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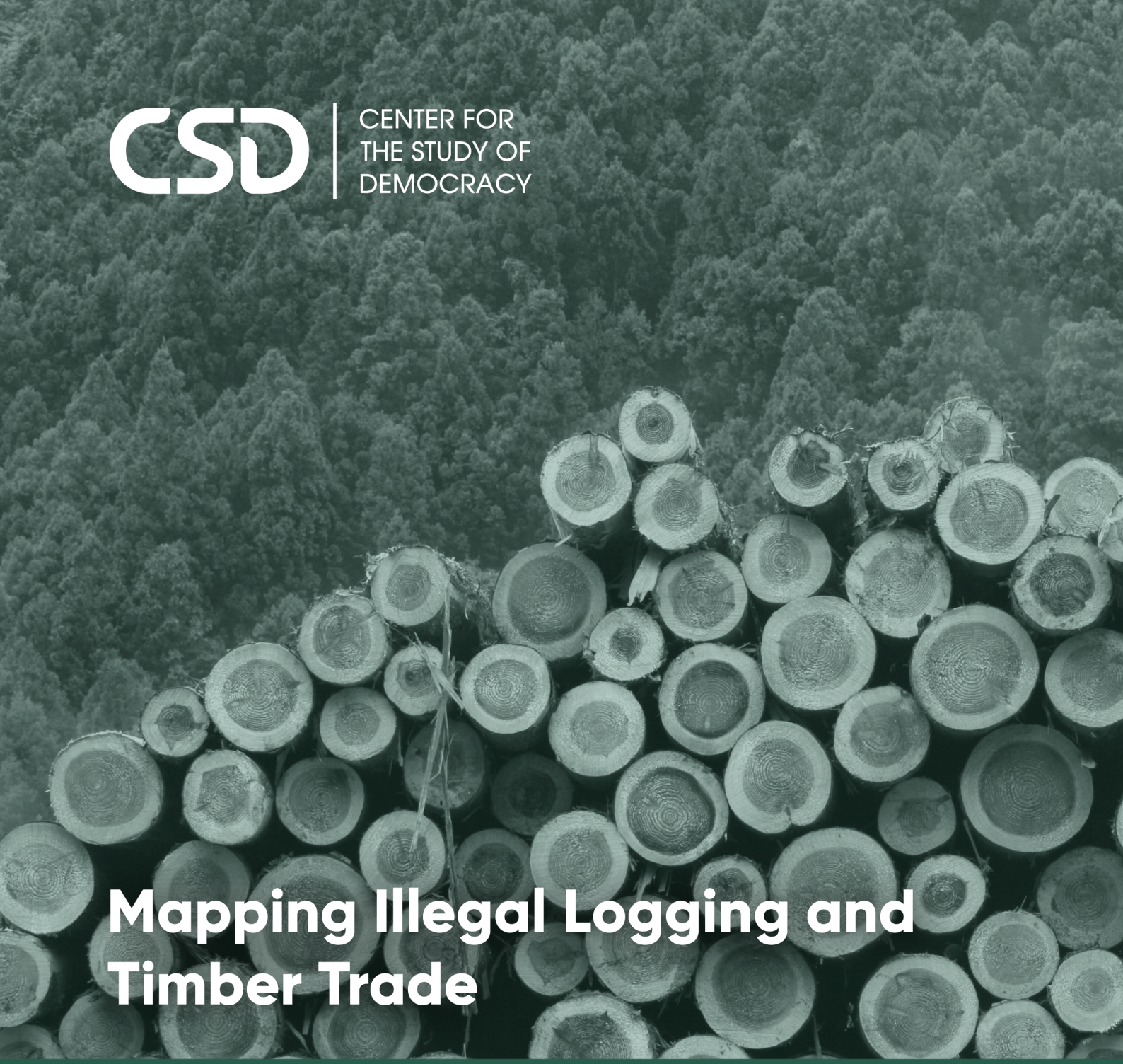

Mapping Illegal Logging and Timber Trade

Promoting Sustainable Environmental Solutions to Tackle Energy Poverty in Bulgaria

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Illegal logging, timber trade, deforestation and energy poverty are pressing challenges for Bulgaria. Despite government efforts to combat these problems, they remain widespread phenomena, leading to lower potential for carbon sequestration with severe environmental and climate impacts. The use of firewood by around a quarter of the Bulgarian population testifies to the inability of many households to adequately heat their homes, or cover their utility bills.

The rise of living standards and the expansion of electricity use for heating have cut in half the use of biomass, as well as overall energy poverty in the past decade. Yet, the Bulgarian government should deploy much more encompassing measures to support vulnerable energy consumers and boost energy efficiency. Meanwhile, by providing incentives to households to phase out firewood use and by implementing measures to improve the tracking of logging activities, the government will accelerate the growth rate of Bulgarian forests, bringing Bulgaria one step closer to climate neutrality.

The current report attempts to map the role that biomass plays in the Bulgarian energy system; measures the extent of illegal logging and timber trade; assesses the structure of the firewood market; and discusses the pathway to decarbonisation via a long-term forest management strategy.

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LIST OF ABBREVIATIONS

EFA	Executive Forest Agency
EPAH	Energy Poverty Advisory Hub
ETS	Emissions Trading Scheme
Ha	Hectare (1 hectare = 10,000 square metres)
GHG	Greenhouse gases
ktoe	Kilotonnes of oil equivalent
LULUCF	Land Use, Land-use Change and Forestry
MtCO2	Metric tons of carbon dioxide
NECP	National Energy and Climate Plan
NRRP	National Resilience and Recovery Plan
OPE	Operational Programme Environment 2021-2027
PM	Particulate Matter
PV	Photovoltaic
RES	Renewable Energy Sources
TJ	Terajoule
TWh	Terawatt-hour

EXECUTIVE SUMMARY

Biomass, and wood in particular, sit at the intersection between several pressing societal issues in Bulgaria. Burning wood remains the heating method of choice for many Bulgarian households. This is partially the result of the delay in decarbonising Bulgaria's energy sector and electrifying heating, coupled with insufficient measures to improve the energy efficiency of homes, which all lead to high levels of energy poverty. The postponement of the full electricity market liberalisation and the lack of adequate measures to support vulnerable consumers are additional causes for the households' excessive dependence on firewood. The demand for biomass in heating is also leading to demand for wood logging, including widespread illegal harvesting practices. By reducing the overall heating demand and enforcing stricter control measures on the logging process, Bulgaria would significantly reduce deforestation and increase the forests' greenhouse gas sequestration potential, thus accelerating the decarbonisation of its economy, maintaining its biodiversity, and improving air quality.

Over the last decade, timber production peaked at 7.42 million cubic metres in 2018, after which it began declining, reaching 5.28 million cubic metres in 2023. The additional illegal timber harvested annually in the 2006-2017 period is in the range of 1.6-2.1 million cubic metres.[1] The latest estimates for 2023 show that **illegal logging amounts to just 400 thousand cubic metres**, a significant slump compared to previous years.

The changes in the size of logging activities are linked to two parallel processes in biomass consumption since 2023. The first is the **structural institutional changes for managing the forestry sector** and the measures against illegal logging.[2] The second is the **falling household consumption of biomass for heating** and the declining use of wood by the industrial and construction sectors. The most important reason for the change in household energy demand patterns is the **transition from firewood to electricity for heating**. In 2023, around 71% of households used electricity for heating, while in 2011, the share was 29%. Primarily, this shift is the result of a steady increase in household incomes, which raises households' ability to cover their electricity bills when using electricity appliances for heating.

The **demographic profile of firewood users** shows that biomass is used by the two most vulnerable groups - 62-69% of people **over 50 years old** and 80 to 90% of **Roma households**. Reducing the level of energy poverty is one of the main steps for a successful and equitable energy transition in Bulgaria, considering that **20,9% of Bulgarian households are unable to keep their homes adequately warm** and 18.8% accumulate arrears on their utility bills.[3]

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[1] WWF Bulgaria, Analysis of illegal logging in Bulgaria for the period 2006-2013, 2014; Analysis of illegal logging in Bulgaria and the effectiveness of control measures in forest areas for the period 2013-2017, 2018.

[2] The law implements the separation of economic from control functions. To implement the creation of the economic functions, six state forest enterprises were established, which have 170 state forest and hunting holdings. The control functions are performed by the Executive Forest Agency, which has 16 regional forest directorates.

[3] Eurostat, Inability to keep home adequately warm – EU-SILC survey, 2023.

The lack of adequate economic resources prevents households from exiting the biomass trap. Bulgaria must overcome its current approach of merely distributing social assistance, and tackle the structural problem of ensuring access to energy efficiency services for the energy poor, the uptake of low-carbon, decentralised power generation solutions, the introduction of individual investment support vehicles, and the creation of one-stop shops to manage the process.

Bulgaria's approach towards reducing energy poverty has centred mainly on the **support of low-income households during the heating season** (from 1 November to 31 March). In 2023-2024 more than 327 000 households were eligible for these social transfers,[4] which is much lower than the number of households currently at risk of poverty and social exclusion. Under the scheme, households can purchase firewood, which disregards the detrimental impact of this type of consumption on air pollution and enables the further lock-in of low-income households in unsustainable and outdated heating modes.

The best long-term **solution to energy poverty is the deep renovation and maintenance of residential buildings**, which would directly reduce energy costs and the need for energy subsidies, while at the same time limiting air pollution and encouraging the use of innovative heating systems. Redirecting social subsidies towards deep renovations and switching from wood-burning stoves to heat pumps, can effectively bring the most vulnerable households out of energy poverty by reducing their energy expenditures.

Expert assessments of previous building renovation programmes showed that deep renovation activities can lead **to energy savings of up to 60% in buildings reaching energy class A**.[5] Currently, there are several planned measures in this field, including **renovation of multi-family buildings**, deployment of solar panels in households for domestic hot water heating, or photovoltaic systems of up to 10 kW, and replacement of energy-inefficient solid fuels and firewood boilers/stoves with energy-efficient heating devices, with priority given to energy poor households. While these measures will have some impact on improving energy efficiency and reducing energy poverty and pollution, they must be coupled with the **liberalisation of the electricity market** on the one hand, and the development of **different forms of funding mechanisms**, on the other.

The demand for firewood for heating and the high levels of energy poverty have contributed to the development of illegal practices in the logging industry. To **undermine the corrupt local dependencies and sever the ties between logging operations and regulators**, in 2010 Bulgaria established six state forest companies, with 170 local branches, which have operated as commercial entities bidding for the timber resources in state forests. Despite the governance deficits in the sector, between 2012 and 2019, the **six state forest companies have increased legal timber harvesting and revenues**. After the reorganisation of the forestry management, the average legal timber extraction increased from around 4.3 million cubic metres annually to 5.2-5.3 million cubic metres between 2015 and 2019.[6]

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[4] Ministry of Labour and Social Policy, *Changes to targeted heating assistance regulations will ensure that more elderly and disabled people are helped (Промените в наредбата за целева помощ за отопление ще гарантират, че повече възрастни и хора с увреждания ще бъдат подпомогнати)*, 2023.

[5] Centre for Energy Efficiency Eneffect, "Energy efficiency in the context of local elections: analytical context", 2019.

[6] Executive Forest Agency, Annual reports for 2006 - 2019.

Nevertheless, illicit logging practices are still present. **When typifying them, one must distinguish firms trying to avoid paying taxes, from firms with a long history of criminal activity**. The main groups of illegal timber harvesters can be largely categorised as follows:

- Members of the local community, who independently procure their timber, but also extract an additional amount illegally.
- Companies that legally harvest timber but extract more than permitted, often through a "rigged" tender approach.
- Small-scale criminal logging, consisting of local gangs or workers from logging companies, who engage in additional illegal harvesting for their own profit.
- Timber harvesting and processing companies involved in serious organised crime practices.

Land management plays a critical role not only in climate change mitigation, serving both as a carbon sink and a source of emissions, but also in limiting corrupt and illegal practices. **The forest stock in Bulgaria will play a key role in the country's objective to reach carbon neutrality by 2050**, and the government needs to commit, at political and regulatory levels, to use its full potential for sequestering GHG emissions. Historically, Bulgaria has sustained a growing forest stock, but the **carbon removal potential of Bulgarian forests has been diminishing steadily since the 1990s**, mainly due to an increase in harvesting operations since the 2000s and the observed increase in the average age of the forest stands.

The country lacks a clearly defined political, legislative, and regulatory approach for enhanced carbon sequestration and GHG removals by the forestry sector. Bulgaria's path to carbon neutrality in 2050 cannot be sustained without applying policies for the afforestation of marginal lands (e.g. shrubs and secondary grasslands). **Nonetheless, Bulgaria's "removal of timber" to "net increment of trees" ratio in the forestry sector is still at healthy levels of below 45%**, compared to the EU average of above 60%, which positions the country as fully capable of achieving the GHG removal targets in different decarbonisation scenarios if more ambitious policies on forest management, afforestation and reforestation are implemented.

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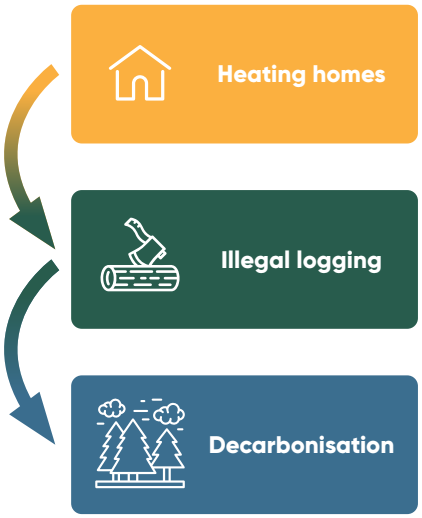
Despite efforts to combat these problems, **energy poverty and illegal logging remain prevalent, leading to deforestation and lower potential for carbon emissions sequestration with severe environmental and climate impacts**. The following recommendations are a non-exhaustive list of measures to be considered by Bulgarian policy-makers:

- Estimating the real number of energy-poor households, based on the recently introduced definition in the Energy Law as part of the **full liberalisation of the electricity market**;
- Deploying targeted measures aimed at **reducing energy poverty to below 10%** of households by 2030 and eliminating it by 2050, through social transfer schemes for energy efficiency and replacing firewood-based heating stoves;

- Expanding **energy efficiency programmes** to accelerate the transition from wood-burning to electrification;
- Promoting the **mechanisation of timber harvesting** (including with targeted financial support) to reduce opportunities for illegal logging;
- Adjusting **existing oversight mechanisms** to include civil society organisations in monitoring logging operations by investing in ICT tools to track the online sale of illegally harvested wood;
- Implementing a **coordinated approach to forestry sector management** by developing a **National Forest Inventory**, which will improve the quantitative and qualitative data about the forest ecosystem;
- Adopting a **National Strategy for the Development of the Forest Sector** in Bulgaria until 2030, recognising the role of forests in the climate mitigation process and reducing the risk for the forest ecosystem related to climate change.

INTRODUCTION

Biomass, and wood, in particular, sit at the intersection between several pressing societal issues in Bulgaria. Burning wood remains the heating method of choice for many Bulgarian households. This is the result of the delay in decarbonising Bulgaria's energy sector and electrifying heating, coupled with insufficient measures to improve the energy efficiency of homes, which all lead to high levels of energy poverty. This process is exacerbated by the delay in liberalising the electricity market and introducing adequate measures to support vulnerable consumers. The continued demand for firewood for heating is also a strong contributing factor towards the still high levels of logging, including significant illegal practices. By reducing households' demand for heating and enforcing stricter control measures on the logging process, Bulgaria would significantly reduce deforestation and increase its forests' greenhouse gas sequestration potential, thus accelerating the decarbonisation of its economy, maintaining its biodiversity and improving air quality.



Bulgaria should reduce demand for biomass by increasing electrification rates of heating and energy efficiency in homes, thus reducing energy poverty.

Reducing demand for harvesting biomass should be coupled with enforcing stricter controls to reduce demand for illegal logging.

Reducing logging will increase forests' GHG sequestration potential, while burning less biomass will improve air quality.

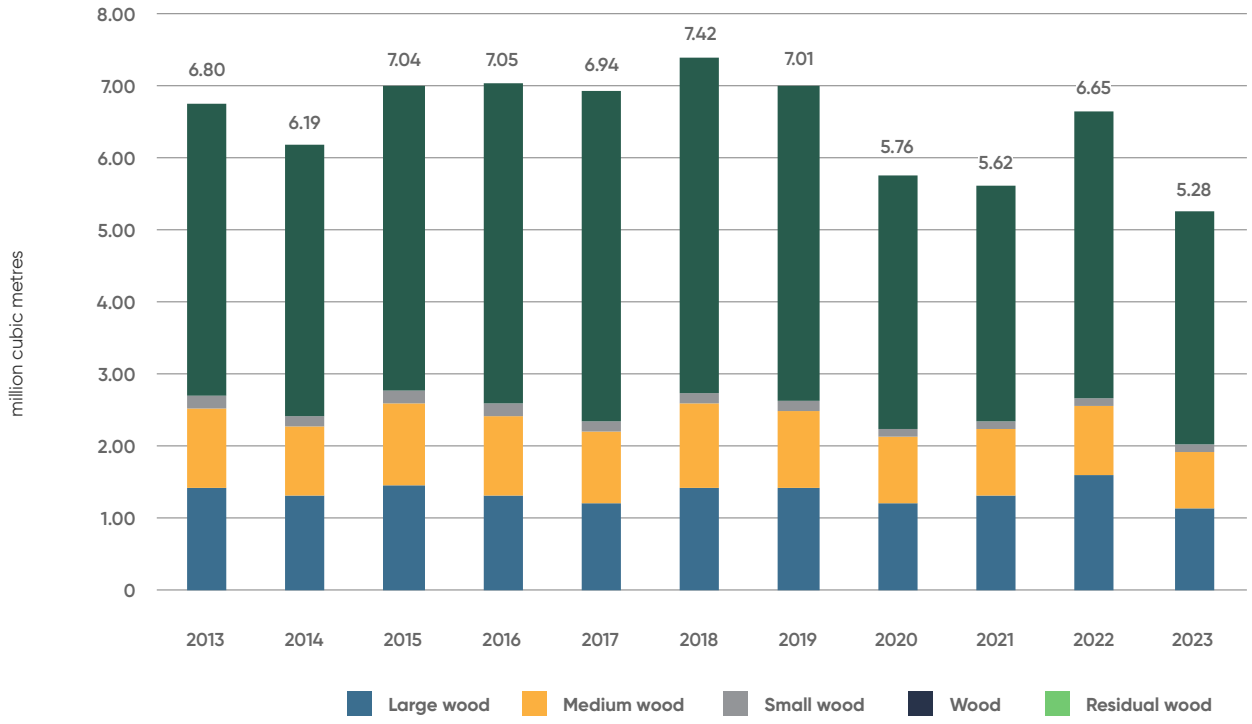
This report reviews the trends and functioning of the biomass market and the changing logging and consumption patterns observed in Bulgaria. It then analyses the link between the use of firewood for household heating and the high levels of energy poverty in Bulgaria, providing policy recommendations to reduce households' energy expenditure. The report then reviews the consequences of continuing the purchase of biomass for heating on the illegal logging market and the policy decisions, which have somewhat reduced criminal practices. The following section analyses the benefits of reducing deforestation and the key role land use and biomass play in the overall decarbonisation process. Finally, the report provides specific recommendations in the policy areas covered by the study.

STRUCTURE AND FUNCTIONING OF THE BIOMASS MARKET

Biomass Consumption

The Executive Forest Agency (EFA), the key institution managing forests in Bulgaria, provides data on biomass consumption mainly in terms of wood extraction. Of the total timber harvested, the 'wood' category accounts for 60-61% of all wood harvested in the country. The term "wood" refers to biomass that is primarily used for heating and domestic purposes. There is no data on the consumption of various other sources of biomass such as straw, rice, sunflower husk and other agricultural products.[7]

Figure 1. Timber production in Bulgaria, 2013-2023 (million cubic metres)



Source: Executive Forest Agency

It should be considered that for all 5 categories of harvested wood, there is an additional percentage of illegal wood. The additional illegal timber harvested annually in the 2006-2017 period is in the range of 1.6-2.1 million cubic metres.[8]

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[7] The annual wood yield is presented by the FEA in five basic categories - large, medium and small wood, and poplar, which are used in the wood processing industry, the furniture industry and quite limited in construction.

[8] WWF Bulgaria, Analysis of illegal logging in Bulgaria for the period 2006-2013, 2014; Analysis of illegal logging in Bulgaria and the effectiveness of control measures in forest areas for the period 2013-2017, 2018.

This means that the annual **total harvest during this period was between 8.0 and 9.5 million cubic metres**. After 2017, there has been a steep drop in illegal timber extraction falling down to between 1 and 1.3 million cubic metres.[9] Previous CSD studies looking at the period 2017-2019 point to slightly lower illegal logging levels of between 800 thousand cubic metres and 1.2 million cubic metres or a total of about 8 million cubic metres of annual timber harvest.[10] In the most recent 2023 estimate, the **illegal harvest is calculated to be only 400 thousand cubic metres or a total of 5.7 million cubic metres of timber extracted for the whole year**.

The changes in the size of logging activities are linked to two parallel processes in biomass consumption in the last decade (2013-2023) in Bulgaria. The first one is that the **structural institutional changes for managing the forestry sector**[11] and the measures against illegal logging have had a positive impact already by 2011. The consequence is that the share of legally harvested timber has started to increase.[12] Accordingly, the demand for illegal wood has plummetted.[13] The 6 State Forest Enterprises have an economic interest in offering the maximum amount of legally harvested wood, which makes large timber processing companies avoid buying wood from companies that have risky timber harvesting.

The second structural trend is the steady decline in overall wood harvesting. The **peak of legal timber harvest was already reached in 2018**. Then during the pandemic years (2020 - 2021), the volumes of timber logging fell precipitously before the war in Ukraine in 2022 recovered some of the extraction levels. The latter comes on the back of bigger household demand linked to fears of a Russian gas supply cut and an overall expansion of EU consumption in the same period. Despite the short-lived recovery, in 2023, wood extraction declined to a new record low of 5.2 million cubic metres.

The structural decline in wood logging is strongly correlated with the **falling household consumption of biomass for heating**. At the same time, wood use in industry has been also on the decline as in construction, demand is falling because of new technological solutions for wood use optimisation. In addition, the small and medium-sized furniture businesses have been hit hard by the slump in demand during COVID, which in turn led to even lower wood consumption.

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[9] WWF Bulgaria, Analysis of illegal logging in Bulgaria for the period 2018 – 2022, 2023.

[10] Center for the Study of Democracy, "Organized Crime Assessment in Bulgaria", 2019 and "Organized Crime Assessment in Bulgaria", 2020.

[11] The law implements the separation of economic from control functions. To implement the creation of the economic functions, six state forest enterprises were established, which have 170 state forest and hunting holdings. The control functions are performed by the Executive Forest Agency, which has 16 regional forest directorates.

[12] Center for the Study of Democracy, "Organized Crime Assessment in Bulgaria", 2019.

[13] Center for the Study of Democracy, "Organized Crime Assessment in Bulgaria", 2019 and "Organized Crime Assessment in Bulgaria", 2020.

Structure of the Timber Market

Approximately **3,500 active companies were active in the timber sector between 2014 to 2023**,[14] 80% of which are micro-enterprises, employing fewer than nine people.[15] Out of this larger list of firms, only around 600 firms were operational in the timber industry before the pandemic. Only a few large private companies have presence on a national level, and they have a strategy to gain an even larger market share. By 2023, only **two or three of them have surpassed the EUR 5 million revenue mark**. Larger companies winning most of the public procurement contracts often subcontract the work to small local firms, and many of the licensed timber firms engage in various forms of illegal logging.[16] Despite the historical policy of various governments to support small timber businesses that provide jobs for locals in economically disadvantaged areas of the country, Bulgaria has failed to prevent the biomass market concentration.

Labour shortages are the most significant challenge for Bulgarian logging companies as a result of the migration out of rural areas, common among the Roma minority, which makes up a great portion of the sectoral labour force. The 2022 surge in timber prices helped retain workers, but a subsequent decline in wood demand in 2023 further worsened the deficit in skilled workers. To counter this structural problem, **several large-scale enterprises have invested in modern logging equipment that reduces the need for manual labour**. These firms can sustain low harvesting prices by minimising their costs. The result will be an even greater concentration within the sector.

Wood-processing enterprises are also an important player regarding the consumption of illegally harvested wood, although there are pronounced structural differences depending on the size of these companies. **Bulgarian timber processing companies can be broadly categorised into three groups**. The first group includes six major industrial enterprises,[17] which reportedly purchase mostly legally harvested timber. The second group comprises pellet producers, and the third group includes **small businesses manufacturing wooden furniture and children's toys** (Figure 2). The enterprises from these last two groups appear to be the main consumers of illegally harvested timber.

Notably, the primary group experiencing a consistent **decrease in consumption are small wood product producers**. Their purchases in 2023 dropped by 356.8% compared to 2018, raising questions about the operational status of these businesses and whether they have resorted to using illegally harvested wood to sustain their activities. Interviews with market participants suggest a significant downturn in production since 2020, with many companies ceasing operations. Wood pellet producers also use less wood. Although wood remains the primary raw material, manufacturers are increasingly taking advantage of agricultural by-products such as straw and sunflower husks, and are also investing in their wood production. In addition, some pellet manufacturers rely heavily on locally sourced, illegally harvested wood.[18]

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[14] Bulgarian Trade Register, December, 2023.

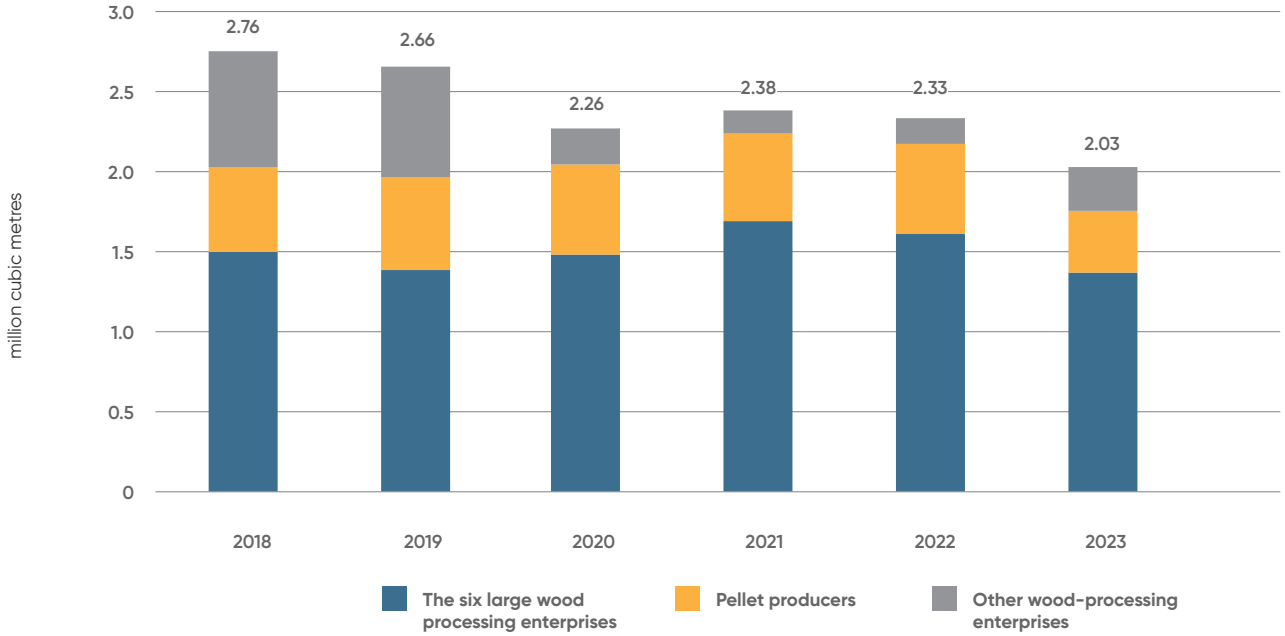
[15] Mebeli.info, The export of bulgarian furniture grows, their demand in the country is decreasing, 2022.

[16] Interviews with timber sector experts.

[17] The 6 major companies are: Mondi Stamboliiski EAD, Kronospan-Bulgaria EOOD (with facilities in Burgas and Veliko Tarnovo), Kastamonu AD in Gorno Sahrane, Svilosa-Svilocel EAD in Veliko Tarnovo, Fazerles AD in Svishtov, and Velde Bulgaria AD.

[18] Data gathered through in-depth interviews with police, prosecutors, NGOs, and local environmental action group representatives.

Figure 2. Wood consumption of wood-processing enterprises in Bulgaria, 2018-2023 (million cubic metres)

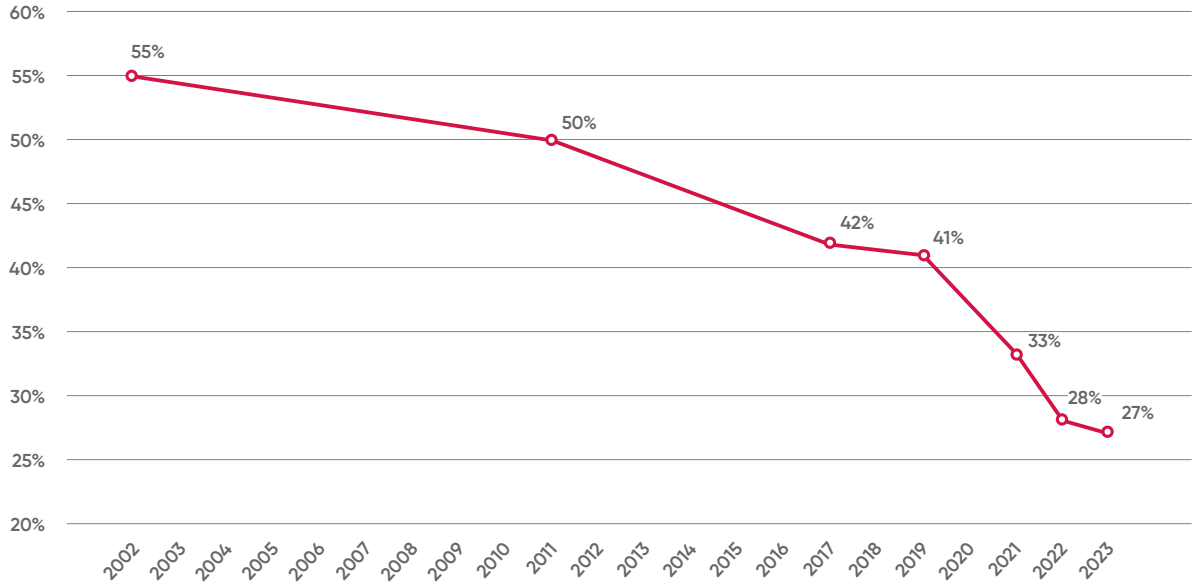


Source: Executive Forest Agency

Biomass Use for Household Heating

Patterns in biomass consumption in Bulgaria have changed dramatically since the 1990s due to a multitude of social and economic factors. On the back of the sharp decline in household incomes in the 1990s, coupled with the suspension of timber imports from Russia, domestic wood harvesting increased sharply. **Firewood became the cheapest heating source**, with prices lower than electricity and domestic or imported coal. After natural gas prices surged in the late 1990s and early 2000s, raising the price of district heating in larger cities, the demand for firewood skyrocketed.[19]

Figure 3. Share of Bulgarian households consuming firewood, 2002-2023 (%)



Source: CSD based on a 2023 household survey

[19] Cheap timber imports from the Russian Federation ceased in the early 1990s due to the suspension of the existing bilateral agreement for joint timber extraction in the Komi Republic. Additionally, in 1997, Bulgaria signed a new natural gas supply contract at a significantly higher price.

People began to stock their homes in multi-family residential buildings with firewood leading to a deterioration of air quality in many urban areas during the winter season, as firewood use led to a severe smog. Part of the reason for the low air quality is the fact that households consume firewood, which is not stored properly and, which has not been dried in centralised storage facilities before distribution and final sale. The result is that the firewood remains moist, which means that during burning, it emits more ash and sulfur dioxide, hence more particular matter.

The true extent of firewood use in Bulgaria in that period is unclear as there was no reliable data from nationally representative surveys. Yet, data from the early 2000s indicates that about **54-55%**[20] **or 1.8 million Bulgarian households used wood for heating**. Therefore, the annual wood consumption could be estimated at around 7.8 million cubic metres of solid wood.[21]

Subsequent studies confirmed the trend, and **despite the fall in the overall population of the country between 2001 and 2011, the share of firewood consumption among households for heating remained at around 50%** or between 5.5 and 6 million cubic metres of solid wood.[22,23,24] The next decade witnessed a much faster shrinking of firewood consumption due to the much higher relative cost of alternative gas use and the acceleration of migration from rural areas and small towns to big urban centres as a result of widening income gaps.[25] By 2017-2019, the share of firewood in the overall heating demand of households had dropped to around 40% or nominal demand of between 4.24 and 5.41 million cubic metres.[26]

The pandemic and post-pandemic period (2020-2023) saw an even sharper drop in the share of firewood in heating, which fell to 33.4% among households, although the annual total volume of firewood use has stayed flat at 4.95 million cubic metres. The survey conducted for the current assessment in 2023 shows an even steeper decline in firewood use. In the winter seasons of 2021-2022 and **2022-2023, the share of firewood in household heat demand dropped to 27-28%**. On average, a typical Bulgarian household consumes around 8 cubic metres of firewood per season. Thus, the overall firewood consumption can be estimated at between 3.6 and 3.9 million cubic metres.

Several factors contribute to the sustained decrease in wood consumption. Nearly half (about 9%) of the reduction in firewood use in 2014-2023 can be attributed to the **transition to wood pellets and natural gas**. The share of natural gas has increased from approximately 1% in 2014-2015 to 3.5% in 2021-2023.[27] Concurrently, wood pellets have also gained popularity over the last decade as a preferred, cleaner alternative for household heating. At the moment roughly 5.6% of households utilise wood pellets for heating.[28]

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[20] Mediana and Vitosha Research Agency.

[21] Trud Newspaper, 22.10.2001.

[22] WWF Bulgaria, Level of Illegal logging in Bulgaria, 2006.

[23] WWF Bulgaria, Analysis of illegal logging in Bulgaria for the period 2006-2013, 2014.

[24] WWF Bulgaria, Analysis of illegal logging in Bulgaria for the period 2006-2013, 2014.

[25] Institute for Market Economics, Map of income and poverty in Bulgaria, 2014.

[26] WWF Bulgaria, Analysis of illegal logging in Bulgaria and the effectiveness of control measures in forest areas for the period 2013-2017, 2018.

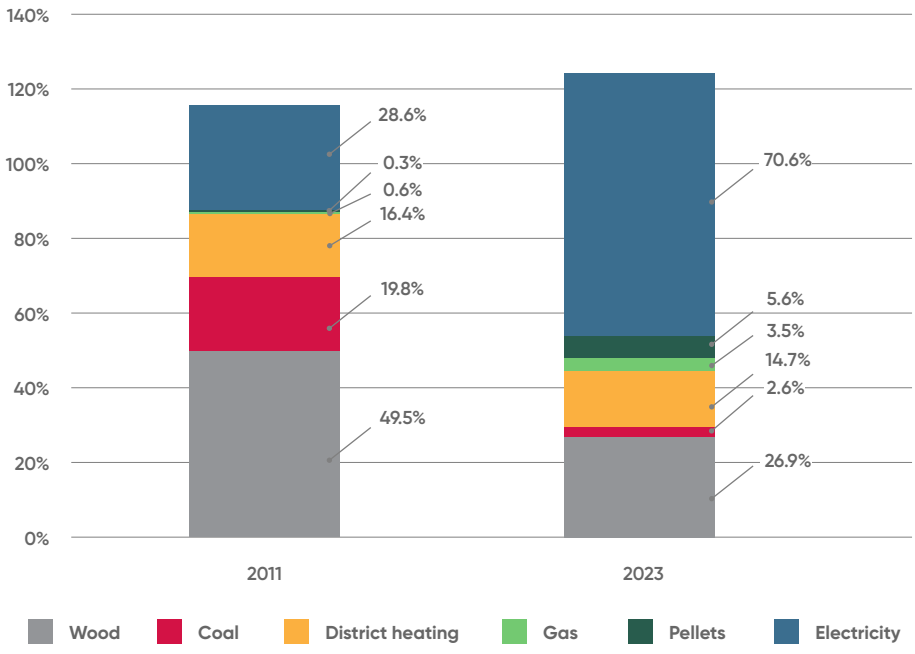
[27] Notably, the study observed no decline in heating demand during the period 2022-2023 compared to 2021-2022, despite the significant natural gas price increase due to the Ukraine conflict. Official data indicates an 18.2% decrease in gas consumption in 2022 compared to 2021. Survey data suggests that despite price shocks, households did not significantly alter their natural gas consumption habits for heating. Experts believe that while natural gas consumption has decreased, households are not substituting it with other forms of heating.

[28] Despite a sharp price increase in 2022, survey data indicates no decrease in the number of households using pellets for heating.

The increase in pellet use comes on the back of a significant increase in investments in new manufacturing facilities that have increased supply at more affordable prices. Some pellet manufacturers, however, rely heavily on locally sourced, illegally harvested wood, which could partially explain the drop in their prices.

Yet, the most important reason for the change in household energy demand patterns is the transition from firewood to electricity for heating. In 2023, around 70% of households used electricity for heating up from 30% back in 2011.[29] The data suggests that **many households use more than one source of heating (and therefore the total exceeds 100%)**. Most commonly, electricity is combined with either wood or district heating, which allows households to choose their heating source each winter season, depending on which option is cheaper, and at the same time cool down their homes in the summer, which is becoming a more important issue in Bulgaria, as a result of global warming.

Figure 4. Types of heating sources used by Bulgarian households in 2011 and 2023 (%)



Source: CSD based on a 2023 household survey

Primarily, the shift to electricity is the result of a **steady increase in household incomes**. Average Bulgarian disposable income rose by 414% from 2003 to 2023.[30] The wage growth coupled with the consistent effort of the government to keep household prices regulated at below-market rates facilitated the

[29] Sofia Energy Agency, National building typology. Energy performance analysis of typical Bulgarian buildings, 2012. (Софийска енергийна агенция, "*Национална сградна типология. Анализ на енергийните характеристики на типични български сгради*", 2012).

[30] Average monthly social security income increased from 414.9 BGN in 2003 to 1,445.6 BGN in 2023.

adoption of new electric heating technologies including air conditioning, which has become the preferred heating option in Bulgaria. Moreover, **households have begun to invest in better thermal insulation**, which has reduced the overall energy consumption in winter making electricity more affordable. Many households have decided to replace the fire stoves of single-family dwellings in smaller or remote communities with air conditioners or electric heaters /electric ovens, primarily because of the physical challenges associated with firewood use.[31]

An additional factor contributing to the reduction in household wood consumption for heating has been the consecutive projects by large municipalities, such as Sofia, Burgas, Ruse, Stara Zagora, and others, funding programmes for **replacing solid fuel stoves with electrical heating systems and direct connections to the district heating**.[32]

Beyond economic incentives, the deep shifts in demographic trends also play a crucial role in altering wood consumption patterns. Bulgaria faces one of the steepest population declines in Europe, with an estimated loss of 18.7% or 1.48 million people between 2001 and 2021. Alongside the overall **population decline**, there has been a notable change in the population's distribution with a marked **decrease in the inhabitants of rural areas and small towns** in favour of larger cities. Over the past 20 years, 65% of the national population decline was observed in rural areas and small towns, driven by high mortality rates, emigration to other European countries, and internal migration to major cities. Wood heating is also becoming increasingly less common in large cities. By 2023, ¾ of firewood consumers were located in villages and small towns.

Another notable trend is the **demographic profile of firewood users**, who are predominantly elderly - between 2020 and 2023, 62-69% of households using biomass for heating were over 50 years old. **Pensioners** are also one of the most economically vulnerable groups in the country, which partially explains why firewood use is most prevalent among the bottom 20% of Bulgarian households by income.

The Roma minority, the other big vulnerable group, is also a major user of firewood for heating, with **80 to 90% of Roma households relying on biomass**.[33] In the past decade, there has been a noticeable acceleration in the emigration of the Roma community,[34] impacting wood consumption in two ways. On the one hand, the Roma are large firewood consumers for heating, even in major cities like Sofia, Plovdiv, and Varna. On the other, the increased emigration rate has led to a labour shortage in logging companies, reducing overall wood extraction.

In addition, the **Russian invasion of Ukraine introduced a major supply shock to the biomass market**. Demand for firewood, and its price, surged as households reacted to the rapid increase in natural gas prices and the fear of a potential supply shutdown. At the same time, falling timber imports from

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[31] A notable example involves a state forestry enterprise employee purchasing an air conditioner for heating because "there is no one to split my mother's wood in the village."

[32] European Commission Energy Directorate and Bulgarian Ministry of Environment and Water reports on clean air financing.

[33] Center for the Study of Democracy, nationally representative survey, 2020.

[34] The 2021 national census and expert analyses highlight a significant population decline, especially among the Roma community, with emigration rates believed to be substantially higher than official figures.

Russia and Ukraine led to higher demand for wood extraction domestically in the EU, including in Bulgaria. **Prices for various wood types surged by approximately 30%**, with grey market prices increasing from EUR 30 to EUR 50 per cubic metre, and official market prices rising from EUR 35-40 to EUR 60. Rising prices prompted many households to **switch from wood-based to electric heating**.[35]

Although in 2023 there has been a sharp decline in wood demand due to high prices and overstocking in 2022, average prices have remained high since many of the logging companies opted to reduce harvesting instead of decreasing retail prices.[36]

Put together, all these factors support the ongoing process of gradual reduction of solid biomass/firewood energy use, and the move to more efficient consumption patterns. This trend must also receive consistent backing by state authorities through leveraging all national and EU funding options targeted at energy-efficient consumption at household level, with a focus on vulnerable groups.

[35] Comparative data from WWF Bulgaria and Center for the Study of Democracy surveys show a notable shift from wood to electric heating among households.

[36] At the beginning of 2023, most logging companies bid high prices to win tender contracts. However, following the market contraction, they faced a significant risk of incurring losses.

THE BIOMASS-ENERGY POVERTY NEXUS

Although overall biomass consumption is declining in Bulgaria, firewood continues to play a key role in Bulgaria's energy system and in particular among the most vulnerable households. Shifting away from burning firewood, whilst increasing electrification rates for heating, coupled with extensive measures to improve energy efficiency, will significantly reduce household energy expenditures, improving heating comfort and indoor and outdoor air quality, ultimately reducing energy poverty and health risks. However, this process must be well coordinated by the relevant institutions and supported by targeted funding schemes aimed at the most vulnerable households, to enable them to shift away from wood.

The Role of Biomass in Energy Policy

Biomass consumption, and renewable energy as a whole, do not only have national implications but are strongly linked to broader geopolitical developments and supranational policies. Notably, the impact of the energy crisis, worsened by Russia`s invasion of Ukraine, has raised the EU's ambition to expand the use of renewable energy sources (RES), notably with the launch in May 2022 of the REPowerEU Plan of regulatory and financial measures. The Plan is part of the "Fit for 55", which aims towards reducing greenhouse gas (GHG) emissions by 55% by 2030 and achieving EU carbon neutrality by 2050. The revised Renewable Energy Directive 2023/2413 raises the **EU binding target of RES share in final energy consumption to a minimum of 42.5%**, up from 32%, by 2030 (with the aspiration to reach 45%).

Historically, solid biomass for energy use has played a major role in the EU mix of renewables as a primary source in the heating sector, electricity generation, and industry. Its share of around 40% of the total renewable energy supply is above all other RES sources (e.g. wind, hydropower, solar, liquid biofuels, biogas).[37] In energy terms, the primary supply of solid biomass has been on the increase at the EU level – by 33.5% in the 2008-2021 period, from around 3,3 million TJ to 4,5 million TJ. The main component of solid biomass supply has been woody/forest biomass with a 66% share[38] (wood pellets production has increased by more than 400% in the reported period).

In terms of overall final energy consumption, **the role of biomass in Bulgaria** ("renewable and biofuels") **is relatively limited, with a share of around 15% in 2022**.[39] However, when considering energy consumption in the heating and cooling sector, renewables make up more than 30%, which has stayed roughly unchanged between 2018 and 2022. The main driver behind this trend is the use of firewood for heating, still widespread among households.[40]

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[37] European Environment Agency, Share of energy consumption from renewable sources in Europe, 2024.

[38] European Commission, Bioenergy report outlines progress being made across the EU, 2023.

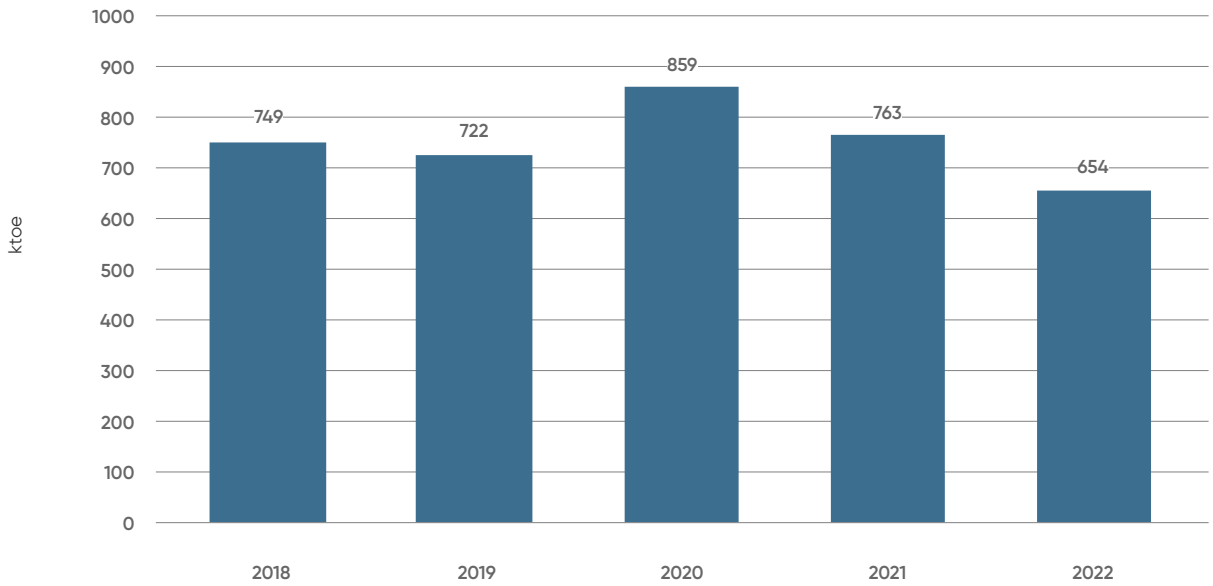
[39] National Statistical Institute, Overall energy balance sheet.

[40] National Statistical Institute, Overall energy balance sheet.

Namely due to the high share of renewables in the heating mix, firewood has contributed the most to the reported overachievement of Bulgaria's 16% binding 2020 RES share in final energy consumption target (20.2%) by 2020. **The government continues to rely on the growing use of firewood for heating to fulfil its RES targets**, including in the draft revised National Energy and Climate Plan (NECP), which forecasts biomass use to rise to almost 40% of the final energy demand by 2025 – an unrealistic expectation, given the latest trends of rapidly declining firewood use by households, discussed in detail by the current report. By 2030, the share of biomass use in the household energy consumption shrinks again to the current level of 30% before gradually falling to below 6% in 2050.

The outlook for biomass use until 2030 may be misleading as the expected growth trend is not supported by recent national survey data, according to which there has been a 10 percentage-point decline in the number of households using firewood since 2017, down to 33,4% in 2021.[41] **Exaggerating the future role of firewood in heating demand appears as an attempt to balance out the insufficient efforts placed on meeting the renewable energy targets for the electricity and transport sectors**.

Figure 5. Household final energy consumption of renewables and biofuels in Bulgaria, 2018-2022 (ktoe)



Source: National Statistical Institute, Overall Energy Balance Sheet

[41] WWF Bulgaria, Analysis of illegal logging in Bulgaria for the period 2018 – 2022, 2023.

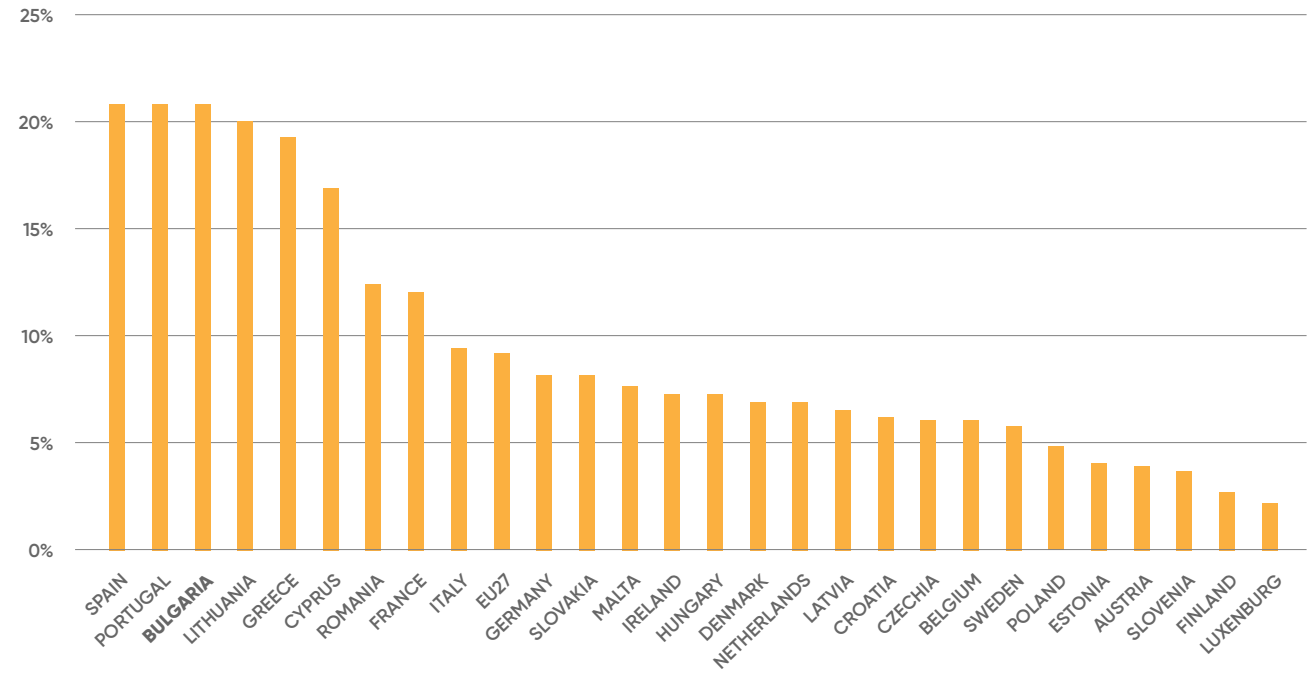
The expected trend for shrinking biomass use in the Bulgarian energy sector is also confirmed by independent modelling scenarios for carbon neutrality by 2050, which envision a significant increase in energy efficiency and the massive uptake of electrification in both residential heating and the industrial and transport sectors.[42] Related to the electrification process, Bulgaria could unlock the substantial potential for decentralised renewable energy-based power generation, which could contribute to the decarbonisation of both heating and power supply. The widespread installation of small-scale rooftop photovoltaic (PV) plants, especially in rural areas and in small towns with predominantly low-rise buildings can reduce the volume of firewood used by individual households.

Energy Poverty

There is a **direct correlation between energy poverty and the high use of solid biomass**. Firewood is consumed predominantly in low-income households, and is widespread among the elderly, in rural areas, and among the Roma minority. Bulgaria has one of the highest shares of energy poverty in the EU, as the percentage of energy-vulnerable households was more than 3 times higher than the EU average in 2021 (23.7% vs 6.9%).[43] The widespread use of firewood indicates either the inability of households to get direct access to centralised forms of energy supply such as natural gas and electricity, or their difficulty in covering the higher costs of using power or gas.

The recent European energy crisis, which was exacerbated by **Russia's war in Ukraine, strengthened the EU's commitment to reducing energy poverty** and the number of vulnerable consumers. The EU created the Energy Poverty Advisory Hub (EPAH), which has introduced several indicators for measuring energy poverty at Member State level such as the share of its

Figure 6. Inability to keep home adequately warm (% of households)



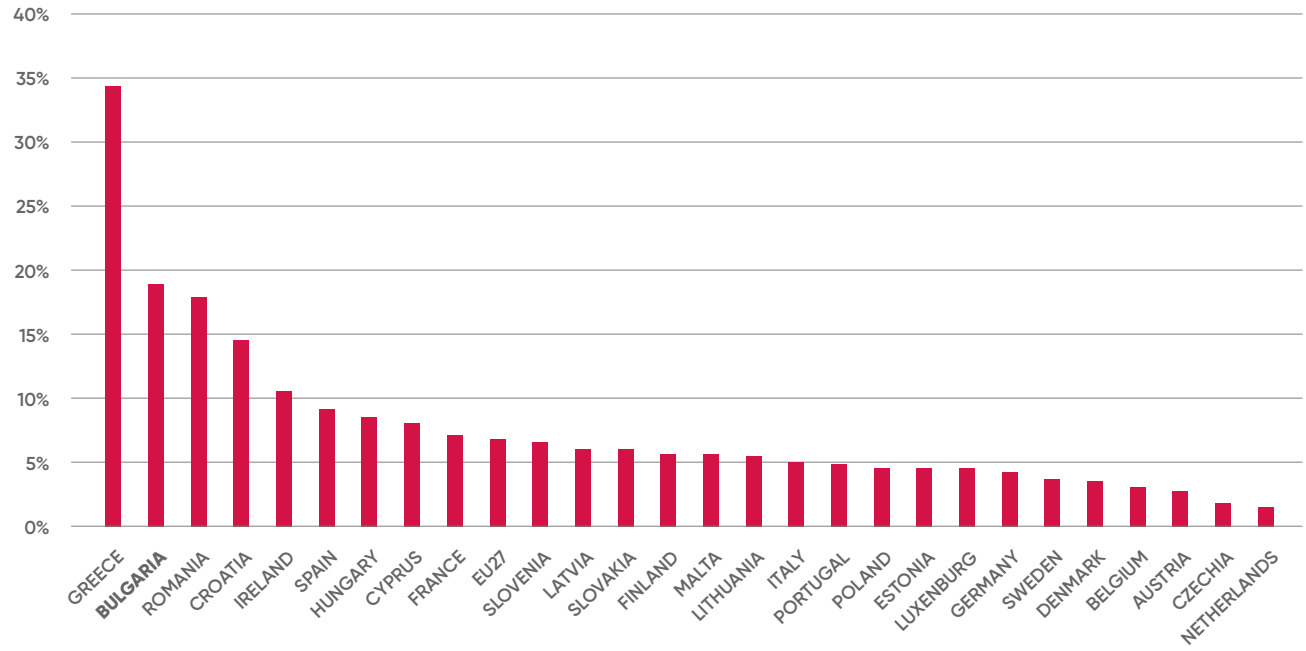
Source: EU Energy Poverty Advisory Hub

[42] Center for the Study of Democracy, At a Decarbonisation Crossroads: Assessing the Feasibility and Policy Pathways for Climate Neutrality in Bulgaria, Policy Brief No. 127, 2023.

[43] EUROSTAT, Bulgaria – Energy Snapshot.

population affected by arrears on utility bills (inability to pay on time due to financial difficulties), inability to keep home adequately warm, at risk of poverty or social exclusion, housing costs overburden rate, i.e. 40% of disposable household income goes to housing costs.

Figure 7. Arrears on utility bills - EU-SILC survey, 2022 (% of households)



Source: EU Energy Poverty Advisory Hub

Reducing the level of energy poverty is one of the main steps for a successful and equitable energy transition in Bulgaria, considering that **20,9% of Bulgarian households are unable to keep their homes adequately warm** and 18.8% accumulate arrears on their utility bills.[44] The changes to the Energy Law from November 2023 have introduced an energy poverty definition, as well as a regulation on the criteria, conditions, and procedures for determining the energy poverty status of households. While the Energy Law envisions the development of a Long-Term Programme for Energy Poverty Reduction with a comprehensive package of measures, no specific targets for reducing energy poverty are included in the draft revised NECP, as the number of those affected is yet to be determined.

The process of **energy poverty mitigation is closely linked with Bulgaria's plans to liberalise its electricity market and phase out regulated electricity prices by the end of 2025**, a key milestone for the decarbonisation of the

[44] Eurostat, Inability to keep home adequately warm – EU-SILC survey, 2023. Bulgaria has the lowest per capita GDP and resulting income levels in the EU, and consequently a larger portion of the population is at risk of economic poverty and social exclusion. As per National Statistical Institute income data covering 2021, the average portion of the population at risk of poverty or social exclusion in Bulgaria is 32%. The percentage of the population at risk of poverty decreases significantly among those with higher level of education (inevitably, the highest share of employed persons at risk of poverty is among those with basic or no education – 65%; and the lowest among those with higher education – 3.2%). The risk of poverty increases with old age according to national statistics – e.g. in 2022, 61.3 % of the population over 65 in a single person household are considered poor.

economy. The large share of energy-poor households in the country has pushed successive governments to delay market liberalisation even though it will make the market more transparent and create incentives for investments in energy efficiency and renewable energy sources. However, it must be accompanied by effective, just and transparent measures to reduce energy poverty, while at the same time enabling citizens to become active participants in the energy transition process.

Part of the reason for the government's hesitance to complete the liberalisation is the slow but steady **process of electrification of heating among households. Since there is a direct correlation between the excessive use of solid biomass and the high levels of energy poverty**, the gradual switch from firewood to electricity is seen as a significant risk for a potential surge in energy affordability risks. Substantial firewood use is also linked to a lower standard of living, as households reliant on biomass often experience lower levels of temperature comfort and are exposed to higher rates of air pollution. The choice to opt for biomass in covering one's final energy consumption for heating is, hence, the result of one's inability to cover the costs of alternative fuels.

Considering its socio-economic challenges, Bulgaria scores badly on all indicators of energy poverty, compared to other EU Member States. **The lack of adequate economic resources prevents households from exiting the trap of excessively depending on unsustainable energy use like burning solid biomass/firewood**. Bulgaria must overcome its current approach of merely distributing social assistance, and tackle the structural problem of ensuring access to energy efficiency services for the energy poor, the uptake of low-carbon, decentralised power generation solutions, the introduction of individual investment support vehicles and the creation of one-stop shops to manage the process.

The current regulatory framework allocates the responsibility for providing social support to energy-poor households to three different ministries (Ministry of Energy; Ministry of Labor and Social Policy; Ministry of Regional Development and Public Works), which leads to confusion and lack of efficient disbursement of the available funds. Avoiding an overly complex administrative process with blurred responsibilities among state institutions will be critical for Bulgaria to effectively utilise the available financial resources for energy poverty mitigation from the new European Social Climate Fund.

Box 1: Social Support Framework for Energy-Poor Households

Bulgaria's approach towards reducing energy poverty has centred mainly on the support of low-income households during the heating season. The Bulgarian law introduces a regime where economically vulnerable groups, incl. retirees or people with disabilities, are approved for targeted social support during the heating season (from 1 November to 31 March).[45] The local directorates (municipality level) of the Agency for Social Assistance manage the approval process. Under this regime, the Minister of Labor and Social Policy issues annual ordinances for

[45] https://asp.government.bg/bg/deynosti/sotsialno-podpomagane/otpuskane-na-celeva-pomosh-za-otoplenie-za-otoplitelen-sezon-2022-2023-g/; Ordinance РД-07-5 of 16.05.2008.

setting the size of the financial support for each heating season, which reflects the upper limit of electricity consumption for heating per month and the average household electricity price on 31 October. In 2023-2024 there were more than 325 000 persons and households, eligible for heating support,[46] which is much lower than the number of households currently at risk of poverty and social exclusion. The restrictive nature of the support programme is the result of the low-income thresholds set for eligibility.

The social support payments during the heating season can be used to cover alternatively - monthly electricity, district heating, natural gas or solid fuel (firewood or coal) costs. The fact that solid fuels are eligible to receive support disregards the detrimental impact of this type of consumption on air pollution and enables the further lock-in of low-income households in unsustainable heating modes.

The approval of applications is implemented by local officials at the municipal level, which creates a high degree of economic dependence of the vulnerable groups on these officials. Hence, the support programmes can be misused to gain political support, especially during election periods by pressuring economically vulnerable groups to vote for particular candidates/political parties.

Leveraging such social dependences for acquiring voter support was cited in reports by ODIHR OSCE observation missions in both early parliamentary election cycles in October 2022 and April 2023.[47] The debates in the Bulgarian Parliament in July 2023 concerning amendments in the Forestry Law, which aim to substantially increase firewood purchase rights of households in state or municipal forests, made evident the attempts of political groups to leverage access to firewood as a tool for attracting political support.[48]

Energy Efficiency

The steady increase in the amount of targeted social support allowances for heating (327 000 households in 2024, compared to 261 000 in 2022[49]) demonstrates that the current measures addressing fuel poverty are ineffective, because they target the consequences, rather than the root causes of the issue, while, at the same time, they harm air quality by enabling the use of polluting technologies for heating.

The best **long-term solution to energy poverty is the deep renovation and maintenance of residential buildings**, which would directly reduce energy

[46] Republic of Bulgaria, Ministry of Labour and Social Policy, Changes to targeted heating assistance regulations will ensure that more elderly and disabled people are helped (*Промените в наредбата за целева помощ за отопление ще гарантират, че повече възрастни и хора с увреждания ще бъдат подпомогнати*), 2023.

[47] Organization for Security and Cooperation in Europe (OSCE), Office of Democratic Institutions and Human Rights (ODIHR); "Republic Of Bulgaria. Early Parliamentary Elections 2 April 2023. Odihr Election Observation. Final Report", "International Election Observation Mission. Republic Of Bulgaria. Early Parliamentary Elections, 2 October 2022. Statement Of Preliminary Findings And Conclusions".

[48] Bulgarian News Agency, "Motion to Up Limit For Firewood Purchase Rejected in Legislature", 2023.

[49] Ministry of Labour and Social Policy, data on 2024 and 2022.

costs, air pollution, as well as the need for energy subsidies. Deploying energy efficiency support measures will also encourage the use of innovative heating systems. Redirecting social subsidies towards deep renovations and switching from firewood-burning stoves to heat pumps, can effectively bring the most vulnerable households out of energy poverty, by reducing their energy expenditure.

Bulgaria has yet to take any serious measures to renovate the building stock. The 2021 Census revealed that **68.2% of the housing stock lacks even basic external insulation**.[50] On the other hand, the relatively high share of fully renovated dwellings (24.2%) suggests that citizens have begun investing in the energy efficiency of their homes even though this has been done in a chaotic manner, which does not maximise energy savings based on deep renovations.

The National Programme for Energy Efficiency of Multi-family Residential Buildings, through which a total of 1968[51] (4.2% of the total) buildings were renovated, demonstrated that **large-scale renovation programmes hold great potential for reducing households' energy demand** and consequently energy poverty levels. Expert assessments of the programme showed that deep renovation activities, including full-building external wall insulation, fitting of energy-efficient windows and replacement of heating systems, can lead to **energy savings** ranging from 40% in buildings, that were renovated to energy class C, to **60% in those reaching energy class A**.[52]

Currently, there are several planned measures for improving energy efficiency and replacing polluting heating technologies in households:

- Under the **National Resilience and Recovery Plan**,[53] two measures are being deployed:
  - **Renovation of multi-family buildings**, which would lead to a reduction of at least 30% of the primary energy demand of each covered building. Estimates show that an additional 780 multi-family buildings could be renovated under this programme.[54] The programme will have two phases. Under the first phase 100% of grant funding will be provided, while under the second phase, households will have to provide 20% own financing to receive the remaining 80% of the funds.
  - **Installation of solar collectors in households** for domestic hot water heating, or **photovoltaic systems of up to 10 kW**, which may also include systems for storing the produced electricity. The grant funding provided can reach 100%, but cannot exceed predefined limits, even if the applicant is an energy-poor household.[55]

[50] National Institute of Statistics, Housing Conditions as of September 7, 2021, Census 2021.

[51] Ministry of Regional Development and Public Works, report on the implementation of the National Programme for Energy Efficiency of Multi-family Residential Buildings.

[52] Centre for Energy Efficiency Eneffect, "Energy efficiency in the context of local elections: analytical context", 2019.

[53] National Recovery and Resilience Plan.

[54] Center for Energy Efficiency EnEffect, "Roadmap for sustainable energy renovation of the housing stock". Second revised edition, 2023.

[55] Ministry of Energy. The application of households for the financing of photovoltaic systems has started, 2023.

- The **Operational Programme Environment 2021-2027 (OPE)**, part of the EU Cohesion and Regional Development Fund, is the main source for subsidising energy-efficient modes of consumption at the household level to replace energy-inefficient solid fuels and firewood boilers/stoves with energy-efficient heating devices, with priority given to energy-efficient households.[56] Grant funding is limited to 21 municipalities (incl. Bulgaria's biggest cities) with excessive Particulate Matter (PM) pollution covered by the decision of the EU Court of Justice under case C-488/15 of 2017. These municipalities should also possess a programme for ambient air quality under implementation, as a precondition for funding eligibility.[57] The **OPE's main target group are households affected by energy poverty**. Given that Bulgaria has not imposed any legal limitations on using fossil fuels, including wood, for heating, the scheme's goal is to compensate for this shortcoming, by providing grant funding for replacing polluting stoves.

The planned measures for improving energy efficiency and replacing polluting heating technologies should be coupled with the **liberalisation of the electricity market** on the one hand, and the development of **different forms of funding mechanisms**, on the other.

After the electricity market's liberalisation, the National Electricity Company will stop buying a regulated power mix to supply households. Before final consumers begin bearing the risk of any market price fluctuations, it is key to **deploy a combination of targeted social/fiscal support and energy efficiency upgrades for energy-poor consumers**, based on the recently introduced definition of energy poverty in the Energy Law. The government can finance these measures by redirecting part of the ETS emissions revenues, implementing the existing energy efficiency programmes funded under many of the EU grant mechanisms, and raising the awareness of the public about the benefits of energy savings. Without preparation well in advance, the electricity market reforms could push vulnerable households into a greater dependence on biomass after the removal of regulated prices in 2026.

On the supply side, the ongoing decarbonisation of Bulgaria's electricity generation mix would lower the cost of power and prevent a price surge after the market opening. This is already visible in 2024 when the massive installation of additional renewables (mostly solar PV plants) has led to the steep decline in power prices, most vividly during the day when prices are often zero or negative. Average wholesale prices in 2024 are trading, somewhat counterintuitively, below the regulated tariff levels.

Up to now, **the government has cross-subsidised household prices by using the revenues from selling CO2 emissions quotas to cover the tariff deficit between the expensive power generation from coal** and the wholesale regulated price, charged by the National Electricity Company. The carbon emissions revenues, however, should not be used to subsidise coal power plants or maintain an artificially low household price as this goes against the EU electricity market liberalisation and removes the incentives for households to seek a more efficient way to consume energy.

[56] Operational Programme "Environment" 2021-2027.

[57] Operational Programme "Environment" 2021-2027.

In terms of funding mechanisms for energy efficiency and replacement of polluting heating technologies, outside the scope of grant funding, the government could introduce numerous other mechanisms, including, but not limited to establishing:

- the **National Decarbonisation Fund**, as part of the NRRP and the upcoming Social Climate Fund, potentially as a unit within the Council of Ministers, with the ability to support existing funding mechanisms (e.g. Fund of Funds, Bulgarian Development Bank, the Fund for Local Authorities in Bulgaria, the Energy Efficiency and Renewable Sources Fund, the National Trust Eco Fund;
- specialised **credit lines** from commercial banks, which will require guarantee mechanisms from a state institution, for example, the National Decarbonisation Fund that provides low-interest energy efficiency improvement loans to households;
- **on-bill or building tax repayment**, which allows households to repay the loan used for energy efficiency improvements or technological upgrades, either through their monthly utility bills, or through their regular building taxes.

Box 2: Resolving the Nexus between Firewood Use and Air Quality

The relationship between chronic air pollution and the use of solid biofuels/firewood in Bulgaria is well established. The European Environment Agency assesses that higher concentration of PM pollution tends to be more common in European regions with lower per capita GDP. To a large extent, this is evident in Eastern and South Eastern Europe due to the combustion of low-quality solid fuels (incl. firewood) for residential heating. The heating and transport sectors are the main sources of PM10 and PM2.5 pollution. 85% of PM10 pollution in Bulgarian municipalities has come from burning firewood and coal in heavily outdated heating stoves.[58] More than 10,800 deaths in Bulgaria were attributable to exposure to PM2.5 in 2021.[59] As a result, the Court of Justice of the European Union sanctioned Bulgaria for violating the EU law when it was found that the government had not complied with annual and daily thresholds of PM10 under its 5 April 2017 Decision - case C-488/15.

[58] Operational Programme "Environment" 2021-2027.

[59] European Environment Agency, Bulgaria - air pollution country factsheet, 2023.

ILLEGAL LOGGING AND TIMBER TRADE IN BULGARIA

Drivers for the Legal and Illegal Timber Markets

Although declining in importance as a heating source for Bulgarian households, logging and timber trade plays an important role in the local economy and is subject to illicit practices. Since the fall of Communism, the sector has been impacted by significant legal changes aimed at regulating the market and reducing illegal logging, with varying success. **Biomass extraction has been traditionally affected by corruption**, linked to widespread illegal logging practices, fixed tenders for timber sale and logging concessions by local forestry authorities, as well as the presence of informal private local monopolies in timber trading, as discussed below.

In the late 1990s, the **privatisation of state-owned timber and wood processing companies led to the rise of small private entities**. A large share of timber extraction from state, municipal, and private forests was either not regulated or outright illegal, despite the deliberate efforts of the authorities to dismantle the criminal networks in the sector. Eventually, these same actors legalised the business by establishing their own logging and wood processing firms, which enjoyed a steady increase in sales on the back of the high timber demand. The prevalence of illegal logging allowed firewood traders to undercut market prices by 30-35%, making the fuel source a significantly cheaper option than coal.[60]

Politicians have also used timber extraction to achieve political objectives. **Local politicians often distribute firewood on quota principle in small settlements to secure votes in parliamentary and local elections**. Around half of this biomass could have been sourced as grey or illegal operations.[61] In response to a growing number of civil society investigations revealing the extent of illegal logging and trade, successive governments over the past 15 years have sought ways to mitigate the problem by enhancing oversight. However, in practice, the local representatives of regulatory bodies have been political appointees close to the government with well-established links to local companies in the sector.

To **undermine corrupt local dependencies and sever the ties between logging operations and regulators**, in 2010 Bulgaria established six state forest companies, with 170 local branches, which have operated as commercial entities bidding for the timber resources in state forests. In exchange, the firms must conduct afforestation, forest road maintenance, and other activities related to infrastructure improvements. Meanwhile, the Executive Forest Agency oversees the violation of forestry regulations nationally, with 16 regional directorates exercising oversight locally. However, this governance model has not resolved the conundrum of the intertwining responsibilities of regulators and business interests within the Ministry of Agriculture (principal of the Executive Forest Agency).[62]

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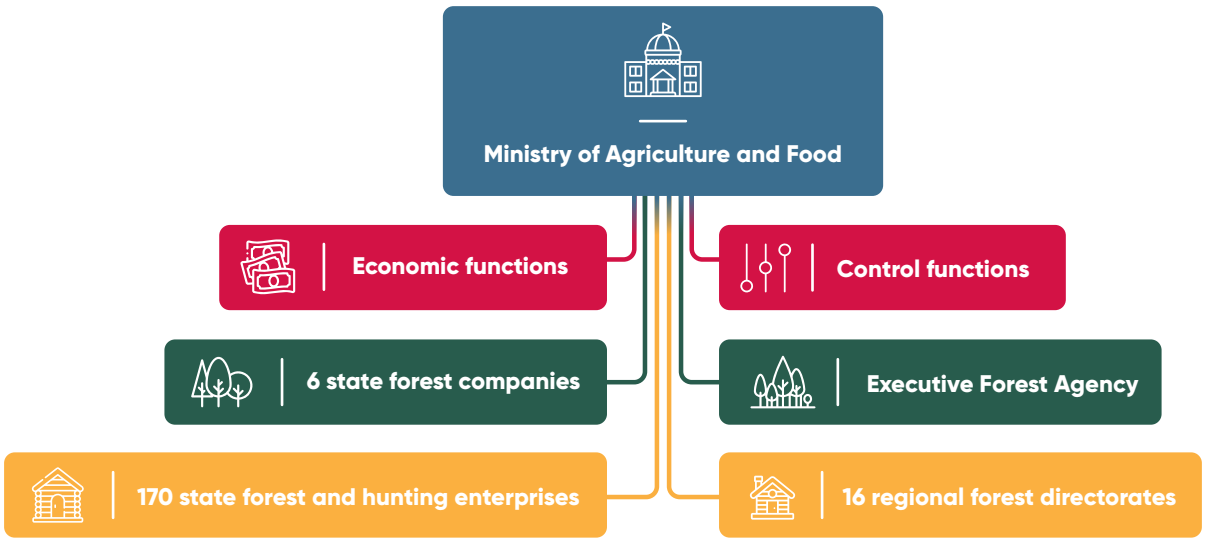
[60] Expert assessment, based on interviews with sector stakeholders.

[61] Expert assessment, based on interviews with sector stakeholders.

[62] Expert assessment, based on interviews with sector stakeholders.

Figure 8. Structure of the control and economic functions in the timber sector



Source: CSD

Despite the governance deficits in the sector, between 2012 and 2019 the **six state forest companies have increased legal timber harvesting and revenues**. After the reorganisation of the forestry management, the average legal timber extraction increased from around 4.3 million cubic metres annually to 5.2-5.3 million cubic metres between 2015 and 2019.[63] As a result, currently, **timber processing and firewood procurement companies prefer legal timber** to avoid the risks associated with the new stricter timber transportation and storage regulations. The decrease in the share of illegal firewood in the market is evident from the shrinking gap between the legally sold timber and domestic consumption and exports, which remained stable from 2011 to 2019.[64] Hence, between 2013 and 2017, the average rate of illegal timber harvesting was between 25% and 28%.[65] While illegal logging has been reduced since the new management and control structures were established, small logging and wood processing companies have adapted to the changes. In addition, state forest enterprises might tolerate certain infractions as stringent enforcement could reduce the overall revenues of the regional state firms.[66]

Furthermore, companies dealing in firewood or wood processing can sometimes use legal and illicit wood, helping them reduce prices and further undercut the competition. Compliance issues are still widely prevalent despite the introduction of camera surveillance and electronic logbooks at timber depots. The **penalties for violations are often low enough to be considered a cost of doing business**, and many companies successfully appeal these penalties in local courts. In local mills, the share of illicit wood processed can exceed 30-40%. The **proximity of harvesting areas to processing plants**

[63] Executive Forest Agency, Annual reports for 2006 - 2019.

[64] Correct data collation should be limited to 2019, because the period 2020-2023 heavily distorts the timber market due to two years of pandemic and two years of war in Ukraine.

[65] WWF Bulgaria, Analysis of illegal logging in Bulgaria for the period 2006-2013, 2014.

[66] Interviews with independent forest experts.

increases the likelihood of illegal wood use due to the lower risk of detection during the transportation of the wood. Since 2014-2015, pellet producers, having located their facilities near logging areas, have become significant consumers of grey and illegal wood. Assessing the difference between the electricity used and the legally purchased wood has indicated a considerable portion of illegally sourced timber among several large producers.[67]

The introduction of GPS systems for timber transportation and video surveillance of timber depots has enhanced monitoring capabilities. Furthermore, State Forestry officials now require logging companies to visually document every step of the logging, transportation and loading of the timber to ascertain that the firewood sourced is legal. Although reliable data on the households' consumption is lacking, the measures against illicit practices in the sector have **reduced the share of illegal wood from 25% of the demand a decade ago to 15-16% in 2023**.[68]

Dimensions and Actors

The analysis of illegal logging and trade shows that it is a highly complex economic, social and criminal phenomenon, in which different layers of criminal activity are evident, from mass individual participation in unauthorised timber extraction by local communities to local gangs and large-scale companies in illegal activities, using institutional and political corruption as tools.

When typifying illegal timber harvesting, one must distinguish firms trying to avoid paying taxes, from firms with a long history of criminal activity. Typically, companies in the informal economy do not pay full social and health insurance contributions. In some instances, they employ workers without a contract. They also sell part of the legally harvested timber without VAT and avoid paying income tax. These offences are, however, largely administrative. Other firms have a clear criminal organisation, whereas they regularly pay bribes to regulatory institutions and occasionally also use violence.

The main groups of illegal timber harvesters can be largely categorised as follows:

1. **Members of the local community, who independently procure their timber but also extract an additional amount illegally**. For example, on the back of an agreement with the mayor and local hunting and forestry companies, families in a particular village can cut trees in a specific area. They pay for 9-10 cubic metres of wood at discounted prices (as a form of social aid) but extract 12 or 15 cubic metres instead.

2. **Companies that legally harvest timber but extract more than permitted**. Such practices become possible with the support of local control institutions that allow harvesting extra wood without officially registering it. Usually, the state forest companies organise tenders that could be rigged in such a way as to ensure well-connected local timber extraction firms win the contracts. Data from the public procurement

[67] Interview with economic police officers.

[68] WWF Bulgaria, Analysis of illegal logging in Bulgaria for the period 2018 – 2022, 2023. The most recent estimate is 20%.

agency shows that in different regions, the same companies usually win all contracts. The interviewed experts[69] claimed that **the rigged tender approach aims to strike a "balance", in which local companies receive guaranteed access to a certain volume of timber harvest with an illegal wood component included**. In turn, the harvesting firms do not extract beyond a 15-20% threshold share of unpaid timber, which is accepted as a "norm" in the sector. These practices are tolerated due to the clientelistic political and economic dependencies created within the management and the workers in the state-owned forest enterprises.

Companies use various techniques in the felling and grouping of timber to extract wood above the permitted volumes. Most often, **they abuse the procedures for measuring felled timber**. Controlling authorities calculate the wood harvested per root in spatial cubic metres. However, companies use solid cubic metres of timber when documenting the transportation, storage and sale of firewood to physical persons. The measurement of timber exports and sales to processing companies are recorded in kilograms and tonnes. Due to differences in the density and quality of the wood, the legally accepted measurement error is up to 10%. However, in the conversion from spatial to solid cubes metres or tonnes, the difference usually favours the harvesting company reaching 15 - 25% of unaccounted and unpaid wood.

Another widespread technique for **illegally extracting additional wood**, which is also difficult to uncover is tempering the length of the logs. By regulation, wood should be cut into 1 m long logs, but instead, it is cut, grouped and shipped into 1.1-1.2 m logs.

3. **Small-scale criminal logging in small sizes**. There are two forms of criminal timber harvesting. The first is the organisation of local gangs, usually consisting of **socially vulnerable groups** such as the Roma minority, who cut, transport and sell illegal wood to nearby settlements in the region of operation. The reason is that these forests are easily accessible. The second is made up of **workers from logging companies** who engage in the illegal harvesting of additional volumes for their profit. They utilise the equipment of the companies they work for, the forest roads made for legal logging and the developed, easily accessible areas with suitable timber. Interviewed experts opined that such criminal structures supply 12-15% of the illegal timber market.[70]

   Usually, **these criminal organisations supply firewood to the local population at around 25% discount to market prices**. In addition, they offer additional services to household consumers such as cutting, splitting and stacking the wood at the buyer's home. At the same time, this type of local criminal gangs, whose activities are associated with less damage compared to that of the illegal logging of legal companies, often engages in violence against forest guards (and occasionally against police officers). Investigative police officers say that **forest guards prefer to avoid confronting such local criminal structures because of risks for their and their families' safety**. Criminal groups engage in different forms of harassment of the local forest agencies, such as setting fire to forest plots (for which the forest guard is responsible) and submitting complaints against local forestry and police officers.

[69] Interviews with independent forest experts, prosecutors and economic police officers.

[70] Interview with economic police officers.

4. **Timber harvesting and processing companies involved in serious organised crime**. These companies use various criminal methods. One involves the **felling of more trees than the permitted quota**. To conceal that the timber is illegally cut, the company then bribes forestry officials to put legal stamps on the logs like on the legally cut ones or uses forged stamps for the same purpose. They also **fell trees outside the designated areas** or at the periphery of the designated areas to make it more challenging to identify such criminal practices. These companies also employ criminal techniques while transporting the illegally felled trees. For example, they **mix marked and unmarked trees**, abusing the regulations that allow for unmarked trees below a specific size. Subsequently, only the unmarked timber is unloaded, and the marked wood is returned to the logging site to conceal the new loads of unmarked timber (the process can be repeated several times). Another common approach is **transporting 2-3 trucks of wood with the same electronic ticket** and/or with GPS trackers switched off.

   Specialised "units" within some of **these large companies operate according to the characteristics of organised criminal groups** (i.e. hierarchical and stable over time). The leaders of the unit coordinate all the activities, wherein timber is cut according to a schedule pre-set by corrupt officials; trucks move at precise time intervals; and are driven to small workshops where the wood is processed. These units also use "pilot cars" that drive ahead of the trucks to warn about police patrols. In addition, such criminal structures use "front" companies quite commonly, which are registered in the name of socially disadvantaged persons who do not have any information about the firm's business operations or true ownership. In case of a police investigation, these front companies are replaced by newly registered ones.

   Some of the larger timber harvesting companies are also involved in criminal activities.[71] Sometimes they collude with each other to operate as an expanded network that operates in coordination with local state institutions. The structure of the criminal organisation "follows the service relations in the control bodies".[72] For example, the Director of the Regional Forestry Directorate leads the criminal network that also features the Director of a State Forest Enterprise and officials directly involved in the logging oversight. The members of the network include the following roles:

   - **"Muscle"**: intimidation of whistleblowers by using or threatening to use violence. Typical reprisals include damage to property such as cars, warehouses or logging machines. "Muscle" men also use arson (e.g. warehouses, serious physical assaults, and even murders in the more distant past).
   - **Document forgers**: to supply falsified documents
   - **Procurement specialists**: managing the tender bid preparation for the companies part of the networks.
   - **Corrupt local forest agency officers**: their role is handling timber control units and interacting with the police.[73]

[71] Interviews prosecutors and policemen from economic police.

[72] Center for the Study of Democracy, "Organized Crime Assessment in Bulgaria", 2020.

[73] Center for the Study of Democracy, "Organized Crime Assessment in Bulgaria", 2020.

THE KEY ROLE OF FORESTRY MANAGEMENT FOR CLIMATE NEUTRALITY

Reducing demand for firewood and placing stricter controls on legal logging would have a significant positive impact on Bulgaria's path to decarbonisation. Reducing deforestation would increase the country's GHG emissions' sequestration potential, whilst also improving air quality and maintaining biodiversity.

Land management therefore plays a critical role not only in climate change mitigation, by serving as both a carbon sink that must be enhanced and a source of emissions that requires abatement efforts, but also in limiting corrupt and illegal practices. Globally, the land sector accounts for the removal of approximately 31% of annual global anthropogenic greenhouse gas emissions, while at the same time, it contributes 15% of total anthropogenic emissions, which are mainly due to activities such as deforestation and peatland drainage.

In this context, **the forest stock in Bulgaria will play a key role in the country's objective to reaching carbon neutrality by 2050**, and the government needs to commit, at political and regulatory levels, to use its full potential for sequestering GHG emissions relying on its vital forest stock. Historically, Bulgaria has sustained a growing forest stock due to several factors, among them – less intensive agricultural production after the fall of Communism that has led to a faster natural afforestation and lower consumption of woody biomass.

The carbon removal potential of Bulgarian forests, however, has been diminishing steadily since the 1990s. This decline is mainly due to the forestry sector, which shows a steady trend in falling removals due to an increase in harvesting operations since the 2000s and the observed increase in the average age of the forest stands. Nonetheless, the forest stock in Bulgaria has expanded over the years and is expected to grow further over the next few decades.[74]

Box 3: Lack of Analytical Clarity about the Risks and Potential of Bulgarian Forests

The potential and risk factors facing Bulgarian forests are a subject of significant debate among experts, primarily due to the lack of a national inventory conducted using a recognised EU methodology. This data gap has led to uncertainties about the basic parameters of the country's forests, such as the total forested area and the wood stock available within these areas.

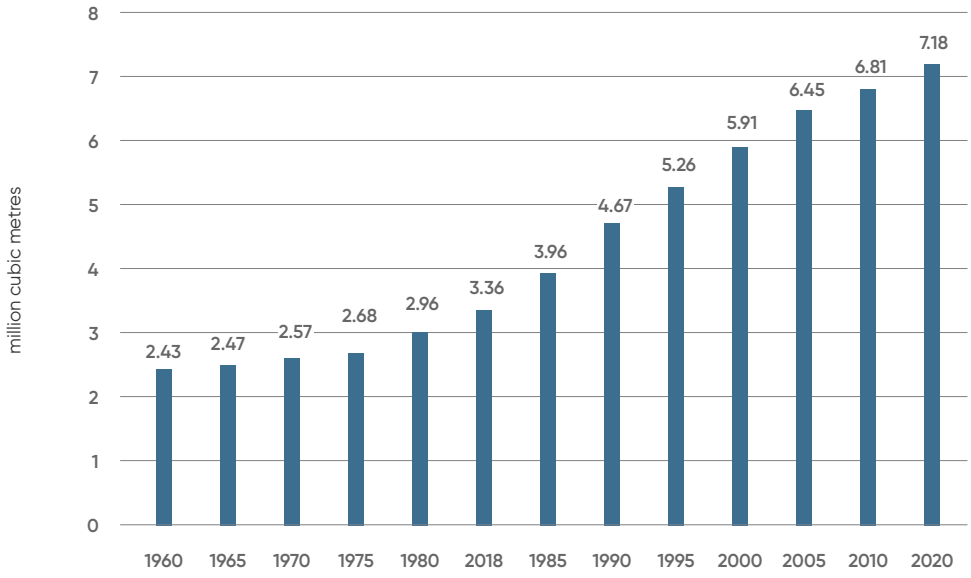
According to the most recent detailed five-year inventory, Bulgaria's forests span 3.896 million hectares, representing 35.1% of the nation's

[74] Stoeva, L., Marinkov, V. and Markoff, I. Prospects of the Bulgarian forest as a net carbon sink. Sofia: Forest science, Special issue II, p.37-43, 2022.

land.[75] However, the Executive Forest Agency's annual report as of December 31, 2022, suggests a larger area of 4.273 million hectares or 38.5% of Bulgaria's territory. This figure includes 317,336 hectares of agricultural land, which, having not been cultivated for 25-30 years, has experienced natural afforestation and thus, by law, acquired forest characteristics according to Article 2 of the Forestry Law.[76] These areas have become contentious regarding whether forest-clearing activities could be deemed legal.

Another contentious issue is the actual stock of wood in Bulgaria's forests. The EFA reports that, as of 2020, it stood at 718 million cubic metres, a figure that represents a threefold increase since 1960.[77] The 2015-2020 data suggests an annual growth of the wood stock of 7.6 million cubic metres, marginally higher than the 7.1 million cubic metres recorded in the previous five years. However, the accuracy of these figures is questioned by environmental organisations, which point to an anomalously high wood increment reported between 1990 and 2005 — between 11 and 14 million cubic metres annually — despite widespread illegal logging practices in Bulgaria during the 1990s.

Figure 9. Total stock of wood for in Bulgaria, 1960–2020 (million cubic metres)



Source: Executive Forest Agency

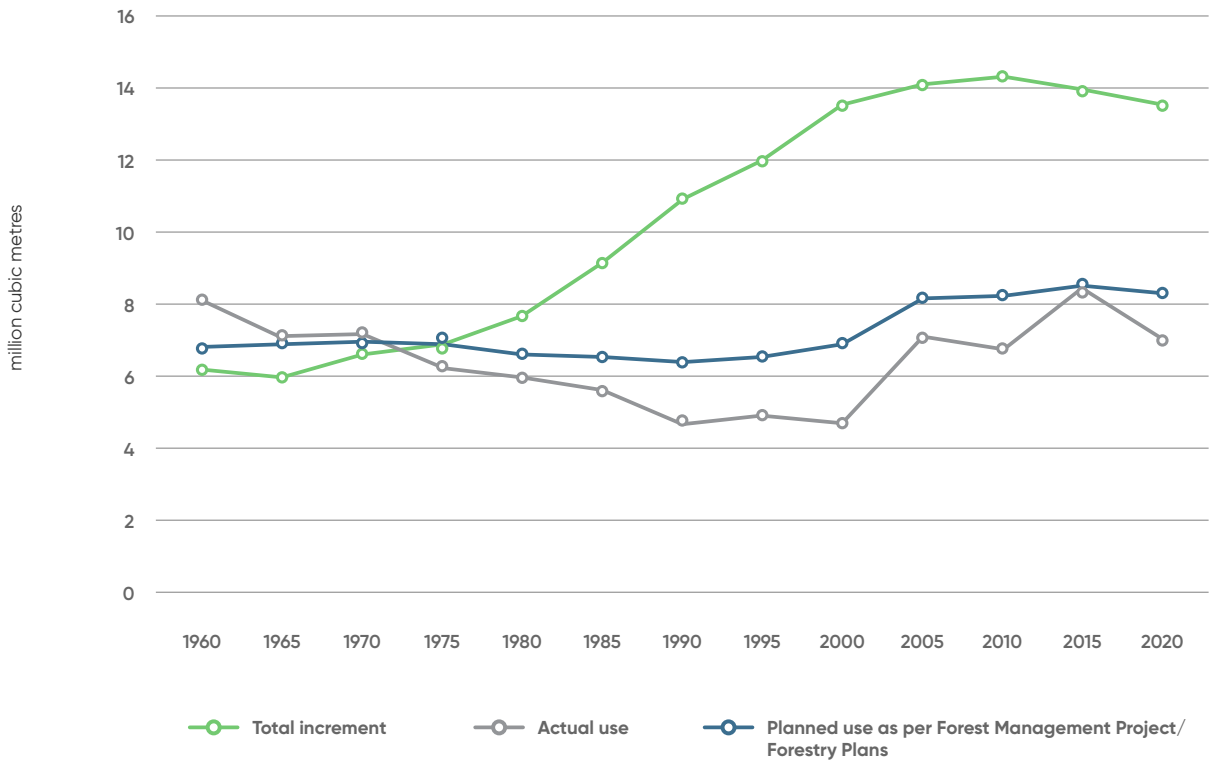
[75] EUROSTAT and European Commission Directorate-General for Agriculture and Rural Development, "The European Union and Forests".

[76] Executive Forest Agency, Annual Report 2022.

[77] Report to the Minister of Agriculture on "The State of Forests and Forest Areas in Bulgaria" 2023.

Without a national forest inventory, it is impossible to accurately estimate the country's timber reserves. Political interest in carbon credits in 2023-2024 spurred a proposal to reorganise state forest enterprises into joint-stock companies, attracting investment for such an inventory. The discussion also encompasses the sustainable use of the timber stock, particularly what proportion of the annual growth is harvested. Official statistics indicate that approximately 51% of the total timber increment has been utilised.

Figure 10. Comparison between total increment, actual use and planned use of wood in Bulgaria, 1960-2020 (million cubic metres)



Source: Executive Forest Agency

The current situation in the **absence of policies and measures in the agricultural and forestry sectors hampers the ability to assess the contribution of the Land Use, Land-use Change and Forestry (LULUCF) sector to the overall emission reduction efforts in the country**. In addition, delays in the implementation of national strategic plans and programmes, especially in the forestry sector, increase the uncertainty related to the policy priorities towards innovation as well as the measures to address the risks, associated with the negative impacts of climate change on forest ecosystems, such as more frequent and severe natural disturbances. Identifying concrete scenarios with feasible measures to reduce agricultural emissions and increase forest carbon stocks is therefore becoming a significant challenge.

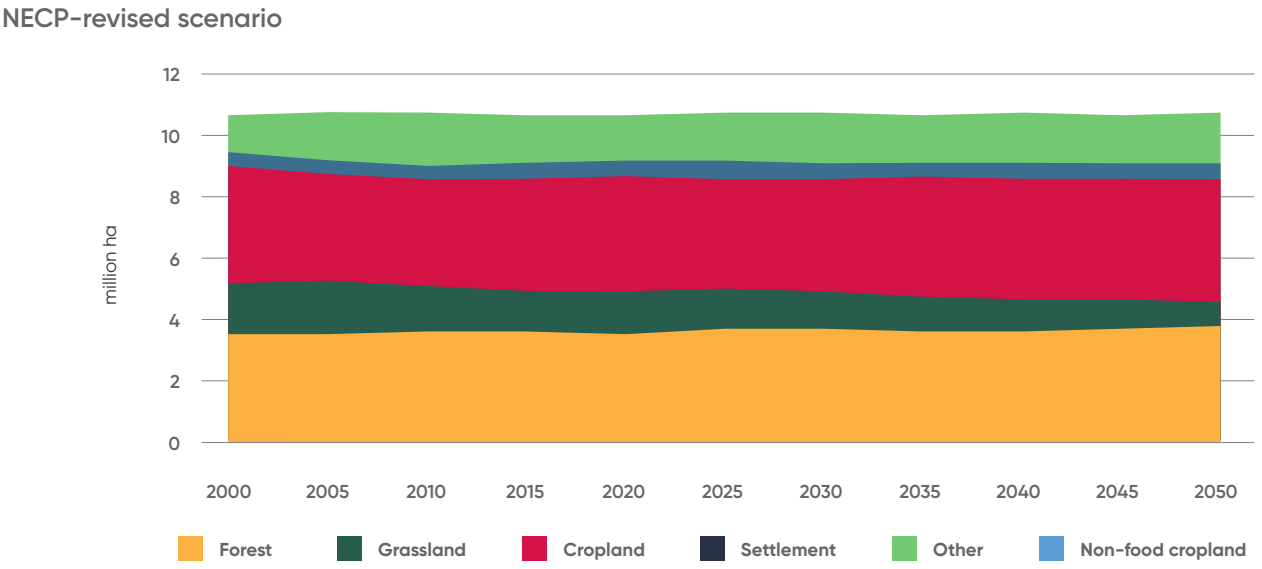
The forestry measures recommended in the Forest Strategy aim to protect forests and increase their resilience to climate change. These measures prioritise the diverse functions of forests, including the provision of environmental services, support for investment, innovation, and rural economic development. In addition, the Biodiversity Strategy seeks to unlock funding for biodiversity conservation and establish a robust governance framework to improve implementation, monitor progress, facilitate knowledge transfer, fund fuels and investments, and promote greater respect for nature in the public sector and business decision-making.

The country lacks a clearly defined political, legislative approach and regulatory framework for carbon sequestration and GHG removal contributed by the forestry sector. Bulgaria's path to carbon neutrality in 2050 cannot be sustained without integrating the carbon sink potential of the national forestry sector and applying policies for the afforestation of marginal lands (e.g. shrubs and secondary grasslands).

According to two forward-looking modelling scenarios, developed by CSD, for the long-term decarbonisation pathways of the Bulgarian economy, the With Existing Measures (WEM) and the NECP-revised scenarios, **forested and arable land is projected to increase**. The rise in forest land until 2050 is between 4-7% based on the scenarios and it is mainly due to conversion from grassland to forest. The NECP-revised scenario foresees a lower increase in wooded lands from 3.86 mill ha to 3.84 mill ha, or 4%. This is because under the scenario, the pressure on the agricultural sector to maintain the same production capacity while adopting environmentally sound practices will require more arable land. This is properly simulated in the land allocation trajectories, which shows that the increase in arable land has a different magnitude under the defined scenarios. The projected increase in cropland according to the NECP-revised scenario is by 9% until 2050 – from 3.86 mill ha in 2020 to 4.01 mill ha in 2050. The area evolution under the WEM scenario stipulates an increase from 3.68 mill ha in 2020 to 3.91 mill ha in 2050, or by 6%. In both scenarios, the projected increase in the forested and arable land is due to a sharp decrease in grassland area by 40% under the NECP-revised and by 44% under the WEM scenario.

A significant risk for the achievement of the forest growth rates is the ageing of Bulgarian forests. The total annual wood growth decreased by 804,000 cubic metres, or 5.6%, between 2010 and 2020, reflecting an increase in the average forest age from 53 to 60 years. Seed forests, which can live for 150-160 years, have an optimal harvest age of 70-80 years. In contrast, 48% of Bulgaria's forests are coppice forests, with a life expectancy of 70-80 years and an optimal harvest cycle of 35-40 years.

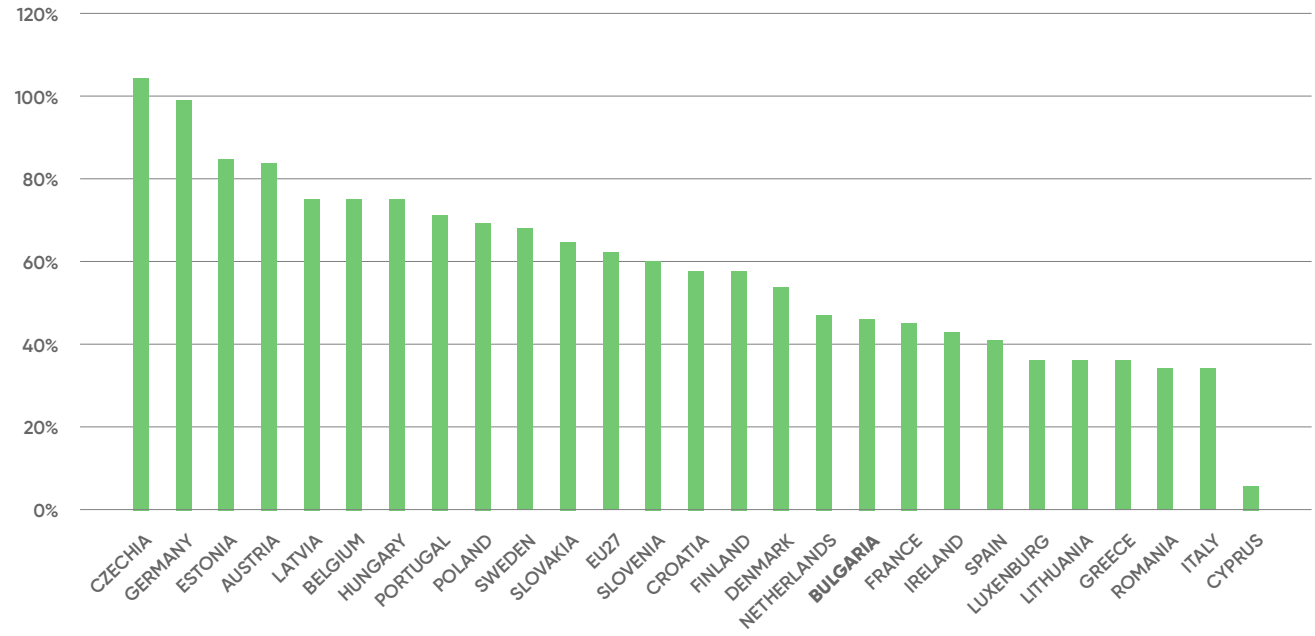
Figure 11. Land allocation in Bulgaria, 2020-2050 (million hectares)



Source: CSD developed scenarios based on the Pathways Explorer

Bulgaria has been experiencing a natural forest stock growth, which must be maintained through targeted state policies on the afforestation of marginal land. The negative growth of the rural population and the overall population in the country can be a contributing factor to less intensive agriculture, less intensive land-based food production and more intensive afforestation and reforestation. **Bulgaria's "removal of timber" to "net increment of trees" ratio in the forestry sector is still at healthy levels of below 45%**, compared to the EU average of above 60%, which positions the country as fully capable of achieving the GHG removal targets under the WEM and NECP-revised scenarios if appropriate state policies on forest management, afforestation and reforestation are implemented.

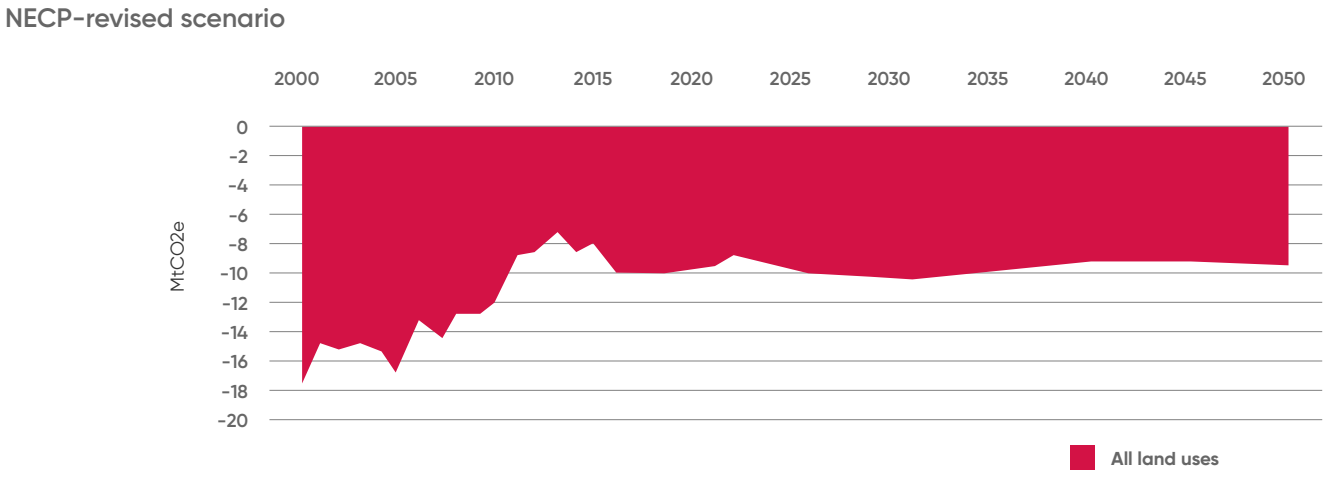
Figure 12. Share of timber removals to net increment in EU forests, 2021 (%)



Source: EUROSTAT

According to the NECP-revised scenario, the Land sector would enhance the carbon removals by 8% from -9.66 MtCO2e in 2020 to -10.32 MtCO2e in 2030, followed by a slight decrease in the removals until 2050, when the Land sector will account for a net removal of -9.37 MtCO2e (Comparative figures 19). Under the WEM scenario, the trend follows the same pattern, but the maximum removal capacity is projected for 2035 or -10.66 MtCO2e, after which the removals drop to -9.55 MtCO2e in 2050. The LTS scenario projects an increase in the net removals until 2030 by 20% to -11.60 MtCO2e, while in 2050 the net removals would have a value of 10.30 MtCO2e. The projections show that the national target for net removals under the LULUCF Regulation will be achieved in all scenarios, **but the overall contribution of the Land and forestry sector to the net zero target for 2050 would decrease**.

Figure 13. GHG emissions per land use and forestry sector in Bulgaria, 2020-2050 (MtCO2e)



Source: CSD developed scenarios based on the Pathways Explorer

Despite the overall positive trend, uncertainties remain over the achievements of the LULUCF target for 2030:

- The draft revised NECP demonstrates a poor understanding of the relationship between policies to increase the share of bioenergy and the impact of these policies on land use and the forestry sector.
- Forest degradation processes related to natural disturbances were not simulated.
- Change in forest management intensity is not projected.
- Enhancement of the Monitoring, Reporting and Verification (MRV) system.
- The updated NECP recognises the potential to increase the share of biomass in renewable energy production and consumption but does not provide specifics on the interactions of such a policy with the targets under LULUCF Regulation.
- There is no information on the projected biomass energy consumption curves distributed across sectors, as well as projected biomass supply curves from different biomass feedstocks, with an indication of their origin.

The lack of more specific information in this regard prevents a quantitative and qualitative assessment of the use of biomass for energy, the expected supply and demand of biomass for energy, including an analysis of the potential for the production and extraction of sustainable biomass for energy, the risk of negative impacts on the environment, ecosystems, and biodiversity concerning policies and measures related to the use of biomass for energy; the impact on emissions and removals from the LULUCF sector.

The LULUCF Regulation does not change the existing way in which emissions from harvested wood used for energy purposes are accounted for. Emissions associated with biomass production for energy are reported and accounted for in the year of harvest by the country producing the raw material. To prevent double counting of emissions at the point of wood combustion for energy production, the CO2 emissions shall be reported as 0 by the installations, providing proof of compliance with the biomass sustainability criteria. This means that the combustion of woody biomass at the installations is considered carbon neutral. However, the associated carbon emissions are reported in the LULUCF sector. This calls for an integrated approach in planning activities to stimulate biomass energy production. Although the LULUCF Regulation provides some flexibility in accounting for the implementation of its commitments, any failure to comply with these requirements will place a greater burden on the achievement of the overall emission reduction targets.

Another source of uncertainty about the projected emissions trend is that the Land sector is subject not only to anthropogenic effects, but is also vulnerable to natural disturbances. The projected increase in temperature coupled with the projected decrease in overall precipitation in Bulgaria, could escalate both the frequency and intensity of extreme weather occurrences, like heatwaves, cold snaps, powerful storms, and instances of wet snow and ice accumulation. These projections pose a threat to forest ecosystems and would likely elevate the vulnerability to pathogenic insects and fungi risk, which, in turn, risks substantial losses arising from forest fires and storm-related damages.

The sequestration potential of forest biomass depends on the dynamic of the age-dependent forest's characteristics. Considering the current forest age structure and the relatively high percentage of the forest stands for transformation, such as conversion coppices and coniferous plantations outside their natural habitats, one might expect that the future harvest intensity will soon increase, whilst adhering to the principles of sustainable forest management practices. This would reflect the carbon balance and sequestration potential of the wooded lands in Bulgaria. However, limited information on the policies and measures prevents the assessment from accurately taking this into account under the current simulation.

Under the LULUCF Regulation, both targets and compliance assessments are based on the data reported by the countries in their national GHG inventories. **The establishment of an improved system for Monitoring, Reporting and Verifying emissions is a necessity** in relation to the ambition of the LULUCF Regulation to improve the precision and accuracy of the inventory reports. The reporting requirements under the Regulation call for the application of an improved methodology by following higher-order methods in line with the Intergovernmental Panel on Climate Change methodology tier structure, as well as strengthening the monitoring of land-use changes with geographically

explicit data. Implementing improved calculations requires a comprehensive national policy aimed at developing improved monitoring systems, proper data maintenance and management, as well as resolving the interoperability issues to facilitate data sharing and utilization.[78]

[78] The uncertainty associated with the MRV system is that any non-compliance with reporting requirements may lead to methodological adjustments and technical corrections during the compliance review process which affect both the historic and future emission trends.

WHAT'S NEXT?

Illegal logging, timber trade, deforestation, and energy poverty are interrelated, difficult challenges in Bulgaria that require urgent policy attention. Despite efforts to combat these problems, **they remain widespread phenomena, leading to lower potential for carbon emission sequestration with severe environmental and climate impacts**. In addition, firewood-related air pollution poses serious health and socio-economic risks for many Bulgarians. These issues demand a comprehensive approach that considers their underlying causes and impacts on the environment, the economy, and local communities.

Although it is difficult to measure the exact extent of illegal logging and timber trade, **the current assessment indicates that it makes up at least 15% of the total firewood consumption, with criminal organisations and legal companies participating in the trade**. One particularly challenging aspect of logging activities in Bulgaria is the proximity to settlements, which can have severe consequences. Deforestation near springs can dry them up and reduce water resources, while overharvested mountain forests can exacerbate flooding in settlements located below them during heavy rains. **Illegal logging results in the loss of valuable forest resources**, with devastating consequences for the environment, threatening local and global ecosystems and contributing to climate change.

The negative impact of illegal logging and deforestation is not limited to the environment. It also **significantly affects local communities**, especially those in rural areas that depend on forest resources for their livelihoods. This is compounded by the state's misguided policy of subsidising firewood-based heating while failing to effectively control illegal wood extraction. In addition, energy poverty is another significant challenge in Bulgaria, with many individuals living in poorly insulated homes and using inefficient and polluting energy sources like firewood – making the country the most at risk of energy poverty in the European Union.

Forestry and agriculture provide significant opportunities to mitigate climate change by reducing net greenhouse gas emissions and increasing carbon sequestration. Realising this potential, however, requires concerted efforts to promote sustainable land management practices, protect natural ecosystems and stimulate climate-smart agriculture and forestry initiatives at local, national, and global levels. Effective policy frameworks, financial mechanisms, technological innovation, and stakeholder engagement are essential to achieving the transformational changes needed to tackle climate change while ensuring food security, biodiversity conservation and sustainable development.

In this policy context, **the following recommendations need to be considered**:

Heating and energy poverty

To resolve the nexus **between energy poverty and the high use of solid biomass** for heating, Bulgarian authorities should introduce a range of well-planned and coordinated measures in several interconnected fields, including:

- Estimating the **true number of energy-poor households**, based on the recently introduced definition in the Energy Law, as a basis for any future energy efficiency programmes and funding mechanisms;
- Formulating policies and measures aimed at **reducing energy poverty to below 10%** of households by 2030 and eliminating it by 2050, including through social transfer schemes linked to specific investments in energy efficiency, decentralisation of power generation and consumption, and replacement of air-polluting coal and firewood-based heating stoves;
- Applying the **principle of 'energy efficiency first'** to all measures aimed at reducing energy poverty;
- **Completing the liberalisation of the electricity market**, after an adequate programme has been established to support vulnerable customers in case and sudden increases in electricity prices;
- Earmarking financial resources to support energy efficiency policies to stimulate private investment by households and alleviate the current dependence on purely grant-based public funding;
- Introducing **deep renovation standards** to ensure higher energy savings, as foreseen in the updated Energy Performance of Buildings Directive to be adopted in 2024;
- Developing efficiency and process optimization measures, such as **one-stop administrative services**;
- Introducing **smart building norms**, by building monitoring systems that can help reduce energy consumption and optimise heating, cooling, lighting and ventilation systems;
- Facilitating **access to renewable energy technologies** for citizens to achieve near-zero energy consumption in residential buildings through incentives for households to invest in renewable energy alongside the renovation process;
- Introducing a system of **incentives for participation** and **penalties for non-compliance** with legal obligations for homeowners.

Illegal logging

Reducing the overall demand for timber by households, in particular, can be achieved by implementing the policy recommendations above, aimed at increasing energy efficiency and the electrification of heating. **Reducing illegal logging requires the following additional measures**:

- **Encouraging the mechanisation of timber harvesting** (including with targeted financial support) to reduce the human factor and hence opportunities for illegal logging;
- Adjusting existing oversight mechanisms to **include civil society organizations** in monitoring logging operations, to reduce corruption in the sector;
- Investing in **digital tools to track and trace** the online sale of illegally harvested wood;
- **Combining and cross-analysing data** collected by the Executive Forest Agency and the National Revenue Agency to identify inconsistencies and potential instances of illegally purchased timber.

Land management

Forestry management requires a coordinated approach to maintain a sustainable forestry carbon pool and achieve carbon neutrality by 2050 as mandated by EU law. This can be achieved by ensuring the synergy between strategic documents and practical implementation:

- Adopting a **National Strategy for the Development of the Forest Sector** until 2030, recognising the role of forests in the climate mitigation process and reducing the risk for the forest ecosystem related to climate change;
- **Implementing the National Forest Inventory**, which will improve the quantitative and qualitative data about the forest ecosystem encompassing all carbon pools – biomass, dead wood, litter and soil;
- **Accelerating the adaptation of the forest ecosystem to the changing climate**, based on scientific evidence, whilst ensuring the continued delivery of ecosystem services and features;
- Introducing a set of state measures under a **Strategic Programme for Afforestation** through targeted financial and policy measures;
- Enhancing the **Monitoring, Reporting and Verification system** and employing state-of-the-art methodologies enabling the national GHG inventory to effectively monitor alterations, reflect policy implementations, and assess the achievement of sink enhancement objectives;
- **Stimulating emission reductions in the agriculture and land sector** through incentives to mitigate the effects of climate change, including subsidies under the Common Agricultural Policy or at the national level, market incentives such as supply chain pressure or participation in a carbon offset market, and demand-side measures such as encouraging a shift to lower-emission products, reducing food waste and promoting consumer preferences aligned with sustainable development objectives.