Bioenergy Landscape

2025

Bioenergy Europe
Statistical Report

Bioenergy EUROPE

The Voice of European Bioenergy

BIOENERGY EUROPE STATISTICAL REPORT 2025

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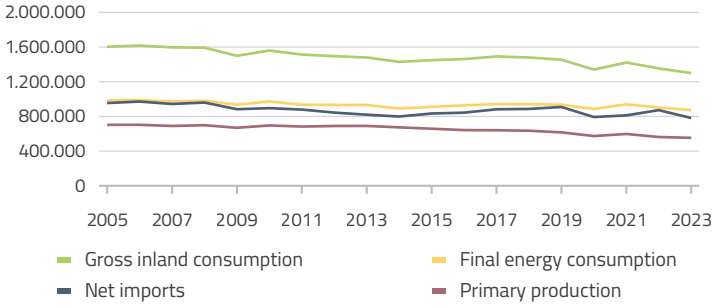
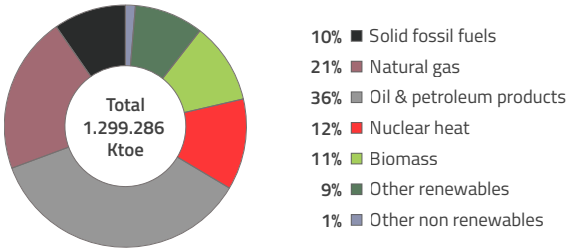
European Energy System

Figure 1: Evolution of the main energy indicators in the EU27 (ktoe).
Source: Eurostat



Across the European Union, all major energy indicators have moved in the same direction over time. Efficiency measures have allowed to reduce the EU's energy consumption, but indigenous energy production also went down, which makes the EU more dependent on energy imports.

Figure 2: Share of fuel in the Gross Inland Consumption in the EU27 in 2023 (%).
Source: Eurostat



In 2023, fossil fuels still made up 66% of EU27 energy use, with oil at 465 million tonnes of oil equivalent (Mtoe), natural gas at 272 Mtoe, and coal at 125 Mtoe. Renewables accounted for about 20% of the total, while most of the rest came from nuclear energy. The breakdown of each Member State's energy mix can be found on the next page.

Figure 3: Share of fuel in the Gross Inland Consumption in EU Member States in 2023 (ktoe). ***Source: Eurostat***

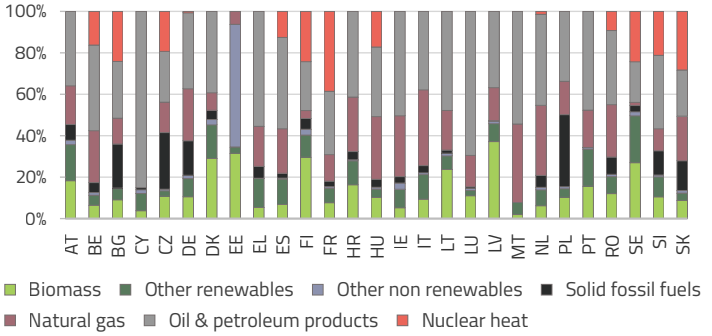
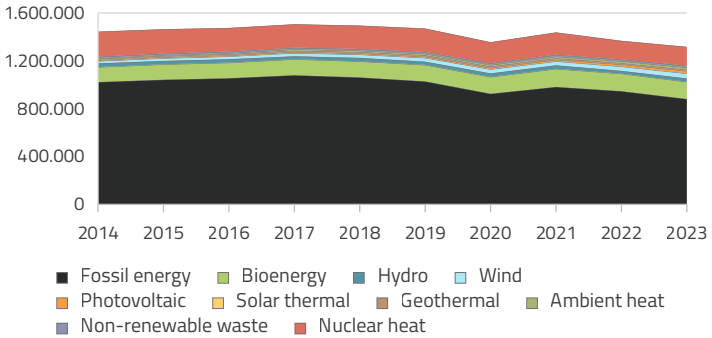
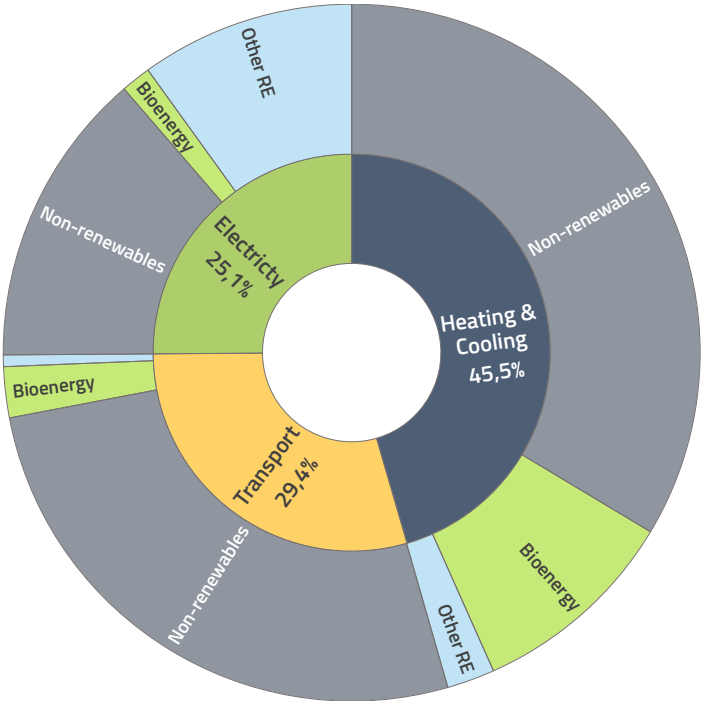


Figure 4: Evolution of the Gross Inland Consumption of different fuels in the EU27 (ktoe). ***Source: Eurostat***



Fossil fuels show the sharpest drop in EU27 energy use, down by 150.000 ktoe over the last decade (-15%). Nuclear energy has also declined, with 2024 consumption a quarter lower than in 2014 (-50.000 ktoe). Renewables, aside from hydropower, are the only sources on the rise, though their growth has not yet fully balanced the gradual phase-out of fossil fuels.

Figure 5: Share of fuel by type of end-use in the EU27 in 2023 (ktoe).
Source: Eurostat, SHARES database



Non-renewables (fossil fuels and nuclear) still dominate every energy sector in the EU27. Heating and cooling, the largest sector at 45% of total energy use, also leads in renewable uptake with 110.000 ktoe, and 81% of it coming from bioenergy. Electricity generation stands out with the highest renewable share, already reaching the EU's 2030 target at 45%. In transport, renewables play a smaller role, with biofuels making up most of the contribution.

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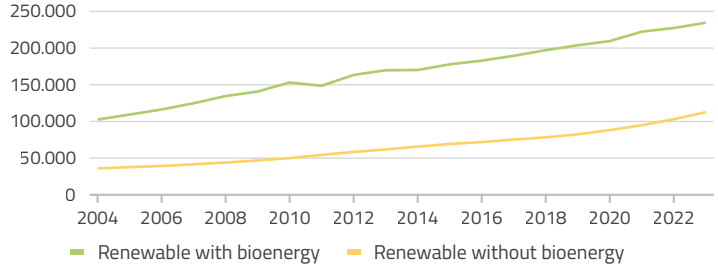
Carbonisation	Torrefaction
up to 25,000 t/a per production line	up to 60,000 t/a per production line

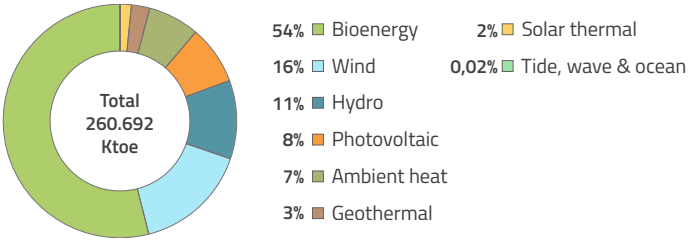
Renewable Energy System

Figure 6: Evolution of the renewable energy consumption with and without bioenergy (ktoe). ***Source: SHARES database***



Renewable energy consumption has grown strongly over the past two decades, increasing by 129%, or an average of 4% per year, equivalent to around 7.500 ktoe annually. Bioenergy continues to account for a substantial share of this growth. Without it, renewable consumption in 2023 would have been reduced by half, significantly diminishing the overall renewable contribution in Europe.

Figure 7: Renewable energy mix in the EU27 in 2023 (ktoe, %). ***Source: Eurostat***



Bioenergy is the main driver of renewable energy in the EU, accounting for 54% of its total consumption and leading in every sector apart from electricity generation where other renewable like wind, solar and hydro thrive the most. Wind represents the second largest share with 16% followed by hydropower with 11%. It is quickly followed by solar energy with a combined 10% share (thermal + PV), while hydropower is reaching its maximum potential in Europe.

Figure 8: Bioenergy consumption by type of fuel in the EU27 in 2023 (ktoe, %). ***Source: Eurostat***

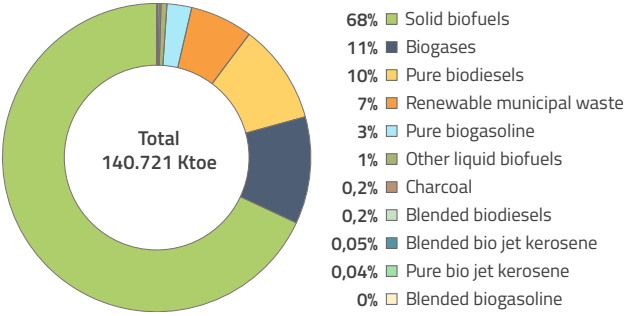


Figure 9: Share of renewable energy in the Gross Final Energy consumption in EU Member States in 2023 with 2030 targets (%). ***Source: SHARES***

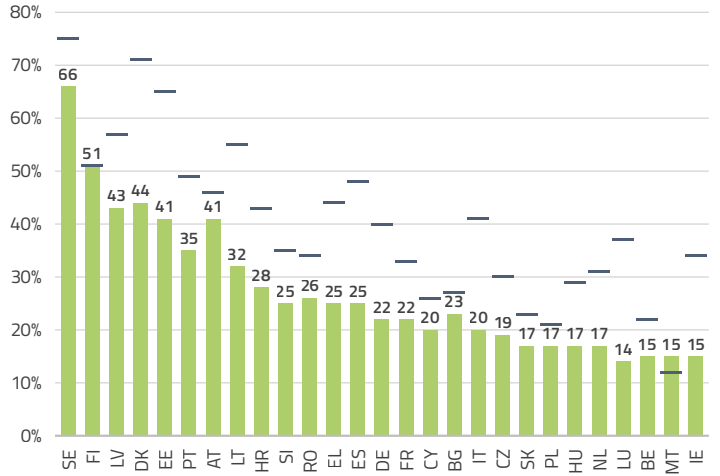
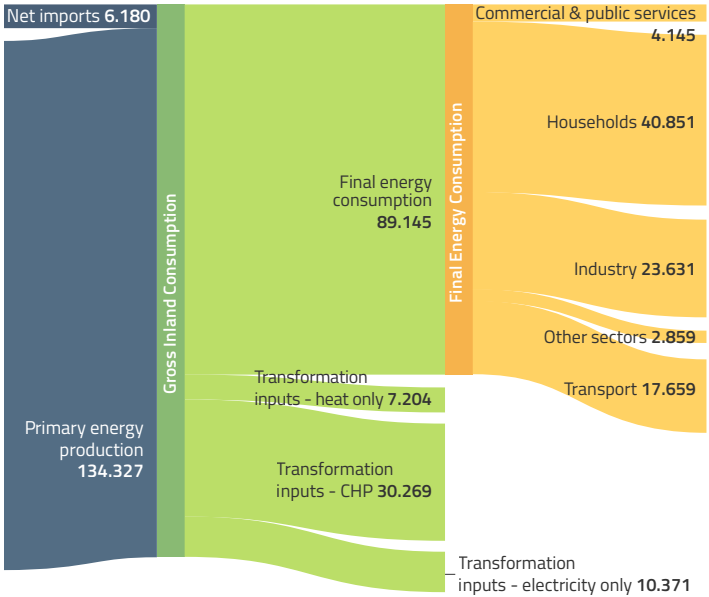


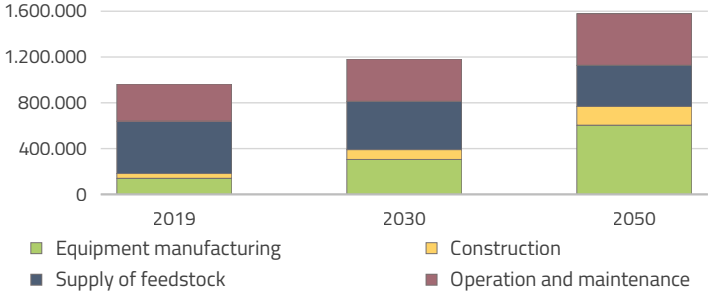
Figure 10: Simplified Bioenergy flows in EU27 for 2023 (ktoe).
Source: Eurostat



Most bioenergy consumption is driven by solid biomass (wood logs, wood pellets, agrobiomass, etc.), which accounts for 70% of the total, followed by biogases (biogas and biomethane) at 11% in 2023. The majority of bioenergy is used directly for heat, with 63% of gross inland consumption occurring in households, industry, and other sectors. The remainder is converted into heat for district heating networks or into electricity.

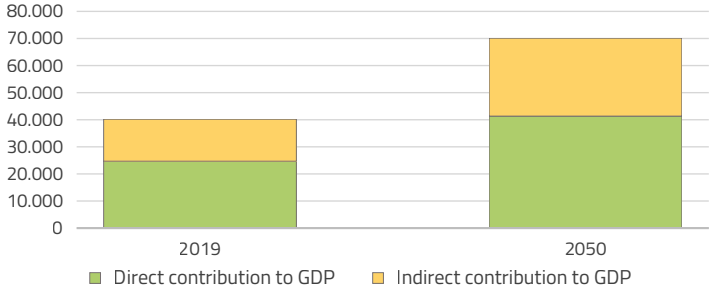
Economic Effect of Biomass

Figure 11: Bioenergy jobs per sub sectors in the EU (Number of jobs). ***Source: Deloitte***



The bioenergy sector supported around 1 million jobs in 2019, with employment concentrated primarily in feedstock supply. Over time, this profile is projected to shift towards higher-value roles, with a growing emphasis on equipment manufacturing rather than raw material provision. This transition reflects the sector's maturing value chain and its capacity to generate more skilled, technology-oriented employment. As such, bioenergy remains a key component of the EU economy, contributing both to job creation today and to the development of more advanced industrial capabilities in the years ahead. The bioenergy sector also currently contributes to around €40 billion to the EU total GDP, which is expected to nearly double by 2050 and go beyond €70 billion.

Figure 12: Bioenergy contribution to GDP in the EU (Million euro). ***Source: Deloitte***



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Focus On Fossil Energy

Figure 13: Price evolution for the oil barrel ($/barel). ***Source: US gov***

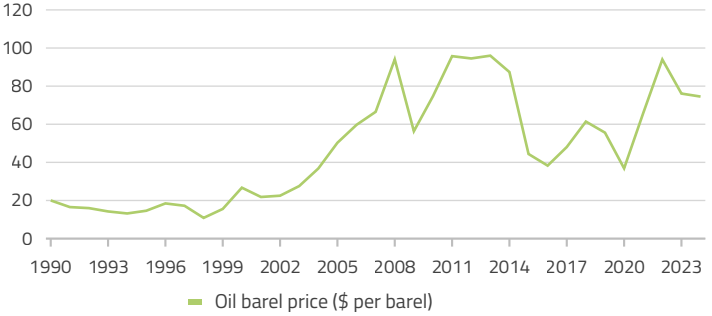

Figure 14: Annual evolution of food price Index with 2014-2016 = 100. ***Source: FAO stat***

While the energy transition is aimed at transforming our system to a less carbon intensive one, fossils fuels are still dominating in our society, impacting the price of food and basic needs. Since 2000, the price of the oil barrel price has experienced ups and downs, connected to different crises. In recent years, price volatility has been shaped by two major shocks. In 2020, the COVID-19 pandemic curtailed consumption, driving prices down. This was quickly followed by Russia's aggression against Ukraine, which sent prices to record highs globally.

The dominance of fossil fuels in the EU's energy mix has direct consequences for energy security. With oil and gas production in Europe almost non-existent, dependency on imports reaches 98% for both fuels. Global crises have pushed prices up, creating volatility that has often been met with subsidies that unintentionally reinforce the fossil fuel status quo. By contrast, biomass is only 5% import-dependent and stands out as a reliable, homegrown energy source, driving the shift toward a more independent and defossilised future.

Figure 15: Consumption, production, imports & dependency of different fuels in EU27 for 2023 (Mtoe, %). ***Source: Eurostat***

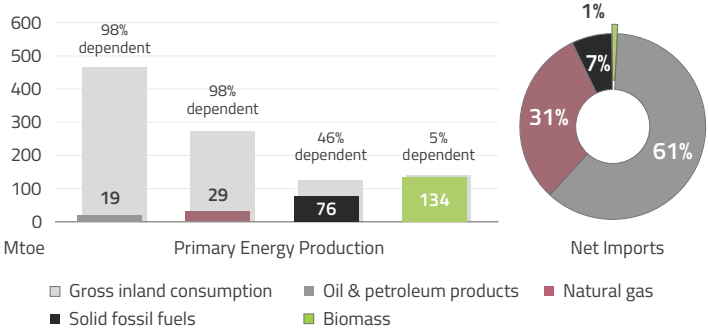

Figure 16: Evolution of energy subsidies in the EU27 per type of energy (Billion €, % of GDP). Source : European Commission). ***Source: Trinomics study, EU commission***

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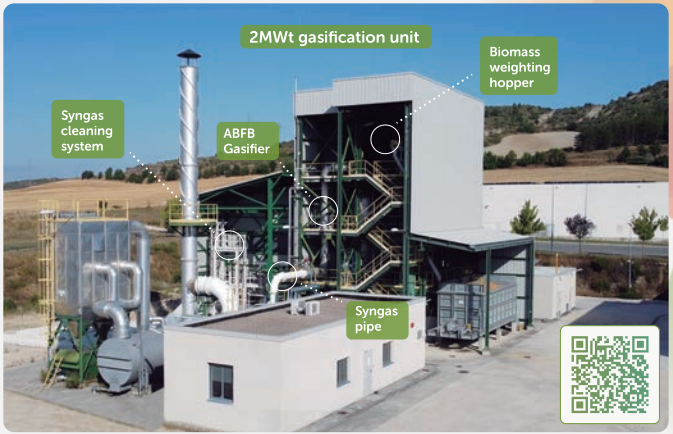

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Figure 17: Evolution of CO_2 emissions and removals by sector in the EU27 (Million tonnes of CO_2eq). *Source: Eurostat*

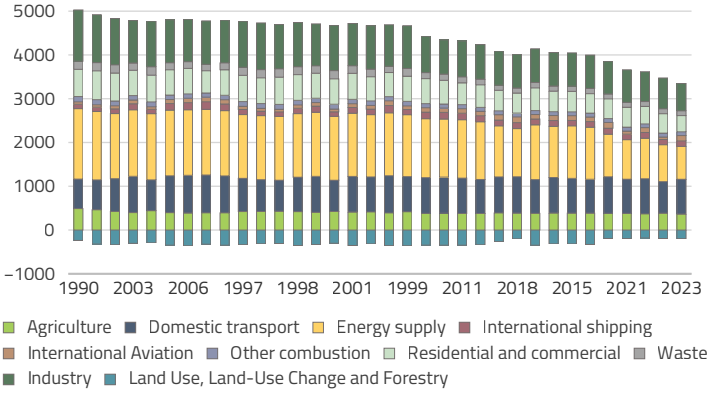
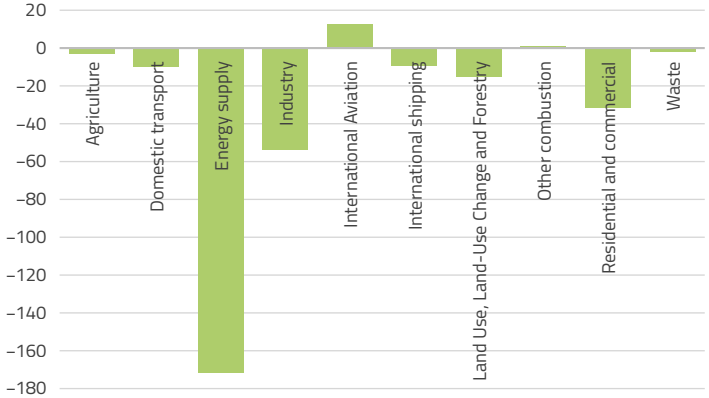


Figure 18: Changes of CO_2 emissions for various emitting sectors between 2022 and 2023 (Million tonnes of CO_2). *Source: Eurostat*



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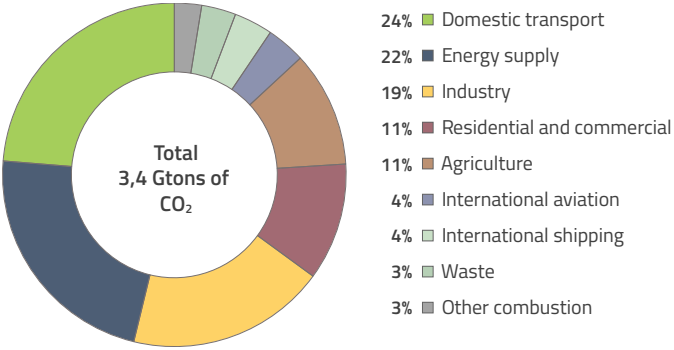
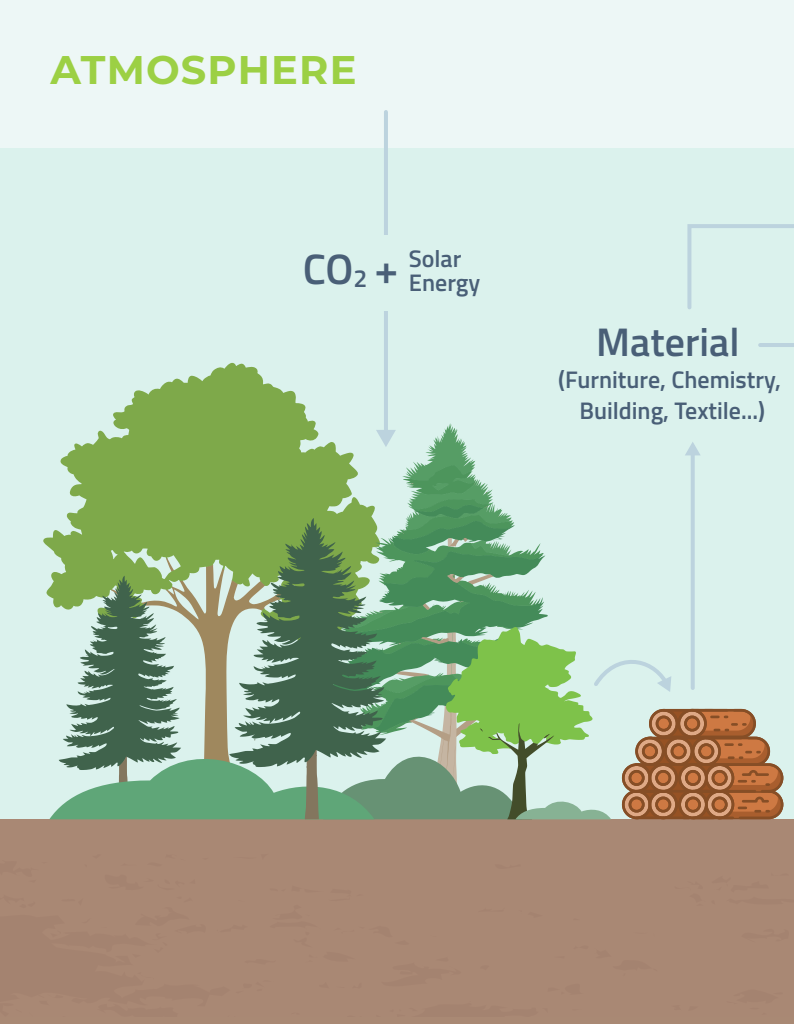
GHG are on the decreasing path in the EU27, although maybe not at the adequate pace. Currently, net emissions in the EU (therefore also accounting for negative emissions of LULUCF) are still at 3,1 Gtonnes of CO_2eq in 2023, a drop of 34% compared to 1990. On average, the EU27 is emitting 1% less GHG each year. Emissions have shown notable year-to-year swings: in successful years such as 2019, they have fallen by up to 10% compared with the previous year. By 2023, emissions had returned to levels observed during the COVID-19 lockdowns, and forecasts based on current trends are encouraging. Nevertheless, on the current trajectory the EU27 would miss its zero-emissions target in 2050 by about 2,1 Gtonnes unless additional measures are implemented and carbon removals are deployed at the appropriate scale.

Figure 19: Share of emissions per sector in the EU27 in 2023 (Gtonnes of CO_2, %)
Source: Eurostat



Bioenergy with Carbon Capture and Storage



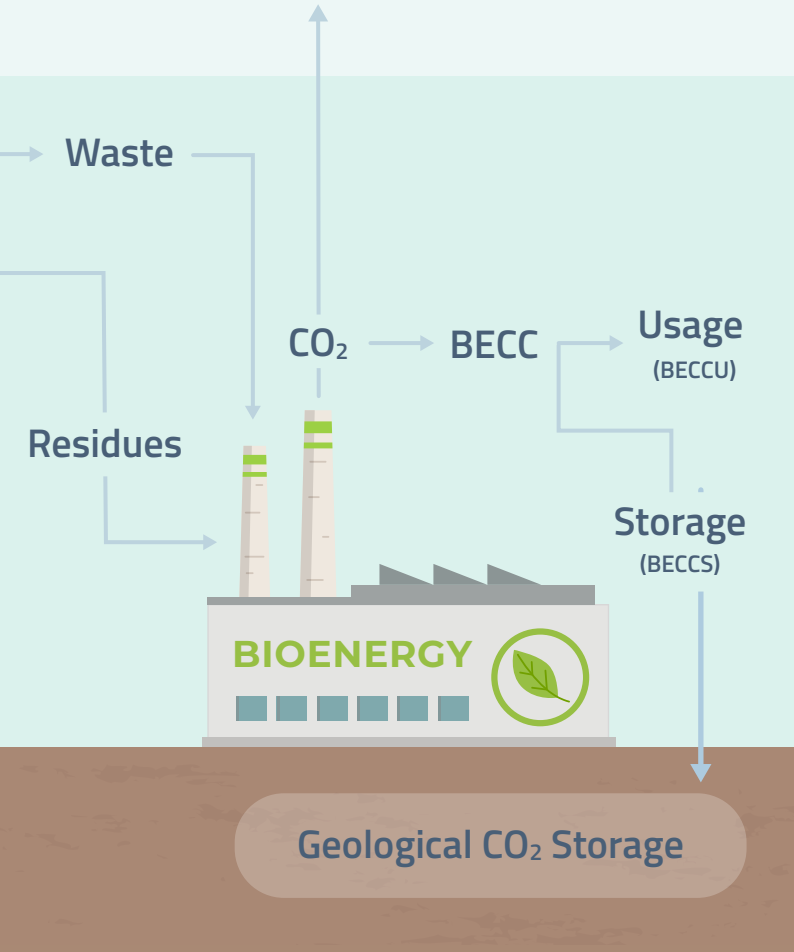

Waste
Residues
CO_2
BECC
Usage
(BECCU)
Storage
(BECCS)
BIOENERGY
Geological CO_2 Storage

Figure 20: Energy flows for Biomass CHP plant with MEA* capture and without capture (MJ)**

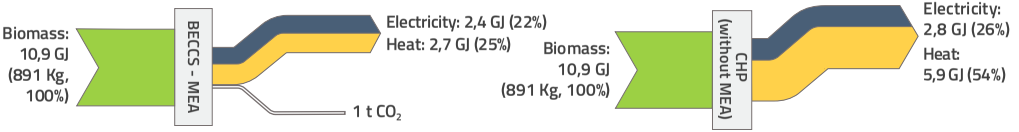


Figure 21: Energy flows for Biomass Power Only plant with MEA* capture and without capture (MJ)**

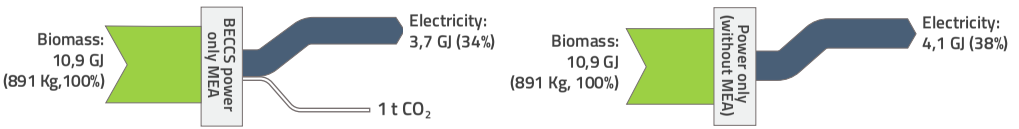
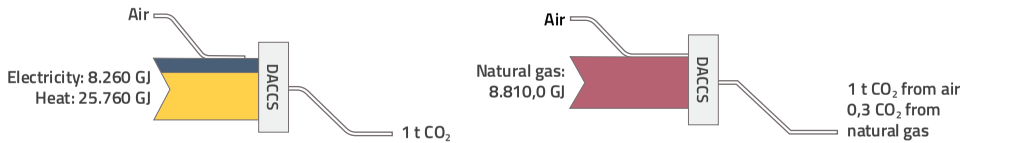


Figure 22: Energy flows for two separate Direct Air Capture & Storage settings (MJ)**

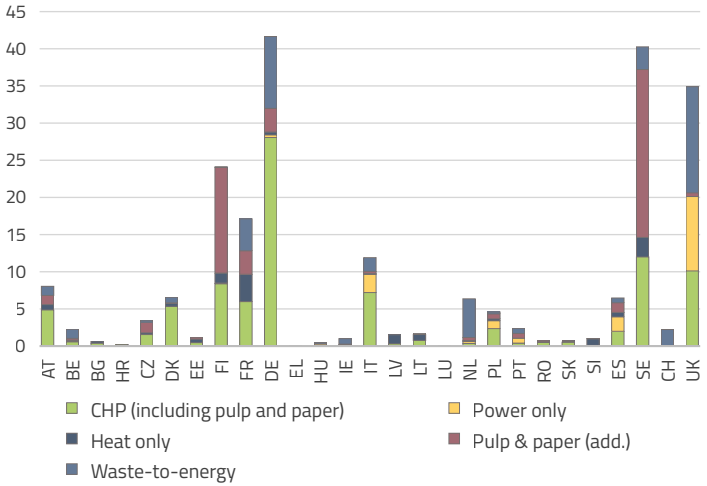


**MEA (monoethanolamine) is a liquid solvent commonly used to capture CO_2 from flue gases in BECCS plants.*

***Source: BEST – Bioenergy and Sustainable Technologies. (2025). Bioenergy with carbon capture and storage: Basics and opportunities.*

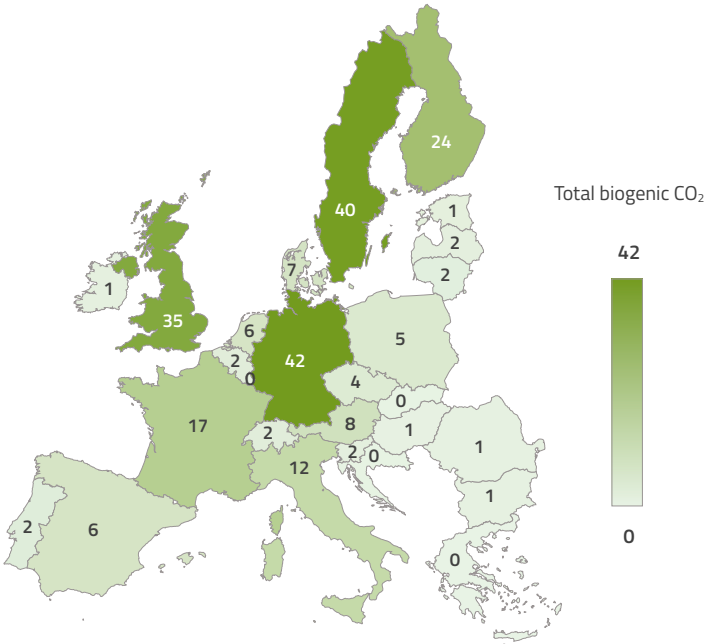
The retrofit of existing industrial structures using biomass appears to be the most cost-effective way of doing carbon removals. While the addition of a carbon capture facility will have an impact on the original energy production, BECCS projects still allow energy to be produced. On the other hand, the removals of carbon through Direct Air Capture (DACCS) is not producing any energy but rather has to consume heat and electricity in order to extract the CO_2 from the atmosphere. While carbon removals is essential in the fight against climate change, it can also generate an additional pressure on the electric grid and therefore has to be carefully evaluated.

Figure 23: Bioenergy Carbon Capture & Storage potential in European countries (Million tonnes captured/ year). ***Source: BEST – Bioenergy and Sustainable Technologies. (2025). Bioenergy with carbon capture and storage: Basics and opportunities.***



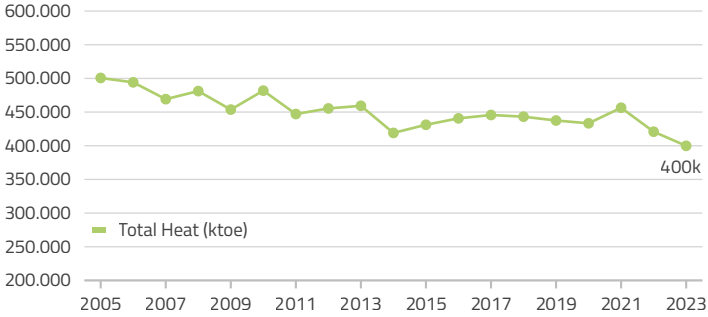
As seen in the evolution of GHG emissions of Europe, achieving net zero emissions in 2050 will imply the use of carbon removals. BECCS (Bioenergy with Carbon Capture and Storage) is the easiest way to achieve such removals. A recent study has shown that the theoretical potential for industrial biogenic carbon could be as high as 222 Mtonnes of CO_2. Germany, Sweden and the UK are the countries with the largest potential for BECCS.

Figure 24: Map of biogenic carbon potential for BECCS (Mt CO_2 potential per year). ***Source : BEST – Bioenergy and Sustainable Technologies. (2025). Bioenergy with carbon capture and storage: Basics and opportunities.***



Heat Generation

Figure 25: Evolution of the total heat consumed in the EU27 (ktoe). *Source: Eurostat*



Heat consumption in the EU27 has declined substantially over the past two decades, driven by efficiency improvements in buildings and industry. In 2023 it reached 400.000 ktoe, a 20% decrease over 20 years. Residential demand is the largest end-use segment, accounting for nearly half of total heat use. While the absolute consumption of renewable heat continues to rise, biomass has remained broadly stable over the past decade; the main source of growth has come from ambient heat (Heat Pumps).

Figure 26: Stacked evolution of the renewable heat consumed in households in the EU27 (ktoe). *Source: Eurostat*

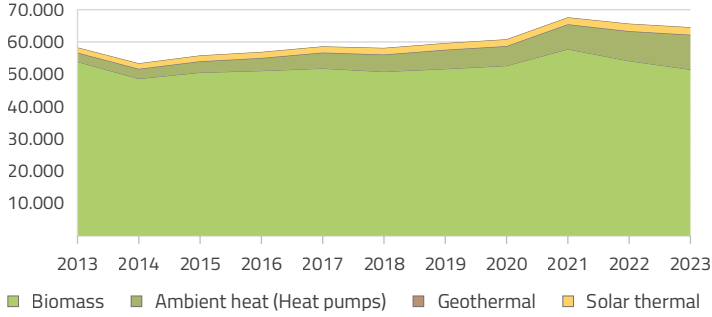


Figure 27: consumption of biomass for heat in the different sectors in the EU27 in 2023 (%). *Source: Eurostat*

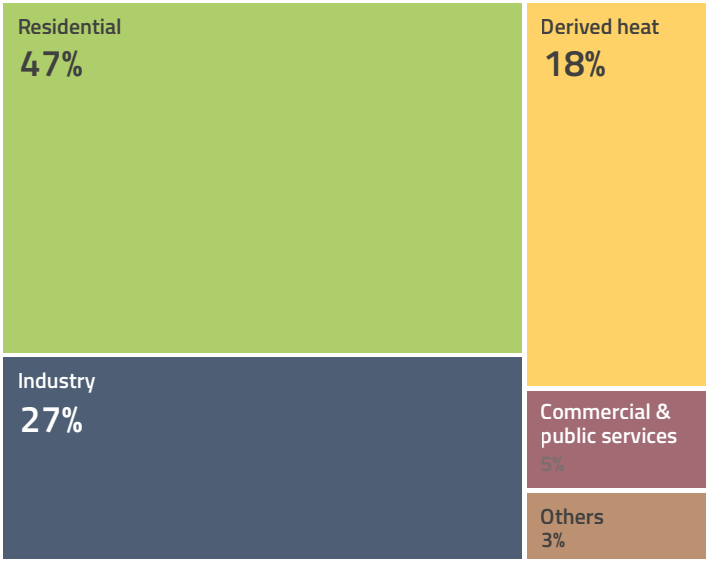


Figure 28: Share of fuels in household heat consumption in the EU27 in 2023 (ktoe, %). *Source: Eurostat*

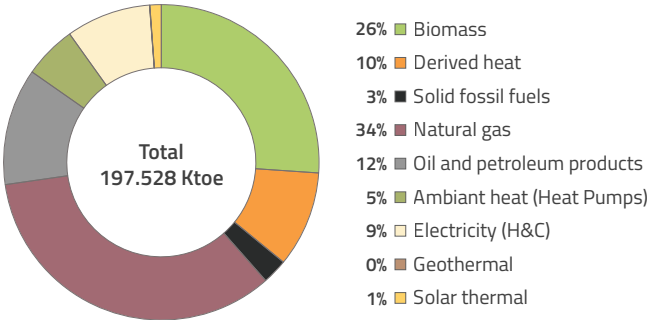
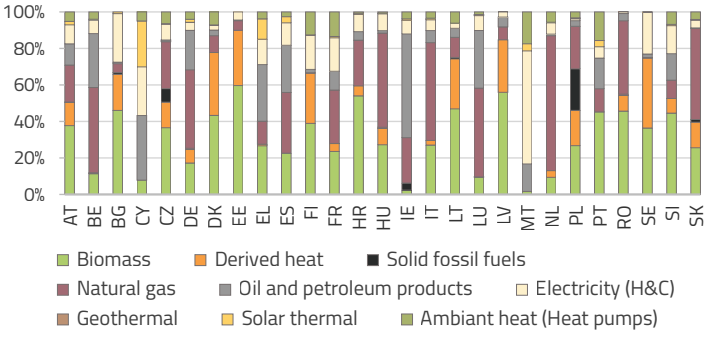


Figure 29: Share of fuels in household heat consumption in the EU27 Member States in 2023 (%). *Source: Eurostat*



Residential heat in the EU27 remains predominantly fossil-based: 48% of household heat is supplied by gas, oil, or coal. Biomass is the second-largest fuel, providing 52.000 ktoe, or 26% of residential heat use. It has long played a central role in heating and continues to evolve with more efficient technologies. While the consumption of solid biomass for heat may remain broadly stable over time, the useful heat delivered could increase significantly if old, inefficient appliances were fully replaced with modern, higher-efficiency systems.

Figure 30: Share of fuels in industrial heat consumption in the EU27 in 2023 (ktoe, %). *Source: Eurostat*

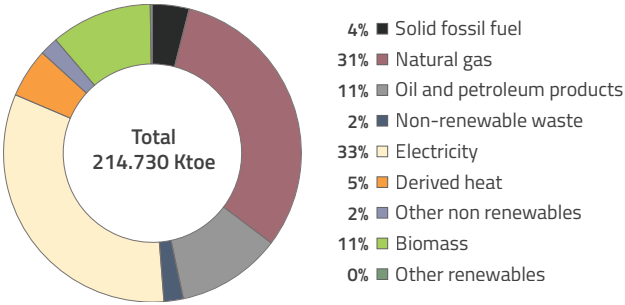
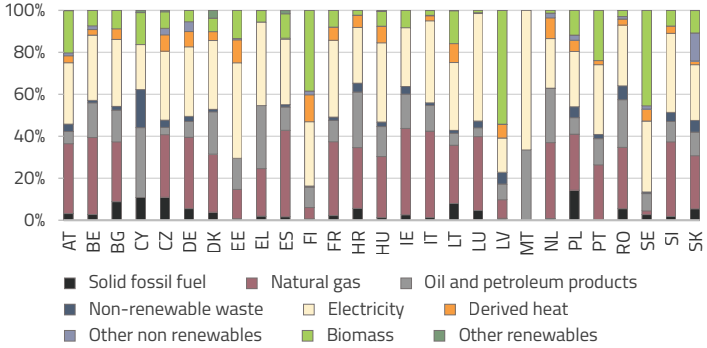


Figure 31: Share of fuels in industrial heat consumption in the EU27 Member States in 2023 (%). *Source: Eurostat*



The electricity consumption shown in the chart covers uses beyond heat, so the share of electricity attributable specifically to heat cannot be reliably inferred from it. In EU27 industry, heat is supplied predominantly by natural gas (nearly 70.000 ktoe in 2023) alongside oil.

Renewable in the industry comprise the renewable fraction of electricity use, ambient heat, and biomass, with biomass currently the leading option for defossilising industrial heat.

Figure 32: Share of fuels in district heating generation in the EU27 in 2023 (ktoe, %). *Source: Eurostat*

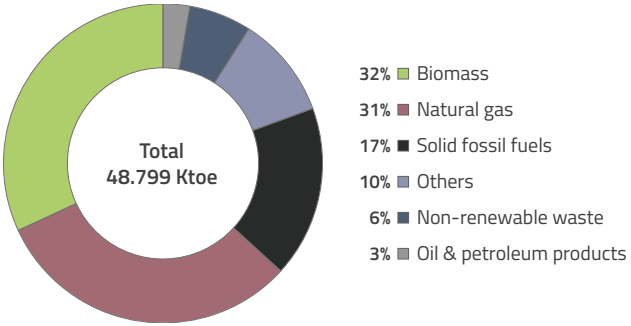
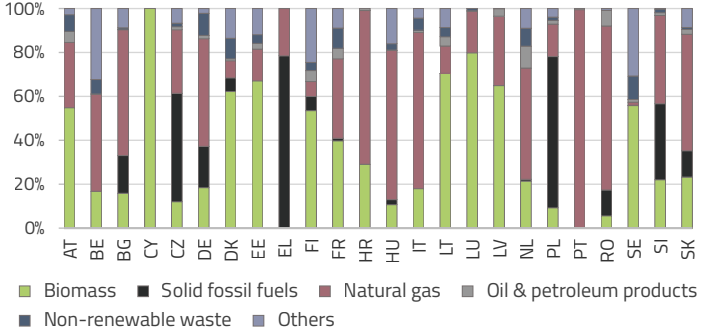
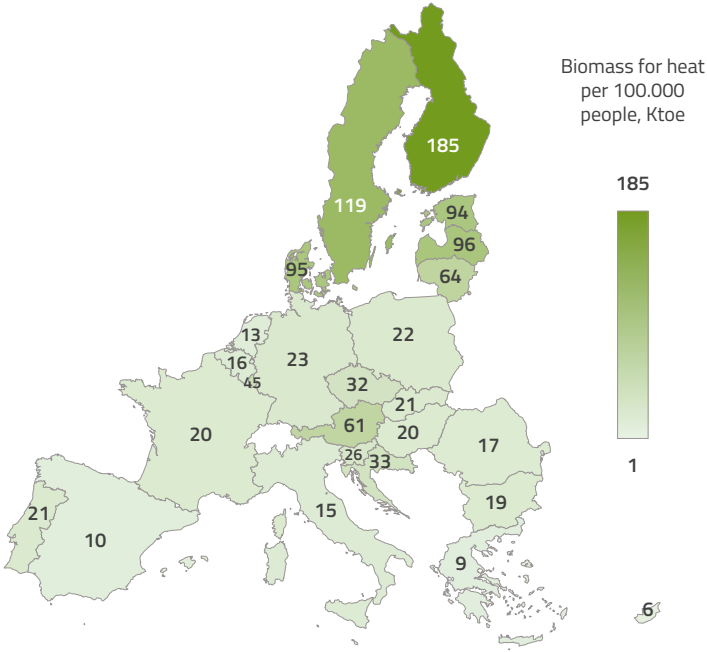


Figure 33: Share of fuels in district heating generation in the EU27 Member States in 2023 (%). *Source: Eurostat*



District heating is widely used in Europe, especially in Northern and Eastern countries, where it provides heat from central plants to many buildings through insulated networks. Traditionally fueled by coal and natural gas, it is increasingly integrating renewables, waste heat, and biomass. This shift makes district heating a key tool for cutting emissions, improving efficiency, and supporting Europe's energy transition. In 2023, biomass has become the first fuel use in district heating with 15.500 ktoe of heat generated.

Figure 34: Distribution of biomass for heat per 100.000 people in EU27 Member States in 2023 (ktoe). ***Source: Eurostat***



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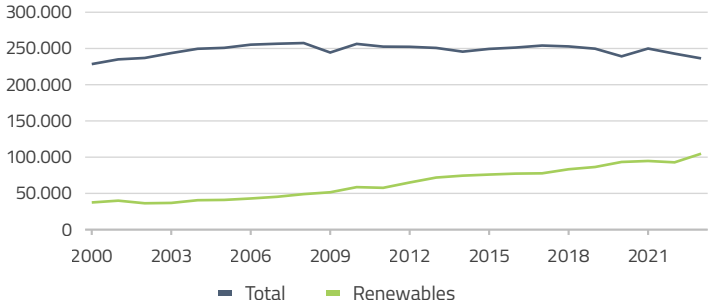
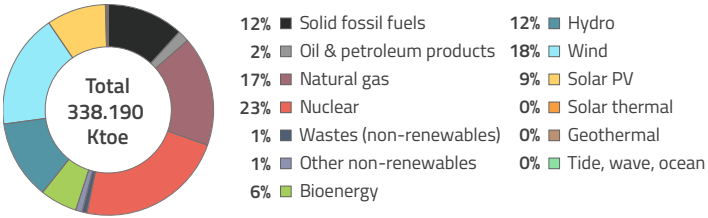
Electricity Generation

Figure 35: Evolution of Total Electricity Generation versus Renewable Electricity Generation in EU27 (ktoe). ***Source: SHARES tool***



Total electricity generation in the EU27 has remained relatively constant since the early 2000s, fluctuating between 225.000 and 250.000 ktoe, while renewable power production has grown substantially. Since 2021, overall EU27 power output has declined, potentially conflicting with the bloc's ambitious electrification targets.

Figure 36: Share of fuel in the Electricity Generation mix in EU27 in 2023 (ktoe). ***Source: Eurostat***



Europe's generation mix remains mostly non-renewable, although its renewable share is increasing quickly. Within the non-renewable portion, nuclear heat and natural gas are the largest contributors, and coal still makes up a share of the mix. Rapidly phasing out solid fossil fuels is a low-hanging opportunity to reduce countries' carbon footprints. This can be easily achieved in a cost-efficient way through biomass co-firing.

Figure 37: Distribution of the carbon footprint of electricity generation in EU27 Member States in 2023 (gCO_2eq/kWh). *Source: Eurostat*

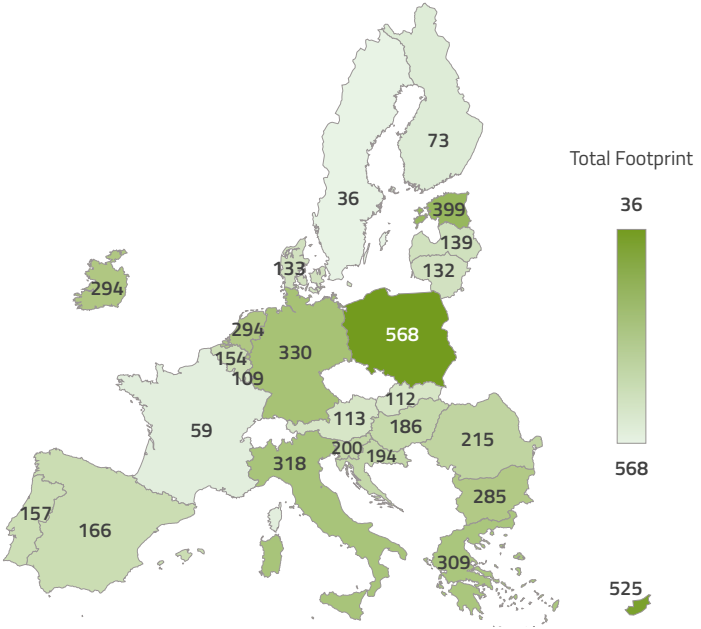
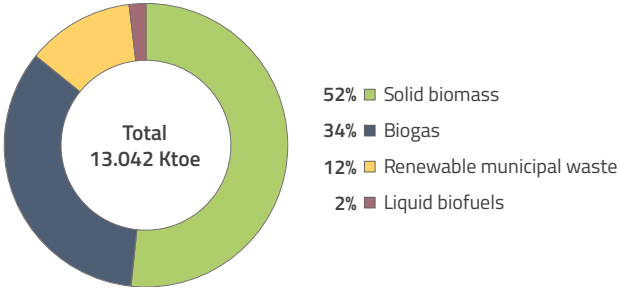
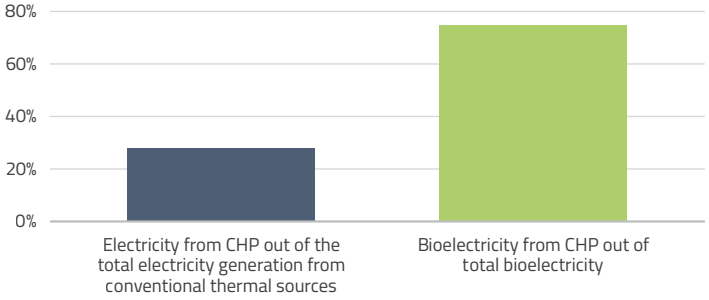


Figure 38: Share of fuels in the electricity generated from biomass in EU27, 2023 (ktoe). ***Source: Eurostat***



Power generation from biomass in Europe is predominantly fueled by solid biomass (wood pellets and wood chips), followed by biogas and renewable waste. Looking ahead, the share of biogas and biomethane in power production could grow more quickly, supported by positive policy signals at EU level.

Figure 39: Repartition of Electricity by type of plant, CHP vs Power Only in EU27, 2023 (%). ***Source: Eurostat***



Power generation from biomass is comparatively resource-efficient because most output comes from cogeneration (CHP) plants (close to 80%) which deliver electricity and useful heat in a single process. By contrast, conventional thermal sources (oil, coal, natural gas) are predominantly operated as power-only plants.

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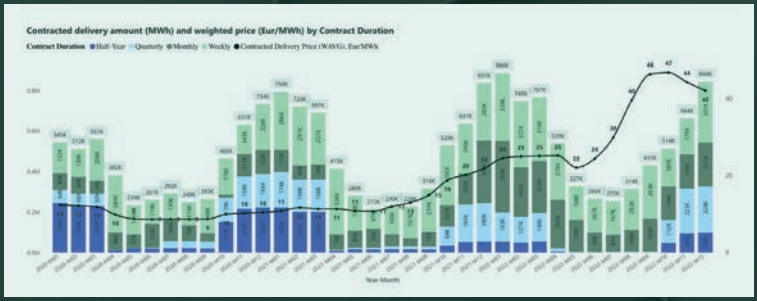

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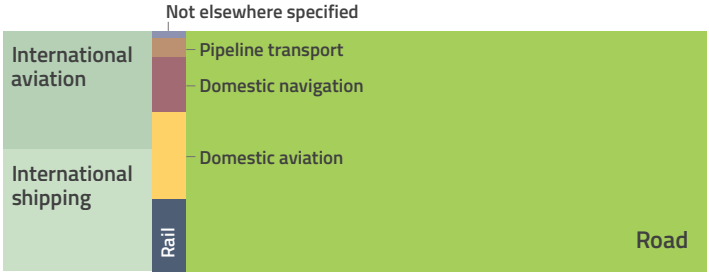
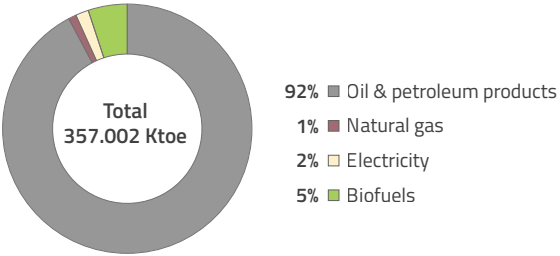
Transport Sector

Figure 40: Share of energy consumption per sub sectors in the transport sector in the EU27 in 2023. ***Source: Eurostat***



Most transport fuel consumed in the EU is used for road vehicles (cars and trucks) followed by international aviation and shipping. Given the magnitude of road transport demand, it is understandable that decarbonisation efforts in the transport sector have largely targeted these uses.

Figure 41: Share of fuel in the transporation sector in the EU27 in 2023 (ktoe, %, multipliers not included). ***Source: Eurostat***



Transport energy use in the EU27 remains overwhelmingly oil based: around 92% of the demand is met by oil and petroleum products. Renewables account for the smallest share in any energy sector (about 8% as raw use, 10% when multipliers are factored in) and are driven by biofuels. This pattern reflects the persistence of liquid fuel demand across road freight, aviation and shipping, combined with long vehicle lifetimes and established supply chains.

Figure 42: Evolution of renewables in the transport sector in the EU27 (ktoe, multipliers not included). *Source: Eurostat*

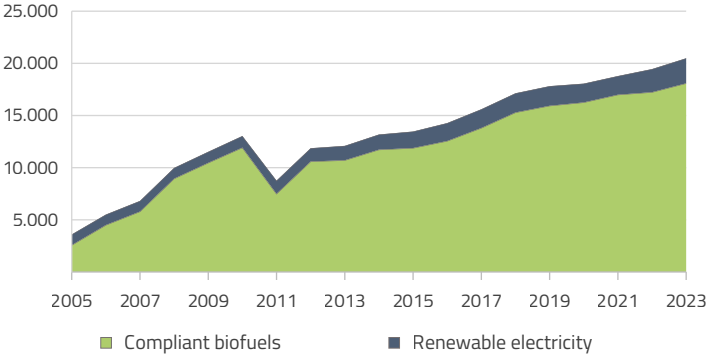
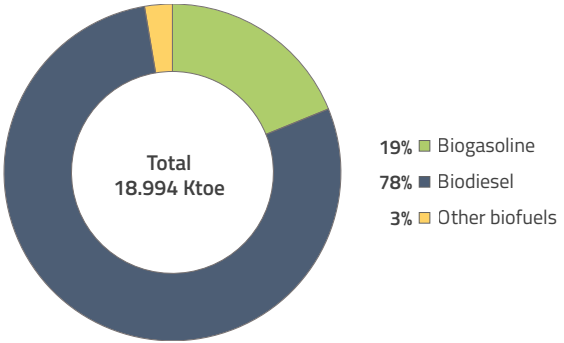
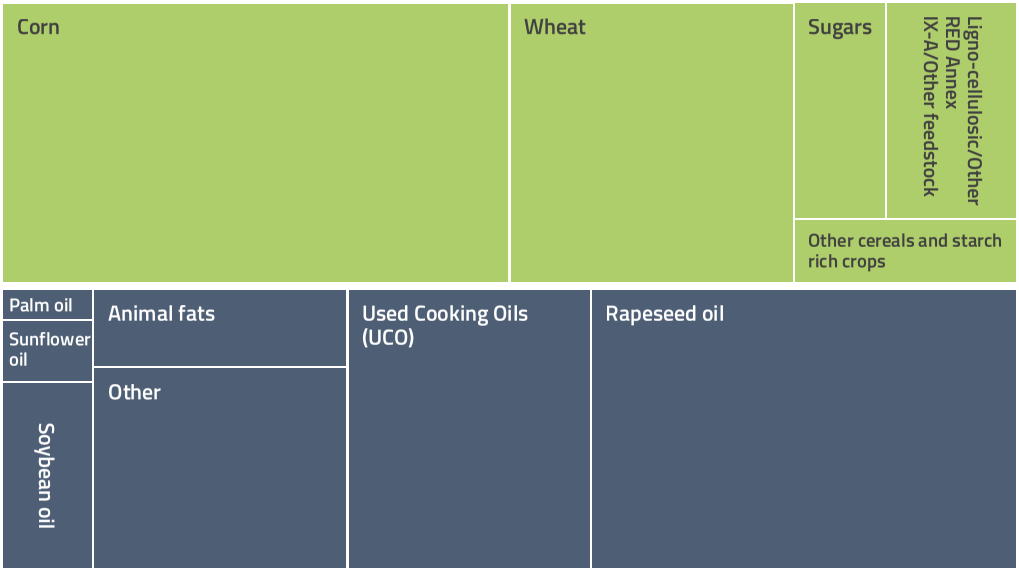


Figure 43: Share of biofuels by type in the EU27 in 2023 (ktoe, %). *Source: Eurostat*



Since the outset of EU27 decarbonisation efforts in the transport sector, biofuels have been the principal driver of growth in renewable energy consumption, accounting for more than 80% of the renewable mix. Within this mix, biodiesel dominates, produced mainly from rapeseed oil and recycled used cooking oils. Biogasoline represents roughly a quarter of biofuel use, with production largely based on corn and wheat.

Figure 44: Share of feedstock for biofuels in EU27, 2024. Focus on biodiesel and bioethanol (ktoe).
Source: USDA, ePURE



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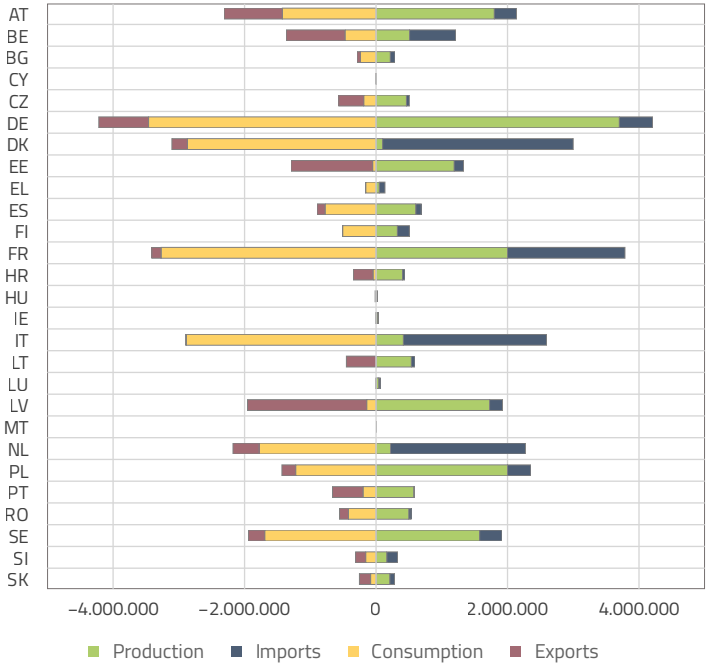
Wood Pellets

Figure 45: Production, consumption, imports and exports of wood pellets in EU27 Member States in 2024 (tonnes). ***Source: Bioenergy Europe Wood Pellets statistical reports 2025***



Wood pellets remain central to the EU27 energy transition. EU27 production reached 19,5 million tonnes in 2024, marking a 5% decline compared to 2023. In contrast, consumption followed the opposite path, with nearly 22 million tonnes used in the EU27, a 2% rise over 2023. The United Kingdom also recorded a sharp increase, consuming two million tonnes more than in 2023. European exports grew by one million tonnes in 2024, reaching 9 million tonnes, while imports fell by 700.000 tonnes to 12 million tonnes.

Figure 46: Global production and consumption of wood pellets in 2023 and 2024 (million tonnes).
Source: Bioenergy Europe, EPC survey, Hawkins Wright, EIA

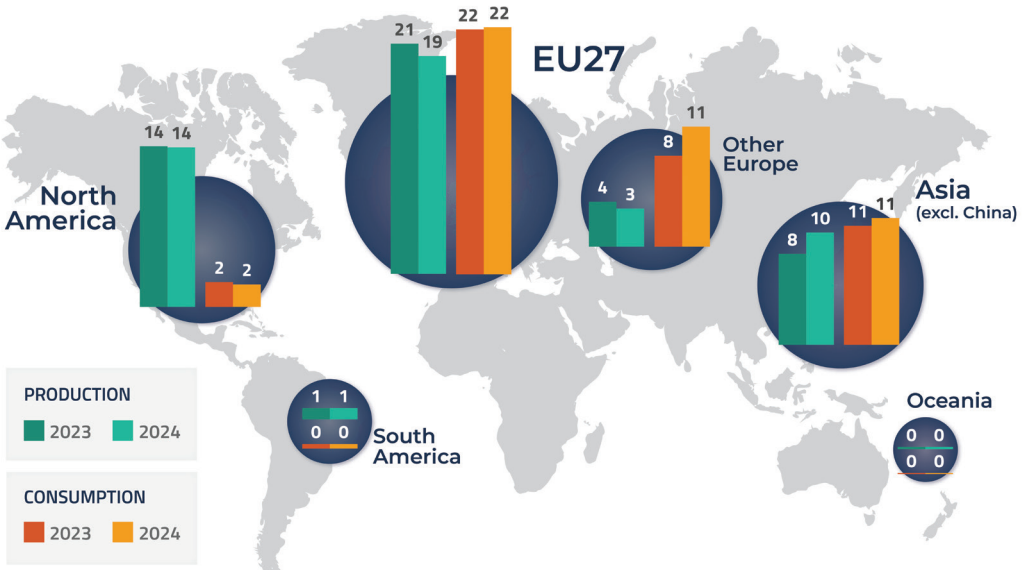


Figure 47: European wood pellet production in 2024 (tonnes). *Source: EPC Survey*

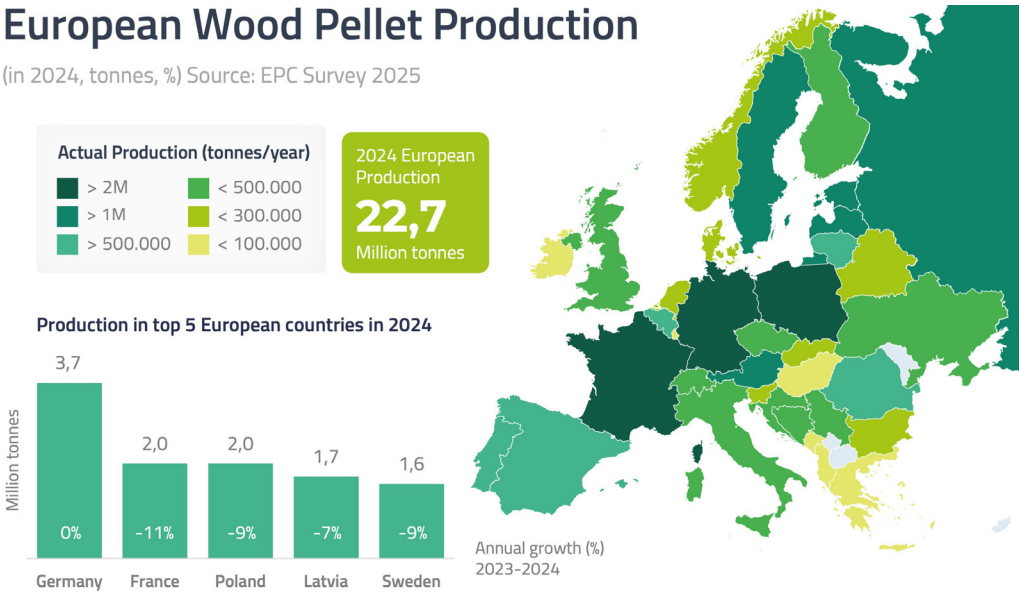
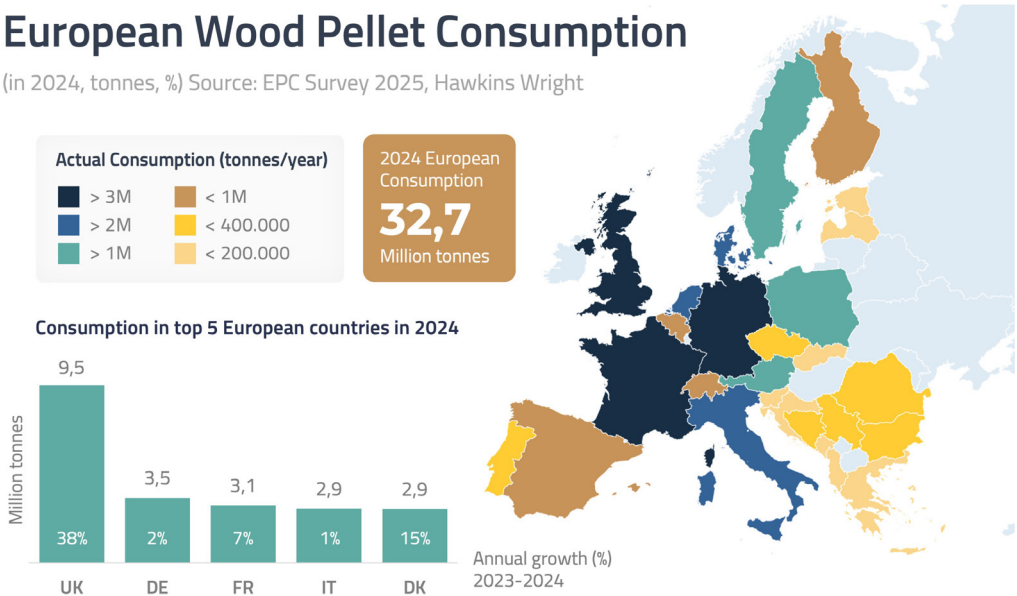


Figure 48: European wood pellet consumption in 2024 (tonnes). *Source: EPC Survey 2025, Hawkins Wright*



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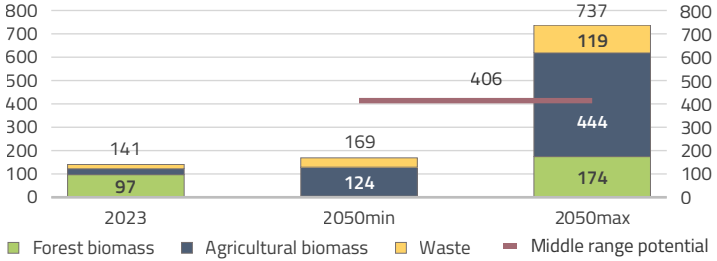
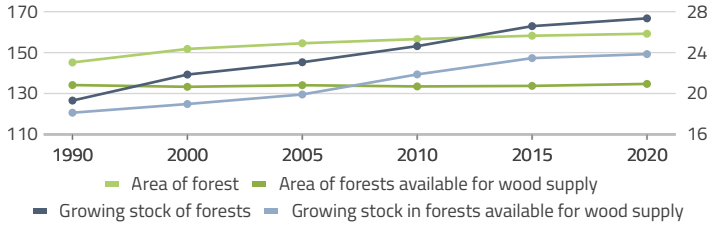
Biomass Supply

Figure 49: Consumption of different types of biomass in the EU in 2023 and in min/max scenarios for 2050 (ktoe). ***Source: Eurostat, Securing sustainable resource availability of biomass for energy applications in Europe; review of recent literature. Prof. Dr. André P.C. Faaij (2018)***



As noted earlier in this booklet, current biomass use for energy in the EU is just over 140 Mtoe and is largely dominated by forest (woody) biomass, primarily derived from forestry residues. According to the literature, the mid-range potential for biomass use in energy by 2050 is around 400 Mtoe, with an upper estimate near 737 Mtoe. Looking ahead, forest biomass use is not expected to expand substantially, whereas agricultural and waste biomass could see strong growth.

Figure 50: Evolution of the total area of forest in Europe. ***Source: FAO stat***



The total forest area in the EU27 has expanded over the past three decades, while the area of forest available for wood supply has remained broadly stable, signaling a steady increase in land set aside for conservation and other non-harvest uses. Over the same period, the growing stock (i.e. the cubic meters of wood contained in forests) has risen faster than the forest area, indicating that Europe's forests have become denser and older.

Figure 51: Share of the harvested growing stock in EU27 forests. *Source: FAOstat*

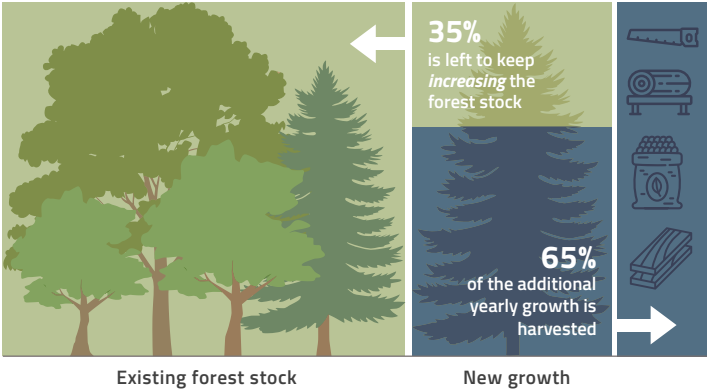


Figure 52: Removals as ratio of net annual increment in EU27 Member States in 2022 (1000m³). *Source: FAO stat*

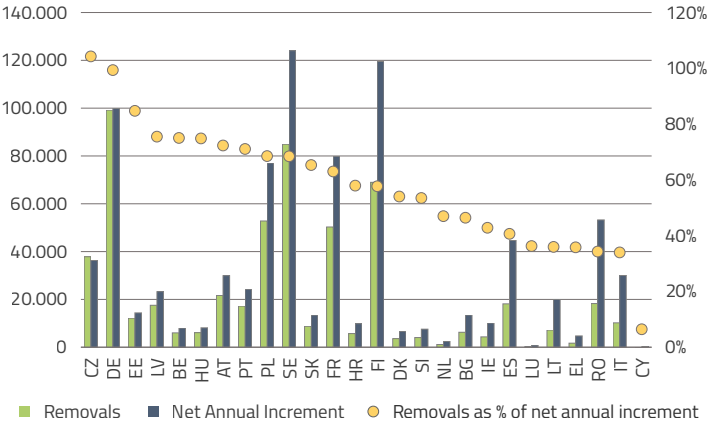
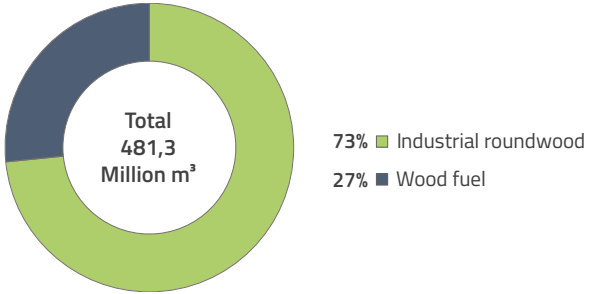


Figure 53: Share of roundwood by type of primary use (Million m³, %).
Source: FAO stat



In the EU27, the average removal rate is about 65% of the net annual increment (the additional quantity of biomass added to the forest each year). With rare, specific exceptions, no country harvests more than its forests can regrow annually, and forest stock has therefore increased continuously over the past three decades. Czechia and Germany record the highest removal-to-increment ratios, largely due to salvage logging undertaken to address bark beetle infestations.

EU wood production is around 481,3 million m³ per year. About three quarters of this output is industrial roundwood, with the remainder used as fuelwood. According to FAO data, this proportion has remained broadly unchanged since the 1960s.

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