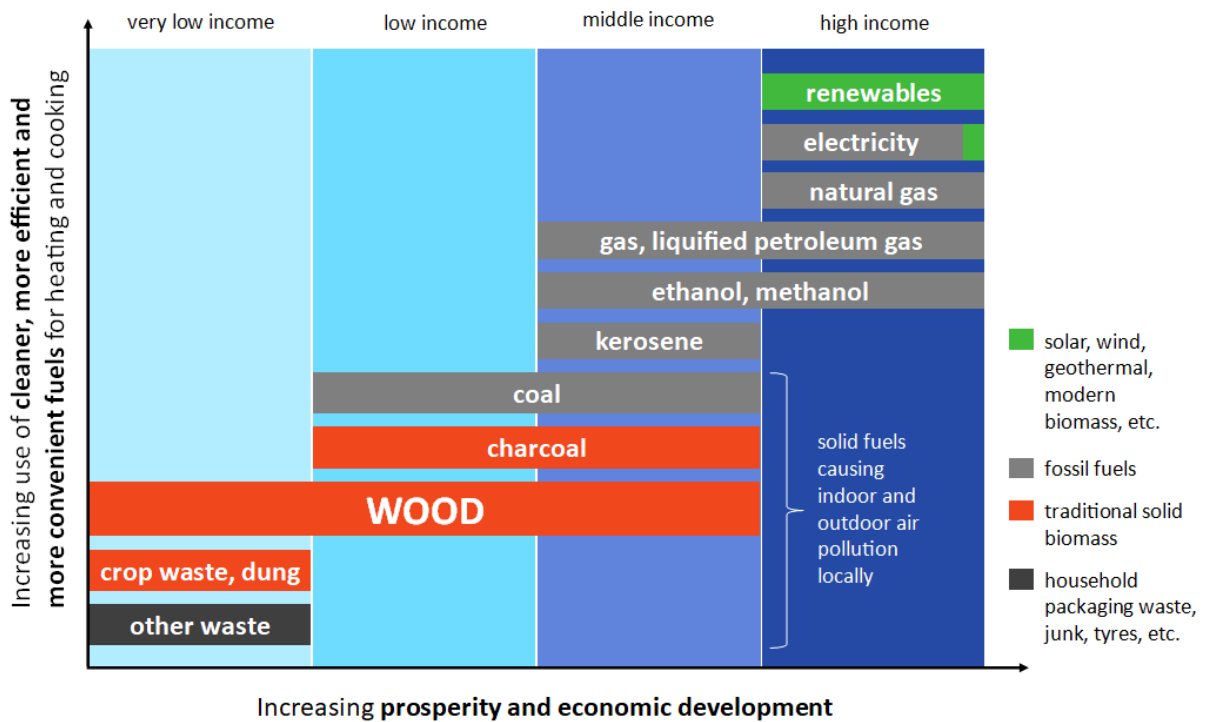
Wood fire has been a fundamental part of human life and civilization since prehistoric times, providing means of heating, cooking, and lighting. Today, through technological and economic advances, its role is less crucial as centralised networks of gas, electricity and district heating entered the homes of many. While more privileged households are already moving on to more advanced technologies – such as solar-powered heat pumps and smart appliances enhanced by artificial intelligence –, around half of the people across the world are still using wood and other solid fuels to keep warm and to cook food¹.

Therefore, to this day, solid biomass – mainly firewood – is one of the most important household energy sources globally. It is the “fuel of the poor” as mainly low-income households rely on it, especially in the Global South and in Central-Eastern Europe (CEE). Firewood can be a more independent and affordable option than other energy sources, however using it can be tiresome and time-consuming, while many people do not have the option to change their heating fuel and system. Furthermore, biomass burnt in inefficient devices is wasteful and imposes health risks of indoor and outdoor air pollution.

The “energy ladder” captures the relationship well between income and the dominant energy source used for cooking and heating (Figure 1). At the lower steps of the ladder, low-income households rely on solid fuels, including firewood and coal. As the households’ income increases, they step up on the ladder and gain access to cleaner energy sources, such as natural gas or electricity alongside more advanced and efficient cooking, heating and cooling equipment.

The use of firewood – i.e., the most common form of “primary solid biofuel” – has another, contrasting side: with strong environmental safeguards, it can be used in sustainable, efficient, and clean ways both in centralised, industrial

¹ Ali et al., ‘[Health Impacts of Indoor Air Pollution from Household Solid Fuel on children and Women](#)’



▲ Figure 1: The energy ladder
based on: [WHO](#)

settings as well as directly in the home. Woody biomass should come from sustainably managed forests or in the form of by-products (e.g., timber production or agriculture) and be burnt in modern heating systems which satisfy strict environmental and safety standards. It can also provide an alternative, off-grid energy source independent from the sometimes fragile and unpredictable energy markets and supply.

Wood-based energy is the main source of renewable energy in the EU, with a share of almost 60%.² Its already important role in the energy mix is expected to become more crucial as the European Union (EU) and other countries are trying to decrease their fossil fuel dependence and reduce greenhouse gas emissions. However, a just and sustainable energy transition can only happen by respecting the limits and boundaries of our natural resources and by adopting stringent environmental and social criteria.

Strategies and policies framing the energy transition in the EU such as the Green Deal or the Fit for 55 package tend to encourage a high technology

² Joint Research Centre (European Commission): [The use of woody biomass for energy production in the EU](#)

future including smart infrastructure and advanced renewable energy systems. However, these often assume a certain degree of financial and material status which are far from the realities of many, especially in the CEE region. Low-income households that rely on firewood and solid fuels need to be supported by policy instruments and subsidies to climb up the energy ladder and be part of the transition.

Recent crises triggered by the COVID pandemic and the aggression against Ukraine are dramatically impacting energy markets, politics, and policies as well as the way people use and think about energy. As fossil fuels become unaffordable or less accessible, many resort to firewood. At the same time, these crises have also driven up the cost of firewood and timber products, putting low-income and vulnerable households at even greater risks of (energy) poverty.

This study sheds light on the situation and challenges these households face, with a focus on EU member states in the CEE region. It aims to provide a basis and input for future policies which successfully incorporate social and environmental considerations when dealing with the complex issues of biomass-based energy and the “fuel of the poor”.



[Habitat for Humanity](#) (HfH) is an international network of housing organizations. HfH Hungary, Bulgaria and Romania are partners in the BioBalance Project which is led by WWF Hungary.

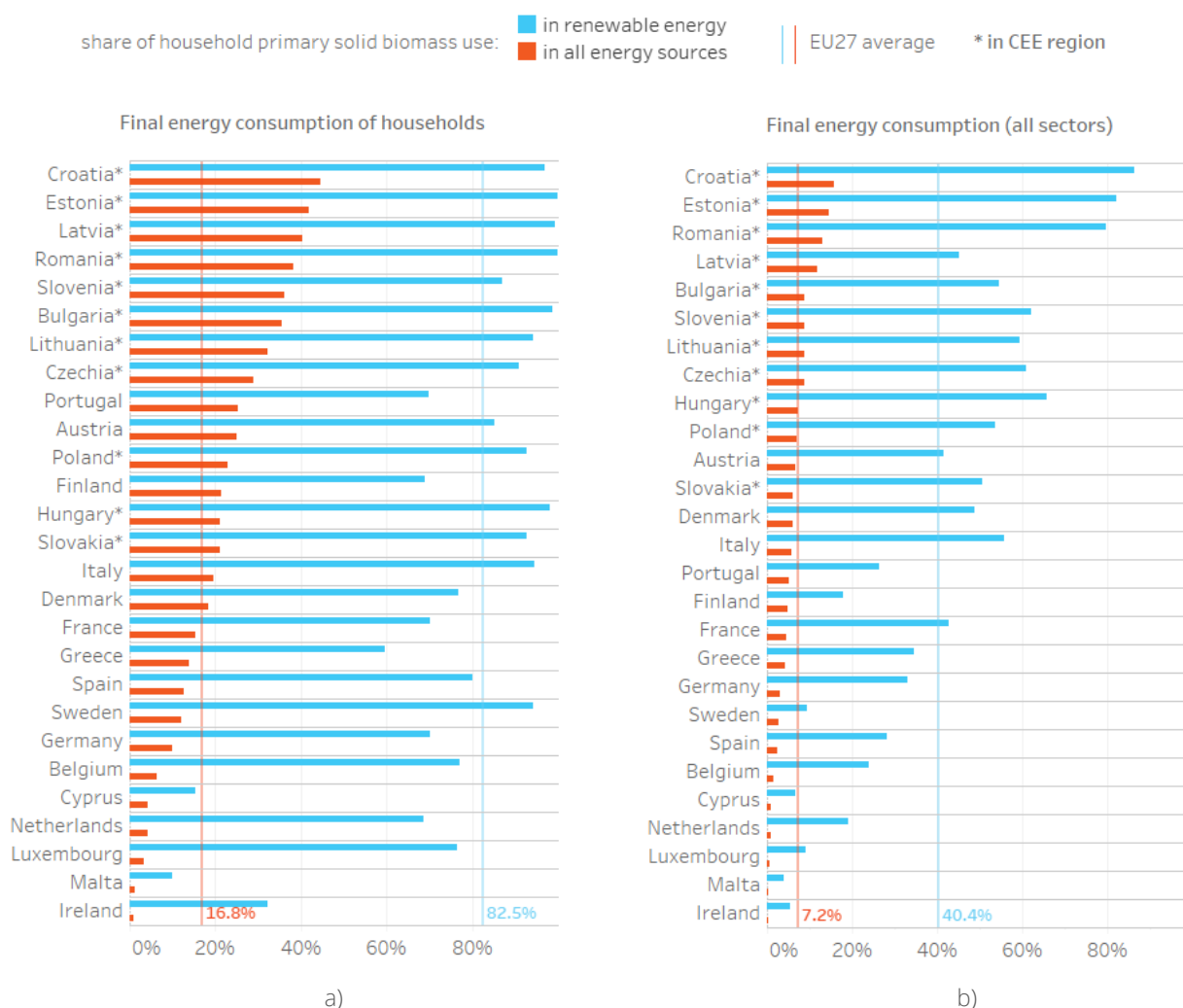
THE LIFE-BIOBALANCE PROJECT

Funded by EU LIFE Programme Climate Governance and Information, the „Balancing solid biomass for climate neutrality in CEE countries“ ([LIFE BIO-BALANCE](#)) projects' overall objective is to support EU Member States to shift to a low-carbon and resilient economy by ensuring that solid biomass is produced and used sustainably at all levels. The project design was motivated by multiple negative trends which connected to the energy utilization of solid biomass, namely climate change, biodiversity, air pollution and energy poverty.



Firewood in the energy mix

The use of solid biomass for home heating and cooking – typically firewood – tends to be considerably more common in countries in relatively worse economic situations, which is also the case in the CEE region of the European Union (EU). Within these member states solid fuels are mostly used by low-income households who often live in poverty, many facing extreme conditions.



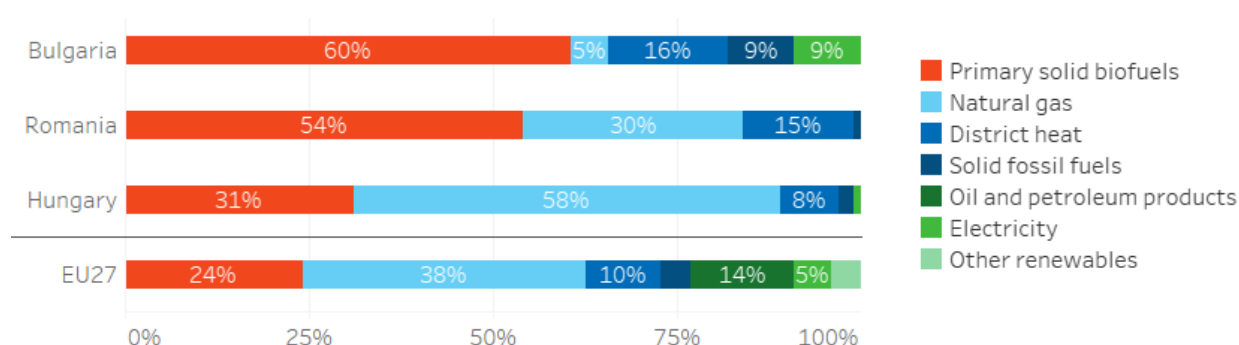
▲ Figure 2. Share of household biomass use in the final energy consumption a) of households and b) of all sectors, EU countries (2020)³

³ Eurostat: [Complete energy balances](#)

At the household level, firewood and other solid biomass are by far the main source of renewable energy consumption in the whole of the EU. According to Eurostat data, the EU average share of biomass from household renewable energy was 83 percent in 2020 while the share in nine out of ten CEE member states was above 90 percent (see Figure 2).

There is an even clearer east-west divide within the EU when countries are ranked by the share of household biomass use in all sources of energy consumed. Practically all CEE countries' share is above the EU average – both in terms of total final energy consumption and within total household energy consumption –, while most of Western-European countries fall below the EU average in these aspects (see Figure 2).

Firewood is mainly used as a heating fuel; therefore, it is even more prevalent in terms of household heating, coming in second after natural gas in the EU, covering almost a quarter of total consumption. In the CEE region this share is often more than double, as it is the case for Croatia with the highest rate⁴, or Bulgaria and Romania (see Figure 3).



▲ Figure 3: Share of energy sources in final energy use by households for heating, (BG, RO, HU, EU27) 2020⁴

Solid biofuels are also considerably more prevalent in the region within renewable energy-based heat and electricity production: the EU average share for the two combined was 17% in 2020, while in the eleven CEE countries this was almost double, at 32%⁵.

⁴ Eurostat: [Complete energy balances](#)

⁵ Sum of gross electricity and heat production – primary solid biofuels as a percentage of all renewables, Eurostat: [Complete energy balances](#)

3. Drivers of firewood use

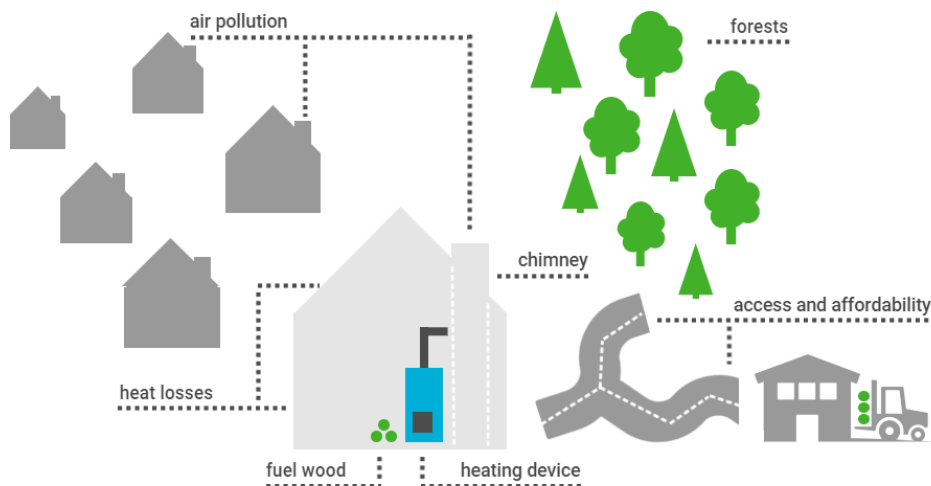
There can be a variety of reasons and factors which result in choosing firewood to heat one's home – for some, it means luxury and comfort and for many, it is the only available or affordable option.

a. Access

- Gas and district heating networks do not reach all locations or settlements; entire towns, villages or streets must rely on other forms of heating, which mostly means using solid fuels. This is typical in areas hard to reach by infrastructure (such as mountains or remote locations, like farms and islands) or in disadvantaged, segregated neighbourhoods. Roma communities are disproportionately affected by this.
- When households are unable to pay their bills on time, they accumulate arrears until the energy supplier disconnects them from the network. This often results in switching to solid fuel heating, especially in rural areas.

b. Flexibility and autonomy

- Not being connected to centralized energy services means independence from monthly bills, the fear of disconnection and the risk of disruptions of supply due to external events. Unlike most energy services, firewood is a 'pre-paid' purchase and can be locally stored for later use.
- Biomass heating and cooking systems are often used in combination with gas heating or other energy sources. This provides the choice to instantly switch between centralized and decentralized forms of energy (fully or partially).
- Firewood can be purchased from various suppliers such as forestries, wood yards and local entrepreneurs. It can also be directly harvested from forests or from the vicinity of rural areas – either legally when one owns the land or has access, or through informal/illegal ways.
- When firewood becomes less accessible or affordable it can be substituted by a range of alternatives in most heating appliances. Examples are biomass briquettes, coal products or other combustible materials such as plastic waste, tyres or old furniture – the fumes of which are extremely harmful to human health and the environment.



▲ Figure 4: Main aspects of wood heating

Affordability

- When the prices of fossil energy sources are high, firewood is often a cheaper option, and therefore the substitution product for space heating. In the CEE region, this used to be the case for much of the 1990s and 2000s, however, in the past decade its price has been sharply increasing, even more so as a result of recent crises. This affects poor households disproportionately, who are unable to diversify and optimise their fuel use, as that often involves significant installation and connection costs.
- The most economical is to buy wood once in a season and dry it for at least a year, however this requires considerable savings and appropriate infrastructure (e.g.: well-ventilated firewood storage). The reason for this is that dry (seasoned) wood has significantly more heating value than freshly cut wood (which is cheaper to buy than already seasoned wood).
- Installing a simple solid fuel heater (e.g.: a metal stove) directly connected to an existing chimney is considerably cheaper than most other heating systems. However, increasingly stricter building and appliances regulations in the EU also impact solid fuel heating (e.g.: EcoDesign, BOX 2, or minimum safety standards of chimneys) and are driving the cost of heating installations higher.

d.

Voluntary choice

- Using solid biomass can be part of a conscious lifestyle choice of individuals or communities who wish to live more simply, to be self-sufficient and/or to minimize their environmental impact.
- And for a lucky few, who can afford it, a fireplace is just a nice addition to a homely atmosphere, where one can enjoy the crackling sound of firewood with a book or some wine.

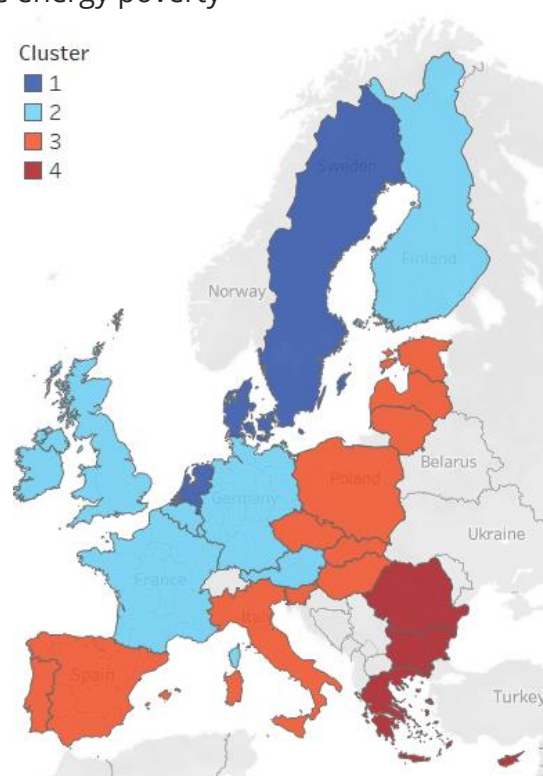
Housing conditions and energy poverty

Europe is part of the global housing crisis with millions lacking access to decent and affordable housing. In the CEE region, home ownership is much more prevalent than in Western Europe – with Romania having the highest rate in the EU at 96 percent of the population living in own property⁶ –, while the share of social housing is far below what would be needed. Therefore, the main housing expense of most low-income households is to cover the energy used for heating, cooking and appliances. Furthermore, home maintenance and improvement it is their responsibility and rarely receive any financial or other support in assistance.

These are drivers of energy poverty, which in addition to lower household income levels and generally worse living conditions, mean that the CEE region is more severely affected by energy poverty than the Western countries. This divide is reflected by indicators commonly used to measure energy poverty (Figure 5).

These sharp differences can be partly explained by the legacies of state socialism. An example is the large share of housing stock built rapidly to provide cheap housing for the working class, such as the high-rise prefabricated concrete-block apartments emblematic of the region. In the state-controlled economies energy prices were low and therefore energy efficiency was not an influential factor in home construction.

Figure 5: Structural energy poverty vulnerability index 4-cluster distribution across the EU⁷



⁶ Eurostat (2021).: [Housing in Europe - House or flat - owning or renting](#).

⁷ Recalde, M., et al. (2019). [Structural energy poverty vulnerability and excess winter mortality in the European Union](#).



Following 1989, the transition to market economy resulted in the privatisation of social housing and energy services, severely increasing the cost of housing and the level of energy poverty.⁸ Simultaneously, the provision of public services and social support decreased, while governments and (civil) society have been unable to effectively cope with the increased levels of poverty.

While energy poverty has gained considerable focus in EU policy making in recent years (see BOX 1), often the above-mentioned specificities are not considered, and the offered solutions are not applicable to many households facing energy poverty in the CEE region. The prevalent use of firewood and other solid fuels among low-income households is one of these crucial issues which has not been addressed by EU policy.

⁸ Bouzarovski, S., & Tirado Herrero, S. (2017): [The energy divide](#)

ENERGY POVERTY IN EU POLICY

Excerpts from the European Commission's Recommendation on Energy Poverty

[EUR-Lex—32020H1563—EN - EUR-Lex](#), 2020

Energy poverty is a situation in which households are unable to access essential energy services. With nearly 34 million Europeans unable to afford to keep their homes adequately warm in 2018, energy poverty is a major challenge for the EU. [...] Adequate warmth, cooling, lighting, and energy to power appliances are essential services that underpin a decent standard of living and health. Access to energy services is essential for social inclusion. Tackling energy poverty thus has the potential to bring multiple benefits, including lower spending on health, reduced air pollution (by replacing heating sources that are not fit for purpose), improved comfort and wellbeing, and improved household budgets. Taken together, these benefits would directly boost economic growth and prosperity in the European Union.

The European Pillar of Social Rights [...] includes energy among the essential services which everyone is entitled to access. Support for access to such services must be available for those in need.

A fair transition towards a climate-neutral Union by 2050 is central to the European Green Deal [...]. A centrepiece of this Green Deal is the Renovation Wave, a major initiative designed to boost the structural renovation of private and public buildings, thereby reducing emissions, boosting recovery and addressing energy poverty. [...] Energy poverty is a key concept consolidated in the legislative package entitled 'Clean Energy for All Europeans', which is designed to facilitate a just energy transition.

In their NECP, Member States have to assess the number of households in energy poverty. [...] In the event that a Member State finds that it has a significant number of households in energy poverty, it shall include in its plan a national objective as well as policies and measures to reduce energy poverty.

The [...] Electricity Directive requires Member States to take appropriate measures to address energy poverty wherever it is identified, including measures addressing the broader context of poverty. Member States must also protect vulnerable customers, in particular those in remote areas. [...] Under the revised version of the Energy Performance of Buildings Directive (EU) 2018/844 Member States must outline relevant national measures to help alleviate energy poverty, as part of their long-term renovation strategies to support the renovation of the national stock of residential and non-residential buildings.

For further resources on energy poverty related information in the EU visit the [Energy Poverty Advisory Hub](#) (EPAH) and its predecessor the [Energy Poverty Observatory](#) (EPOV).

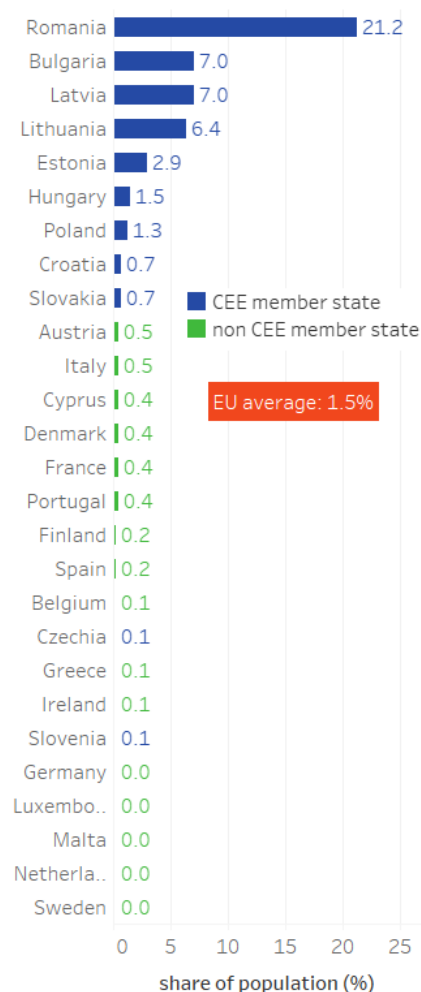
a.

Access to basic infrastructure and amenities

Regrettably, extreme forms of poverty are still prevalent in the CEE region where hundreds of thousands of households lack access to basic services and networks such as drinking water, sewage treatment, paved roads or even electricity. Lack of running water means no bathroom or toilet, and lack of electricity means inability to reach numerous other services so basic in the 21st century.

Households without these amenities most typically use firewood and other solid fuels for heating – often for cooking and water heating as well – and do so in the most basic metal stoves (see page 17), which are highly inefficient and polluting.

When talking about energy poverty and energy efficiency it is an absolute priority to address – and eliminate! – such extreme forms of deprivation and enable these households and communities to live in dignity. This is a prerequisite for a truly Just Transition.



▲ Figure 6. Total population having neither a bath, nor a shower, nor indoor flushing toilet in their household⁹

b.

Housing quality and energy efficiency

The amount of energy needed to adequately heat a home is largely determined by the quality – especially the energy efficiency – of the dwelling and the appliances used within. Walls, roofs, windows and doors with thermal insulation can significantly reduce the energy demand and expenses of a building; a newly built home or one which has undergone significant energy renovation (or deep renovation) may need less than half the energy per unit area than that of a dwelling built decades ago.

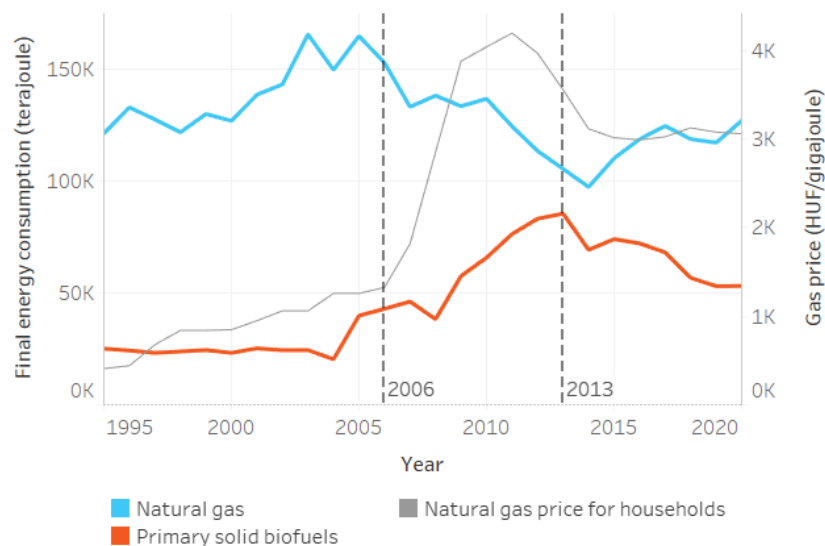
⁹ Eurostat: [Data Browser](#)



The housing stock of the CEE region is considerably less efficient¹⁰ and less modernized than the EU average. Low-income households cannot afford to live in newly built, high-performance homes and lack the resources to renovate. Therefore, they are likely to need more energy to heat their home than high-income households living in the same size dwellings. High energy expenses – especially in the wintertime – further reduce the possibility of saving money for repairs and renovation, reinforcing the vicious cycle of energy poverty.

c. Affordability and energy prices

In the CEE region solid fuel heating is dominantly used by low-income households and therefore users are highly vulnerable to price increases. On the other hand, when gas prices increase, rural households tend to shift to using more firewood.



▲ Figure 7: Biomass and gas consumption vs. gas prices in Hungary

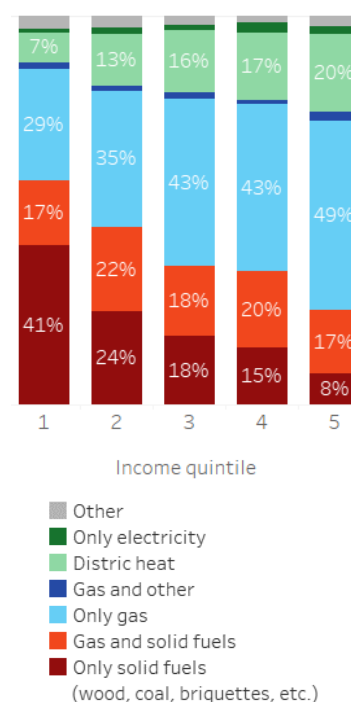
¹⁰ ODYSSEE-: [Key Indicators](#)

This can be illustrated by the example of Hungary, where biomass use sharply increased as a response to the rise in gas prices following 2006 (see Figure 7). This was halted in 2013 by the national regulation which reduced and fixed utility prices, in the case of gas by 25 percent compared to the price in 2012. Consequently, the consumption of bioenergy decreased, however it is still higher than pre-2006 levels.

In August 2022 the Hungarian government made significant modifications to the utility regulation, which increased the price of household gas above a certain consumption level roughly five times, in an attempt to close the gap with soaring global prices. Once again, masses of households instantly turned to firewood, consequently driving up prices and causing shortages in supply.

In Hungary, it is most common among households with the lowest incomes to use only solid fuels for heating, therefore, they are less capable diversify or to switch to and from gas when prices change. Higher income households are using solid fuels more typically in combination with gas heating, enabling them to optimize their consumption based on fuel prices (see Figure 8).¹¹

As fossil energy prices have been rising to unprecedented levels, electricity and gas has become unaffordable for millions in the EU, pushing even middle-class households into energy poverty and to using firewood¹². At the same time, the post-COVID inflation of raw material prices have greatly impacted wood products and the aggression against Ukraine has put further strain on their trade. Transporting and processing solid biomass also requires fossil energy. The fear of gas supply disruptions across Europe are driving up demand and prices even more¹³.



▲ Figure 8: Fuels used for household heating by income quintiles, Hungary (2019)¹¹

¹¹ Habitat for Humanity Hungary: [Energy poverty](#) - Yearly Housing Report 2020

¹² Notes From Poland (3 June 2022)

¹³ Reuters (1 April 2022)

Affording adequate levels of energy in the home is becoming increasingly difficult for millions of Europeans, therefore, governments must grant protections and support to their citizens to prevent further crises. The CEE region is at special risk due to weaker economies and welfare systems, and need policy instruments that reach the poorest, most of whom are using solid fuels.

5.

Heating devices and systems

Same as for all technologies that use energy, a set of crucial factors determine the performance of solid biomass-based space heating systems – i.e., how good they are at keeping a home warm by turning fuel into heat.

■ Combustion temperature

The fire needs to be hot enough to burn most of the fumes released from the heated wood, converting it to useful energy and avoiding particulate matter (PM) emissions; hotter fire means less air pollution.

■ Ventilation

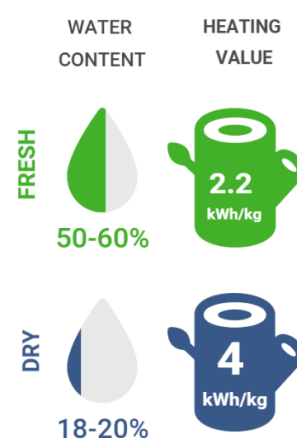
Clean combustion also requires a sufficient supply of oxygen. Fresh air can enter the heating device either from the room – through doors and windows or a ventilation system – or through an outdoor air supply directly connected to the heating device. At the other end, an appropriately sized chimney must provide the suction for the smoke to be pulled outdoors.

■ Heat storage capacity

Once the fuel is converted to heat – which must happen rapidly to reach high temperatures –, it needs to be captured and released to the rooms in the house. This can happen through the mass of the materials surrounding the firebox (single space heating) or through another medium like water (central heating). Generally, the larger the mass of a heating system, the more efficient it is at storing and utilising the heat of the fire.

■ Fuel quality

The amount of heat energy that can be generated from the combustion of biomass (heating value) depends on its carbon and moisture content. While most woody biomass has a similar carbon content, the amount of



▲ Figure 9: Moisture (water) content vs. heating value



moisture in the wood significantly impacts its heating value; additional energy is needed to evaporate the water contained in the wood fibres. Wood logs that were dried outdoors for at least 1 year can release close to twice as much heat as freshly cut wood by unit of mass (Figure 9) and this is even higher for wood pellets which typically have a moisture content below 10%.

■ **User behaviour**

With most solid fuel heating systems user behaviour and maintenance practices are especially crucial and can greatly impact the performance, safety and lifetime of devices. Examples are:

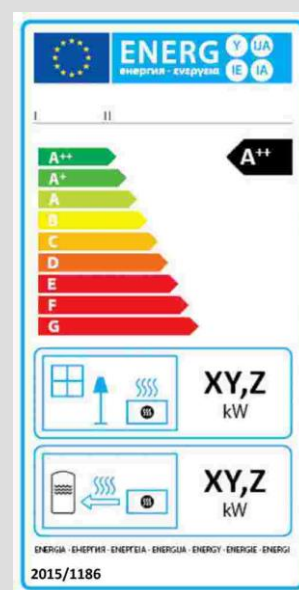
- choice of fuel; the quality of the fuel that a household uses depends on access to information on what is optimal and on what is available and affordable,
- the way the fuel is prepared; how it is chopped and how long it was dried,
- how much air is supplied during burning; how often windows are open for ventilation or whether the stove door is kept open or shut at appropriate times,
- how the fire is built and lit; lighting the kindling on top of the logs ("top-down fire") as opposed to the bottom, reduces particulate emissions.

ECODESIGN AND ENERGY LABELLING¹⁴

The EU energy labelling and ecodesign legislation aims to improve the energy efficiency of products on the EU market. Energy labels provide a clear and simple indication of the energy efficiency and other key features of products at the point of purchase. Ecodesign sets common EU wide minimum standards to eliminate the least performing products from the market.

From 1st January 2022, any solid fuel local space heater placed on the market is required to meet the efficiency and emission performance standards set by the ecodesign requirements.

The regulations set minimum levels of efficiency as well as maximum permitted levels of emissions of pollutants in the flue gases, namely Particulate matter (PM), Carbon Monoxide (CO), Organic Gaseous Compounds (OGC) and Nitrous Oxides (NO_x).¹⁵



▲ Figure 10: Energy label of local space heaters¹⁵

Wood heating requires considerably more attention and effort from users than being connected to centralised energy grids. State of the art technologies can incorporate automated functions, reducing this responsibility. These are unaffordable to many households, while burning fresh (wet) wood or synthetic materials (like plastic waste) can significantly damage appliances, decrease efficiency and harm health and the environment.

The specific heating system that a household is equipped with depends mainly on the characteristics of the dwelling, the residents' preferences and on what is available on the market. And of course, on the income and savings of the household and whether financial support and information are accessible if they want or need to upgrade.

The following is an overview of the most used devices in the CEE region.

¹⁴ European Commission: [Guidelines accompanying Regulations \(EU\) 2015/1188, 1186 & 1188](#)

¹⁵ European Union: [Commission delegated regulation \(EU\) 2015/1186](#)

a.

Single space heaters

Appliances which release heat only in the room they are in (which is where the combustion takes place), are categorised as single space heaters. In the case of solid fuel heating, they are directly connected to a chimney. It is common to have them installed as secondary heating alongside gas or other primary heating especially for households with higher incomes.

- **Conventional metal stoves**

Individual biomass heaters can be relatively cheap metal (sheet or cast iron) stoves having low efficiency and poor heat retention; therefore, they need to be fed with wood almost constantly and have high emissions. In the CEE region, low-income households typically use this way of heating, as it is the cheapest to install and maintain. Most of these will be phased out after 2022, as the EU Ecodesign Directive came into force (see BOX 2), while products that are certified cost significantly more. Not being able to replace and upgrade old stoves is likely to cause a technology “lock-in” for many of the most vulnerable households.

- **Fireplaces**

Open fireplaces are rarely used today, however modern versions with large glass surfaces are preferred by many households, mainly due to the warm atmosphere associated with the view of the fire. Therefore, their efficiency is often relatively low, unless the fireplace inserts are of high quality and are surrounded by materials of significant heat storage capacity – resulting in prices multiples of simple metal stoves.



▲ Image 1. a), b), c):
Conventional metal stoves



▲ Image 2: Fireplace insert

- **Masonry heaters**

Masonry heaters work on the principle of burning wood rapidly and storing the resulting heat in a large thermal mass of hundreds of kilos of masonry materials, which then slowly dissipates to heat the space. As opposed to light metal stoves, where the smoke (and heat) directly exits through the chimney, a masonry heater forces the fumes to pass through channels, drawing much of the heat into the body of the heater.

Depending on the mass of the stove and the efficiency (insulation) of the building a masonry heater can heat a room or house over a period of 10-24 hours with just one load of firewood.

Therefore, these heaters consume significantly less wood than metal stoves. The installation cost is significantly higher, unaffordable for low-income households. These heaters can be fuelled by wood logs and briquettes (from sawdust or agricultural waste) and by coal products if they are equipped with a grate and a bottom air supply (common with old heaters).

Masonry heaters are widespread in many European countries with harsh winters and their traditions date back to hundreds of years. In the CEE region, the most common are tiled masonry heaters, which can have a lifetime of 20-50 years and are installed and maintained by certified professionals. Due to advances in the technology, masonry heaters can be built to comply with modern efficiency and emissions requirements including the ecodesign standard.



a)



b)

▲ Image 3: Tiled masonry heaters
a) from 1970s and b) from 2000s

■ Pellet Stoves

Pellets are a relatively new solid fuel type made from compressed biomass, most commonly from sawdust, but can be produced from a range of agricultural crops or food residues. Their advantages are due to their uniform quality and low moisture content – can contain less than half the water as dried wood – guaranteed by the industrial manufacturing process. Their feeding into the firebox of the stove is automated making it more convenient and less time consuming than appliances operated by wood logs. Pellet stoves are more expensive than conventional metal stoves while users are more restricted in the choice of fuel suppliers. Pellet stoves can also be manufactured to be part of a central heating system.



a)



b)

Image 4:
a) Pellet stove
and b) pellets



b.

Central Heating

In a biomass central heating system, wood or other solid fuels are combusted in a boiler stove which heats water that is circulated through several locations in the home, where the heat is dissipated through radiators. They also often provide the hot water needs of the dwelling(s).

A central system has a relatively high installation cost as the system may consist of many parts including the stove, radiators, pumps, buffer storage, pipes, fitting, electronics through to the chimney. Outdated centralised systems, common in rural areas of CEE countries, are highly polluting and inefficient, which combined with the low efficiency of the housing stock results in high solid fuel consumption. These boilers can also be fuelled by coal products and other highly polluting materials such as painted or glued furniture boards or even car tyres.



a)



b)

▲ Image 5: Central heating
a) boiler stove and b) radiator

On the other hand, modern systems (e.g.: wood gasification) use highly efficient boilers with significantly less emissions, including pellet-based systems which can be equipped with automatic feeding and burning controls.

The ecodesign standard has been in effect for solid fuel-based central heating systems since 2020, increasing the minimum installation costs and keeping the outdated ones in use for longer (lock-in effect) for households who cannot afford the upgrade.

c.

The future of biomass heating technologies

All above-mentioned solutions are in constant development as environmental regulations and the needs of consumers change. However, a lot will depend on future regulations and policies including support and funding schemes which can determine which technologies become more widespread and in turn more affordable.

Biomass-based central heating systems can also be combined with other renewable systems, such as solar panels and heat pumps to create a more diverse fuel mix for households. Furthermore, as an intermediate scale between large grids and individual household solutions, small, municipal district heating systems – in combination with deep renovation of the dwellings – can be an option. Such systems could also play an important part in fulfilling ambitions to increase community energy production across the EU.



6. Environment and health

a. Emissions and pollution

Residential solid fuel heating (wood, coal, waste etc.) is the largest source of airborne fine particle emissions (PM₁₀ and PM_{2.5}) in Europe resulting in the premature death of hundreds of thousands of citizens each year¹⁶. At the same time this highly polluting form of energy (i.e., heat generation from biomass at a household level) is the largest source of renewable energy in most of CEE. Furthermore, wood as an energy source is generally accounted as CO₂ neutral due to the carbon stored in the trees, however considerable CO₂ emissions are released at the time of combustion raising current greenhouse gas emissions (GHG) in the atmosphere.

This kind of emission is indirectly recorded under the land use, land-use change and forestry sector (LULUCF). However, current climate policies do not address this issue sufficiently, allowing member states to burn biomass to reach their renewable energy target. As of May 2022, this debate has been on the table in the frame of the legislative process of the Fit for 55 package. The package aims to create change with strong sustainability criteria and an ambitious carbon sequestration target. It also envisages a role for biomass in the energy transition with strong environmental safeguards.

¹⁶ European Environment Agency: [Air pollution](#)

Wellbeing

The serious health risks associated with the emissions of household solid fuel heating – such as vascular and respiratory diseases or even cancer – impact its users and their local communities. Furthermore, using firewood is often time consuming and physically demanding adding to the various stresses caused by (energy)poverty.

The less income a household has, the more likely that they live in an inefficient dwelling, have an outdated stove, and will compromise on the quality of the fuel being used. In CEE countries solid fuel heating – being on the bottom of the energy ladder (see Figure 1, pg. 2) – is most prevalent among underserved and segregated communities. Their wellbeing can only be significantly improved by complex efforts to alleviate the root causes of such poverty. A key aspect is providing access to affordable and clean energy.

Forestry

Bioenergy represents 60 per cent of the final renewable energy consumed in the EU, from which 76 per cent is derived from wood and other solid biomass.¹⁷ The key aspect of long-term forest productivity – i.e., how much biomass can be extracted from a forest – is sustainable forest management, where the harvesting level is below growth levels, so that net forest growth is positive. However, it is important to note that this definition does not reflect on other important ecological and social services of forests.

The Joint Research Center (JRC) of the EU estimated that 26 per¹⁸ cent of solid biomass use for energy is unaccounted or uncategorised, meaning that their origin is unknown. In the frame of the BIOSCREEN-CEE project, in-depth analyses were made for Bulgaria, Hungary, and Romania. The gap between the supply and demand side was even more significant, varying between 40-50 per cent. The actual level of illegal logging is unknown, but possibly also contributes significantly for the deficiency. Range of illegal logging varies country by country¹⁹.

¹⁷ European Commission: [Biomass](#)

¹⁸ JRC: [The use of woody biomass for energy production in the EU](#)

¹⁹ BioScreen CEE: [The National Biomass Analysis](#)

7. Recommendations

Firewood has always played an important role in keeping homes warm. While it is primarily the ‘fuel of the poor’, we can expect more and more households to turn to this energy source due to high fossil energy prices and fears over supply security. At the same time, solid biomass will become increasingly dominant in the rest of the energy mix as well, as EU member states increase their renewable shares to reach the targets set for 2030 and 2050.

The increased demand will likely further increase fuel wood prices, putting even more strains on energy poor and vulnerable households. When good quality solid biomass, efficient heating devices and energy retrofits are not affordable or accessible for low-income households, they are forced to substitute with low quality solid fuels and heating devices that cause significant air pollution and negative health impacts.

The previous chapters have illustrated that these issues disproportionately effect CEE countries. A just energy transition can only happen if these are recognised in their complexities and are specifically targeted and tackled by policies and support mechanisms at the EU, national and local levels.

a. EU level

In the EU, several legal and financial instruments are in place in order to decrease the economic disadvantages of CEE member states. These countries are the largest per capita beneficiaries of sources such as the European Regional Development Fund, the European Social Fund or the Just Transition Fund²⁰. The first fund to be specifically targeted at energy poverty and the energy transition of low-income households is the Social Climate Fund (SCF) which is to be rolled out as part of the Fit for 55 Package (its details are still debated at the time of writing this report).

- The SCF and other energy poverty alleviation measures and policies need to specifically address the issue of solid fuel and biomass heating in a socially sensitive manner.

²⁰ European Commission: [EU spending and revenue 2014-2020](#)

- There needs to be more stringent monitoring and enforcement mechanisms which ensure that these funds really benefit households in need.
- Funds need to be strictly ringfenced not only for energy poverty but for other fundamental related issues such as eradicating the situations of households without access to basic infrastructure and amenities (water, electricity, bathroom, etc.)
- The (deep) renovation and modernization of the worst performing building stock needs to commence and has to prioritise low income households and should consider specifics of the CEE building stock and housing context.
- The above must also focus on solid fuel heating devices and offer support which is adequate for the technological and economic situation of energy poor households.
- Social heater exchange programmes need to be promoted and supported in CEE member states.
- Environmental and safety regulations need to be implemented in ways that do not further disadvantage low-income households, and therefore avoid causing technological lock-ins, as it is the danger with the ecodesign standard in the case of the most used solid fuel stoves (cheap metal stoves).
- Matching funds need to be directly and readily available to comply with such regulations.
- These issues can only be dealt with if the sufficient data and monitoring tools are in place.
 - Energy poverty indicators need to be developed and recorded which capture solid fuel heating and access to modern energy services.
 - Firewood prices need to be included in the Eurostat energy statistics along with gas and electricity.
 - Eurostat should give guidance on how to record and monitor the heating appliances used by households within Member States.
- EU decision makers need to consult and work with non-governmental organizations (NGOs), advocacy groups and professionals who can channel in experiences of local stakeholders as well as the voice and needs of the affected households.

- The contradicting nature of solid biomass as an energy source needs to be addressed – i.e.: sustainably harvested clean renewable fuel versus highly polluting ‘fuel of the poor’ associated with deforestation.

b.

National and local level

- CEE member states need considerable effort and commitment to achieve their climate and energy targets and need realistic strategies and policies – part of which is dealing with the challenges of household solid fuel heating.
- Funds provided by the EU need to be directed towards households in energy poverty, which requires special attention towards the issue of solid fuel users.
- It needs to be recognised that this issue is fundamentally linked to other aspects of poverty and therefore ministries, authorities, and institutions responsible for social issues need to be included when policies are planned and implemented.
- Therefore, the primary policy instruments of transition away from harmful solid fuel use must be various forms of support mechanisms rather than penalisation, criminalisation, and stigmatization of affected households.
- Groups which are more affected or are at higher risks need to be identified and accordingly supported – examples are the elderly, single (parent) households or Roma communities.
- National and local NGOs and advocacy groups have a crucial role in finding effective solutions and shaping policies, which must be supported. They are often in direct contact with affected households and have extensive experience in piloting innovative solutions to social and environmental challenges.



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