WOOD FUELS IN ENERGY GENERATION IN FINLAND

18 July 2023

Ministry of Agriculture and Forestry of Finland

BY-PRODUCTS OF FOREST INDUSTRY ARE AN IMPORTANT SOURCE OF ENERGY IN FINLAND

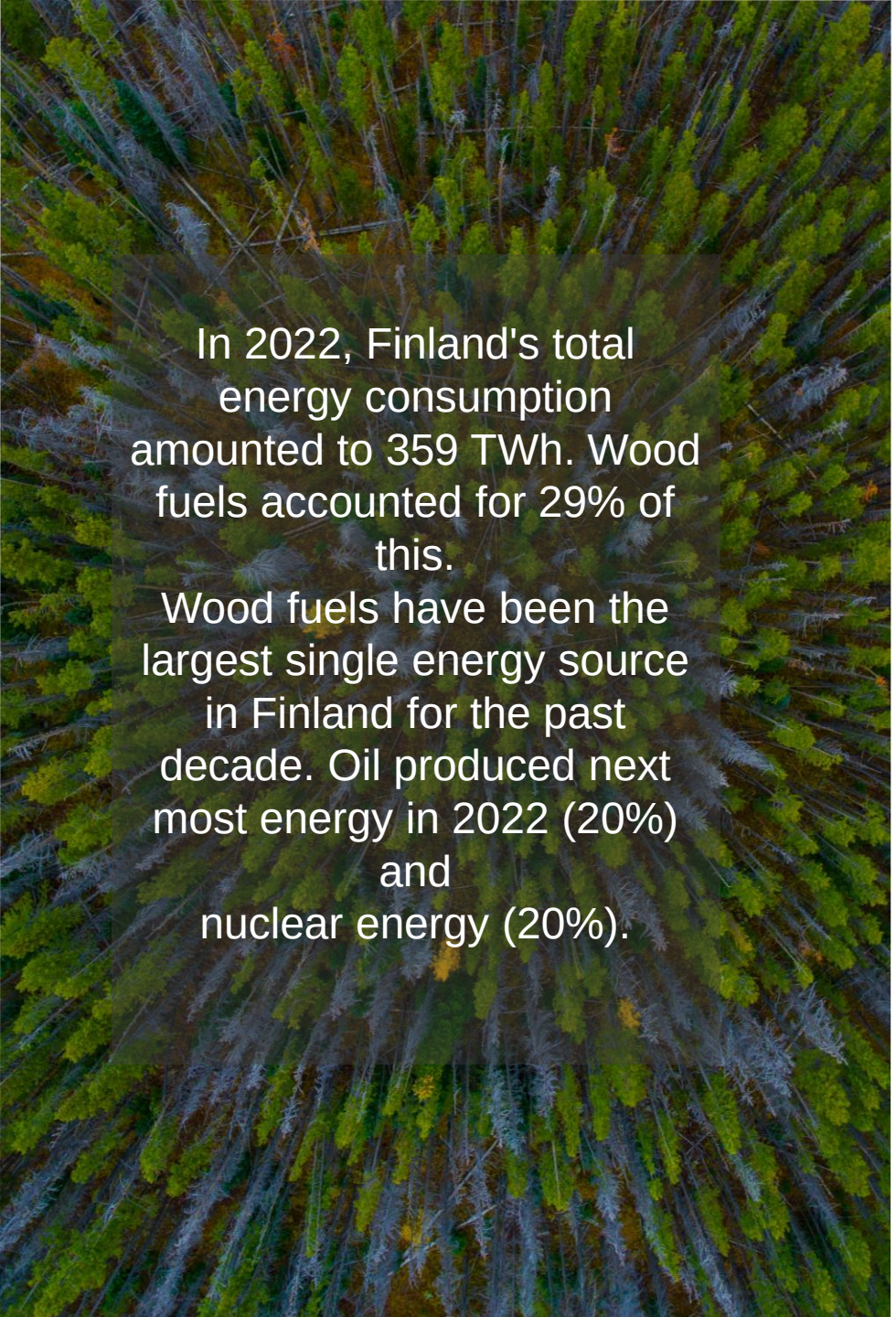
Bioenergy production in Finland is largely integrated into forestry and forest industry.

When roundwood is processed in the forest industry, energy is derived in many phases.

Wood fuels represent the most important single energy source in Finland.

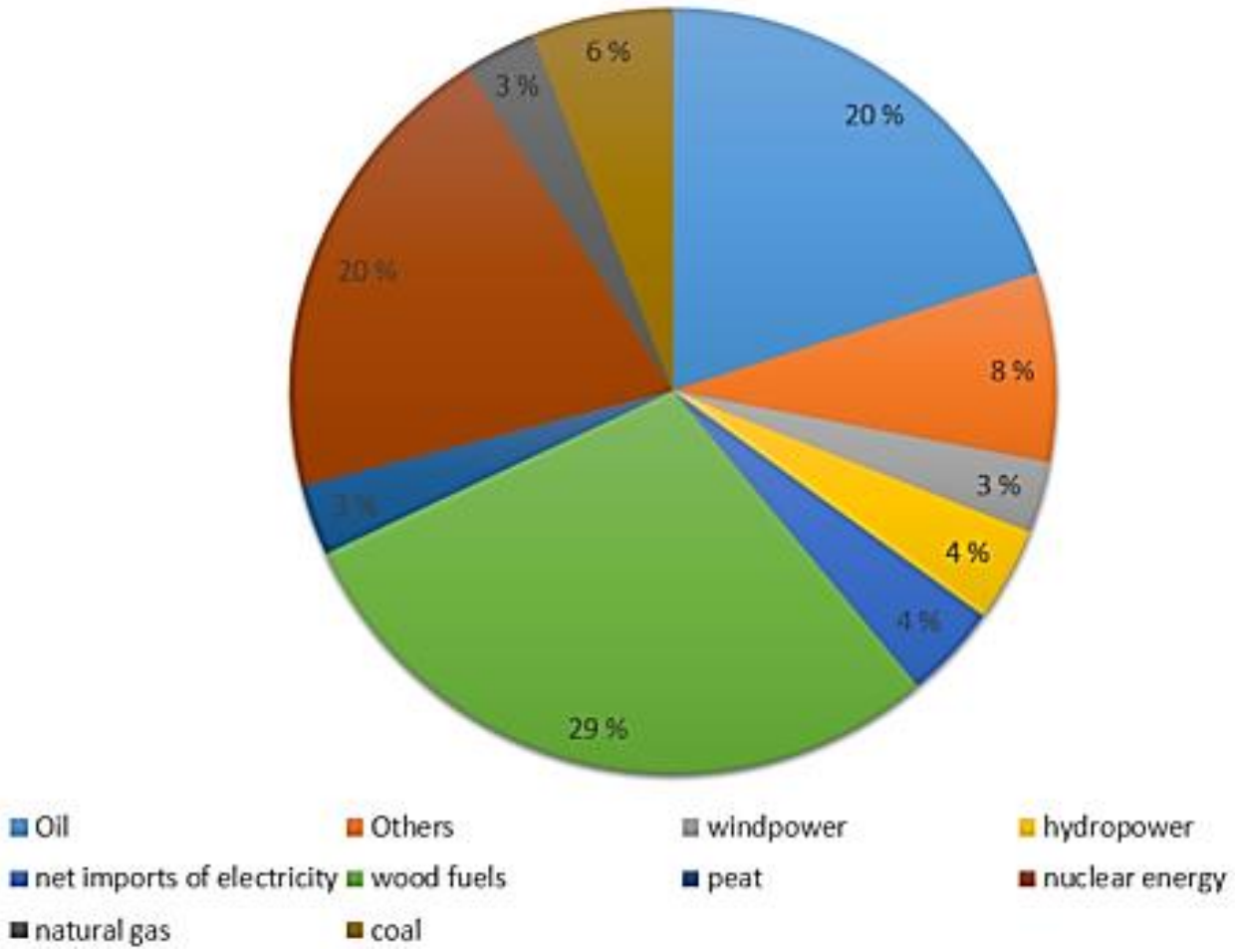
Wood fuels are the largest single energy source in Finland. In 2022, 103 TWh of energy was produced with wood fuels. Wood fuels accounted for 29% of total energy consumption. More energy was produced with wood fuels than with oil or coal, for example.

The increase in wood-based energy has resulted especially from the increased use of black liquor produced by forest industries.



In 2022, Finland's total energy consumption amounted to 359 TWh. Wood fuels accounted for 29% of this.
Wood fuels have been the largest single energy source in Finland for the past decade. Oil produced next most energy in 2022 (20%) and
nuclear energy (20%).

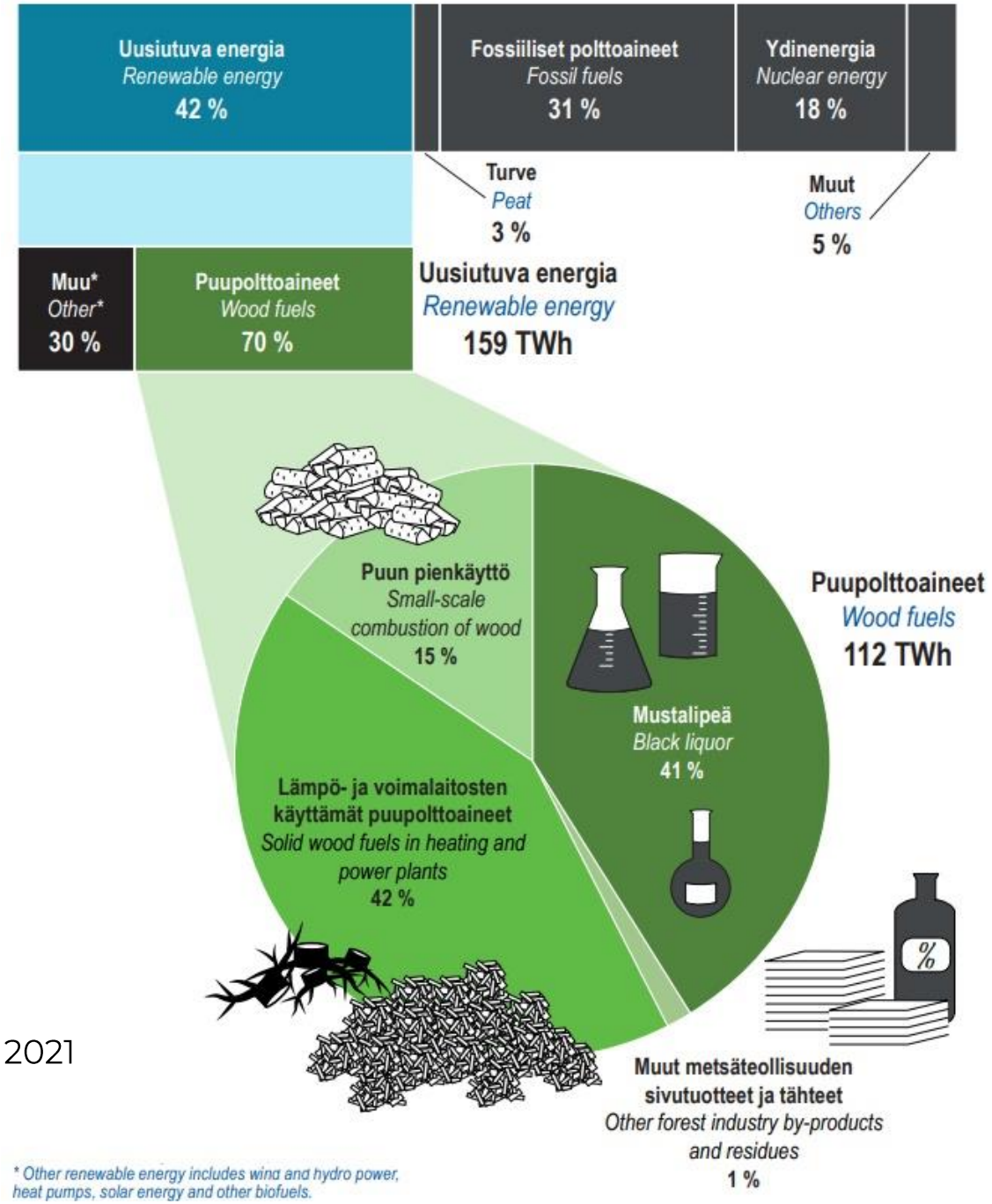
WOOD FUELS ACCOUNTED FOR 29% OF TOTAL ENERGY CONSUMPTION IN 2022



Total energy consumption in Finland in 2022.
Source: Official Statistics of Finland (SVT): Energy supply and consumption

In 2022, a total of 103 TWh of energy was produced with wood fuels. Of this, 40 TWh was produced with black liquor and 46 TWh with solid wood fuels in manufacturing and energy production.

Wood fuels account for 68% of our renewable energy production.



Use of wood fuels, 2021

Sources: OSF: Statistics Finland; OSF: Natural Resources Institute Finland

The annual use of bark, sawdust and industrial chips in energy production varies. The amount is related to consumption of roundwood in the forest industry.

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SOLID WOOD FUELS ARE USED FOR HEAT AND POWER GENERATION

Major share of solid wood fuels are derived from the by-products of the forest industry, including bark, sawdust and other industrial wood residues.

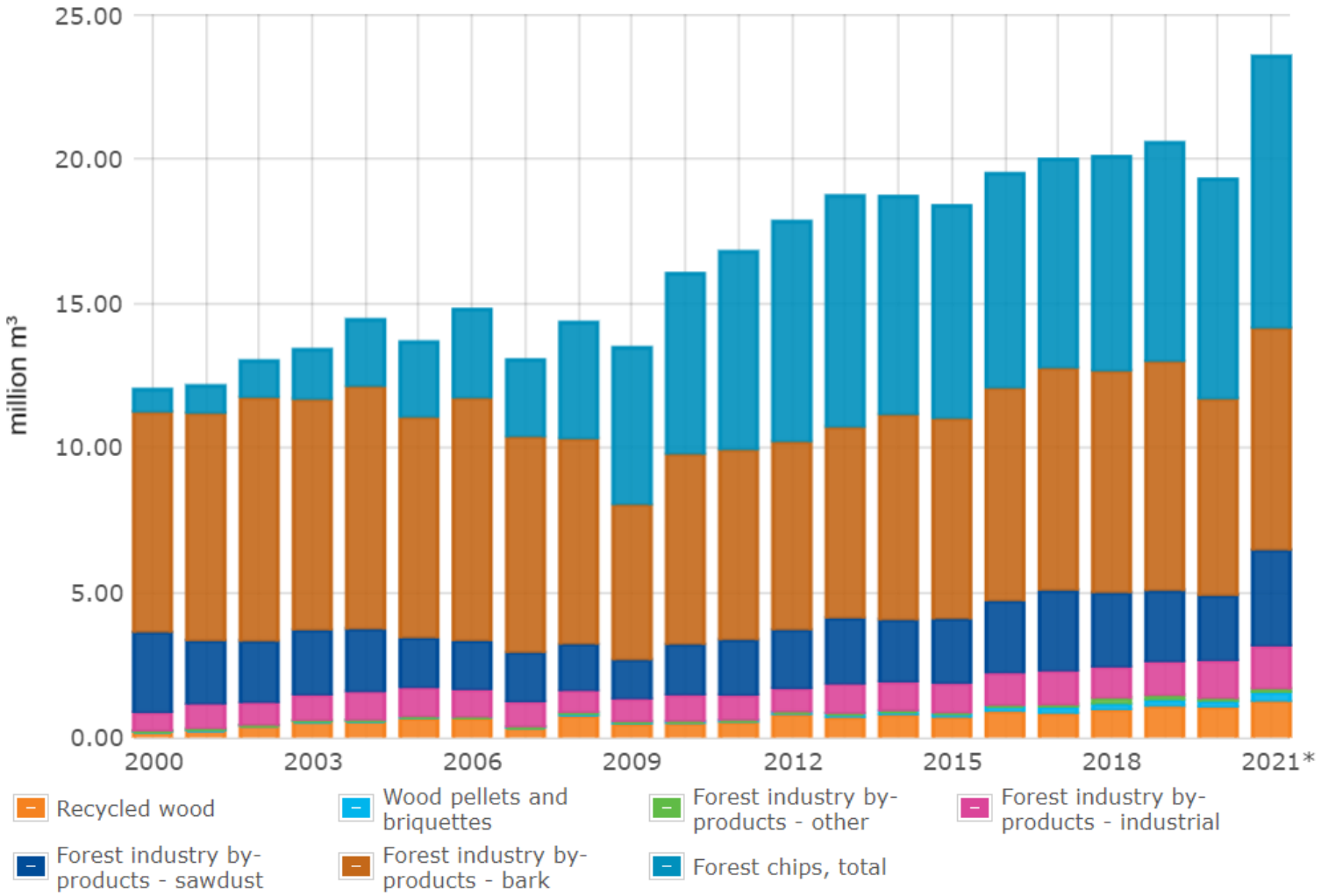
Also logging residues or other low value biomass from silvicultural and harvesting operations are used for energy generation. The branches and tree tops can be collected from regeneration areas and used for energy generation. Also small-sized stems e.g. from young stand tending sites are used for energy.

In 2021 heating and power plants consumed 23.5 million solid cubic metres of solid wood fuels. This equals to 45.7 terawatt-hours.

In 2021, volume of various solid forest industry by-products was 12.6 million cubic metres. The main industrial by-product was bark, accounting nearly for two thirds, and the rest were sawdusts and industrial chips.

In 2021, the consumption of forest chips at heating and power plants was 9.4 million cubic metres.

SOLID WOOD FUEL CONSUMPTION 2000-2021



Source: OSF: Natural Resources Institute Finland, Wood in energy generation.

Solid wood fuel consumption in heating and power plants

Source: Natural Resources Institute Finland (Luke)

Around four to five per cent of Finland's total energy consumption has been produced annually with forest chips.

MAIN SOURCE OF FOREST CHIPS IN FINLAND IS SMALL-DIAMETER WOOD

The term ‘forest energy’ generally refers to energy derived from logging residues, small-sized wood and stumps, also known as energy wood or forest chips. Normally branches, crowns and small-sized stems gathered from the forest are chopped into chips before use.

Rawmaterial for forest chips

In 2022, the consumption of forest chips at heating and power plants was 10,2 million cubic metres. The majority of the forest chips, 6,4 million cubic metres, was manufactured from small-sized trees and use of logging residues was 3,0 million cubic metres. Use of stumps has been decreasing in past years and was 0.3 million cubic metres in 2022. The use of large-sized, mainly decayed and rotten roundwood, was 0.6 million cubic metres.

Together with forest chips burned in small-scale housing the total consumption of forest chips reached 10,8 million solid cubic metres in 2022.

WOOD FUELS ARE TYPICALLY USED IN COMBINED HEAT AND POWER PLANTS

Combined heat and power (CHP) production has a long tradition in Finland.

Typically, solid wood fuels are used in highly efficient district heating (DH) systems and combined heat and power (CHP) plants. Most of these rely on direct combustion, but the most modern CHP plants use fluidised bed boiler or circulating fluidised bed technology to gasify a wider range of low-quality forest residues. Gasification also allows forest residues to displace coal in coal-fired CHP plants, which cannot use residues directly.

Typical multifuel CHP plant in Finland. Photo: VTT

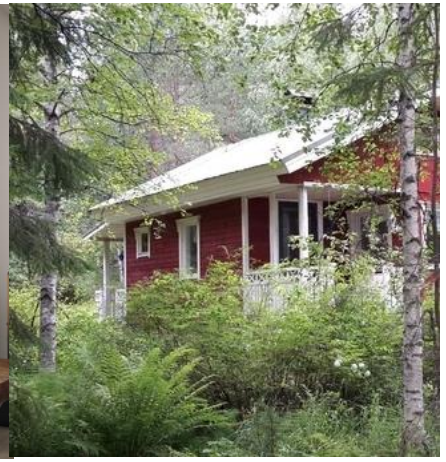
In Finland, about three-quarters of district heat production is based on combined heat and power (CHP) generation. Correspondingly, one-third of electricity is obtained in CHP generation.

In Finland most residential houses and summer cottages have a fireplace.

TRADITIONAL USE OF FIREWOOD IS ALSO REMARKABLE

In Finland, the small-scale use of wood for heating in residential houses, summer cottages and farms is also a significant part of the bioenergy mix. The small-scale combustion of fuelwood by households and farms is around 6.5 million cubic metres annually. The natural resources Institute Finland conducts surveys to assess the use of firewood in households every few years.

A hundred years ago, the majority of wood felled annually from Finnish forests was fuelwood. The use of firewood began to decrease rapidly, and after the Second World War the use of wood in the forest industry increased correspondingly.



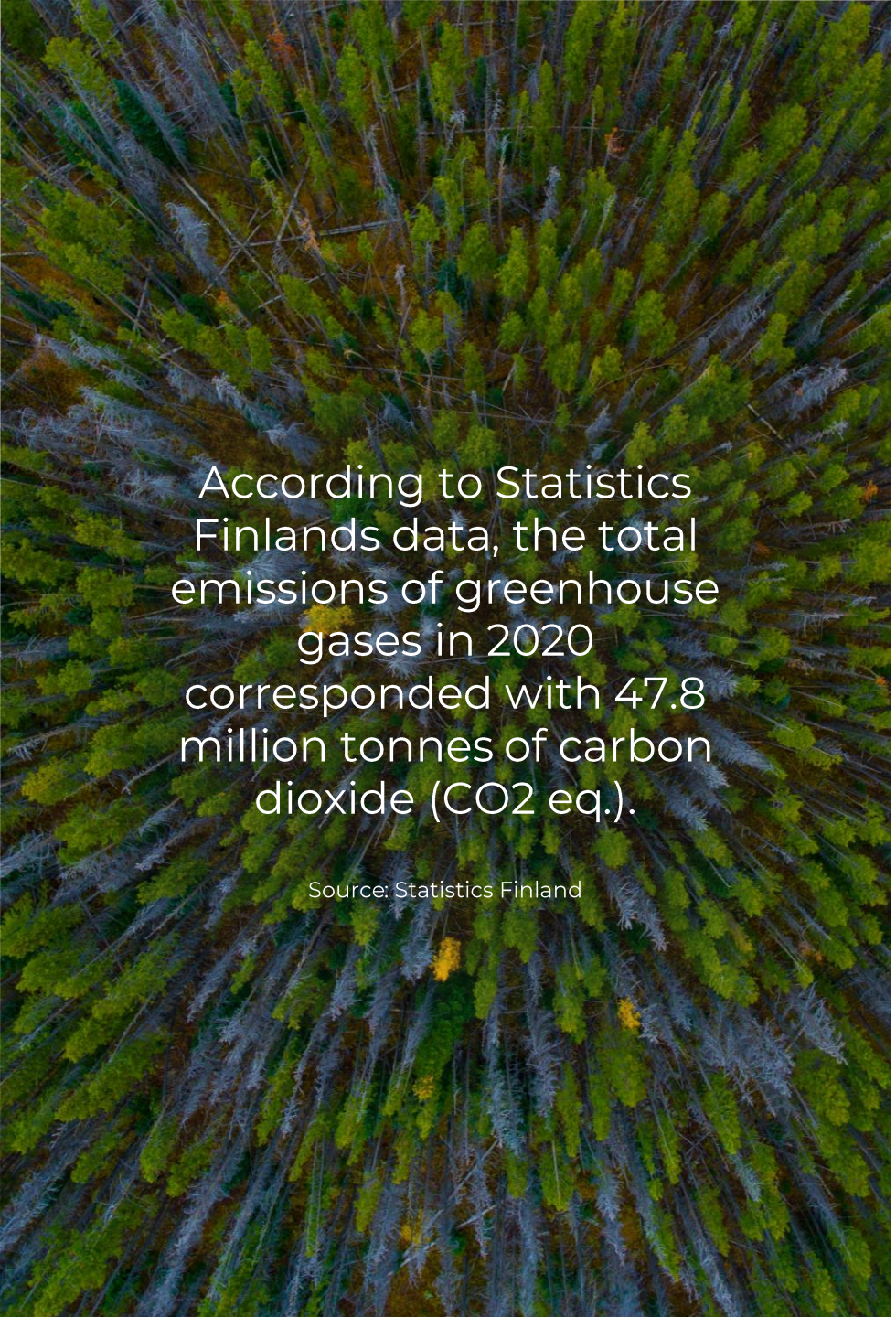
USE OF RENEWABLES HAS INCREASED STEADILY IN FINLAND

The key objective of promoting renewable energy is to reduce greenhouse gas emissions and to disengage from the energy system based on fossil fuels. The use of renewable energy also increases energy self-sufficiency and employment and supports the development of technology in the sector.

The most important renewable energy sources used in Finland are bioenergy, especially wood fuels derived from forest industry side streams and other wood-based fuels, hydro power, wind power and geothermal heat. Bioenergy is also obtained from biodegradable waste and side streams from agriculture, communities and industry. Other production methods based on renewable energy have also increased significantly in recent years. Source of the text: Ministry of Economic Affairs and Employment.

The use of renewable energy sources in the production of electricity and district heating has increased rapidly in Finland in recent years. In 2022 share of renewable energy was 42 % of total energy consumption.

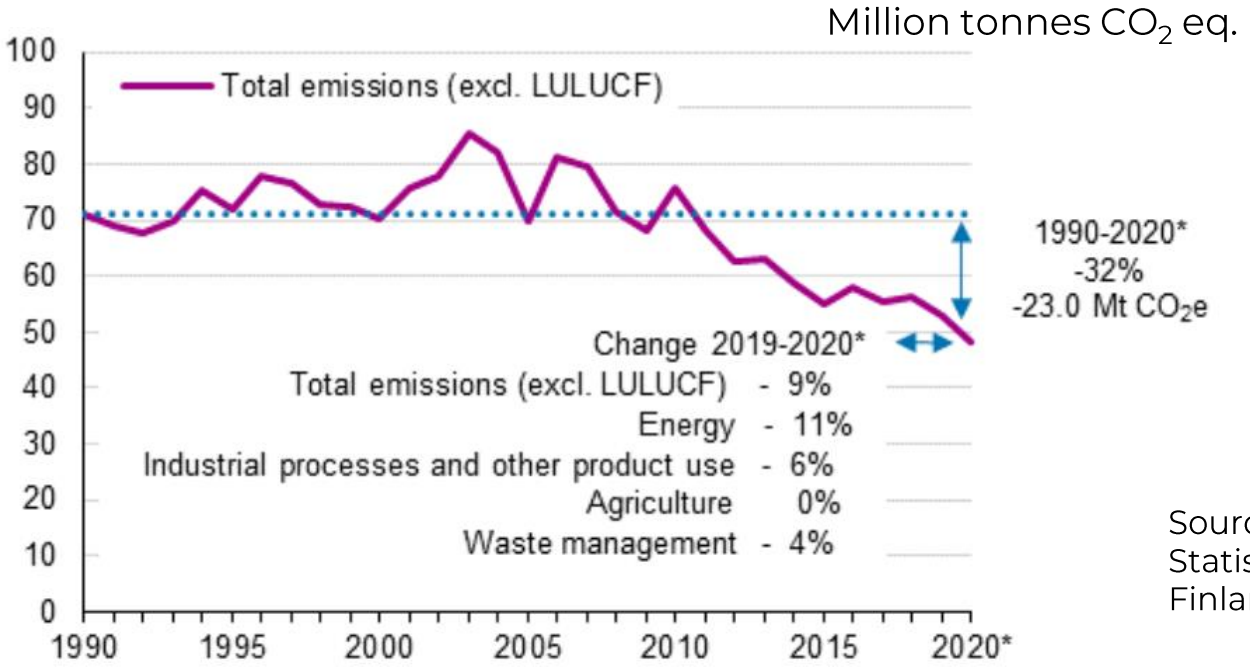
Source: Statistics Finland: Energy in Finland 2021



According to Statistics Finlands data, the total emissions of greenhouse gases in 2020 corresponded with 47.8 million tonnes of carbon dioxide (CO2 eq.).

Source: Statistics Finland

CARBON DIOXIDE EMISSIONS HAVE DECREASED

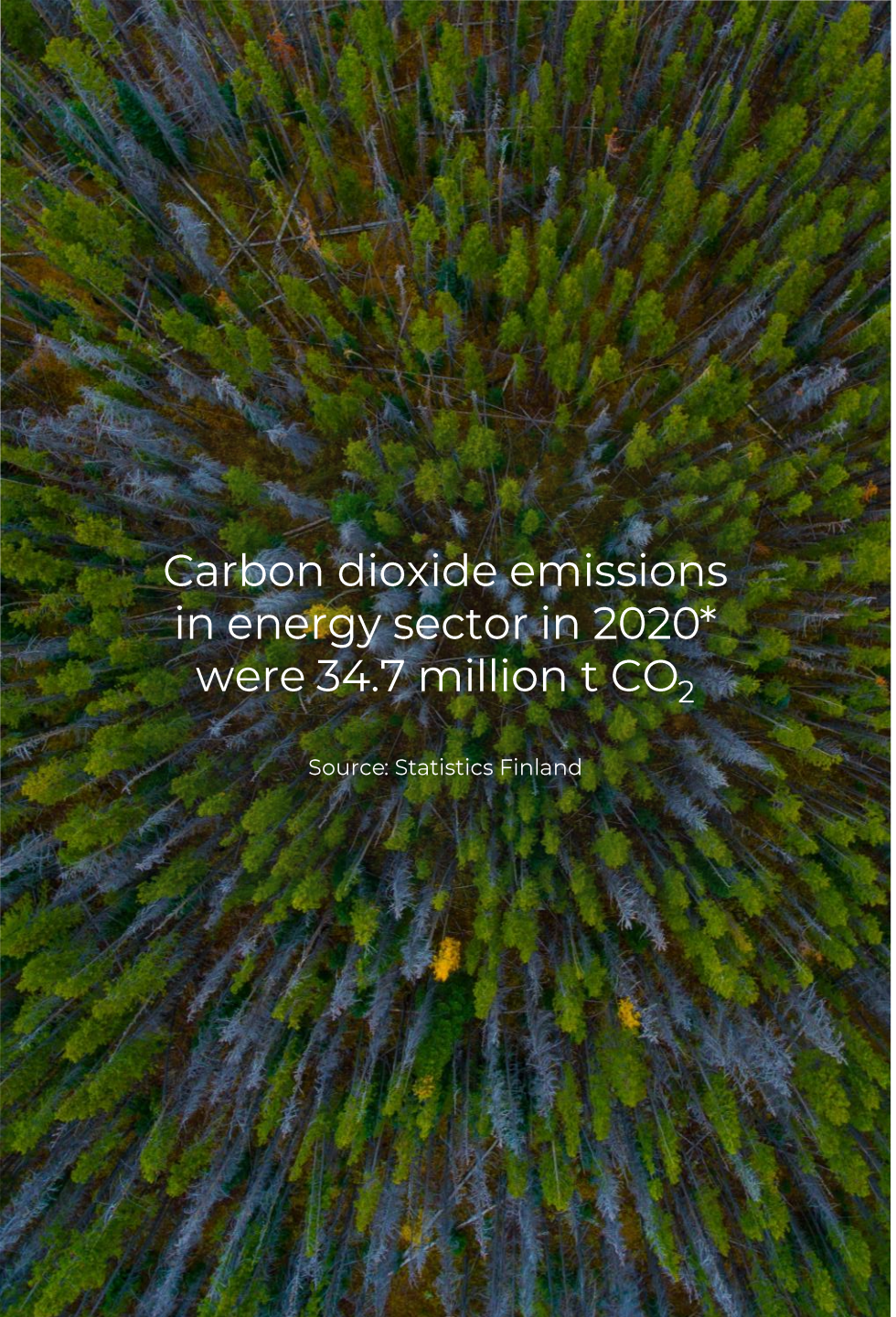


Source: Statistics Finland

Finland's greenhouse gas emissions without the LULUCF sector 1990-2020

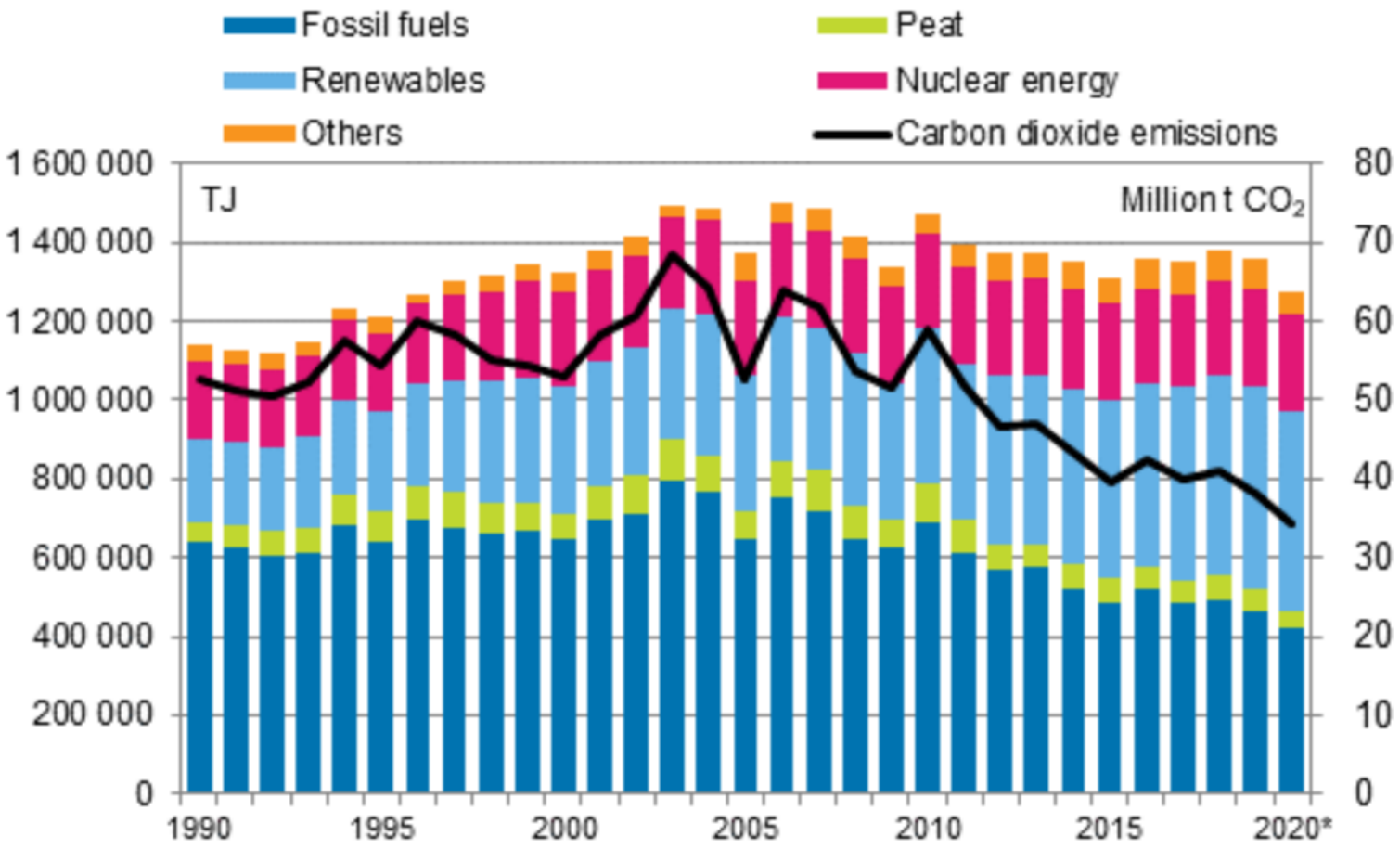
Total greenhouse gas emissions in Finland amounted to 47.8 million tonnes of CO_2 equivalent in 2020. The sum of emissions and removals in the (LULUCF) sector, or the net sink is not included in these total emissions. The net sink of the LULUCF sector amounted to -17.3 million tonnes of CO_2 eq. in 2020. Taking the net sink of the LULUCF sector into account total emissions would translate into 30.5 million tonnes of CO2 equivalent in 2020. Statistics Finland's database

CARBON DIOXIDE EMISSIONS IN ENEGY SECTOR 1990-2020* IN FINLAND



Carbon dioxide emissions in energy sector in 2020* were 34.7 million t CO_2

Source: Statistics Finland



Total energy consumption and carbon dioxide emissions 1990–2020*

Source: Statistics Finland

EU HAS A TARGET FOR RENEWABLE ENERGY

The EU target for renewable energy production of gross final energy production is 32 % by 2030.

Finland has the second highest share of renewable energy in Europe.

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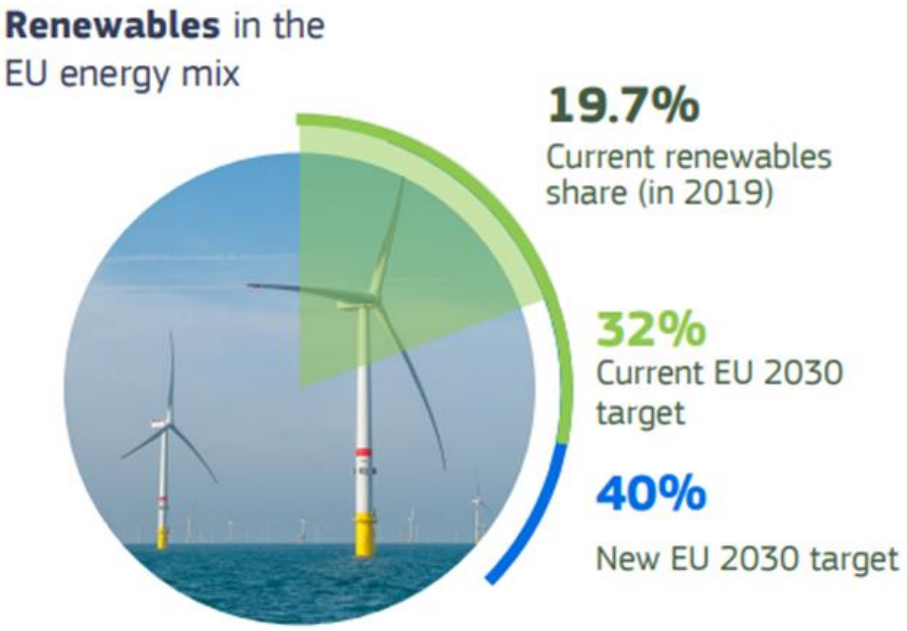
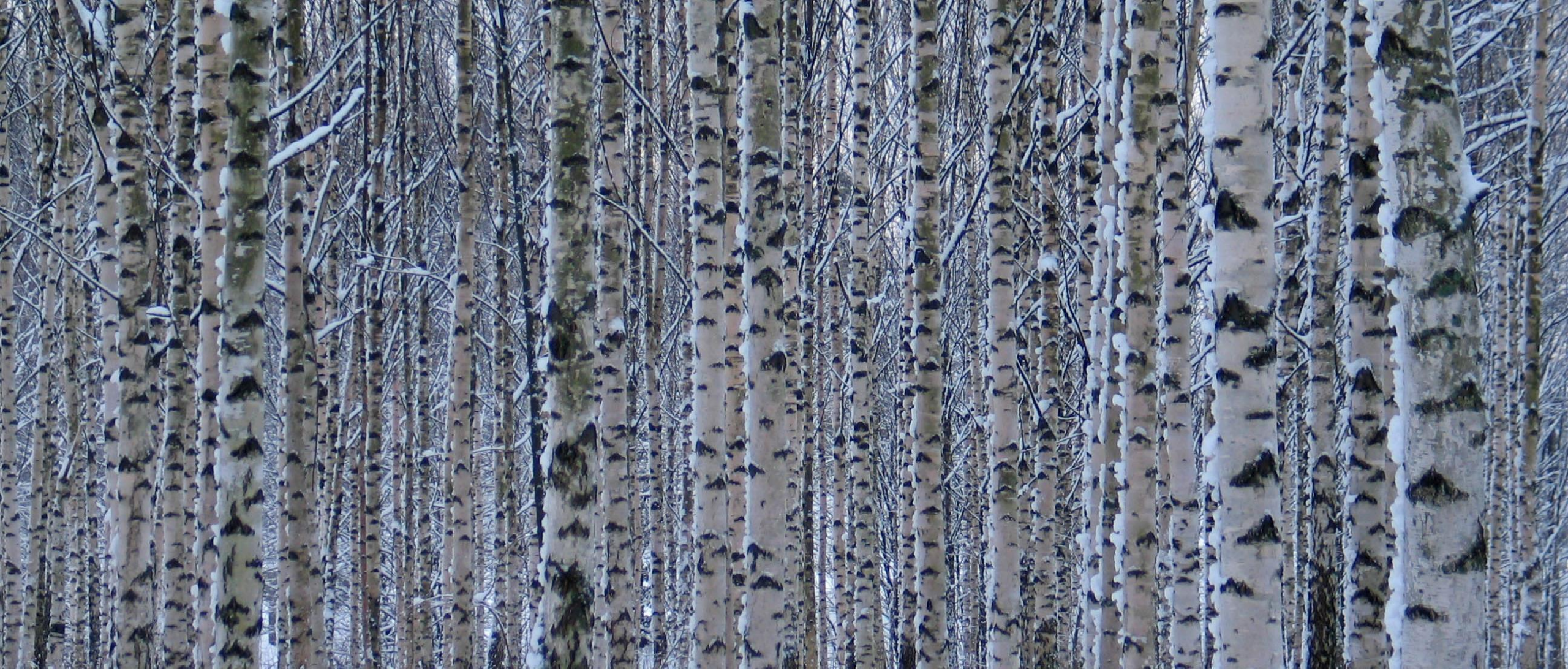


The objective of the extensive legislative proposal package (fit for 55) published by the European Commission in July 2021 is to reduce greenhouse gas emissions from the EU by at least 55 per cent by 2030 from the 1990 level. The target set for 2030 for the share of renewable energy would also be raised to 40% due to the EU's new climate targets.



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