Ministry of the Environment Finland

Annual Climate Report 2023

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Abstract

According to the Climate Act, the Government submits the Annual Climate Report to Parliament every year. The Report examines the trends in emissions and sinks, sufficiency of the planned measures to achieve the emission reduction targets, need for further measures, and implementation of the targets and measures of the Medium-term Climate Plan and Climate Plan for the Land Use Sector. The sufficiency and implementation of measures in the National Adaption Plan are also discussed.

Total emissions without the land use sector decreased in 2022 compared to 2021. Emissions from the emissions trading sector decreased clearly from the previous year. Emissions from the effort-sharing sector decreased as well, and they were within Finland's annual emission allocations in 2021 and 2022.

The land use sector was a small net sink in 2022. The fact that the sector turned from a source of net emissions in 2021 to a net sink is due the smaller felling volume in 2022. Net emissions, i.e. emissions and sinks from all sectors combined (including the land use sector), decreased in 2022 compared to the previous year.

The pace of emission reductions is in line with the emission reduction target for 2030 set in the Climate Act. If no further measures are taken in the land use sector, Finland is not likely to achieve the EU commitments under the LULUCF Regulation without buying emission credits from other Member States. Achieving the national climate neutrality target requires further measures in the land use sector and other sectors.

Keywords climate policy, emissions, reporting, Annual Climate Report, climate change, environmental protection

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Ilmastovuosikertomus 2023

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Toimittaja/t	Riikka Siljander, Magnus Cederlöf, Kai Skoglund, Vilma Herronen		
Kieli	englanti	**Sivumäärä**	141

Tiivistelmä

Ilmastolain mukaan valtioneuvosto antaa ilmastovuosikertomuksen eduskunnalle vuosittain. Siinä tarkastellaan päästö- ja nielukehitystä, toimien riittävyyttä päästövähennystavoitteiden saavuttamiseksi, lisätoimien tarvetta sekä keskipitkän aikavälin ja maankäyttösektorin ilmastosuunnitelmien tavoitteiden ja toimien toteutumista. Lisäksi käsitellään sopeutumissuunnitelmaan sisältyvien toimien riittävyyttä ja toteutumista.

Vuonna 2022 kokonaispäästöt ilman maankäyttösektoria laskivat verrattuna vuoden 2021 tasoon. Päästökauppasektorin päästöt vähenivät selvästi edellisvuodesta. Myös taakanjakosektorin päästöt laskivat, ja ne ovat pysyneet Suomelle asetettujen kiintiöiden puitteissa 2021 ja 2022.

Maankäyttösektori oli vuonna 2022 pieni nettonielu. Sektorin kääntyminen edellisvuoden nettopäästöstä nettonieluksi johtui edellisvuotta pienemmistä hakkuumääristä. Nettopäästöt, eli kaikkien sektoreiden (ml. maankäyttösektori) yhteenlasketut päästöt ja nielut, laskivat vuonna 2022 edellisvuodesta.

Päästövähennystahti on linjassa ilmastolain vuoden 2030 päästövähennystavoitteen kanssa. Ilman merkittäviä lisätoimia maankäyttösektorilla on todennäköistä, ettei Suomi saavuta EU:n LULUCF-asetuksen mukaisia velvoitteita ilman päästöyksiköiden ostoja muista jäsenmaista. Myös kansallisen hiilineutraaliustavoitteen saavuttaminen edellyttää lisätoimia maankäyttösektorilla sekä muilla sektoreilla.

Asiasanat	Ilmastopolitiikka, päästöt, raportointi, ilmastovuosikertomus, ilmastonmuutos, ympäristönsuojelu		
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Klimatårsberättelse 2023

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Referat

I enlighet med klimatlagen avger statsrådet en klimatårsberättelse till riksdagen årligen. I den beskrivs utsläppens och sänkornas utveckling, åtgärdernas tillräcklighet för att uppnå utsläppsmålen, behovet av ytterliga åtgärder samt uppgifter om hur åtgärderna i den klimatpolitiska planen på medellång sikt samt samt planen för markanvändningssektorn har förverkligats. Dessutom behandlas tillräckligheten och förverkligandet av de åtgärder som ingår i anpassningsplanen.

År 2022 minskade de totala utsläppen jämfört med år 2021. Utsläppen inom utsläppshandeln minskade klart jämfört med föregående år. Också utsläppen inom ansvarsfördelningssektorn minskade jämfört med föregående år och har hållit sig inom de kvoter som är uppställda för Finland för åren 2021 och 2022.

Markanvändningssektorn var en liten nettosänka 2022. Omvandlingen av sektorn från föregående års nettoutsläpp till en nettosänka berodde på lägre avverkningsvolymer än föregående år. Nettoutsläppen, det vill säga de sammanlagda utsläppen och sänkorna från alla sektorer (inklusive markanvändningssektorn), minskade 2022 från föregående år.

Utsläppsminskningstakten ligger i linje med klimatlagens utsläppsmål för 2030. Utan betydande tilläggsåtgärder i synnerhet inom markanvändningssektorn är det troligt att Finland inte uppnår förpliktelserna enligt EU:s LULUCF-förordning utan att ta till upphandling av utsläppskrediter från andra länder. Också det nationella klimatneutralitetsmålet för 2035 förutsätter ytterligare åtgärder inom markanvändningssektorn och de övriga sektorerna.

Nyckelord	klimatpolitik, utsläpp, rapportering, klimatårsberättelse, klimatförändring, miljövård		
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Contents

ANNUAL CLIMATE REPORT 2023 – EXECUTIVE SUMMARY

Provisions on the preparation of the Annual Climate Report are laid down in the Climate Act (423/2022). By means of the Annual Climate Report, the Finnish Government reports to Parliament each year on the trends in emissions and sinks as well as on the achievement of the targets contained in the Medium-term Climate Plan and the Climate Plan for the Land Use Sector and estimates the adequacy of the measures in relation to the targets set. The Annual Climate Report has been submitted since 2019. Parliamentary readings of previous Annual Climate Reports have raised development needs on the basis of which the Annual Climate Report has been made more diverse, with a view to providing the most comprehensive situation report possible concerning development trends in climate policy.

The Annual Climate Report covers emissions reduction targets and the current status of their achievement, emission trends both as a whole and sector-specifically, progress made in cross-cutting measures, and climate change adaptation. In addition, the annually changing themes specific to this year's report are the voluntary carbon market and the strengthening of the climate policy dialogue.

Emission trends in 2022

The data reported in the Annual Climate Report on actual emissions and sinks is based on data published by Statistics Finland. The 2023 Annual Climate Report reports the final emissions data for 2021 and proxy estimates for 2022.

Finland's total emissions excluding the land use, land use change and forestry (LULUCF) sector amounted to 45.8 Mt CO_2eq in 2022. Emissions decreased by 2.0 Mt CO_2eq compared to 2021. Since 2005, total emissions excluding the LULUCF sector have declined by a total of 24.0 Mt CO_2eq or 34%.. Net emissions – aggregate emissions and removals from all sectors (including LULUCF) – amounted to an average of 43.9 Mt CO_2eq in 2005–2022. In 2022, they totalled 44.9 Mt CO_2eq – down 3.5 Mt CO_2eq compared to 2021.

The LULUCF sector was a net sink of -1.0 Mt CO_2eq in 2022. The LULUCF sector has been a significant net sink in Finland, but in 2021 it turned into a net source for the first time, emitting 0.5 Mt CO_2eq. This was due in particular to a slowdown in tree growth and to high levels of forest harvesting. The reversal of the sector from being a slight net emitter

to being a net sink in 2022 was affected by the 2% reduction in harvesting volumes compared with 2021 taken into account in the proxy estimate. The estimated sum of the LULUCF sector's emissions and removals, that is, the magnitude of the sector's sink or source, will be revised in the next release as data updates are received on the harvested wood products pool, surface area sizes and growing stock. This is also when it will be known whether the sector was a net sink or a net source. In 2005–2022, the LULUCF sector has been a net sink averaging around 18 Mt CO_2eq. The LULUCF sector's greenhouse gas (GHG) balance has ranged in 2005–2022 between 37.55 Mt CO_2eq (in 2009) and 0.5 Mt CO_2eq (in 2021).

Emissions from installations covered by the EU Emissions Trading System (EU ETS) amounted to 19.0 Mt CO_2-eq in 2022. Emissions decreased by 1.3 Mt CO_2eq or 6.4% year on year. This was affected by the halving of the consumption of natural gas due to its high price and the discontinuation of its imports from Russia. The consumption of coal, on the other hand, increased somewhat. Since 2005, total emissions from the EU ETS sector have declined by a total of 14.1 Mt CO_2eq or 43%.

GHG emissions from the effort sharing sector were 26.7 Mt CO_2eq in 2022, down 0.8 Mt CO_2eq compared to 2021. Effort sharing sector emissions decreased by a total of 22% in 2005–2022 – at a clearly slower pace than EU ETS sector emissions. The most significant emission sources in the effort sharing sector are transport, agriculture, building-specific heating, non-road mobile machinery, waste treatment and fluorinated gases (F-gases). Emissions have decreased in all of these sectors excluding agriculture.

Achievement of emissions reduction targets

Finland's national Climate Act sets the target of reducing emissions by 60% by 2030 compared to 2005 levels, which means total emissions may not exceed 28.5 Mt CO_2eq in 2030. The Act also lays down the aim for Finland to be carbon neutral in 2035 and carbon negative soon after that.

The rate of emissions reductions is in line with the 2030 target of the Climate Act. A key aspect in terms of the carbon neutrality target is the assumed level of carbon sinks in 2035, which determines the magnitude of emissions reductions. In climate policy design, it has been assumed that the net sink level of the LULUCF sector will be 21 Mt CO_2eq in 2035, which means the EU ETS and effort sharing sectors could emit a combined total of no more than 21 Mt CO_2eq. Due to the significant decrease in the LULUCF sector's net sink identified in 2021, the assumption of the 21 Mt CO_2eq carbon sink level does not appear to be achievable by means of the existing and planned measures of the LULUCF sector. In the absence of significant additional measures in the LULUCF sector, it is also likely

that Finland will not achieve the commitments laid down in the EU's LULUCF Regulation without buying units from other Member States. Achieving the national carbon neutrality target also requires additional measures in the LULUCF as well as other sectors.

The revised EU Effort Sharing Regulation sets for Finland the obligation to reduce emissions in the effort sharing sector by 50% in 2030 in relation to the 2005 level, which means emissions amounting to 17.2 Mt CO_2eq. Finland's annual emission allocation (AEA) for 2022 was 28.0 Mt CO_2eq, and emissions were around 1.3 Mt CO_2eq below that. In 2021, too, emissions were 1.4 Mt CO_2eq below the allocated level. This means effort sharing sector emissions in 2021 and 2022 remained within the values allocated to Finland.

Completed in 2022, Finland's Medium-term Climate Change Policy Plan outlines measures to meet the obligation set by the EU. The magnitude of the measures is such that the obligation will be met. However, the change in the net removals of the LULUCF sector has increased uncertainty as to whether LULUCF flexibility will be available in the 2026–2030 period as assumed in the plan. On the other hand, the achievement of the plan's emissions reduction target will also depend on policy measures yet to be implemented, such as the increase in the distribution obligation of biofuel in light fuel oil.

Sector-specific trends

GHG emissions from domestic transport excluding aviation in 2022 totalled around 9.8 Mt CO_2eq, accounting for around 37% of the emissions of the effort sharing sector and around 21% of total emissions. Transport emissions remained almost at the previous year's level. The emissions trend of road transport in recent years has been affected by the change in the share of biofuels, improvements in the energy-efficiency of new vehicles and the slowdown of the transport performance of passenger vehicles. The aim is to reduce transport emissions by 50% by 2030 compared to the 2005 level.

In agriculture, emissions reported for the effort sharing and LULUCF sectors have remained more or less unchanged in recent years. Emissions accounted for under the effort sharing sector amounted to around 6.3 Mt CO_2eq in 2022. Emissions reduction measures have been proposed in the Medium-term Climate Policy Plan, the Climate Plan for the Land Use Sector and Finland's Common Agricultural Policy (CAP) Strategic Plan. In addition, improvements to the overall sustainability of the food system aim to reduce the carbon footprint of food consumed.

Emissions from building-specific heating have decreased in recent years due to a reduction in oil heating and to the improved energy-efficiency of buildings. Emissions from building-specific heating amounted to 2.2 Mt CO_2eq in 2021, with the majority of these emissions arising from oil heating, the phasing out of which is promoted through grants.

GHG emissions from non-road mobile machinery (NRMM) in 2022 totalled 2.5 Mt CO_2eq, accounting for around 9% of the effort sharing sector's emissions and remaining at the same level as in previous years. Going forward, emissions are anticipated to decrease following increases in the bio-component distribution obligation concerning light fuel of and in electrification. Changes in the way NRMM is used can also affect emissions.

GHG emissions from waste treatment in 2022 totalled 1.7 Mt CO_2eq, accounting for around 6% of the effort sharing sector's emissions. Emissions have been declining steadily since the 1990s, with a 44% decline seen since 2005. This results from a decrease in the landfilling of municipal waste, the recovery of landfill gas, and an increase in the energy recovery of waste. On the other hand, the increased energy recovery of waste has resulted in significant increases in emissions from waste incineration.

Fluorinated GHG (F-gas) emissions amounted to 0.8 Mt CO_2eq in 2022. F-gas emissions increased from the 1990s until 2008 but have been decreasing in recent years. Their emissions are reduced in particular by the increasing use of carbon dioxide as a refrigerant instead of refrigerants with high global warming potential. With current measures, the emissions are projected to decrease significantly from the current level by 2035.

The EU ETS covers energy production, large-scale industrial installations, and aviation within the European Economic Area. Since 2021, the price of emission allowances has mainly ranged between EUR 70 and EUR 100 per tCO_2. There are also national policy instruments affecting installations covered by the EU ETS in use alongside the EU ETS.

Cross-cutting measures

Municipalities play a key role in efforts to reach the 2035 carbon neutrality target, as they are able to actively impact both their own GHG emissions as well as those of operators in their area. There are, however, significant differences between municipalities in terms of climate action. An obligation for Finnish municipalities to draw up their climate plans and update them at least once in every term of the municipal council was added to the Climate Act in March 2023. Under the Act, the plan must be drawn up and adopted no later than during the municipal council term beginning in 2025.

Service procurement accounts for 60% of emissions from municipal procurement, whereas in investments emissions from construction stand out. Promoting low-carbon procurement, the National Public Procurement Strategy aims to support Finland's carbon neutrality target for 2035. Some municipalities have also set their own emission targets for procurement.

According to Finnish Environment Institute calculations in 2023, household consumption accounts for 83% of consumption-based emissions, municipal procurement for 11% and investments for 6%. Carbon footprint per capita has remained at around 8 t CO_2eq since 2015. A 2022 report of the Finnish Climate Change Panel identified emissions reduction potential particularly in adopting a more plant-based diet but also in housing, mobility, food and consumption of goods and services.

Circular economy models can reduce both consumption- and production-based emissions. Completed in 2021, the Strategic Programme for Circular Economy set the vision and objectives for the circular economy, determined the necessary measures and monitoring indicators and proposed the resources necessary for circular economy promotion.

Adaptation

Completed in 2022, Finland's National Climate Change Adaptation Plan until 2030 promotes Finland's preparedness for and adaptation to the impacts of climate change in accordance with the Climate Act. It contains 24 targets and the measures determined to achieve them. The plan is divided into ten themes, with one or more targets and measures to promote the target determined for each theme. The status concerning their implementation is reported specifically for each target in the Annual Climate Report.

Annually changing themes: voluntary carbon market and strengthening of climate policy dialogue

There has been a major increase in climate targets and the use of certified carbon credits among non-state actors: for example, data for 2022 shows that 4% of Finnish small and medium-sized enterprises buy and use carbon credits as part of their climate efforts. Voluntary climate action can promote climate benefits and sustainable development, but it can also cause avoidance of climate efforts in the form of misleading climate claims, for example. The formulation of the regulatory framework for voluntary climate action is still in progress. In 2022, a guide to good practices for voluntary carbon markets was published by the Finnish Government.

The Climate Policy Roundtable and the parliamentary monitoring group on Finland's climate policy have for their part supported the national preparation and implementation of climate policy and taken part in the dialogue on climate justice. The purpose of the Climate Policy Roundtable is to ensure a just transition and the acceptability of climate actions. The Roundtable has provided stakeholders and experts with a channel for participation in the national preparation and implementation of climate actions. The Government appointed the Roundtable in conjunction with the National Commission on Sustainable Development for the duration of the government term. The parliamentary monitoring group on climate policy has been tasked with monitoring Finland's national climate policy and its implementation, ensuring the achievement of the carbon neutrality target and taking part in the debate on climate justice. The group was appointed by the Government for the period from September 2022 to June 2023.

1 Introduction

Provisions on the preparation and content requirements of the Annual Climate Report are laid down in the Climate Act (423/2022). The Government submits an Annual Climate Report to Parliament each calendar year to report on data on the trends in emissions and removals, assess the adequacy of measures with regard to the achievement of the targets set for the following 15 years and the need for additional action required, as well as data on the achievement of the emissions reduction targets contained in the Medium-term Climate Plan and the Climate Plan for the Land Use Sector. In addition, the Annual Climate Report reports on the adequacy and effectiveness of the adaptation measures contained in the National Climate Change Adaptation Plan. Under the Act, the public must be provided with information on the publication of the Annual Climate Report and its key content.

The Annual Climate Report has been submitted since 2019. Parliamentary readings of previous Annual Climate Reports have raised development needs concerning the report. These requests have been taken into account in the preparation of subsequent Annual Climate Reports, and the content of the Annual Climate Report is broader than required by the Act. It covers matters including reports on cross-sectoral sets of action, such as municipal climate policy, circular economy and carbon footprint of consumption. The report of the Environment Committee of Parliament (25/2022) on the 2022 Annual Climate Report stated that the Annual Climate Report could be developed so that, in addition to statutory content, supplementary sections could be included less frequently than every year. Going forward, the Annual Climate Report will include changing themes on the basis of criteria such as availability of data or currency of a theme (Chapters 8 and 9 of this year's report). As regards cross-cutting themes (Chapter 6), the inclusion of the various themes is considered based on the progress made on the topic over the past year. As in previous years, a separate communication summary is also published on the Annual Climate Report.

In this year's annual report, the situation of climate policy implementation is described as it has been in the spring of 2023, and the report has therefore not taken into account the new policy guidelines of the government program. The government program is briefly described in chapter 2.1. New government was appointed on 20 June 2023.

2 Emissions reduction targets

2.1 Government programme

Prime Minister Orpo's government was appointed on June 20, 2023. According to the government program, the government is committed to the goals of Finland's national climate act. The aim is to make an impact on climate change primarily through effective emissions reduction measures, increased carbon sinks and innovative clean solutions. The use and export of these solutions will replace solutions based on polluting energy sources and raw materials both in Finland and in other countries. Climate measures will be implemented in a manner that is economically, ecologically, socially and regionally sustainable and just. Along with actions to combat climate change and reduce emissions, Finland will promote measures that improve the ability of society to adapt to climate change.

Finland aims to meet the climate targets in a way that does not increase everyday costs or weaken competitiveness. Achievement of the climate targets will be promoted by concrete measures and effective climate policy at the national and EU levels and with respect to international agreements. According to the vision of the Government Programme, Finland will become a leader in clean energy while maximising its climate handprint. In addition, the Government will set a target for the use of technological sinks. The objectives and policy measures of the new Government Programme will be taken into account in the preparation of climate policy plans during this Government term.

The climate policy guidelines of the new Government Program has not included in the Annual Climate Report 2023 other than described in this chapter. The implementation of the climate policy has described in this report as it has been in the spring of 2023.

2.2 Climate Act

Finland's reformed Climate Act entered into force on 1 July 2022. The new Act includes a carbon neutrality target for 2035 and emissions reduction targets for 2030 and 2040 as well as an updated target for 2050. The emissions reduction targets are 60% by 2030, 80% by 2040 and 90% (but aiming at -95%) by 2050 compared to the 1990 level. The Act also lays down the obligation to increase sinks in order to achieve the carbon neutrality target and also further after 2035. The reform is extensive in terms of scope, resulting in

further specifications concerning the scope of application and target-setting of the Act. Nevertheless, the Act still remains a framework act in terms of its basic nature, laying down provisions on the climate policy planning system and monitoring.

In autumn 2022, Parliament adopted an amendment to the Climate Act under which the municipalities must draw up and update a climate plan at least once in every municipal council term either alone or together with other municipalities in the region. In addition, clarifying rules for requests for review under the Climate Act were included in the Act. The amendments aim to promote the implementation of the objectives of the Climate Act and to strengthen municipalities' climate action and improve legal protection.

In March 2023, the Government adopted two decrees under the Climate Act. One of these concerns the Finnish Climate Change Panel, its appointment and activities and the other the Sámi Climate Council. The latter is an entirely new institution, with provisions on it laid down in the reformed Climate Act.

2.3 EU climate targets

In December 2020, the European Union made a commitment under a decision of the European Council to reduce net GHG emissions by at least 55% by 2030 compared to the 1990 level. The increase in the target from 40% to 55% seeks to ensure that climate neutrality can be achieved over the longer term. Both the new target for 2030 and the target for a climate-neutral European Union by 2050 are included in the European Climate Law, which entered into force in 2021.

In autumn 2022, a provisional agreement was reached in interinstitutional negotiations on the Fit for 55 legislative package proposed by the European Commission in 2021. The package includes the sectoral legislation required to reach the 2030 target. The new legislation will increase the ambition of emissions reductions for the EU ETS sector to 62% and for the effort sharing sector to 40% by 2030. The country-specific obligation set for Finland is to reduce emissions in the effort sharing sector by 50% in 2030 in relation to the 2005 level.

The Fit for 55 package also includes a revised LULUCF Regulation. The Regulation aims for the accounted GHG removals from the sector to be at a level equivalent to at least the accounted emissions from the sector in the period from 2021 to 2025. This "no debit" rule applies to the EU as a whole and to individual Member States. The key elements of the Regulation revised for the 2026–2030 period are the EU-wide net sink target of 310 Mt CO_2eq for 2030, a transition to a GHG inventory-based calculation system, and a transition to net GHG removal targets in the entire LULUCF sector for each Member State. The

minimum net removal level set for Finland's LULUCF sector for 2030 is 17.8 Mt. The climate targets determined in EU law for the EU ETS, effort sharing and LULUCF sectors are part of the EU's Nationally Determined Contribution (NTD) under the Paris Agreement.

2.4 International policy framework and Paris Agreement

The Paris Agreement on climate change was adopted in 2015 and entered into force in November 2016. By March 2023, the Agreement has been ratified by 195 parties and covers more than 97% of global GHG emissions. The Agreement applies to the post-2020 period and remains in force until further notice. In November 2021, the 26th Conference of the Parties (COP26) in Glasgow finalised the rules for the implementation and application on the Agreement by agreeing on further modalities for Article 6 on market mechanisms and on consistent and transparent reporting of climate action and emissions.

The central aim of the Paris Agreement is to hold the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 ° above pre-industrial levels. In addition, the aim is to increase the ability of the parties to the Agreement to adapt to the adverse impacts of climate change and to foster climate resilience as well as to make finance flows consistent with a pathway towards low GHG emissions. In order to achieve the temperature goal, the parties aim to reach global peaking of GHG emissions as soon as possible and to undertake rapid reductions after that so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of GHGs in the second half of this century.

One of the key elements of the Paris Agreement is the parties' obligation to prepare Nationally Determined Contributions (NDC) by means of which the parties communicate their emissions reduction and adaptation targets and their planned climate actions. Each party's successive NDC, communicated at least every five years, must represent a progression beyond the party's then current NDC and reflect its highest possible ambition. Based on the NDCs and their action plans reported by the most recent Conference of the Parties (COP27) in November 2022, global warming will exceed 2 °C. Published in March 2023, the latest Synthesis Report of the Intergovernmental Panel on Climate Change (IPCC) states that emissions reduction measures must be accelerated already during the current decade in order to reach the international targets set to limit global warming, and a downturn in global emissions must be achieved at the latest by 2025. Collective progress made by countries towards the Paris Agreement targets is reviewed by means of global stocktakes every five years. The first stocktake will take place in 2023, and its purpose is to inform the preparation of the NDCs so that the targets will be reached.

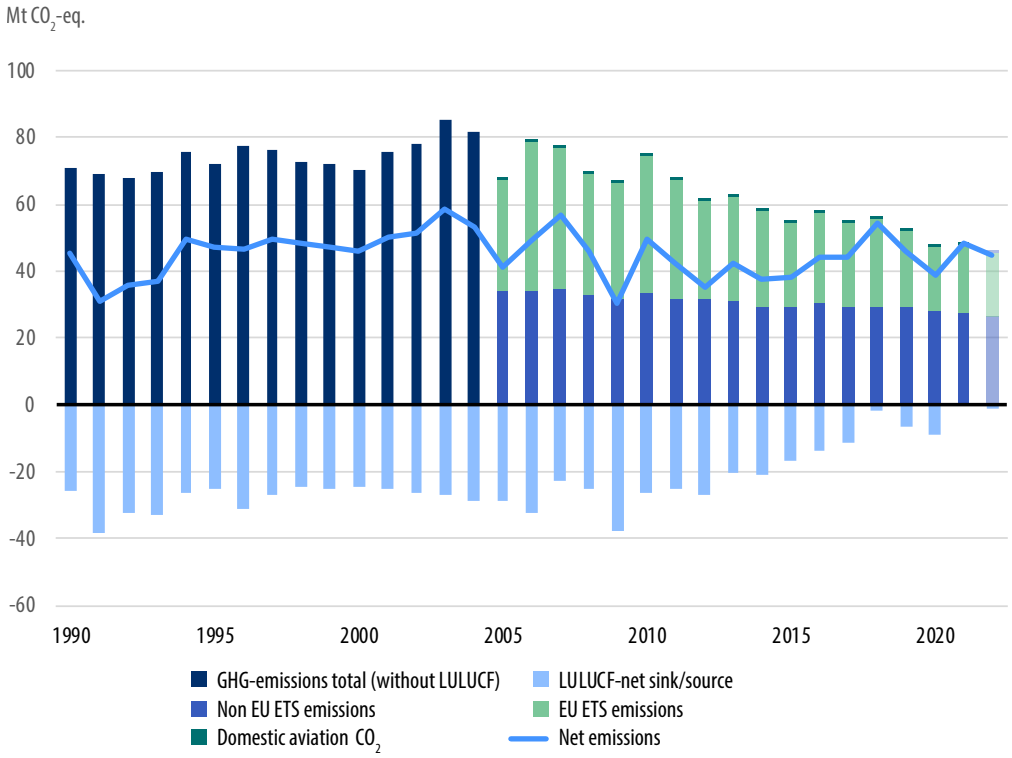
As a party to climate treaties, Finland has undertaken to finance developing country parties' climate actions and report on this finance. In Finland, this finance is part of the development cooperation budget (see Appendix 2). Finland's reporting on its climate finance includes National Communications submitted every four years and Biennial Reports submitted to the UN, as well as a report in accordance with Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate. Under the Paris Agreement, Finland has, as one of the so-called developed countries committed to the collective goal of mobilising jointly USD 100 billion in climate finance from various sources (public, private and innovative sources) in 2020–2025. There is no country-specific allocation of the mobilisation target, but in practice the EU as a whole accounts for a large part of its implementation.

3 Greenhouse gas emissions in 2005–2022

3.1 Total emissions

Finland's total emissions excluding the LULUCF sector amounted to 47.9 Mt CO_2eq in 2021 and, based on proxy estimate data, to 45.8 Mt CO_2eq in 2022. In 2022, emissions decreased by 2.0 Mt CO_2eq year on year. Since 2005, total emissions excluding the LULUCF sector have declined by an annual average of 2%. Over the past five years, the rate of reduction has averaged 4% a year. In 2005–2022, total emissions have declined by 24.0 Mt CO_2eq or 34%. The LULUCF sector has been a significant net sink in Finland, but in 2021 the sector turned into a net source of emissions for the first time. (Figure 1.)

Figure 1. Trend in total emissions 1990–2022. Negative values represent the net sink of the LULUCF sector. From 2005 onwards, total emissions have been divided between the effort sharing (non-ETS) and EU ETS sectors. Data for 2022 is based on a proxy estimate.

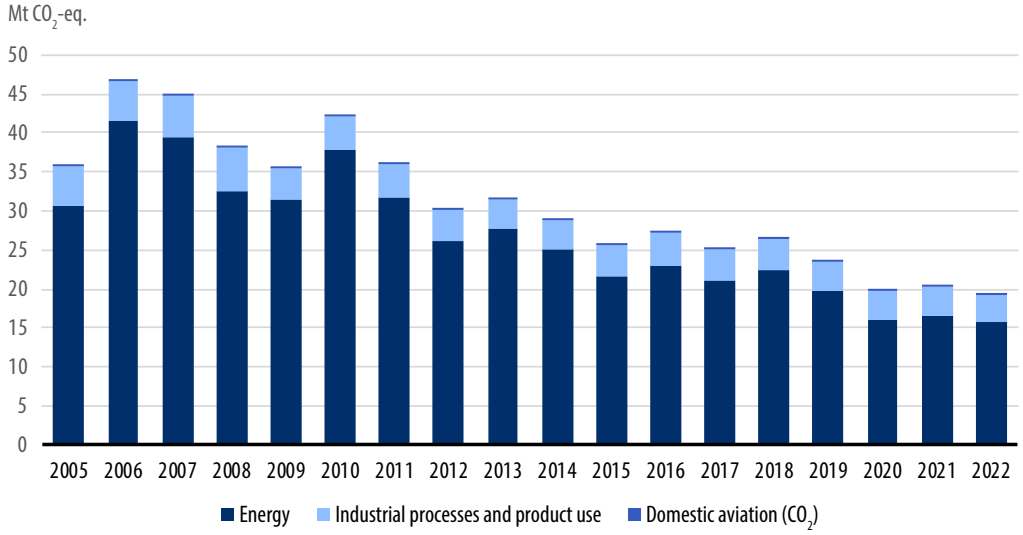


The trend in net emissions plays an essential role in terms of climate change mitigation. Net emissions means the difference between emissions and removals. Net emissions have ranged between 30.2 Mt CO_2eq and 56.8 Mt CO_2eq in 2005–2022, averaging 43.9 Mt CO_2eq. In 2021, net emissions increased by 9.6 Mt CO_2eq year n year and amounted to 48.3 Mt CO_2eq. The increase in net emissions was affected by the LULUCF sector changing from a net carbon sink to a net source of emissions. According to proxy estimate data, in 2022 net emissions decreased by 3.5 Mt CO_2eq year on year and amounted to 44.9 Mt CO_2eq. (Figure 1.)

3.2 EU Emissions Trading System sector

The EU Emissions Trading System (ETS) covers large-scale industrial and energy generation installations, and aviation within the European Economic Area. In 2022, emissions from Finnish installations covered by the EU ETS totalled 19.0 Mt CO_2eq (Figure 2) and accounted for 42% of Finland's total emissions. Emissions decreased by 1.3 Mt CO_2eq or 6% year on year. The underlying factors include the halving of natural gas consumption since the year before due to the high price of natural gas and the discontinuation its imports from Russia. Since 2005, emissions have decreased by an annual average of 3%, with the total reduction in emissions from the EU ETS sector amounting to 14.1 Mt CO_2eq or 43%. Energy-related emissions accounted for around 82% and emissions from industrial processes and product use for around 18% of the total emissions of the EU ETS sector. A proxy estimate for 2022 shows that CO_2 emissions from domestic aviation based on the GHG inventory have decreased by 61% since 2005.

Figure 2. Greenhouse gas emissions from the EU ETS sector and inventory-based CO_2 emissions from domestic aviation in 2005–2022. Emissions have been calculated in accordance with the current coverage of the EU ETS. The EU ETS coverage and calculation method for aviation differ from the inventory calculation method.

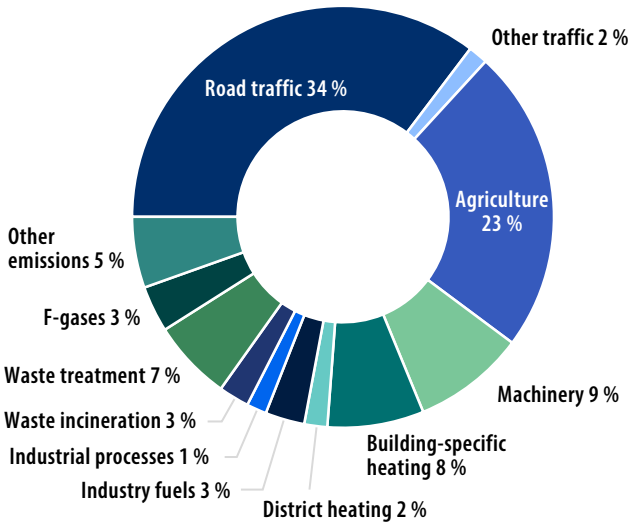


Alongside the phasing out of fossil energy sources, the emissions trend in the EU ETS sector is affected by factors including industrial electricity demand, the electrification development, weather-dependent consumption of heating energy, and the Nordic power market situation, which affects the power exchange price of electricity and, consequently, electricity imports and the need for separate production of electricity. Another key factor is the emission allowance price in the EU ETS.

3.3 Effort sharing sector

The effort sharing sector includes all of the non-ETS and non-LULUCF GHG emissions that are reported in the national GHG inventory. CO_2 emissions from domestic aviation in accordance with the GHG inventory are not, however, included in the effort sharing sector. The most important emission sources in the effort sharing sector are transport, agriculture, building-specific heating, non-road mobile machinery, waste treatment and fluorinated gases (F-gases). In addition, emissions from small-scale industry, the Finnish Defence Forces and other unspecified fuel use as well as non-CO_2 emissions from EU ETS sector energy use are accounted for under the effort sharing sector. Waste incineration is also mostly included in the effort sharing sector. Figure 3 shows the breakdown of emissions from the effort sharing sector in 2021.

Figure 3. Breakdown of greenhouse gas emissions by source from the effort sharing sector in 2021.



Emissions from the effort sharing sector have decreased more slowly than emissions from the EU ETS sector. In 2021, emissions from the effort sharing sector amounted to 27.5 Mt CO_2eq and in 2022, based on proxy estimate data, to 26.7 Mt CO_2eq. In 2021, the emissions were 0.7 Mt CO_2eq lower than in the previous year. Proxy estimate data shows an emissions decrease of 0.8 Mt CO_2eq in 2022 compared to 2021.

The aggregate emissions from the effort sharing sector in 2022 were around 22% lower than in 2005. Emissions have decreased in all sectors excluding agriculture. Transport emissions (excluding CO_2 emissions from domestic aviation) have decreased by around 2.7 Mt CO_2eq. Emissions from waste treatment and industry included in the effort sharing sector are currently also clearly lower than in 2005 (Table 1).

Table 1. Emissions from the effort sharing sector in 2005, 2021 and 2022 and the change from 2005 (Mt CO_2eq). (Inventory data for building-specific heating in 2022 will be completed in December 2023.)

	2005	2021	2022	Change 2005–2022 (Mt)	Change 2005–2022 (%)
Transport	12.6	9.9	9.8	-2.7	-22%
Agriculture	6.3	6.3	6.3	0.01	0.2%
Building-specific heating	4.1	2.2	…	…	…
Non-road mobile machinery	2.6	2.5	2.5	-0.1	-5%
Waste treatment	3.1	1.8	1.7	-1.4	-44%
F-gases	1.2	0.9	0.8	-0.4	-31%
Industry	1.7	1.4	1.3	-0.3	-20%
Other emissions	2.6	2.5	…	…	…
Total	34.2	27.5	26.7	-7.5	-22%

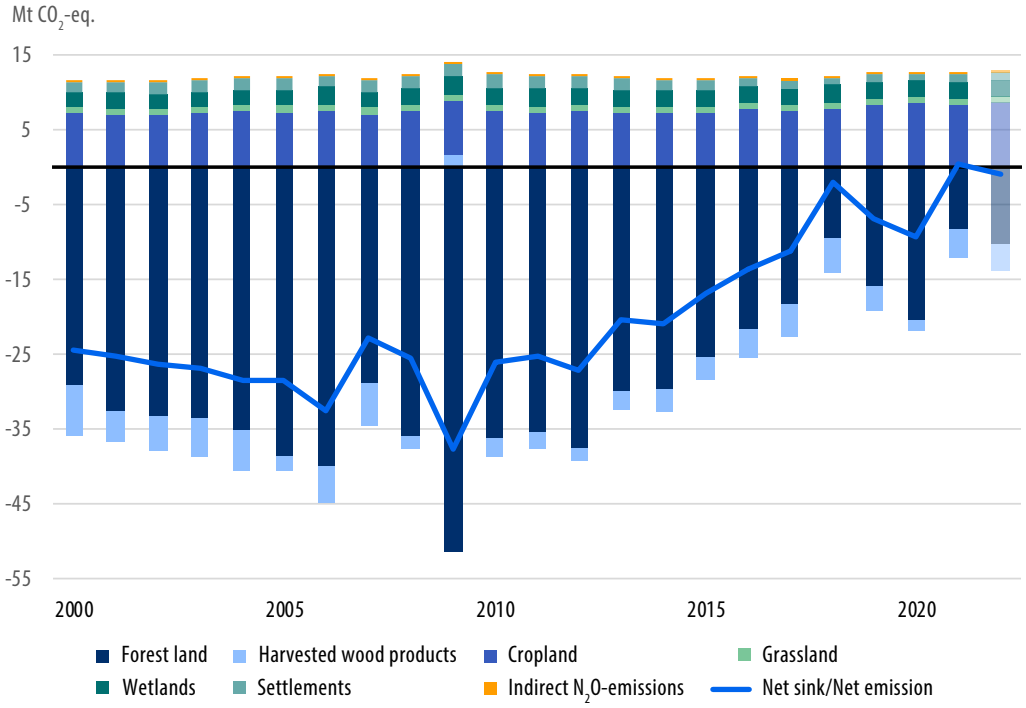
3.4 Land use, land use change and forestry sector

The land use, land use change and forestry (LULUCF) sector comprises six land use categories: forest land, cropland, grassland, wetlands, settlements and other land as well as harvested wood products. The LULUCF net removals/emissions are obtained by calculating the sum total of the emissions and removals of all of the land use categories (Figure 4). Forest land is the sector's most significant net sink, that is, its removals exceed its emissions. Harvested wood products have also primarily acted as a carbon sink.

In 2021, the LULUCF sector turned from a carbon sink into a net source of emissions for the first time. The sector's emissions exceeded its removals (the amount of carbon stored in the various pools during the year) by 0.5 Mt CO_2eq. The sector turning from a net sink into a net source of emissions was due in particular to a slowdown in tree growth and to high levels of forest harvesting. Forests still remained a net sink (8.3 Mt CO_2eq) in 2021, but emissions from the other land use categories exceeded the net removals of forests. According to proxy estimate data, the LULUCF sector was a net sink of -1.0 Mt CO_2eq in 2022. The reversal of the sector from being a slight net emitter to being a net sink in 2022 was affected by the 2% reduction in harvesting volumes compared with 2021 taken into account in the proxy estimate. The estimated sum of the LULUCF sector's emissions and removals, that is, the magnitude of the sector's sink or source, will be revised in the next release as data updates are received on the harvested wood products pool, surface area sizes and growing stock. This is also when it will be known whether the sector was a net sink or a net source.

The estimated increment of the growing stock of Finnish forests is based on the 13th National Forest Inventory of Natural Resources Institute Finland, which indicated a slowdown in the rate of forest growth. Changes in the carbon pool of forest land are also affected essentially by the drain of growing stock. According to the Natural Resources Institute Finland, forest harvesting amounted to 74.7 million cubic metres in 2022 (preliminary data) (see Appendix 3, Figure 40), down 2.2% year on year. Roundwood removals have averaged 64.4 million cubic metres in 2000–2022. Of the total roundwood removals in 2022, 63.8 million cubic metres were harvested for the forest industry or exports, 10.6 million cubic metres for energy wood and 0.3 million cubic metres for household use by forest owners.

Figure 4. The sums of emissions and removals by land use category in the LULUCF sector and the sector's aggregate emissions and removals (net sink/net emission) in 2000–2022. The data for 2022 is a proxy estimate containing preliminary estimates for forest land and cropland, whereas the data for the other land use categories corresponds to the previous year's figures.



4 Achievement of targets

4.1 Climate Act targets for 2030 and 2035

The 60% emissions reduction target set in the Climate Act requires that total emissions will not exceed 28.5 Mt CO_2eq in 2030. A key aspect in terms of the carbon neutrality target is the assumed level of carbon sinks in 2035, which determines the magnitude of emissions reductions. In climate policy design, it has been assumed that the net sink level of the LULUCF sector will be -21 Mt CO_2eq in 2035 (see Section 4.3). This means the total emissions in 2035 may be a maximum of 21 Mt CO_2eq or around 70% lower than in 1990. In this context, total emissions means the aggregate emissions of the EU ETS and effort sharing sectors.

The scenario analysis of the Annual Climate Report is based on the scenario data (with some minor changes) reported in conjunction with the National Energy and Climate Plan Progress Report (NECPR) submitted to the EU in March 2023. The scenarios do not include any impacts of carbon capture on the emission level. In the scenario with existing measures (WEM), emissions are projected to decrease to the level of 29.3 Mt CO_2eq in 2030 and further to 24.5 Mt CO_2eq in 2035. In the scenario with additional measures (WAM), a more rapid rate of emissions reductions is projected, with emissions being at 28.0 Mt CO_2eq in 2030 and decreasing to 23.0 Mt CO_2eq in 2035. (Figure 5.) Based on this data, the rate of emissions reductions is in line with the 2030 target of the Climate Act. However, the existing and planned measures would not be sufficient to reach the 21 Mt CO_2eq emissions level without carbon capture.

The trend in emissions from the EU ETS sector is projected to be the same in both scenarios, that is, emissions are projected to decrease to the level of 9.2 Mt CO_2eq in 2030 and further to 6.7 Mt CO_2eq in 2035. The WEM scenario projects a decrease in emissions from the effort sharing sector to the level of 19.9 Mt CO_2eq in 2030 and further to 17.6 Mt CO_2eq in 2035. The WAM scenario projects a more rapid rate of emissions reductions, with emissions from the effort sharing sector projected to be at the level of 18.6 Mt CO_2eq in 2030 and to decrease to 16.1 Mt CO_2eq in 2035. (Figure 5.)

The LULUCF sector was a net source of emissions of 0.5 Mt CO_2eq in 2021 and a net sink of emissions of -1.0 Mt CO_2eq in 2022. If the assumed net sink level of 21 Mt is to be adhered to, new efficient measures must be taken to strengthen the sink development in order to ensure the carbon neutrality target is reached. This is examined in more detail in Section 4.3.

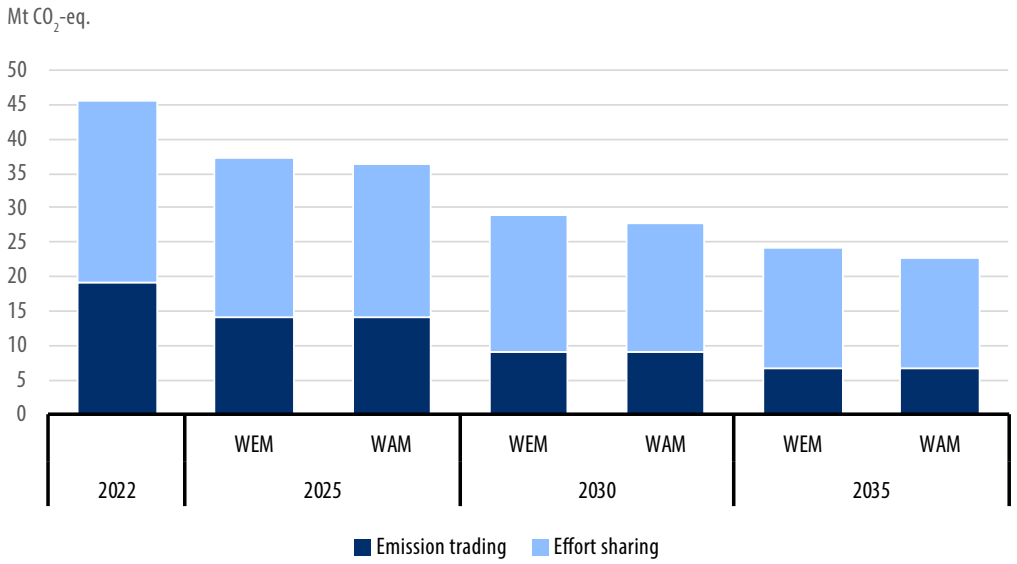
The outlook for the energy sector has also changed considerably due to Russia's war of aggression. The discontinuation of trade with Russia will also be reflected in the scenarios and their assumptions going forward. Spring 2023 also saw the launch of a project (PEIKKO) of the Government's analysis, assessment and research activities (VN TEAS) aiming to update all of the sectoral scenarios. The project will not, however, be concluded until early 2024, so this Annual Climate Report could not draw on its results.

Emissions steering at the EU level regarding both the existing and the new EU ETS is going to be more ambitious than originally proposed by the Commission. The rate of emissions reductions in the EU ETS sector may therefore be more rapid than previously assumed. This is due to stronger price controls as well to the stepping up of planned and foreseeable investments relating to the green transition.

As regards the emissions trend in the EU ETS, the rapid phasing out of fossil fuels in heat and power generation is also being realised in the next few years. The relatively high emission allowance price level is accelerating this trend. The process industry has also presented investment plans enabling significant reductions in emissions. For example, the transformation of the SSAB Raahe mill to make steel without significant CO_2 emissions may already take place by 2030. This project alone will generate significant emissions reductions in 2030 and 2035. In addition, Neste Corporation has announced that it will transition to producing green hydrogen at its Porvoo refinery for its own process needs, which would mean a significant reduction in CO_2 emissions from the process industry by 2030.

As there are uncertainties involved in the realisation of the planned investments and policy measures, it is important to regularly review the sufficiency of the measures and, where necessary, also decide on new measures. On the other hand, for example, the Finnish Climate Change Panel estimated in early 2023 that the rate of emissions reductions may be much faster than previously projected. The Panel estimates that an 18–19 Mt emissions level could be achievable in 2035. In that case, Finland might be able to achieve carbon neutrality also with a smaller net sink than has so far been assumed. In any case, there are uncertainties concerning the trends for the LULUCF sector's emissions and sink in the years ahead that are greater than the uncertainties relating to total emissions.

Figure 5. Emissions trends in the baseline scenario (WEM) and scenario with additional measures (WAM).



4.2 Effort sharing sector 2030 obligation

At the EU level, binding obligations have been set for all Member States in the effort sharing sector, consisting of an obligation to reduce emissions by a certain percentage in the target year and annual emission allocations (AEA). In addition, the effort sharing legislation provides for flexibilities that Member States can make use of to achieve the targets. For example, Member States can make use of time-related flexibilities where emissions can be banked and borrowed between individual years. Where necessary, emission credits can also be acquired from other Member States to meet the emissions reduction target. In addition, the one-off flexibility mechanism can be used to access a limited amount of allowances from the EU ETS to cover emissions from the effort sharing sector and, under certain conditions, any surplus credits from the LULUCF sector may be used to meet the effort sharing sector obligation. On the other hand, if the LULUCF sector becomes an accounted source of emissions, the LULUCF sector's accounted emissions may have to be compensated for by means of additional emissions reductions in the effort sharing sector and/or by means of buying credits from other Member States in the 2021–2025 period.

The revised EU Effort Sharing Regulation sets for Finland the obligation to reduce emissions in the effort sharing sector by 50% in 2030 in relation to the 2005 level. The AEAs for 2021–2022 remained unchanged from the Commission implementing decision

(2020/2126) pursuant to the Effort Sharing Regulation. AEAs for 2023–2030, on the other hand, are re-calculated on the basis of the rules specified in the Regulation. Finland's AEA was 28.8 Mt CO_2eq for 2021 and 28.0 Mt CO_2eq for 2022. In 2021, emissions from Finland's effort sharing sector were 27.5 Mt CO_2eq, being around 1.4 Mt CO_2eq below the AEA. According to the proxy estimate, in 2022 the emissions amounted to 26.7 Mt CO_2-eq, being around 1.3 Mt CO_2-eq below the AEA (Table 2). In the light of this data, Finland would have a total surplus of around 2.7 CO_2-eq from 2021–2022 available to compensate for any excess emissions of coming years. The final emissions data used in the compliance check will not be fixed until in 2027, which means the data may still change (see Appendix 1).

Table 2. Effort sharing sector's annual emission allocations and emissions in 2021 and 2022. Emissions data for 2022 is based on a proxy estimate.

	2021	2022
Annual emission allocation	28.8	28.0
Emissions	27.5	26.7
Surplus (+) / Deficit (-)	1.4	1.3

The most recent Medium-term Climate Change Policy Plan (MTCCPP) was submitted to Parliament in summer 2022. It outlines measures to achieve the 50% emissions reduction target laid down by the Effort Sharing Regulation. The MTCCPP projects that the current trend and current measures will result in the emissions from the effort sharing sector decreasing to 22.8 Mt CO_2-eq by 2030, whereas the emissions level in line with the 50% emissions reduction target is 17.2 Mt CO_2-eq. This means the starting point for the preparation of the plan was an emissions gap of 5.6 Mt CO_2-eq in 2030, and additional measures were set out in the plan to bridge this gap.

The scenario analysis was updated in conjunction with the National Energy and Climate Plan Progress Report (NECPR) submitted to the EU in spring 2023. Based on the latest scenario analyses available, emissions from the effort sharing sector are projected to decrease with existing measures (WEM scenario) to 19.9 Mt CO_2eq in 2030 and with additional measures (WAM scenario) to 18.6 Mt CO_2eq. Flexibilities are not taken into account in these.

When preparing the MTCCPP, the starting point was that Finland will make use of the one-off flexibility and the LULUCF flexibility for the effort sharing sector to reach the 2030 target. Additional GHG emission reductions corresponding to the flexibilities must

be achieved in the EU ETS and LULUCF sectors. Under a Government decision, EU ETS emission allowances will be cancelled at the maximum amount under the Effort Sharing Decision, which corresponds to 0.7 Mt CO_2-eq per year or a total of 7 Mt CO_2-eq over the 2021–2030 period. The maximum LULUCF flexibility available to Finland is 0.45 Mt CO_2-eq per year. It is estimated that the LULUCF calculation rules for 2021–2025 will in practice not enable the creation of surplus or flexibility for the effort sharing sector. Whether or not Finland will be able to make use of the flexibility in the 2026–2030 period depends on the creation of a surplus in relation to the LULUCF target. It was outlined during the preparation of the MTCCPP that the additional measures decided in the Climate Plan for the Land Use Sector will be implemented so that this flexibility is available. The situational picture concerning the LULUCF net sink development has since changed, as the sector turned out to be a source of net emissions in 2021 and the proxy estimate indicates that it was only a minor net sink in 2022. Consequently, it currently appears quite unlikely for flexibility from the LULUCF sector to be available for the implementation of the MTCCPP.

The MTCCPP estimated that the measures presented in the plan (including flexibilities) would be able to reduce emissions by an additional 5.7 Mt CO_2-eq compared to the baseline scenario, which would mean the 2030 emissions reduction obligation being achieved. The uncertainty caused by the LULUCF sector flexibility would, however, require the strengthening of the MTCCPP action plan. The final adoption of the EU's Fit for 55 package includes some elements that strengthen emissions steering in the effort sharing sector. These include the introduction of the EU ETS for transport and heating over a broader scope than previously estimated. On the other hand, reaching the MTCCPP emissions reduction target will also depend on policy measures that are yet to be implemented, such as the increase of the biofuel distribution obligation for light fuel oil as presented in the plan. The implementation of the MTCCPP action plan can be assessed more specifically when the new scenarios for the emissions trend for the effort sharing sector are available in early 2024. The MTCCPP includes emissions reduction measures from all sectors within the scope of application of the plan. The plan also contains cross-sectoral measures such as those relating to municipalities' climate action, consumers and public procurement. Sector-specific measures and emission trends are described in more detail in Chapter 5. Cross-sectoral measures are discussed in Chapter 6.

4.3 LULUCF sector commitment

Under the revised LULUCF Regulation of the EU, the commitments of the Member States are divided into two separate five-year periods: 2021–2025 and 2026–2030. During the first period, Finland must ensure that no accounted emissions arise from the LULUCF sector. In this respect, the commitment concerning the sector remains unchanged from the previous Regulation. The commitment is based on calculation rules concerning

accounting categories. The accounted removals or emissions of forests are obtained by comparing the commitment period's actual removals to the determined reference level where the sink of harvested wood products is also taken into account. The reference level for forest land is based on the continuation of forestry practices from 2000–2009 and a projection for the development of forest and harvested wood product sinks obtained using this calculation. Emissions from cropland and grassland are calculated by comparing them with emissions in the 2005–2009 period. Emissions from deforestation and afforestation are calculated in total amounts. In the 2026–2030 period, the commitment is based on inventory calculations, and Finland's net sink target set for 2030 is -2.9 Mt CO_2eq, which must be additional to Finland's actual average sink in the 2020 inventory for 2016–2018 used by the Commission in its regulation proposal (-14.8 Mt CO_2eq). This means the target level for 2030 is -17.8 Mt CO_2eq. The commitment may still change following technical corrections.

The land use classification in the inventory differs from the accounting categories of the LULUCF Regulation for the 2021–2026 period but serves as an indicative reference point. In the 2021 inventory, the forest land sink was -8.3 Mt CO_2eq and the net removals of the carbon pool of harvested wood products -3.7 Mt CO_2eq, measured using GHG inventory classifications. The proxy estimate for 2022 indicates a forest land sink of -10.1 Mt CO_2eq. The forest reference level adopted by the European Commission in 2020 for Finland is -29.4 Mt CO_2eq including harvested wood products. Based on available data, the forest land carbon sink was clearly smaller than the reference level set for Finland in both 2021 and 2022. The 2021–2025 period is examined as a five-year whole. Technical corrections will still be made to the reference level, which is why it is not yet possible to assess precisely how much the forest land sink deviates from the reference level.

An estimate released by the Natural Resources Institute Finland in December 2022 indicates that Finland is going to fall short of the commitment by 50–80 Mt CO_2eq. The estimate assumes that the managed forest land flexibility determined country-specifically for Finland will be available to Finland and that Finland will use its specific flexibility. The condition for using the flexibility is that the LULUCF target of the EU as a whole will be reached. If the EU as a whole does not reach its LULUCF target, the managed forest land flexibility will not be available to Finland (or any other Member State), which will increase the potential deficit in relation to the commitment. The estimate will be made more specific once the data for 2023–2025 is available and the technical correction to the forest reference level is made.

If the LULUCF sector, having complied with the accounting rules, generates net emissions in the 2021–2025 period, the Member State may buy LULUCF credits from another Member State that has exceeded its commitment and wishes to sell its surplus credits. If the commitment is not reached by means of the credits bought, the deficit is transferred

to the effort sharing sector. In practice, this means a reduction in the annual emission allocation (AEA) of the effort sharing sector by an amount equivalent to the deficit. If, following this, the effort sharing sector's emissions reduction obligations are not met, the Member State may buy effort sharing sector emissions reduction credits from other Member States if these are available. If the annual obligation is not met in any year, the deficit is multiplied by a factor of 1.08 and added to the following year's commitment.

Finland's Climate Plan for the Land Use Sector contains a variety of climate actions in the LULUCF sector. The plan was submitted to Parliament as a government report in 2022. The report was considered by Parliament in January 2023. The plan aims to strengthen the net sink of the LULUCF sector by at least 3 Mt CO_2eq by 2035 compared to the baseline scenario. Prepared in the Carbon Neutral Finland 2035 – measures and impacts of climate and energy policies (HIISI) project, the baseline scenario provides a LULUCF net sink of around 18 Mt in 2035.

Based on LULUCF inventory data for 2021 and 2022, however, it appears quite unlikely for the net sink of 18 Mt of the HIISI baseline scenario to become a reality. The baseline scenario produced in the project does not, for example, take account of the new estimates of forest growth or the timber market implications of Russia's war of aggression.

4.4 Need for additional action

In the light of the data presented in Section 4.1, the rate of emissions reductions is in line with the 2030 target of the Climate Act. Reaching the carbon neutrality target requires a balance between emissions and reductions in 2035. Due to the significant decrease in the LULUCF sector's net sink in 2021, the assumption of the 21 Mt CO_2eq carbon sink level used as a basis of 2022 climate policy plans does not appear to achievable by means of the current and planned action of the LULUCF sector. A variety of projects to strengthen sink development in the LULUCF sector have been launched since summer 2022 when the preliminary data on the declining sink trend became available (LULUCF sector actions are described in Section 5.9).

In the absence of significant additional action in the LULUCF sector, it is likely that Finland will not achieve the commitments laid down in the EU's LULUCF Regulation. Achieving the national carbon neutrality target also requires additional measures in the LULUCF as well as other sectors. Based on available inventory data, a deficit of tens of millions of tonnes in relation to the commitment in force has already accrued from 2021–2022. The achievement of the national carbon neutrality target in 2035 also requires a significant increase in the net sink compared to the 2021–2022 level and more rapid reduction of emissions. If the sink level in accordance with the EU commitment is not reached, Finland

must acquire an equivalent amount of reduction credits from other Member States. If the deficit cannot be covered by means of buying LULUCF sector credits, the deficit for the 2021–2025 period is transferred to the effort sharing sector. Due to the already ambitious effort sharing sector obligation and the magnitude of the potential deficit of the LULUCF sector, covering the deficit to any significant extent by means of additional action in the effort sharing sector is in practice impossible. If the deficit is transferred to the effort sharing sector, it is likely that Finland will have to buy effort sharing sector emission credits from other Member States. There is currently no data on the availability or price of credits of either sector. Under the Climate Act, the Climate Plan for the Land Use Sector must be prepared at least in every other parliamentary term. This means the next Climate Plan for the Land Use Sector must be prepared no later than in the 2027–2031 parliamentary term. Based on current data, the preparation of a new Climate Plan for the Land Use Sector should, however, already be considered during the current parliamentary term. The Climate Act also requires that the plan be assessed during the current parliamentary term.

Measures to meet the obligation set by the EU for the effort sharing sector are outlined in Finland's Medium-term Climate Change Policy Plan completed in 2022. The magnitude of the measures is such that the obligation will be met by a low margin, although there are always uncertainties involved in the emissions reduction impacts of measures. One of the plan's key measures, the implementation of which was not completed during the previous government term, was the increase of the distribution obligation of biofuel in light fuel oil. To ensure the achievement of the effort sharing sector's obligations, it would be important to include the increased obligation in legislation during the current government term. The change in the net sink of the LULUCF sector has also increased uncertainty as regards whether LULUCF flexibility will be available in the effort sharing sector in the 2026–2030 period as assumed in the Medium-term Climate Change Policy Plan issued in 2022. The availability of the flexibility and any compensatory measures should be reassessed in conjunction with the update to the Medium-term Climate Change Policy Plan. The plan is updated once in every parliamentary term.

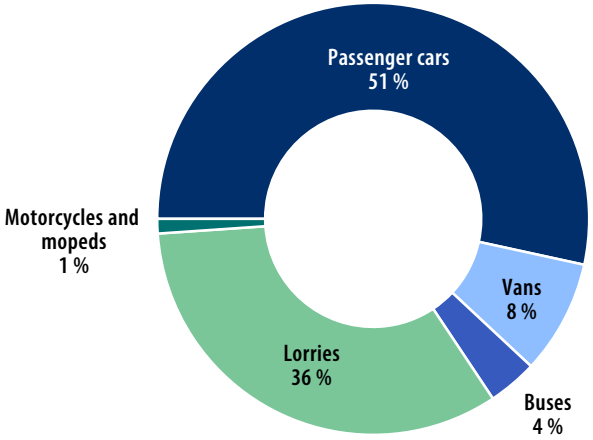
5 Emissions reduction measures by sector

5.1 Transport

Transport is the biggest source of effort sharing sector emissions in Finland. It accounted for around 37% of the effort sharing sector emissions and around 21% of total emissions in 2022. GHG emissions from domestic transport, excluding CO_2 emissions from domestic aviation, are accounted for under the effort sharing sector. Most of the emissions are generated in road transport (around 96%), with the more specific breakdown by mode of transport shown in Figure 6.

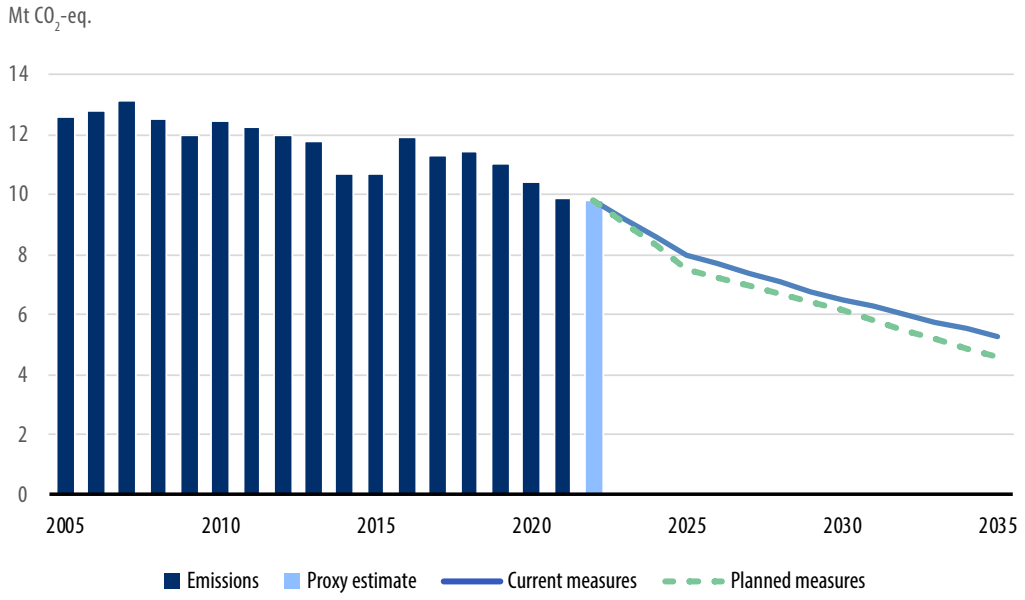
Transport emissions have as a rule decreased since 2008, including in recent years. Statistics Finland's proxy estimate shows that GHG emissions from domestic transport excluding CO_2 emissions from domestic aviation in 2022 totalled around 9.8 Mt CO_2eq. In 2021, domestic transport emissions excluding CO_2 emissions from domestic aviation were around 9.9 Mt CO_2eq. Transport emissions remained almost at the previous year's level in 2022. In 2021, emissions decreased by around 4% compared to 2020 (see Figure 7). The 2021 emissions reduction was affected in particular by the increase in the share of biofuels from 11% to around 18%. In 2022, however, the share of renewable transport fuels declined slightly, from 18% to around 16% (see Appendix 3, Figure 28). On the other hand, the final consumption of transport fuels also decreased, resulting in emissions remaining almost at the same level. Nevertheless, transport fell around 0.3 Mt short of the emissions reduction trajectory calculated in the baseline scenario for transport (2021) that would lead fairly steadily to transport emissions being halved in 2030.

Figure 6. Breakdown of greenhouse gas emissions from road transport in 2022.



A temporary lowering of the renewable fuel distribution obligation in 2022–2023 was agreed in 2022. On the other hand, the distribution obligation was increased beyond the original obligation pathway for 2024–2030 so that the increase in emissions caused by the temporary lowering can be compensated for. The new Distribution Obligation Act entered into force on 1 January 2023. Under the new Act, the distribution obligation increases to 28% in 2024 and to 34% in 2030. The distribution obligation is a key action for the reduction of transport emissions and the entire effort sharing sector's emissions and for the achievement of the obligation under the EU Effort Sharing Regulation. From 2022 onwards, the distribution obligation also takes account of gas.

Figure 7. Emissions from domestic transport (excl. CO_2 emissions from domestic aviation) in 2005–2022 as well as an estimate based on the baseline scenario and the target trajectory of the Roadmap to Fossil-Free Transport (planned measures) for 2023–2035. Data for 2022 is based on a proxy estimate.



Emissions reduction strategies for transport

The objectives and actions for reductions in GHG emissions from transport until 2030 are set out in the government resolution on reducing domestic transport's greenhouse gas emissions (Roadmap to Fossil-Free Transport). The resolution was adopted by the Government in May 2021. The objectives and actions of the Roadmap are also included in the Medium-term Climate Change Policy Plan (2022).

In May 2021, resolutions were also adopted to reduce GHG emissions from aviation as well as from maritime and inland waterway transport. The resolution on reducing GHG emissions from aviation aims to reduce emissions from domestic aviation and outgoing international flights from Finland by 15% by 2030 and by 50% by 2045 compared to the 2018 level. The aim for international maritime transport is to reduce GHG emissions by at least 50% by 2050 compared to the 2008 level. The resolutions have confirmed domestic actions and the focus areas for international influencing to reach these targets.

In spring 2021, the Government also decided on the National Transport System Plan for 2021–2032 The plan is based on the Transport System and Highways Act (503/2005) and was prepared at the parliamentary level. The objectives and strategic guidelines of the plan seek to improve people's opportunities to choose more sustainable modes of mobility especially in urban regions. Other objectives of the plan relate to accessibility and efficiency. The plan aims to improve capacity for sustainable transport by measures such as shifting the focus in transport network maintenance and development to the rail network, developing the infrastructure for walking and cycling as well as for park-and-ride facilities, developing public transport and travel chains, and increasing the efficiency of making use of data in the transport system.

Three phases in transport emissions reduction actions

The implementation of the measures of the Roadmap to Fossil-Free Transport and the Medium-term Climate Change Policy Plan is underway. As set out in the Roadmap, the measures are implemented in three different phases. The measures seek to achieve an emissions reduction of around 1.25 Mt CO_2-eq by 2030 compared to the baseline scenario. All in all, transport emissions should be reduced from the 2021 level by around 3.65 Mt by 2030 (both the Roadmap measures and the previously agreed baseline measures).

Most of the Roadmap's subsidy and incentive measures (Phase 1 measures) became effective at the beginning of 2022. These include updated support programmes for the promotion of public distribution infrastructure and private charging infrastructure as well as the updated purchase and conversion subsidy. It has not, however, been possible to obtain funding for all of the Phase 1 measures as proposed by the Roadmap. There are shortages in the funding of walking, cycling and public transport in particular.

Phase 2 of the Roadmap involved investigations into the emissions reduction impacts of remote work, mobility services and combined transport. It was also assessed whether the distribution obligation could be increased and what impacts it would have on transport emissions and fuel prices. The amendment to the Distribution Obligation Act entered into force on 1 January 2023.

The processing of the transport-related proposals of the Fit for 55 package presented by the European Commission in July 2021 also continued in 2022. In October 2022, a provisional agreement was reached on the Regulation on CO_2 emission performance standards for passenger cars and vans under which car manufacturers must reduce emissions from new passenger cars and vans manufactured by them by 100% in 2035 compared to 2021. In practice this means that from 2035 onwards only zero-emission cars will be permitted. December 2022 saw the conclusion of a provisional agreement on a new EU ETS 2 for road transport and building-specific heating that is set to come into force in either 2027 or 2028 depending on the world market prices of fuels. The EU ETS 2 regulations concern fuel suppliers, but the impacts are likely to be passed on to consumer prices of fuels. In March 2023, a provisional agreement was reached on the new Regulation for the deployment of alternative fuels infrastructure (AFI) promoting the creation of infrastructure for new fuels for the various transport modes. In February 2023, the Commission also tabled a proposal for a revision of the CO_2 emission standards for heavy-duty vehicles steering towards the manufacture and sale of zero-emission lorries, buses and coaches. Under the proposal, emissions from new lorries, buses and coaches would have to fall by 45% by 2030, by 65% by 2035 and by 90% by 2040.

The Roadmap to Fossil-Free Transport states that the conditional Phase 3 of the Roadmap will be deployed if measures included in Phase 1 and Phase 2 together with EU measures and other measures are insufficient to halve transport emissions. In practice, Phase 3 would mean measures such as the introduction of a national emissions trading system or a transport tax model based on kilometres driven and road categories in Finland. According to an assessment conducted by the Ministry of Transport and Communications in January 2022, the conditional Phase 3 would not be needed if all measures under Phases 1 and 2 are implemented in full, the EU legislation enters into force as proposed, and all of the emissions-reduction potential included in the Roadmap is realised as expected.

Implementation and ability to have effects of transport emission reduction measures

The following three factors play a key role in terms of the emissions trend in transport: the trend in transport performance (the number of kilometres driven), the energy-efficiency of means of transport, and the propulsion (energy sources) used in transport. Current and planned measures relating to these areas and their assessed ability to have effects in relation to the baseline projection concerning GHG emissions from transport (2021/2022) are examined below.

Propulsion or energy sources used in transport

Objectives

For GHG emissions from transport to be halved by 2030, fossil fuel consumption in 2030 compared to 2005 must be nearly halved over the same period. Fuel consumption can be reduced by reducing the number of kilometres driven or the amount of fuel consumed by individual means of transport or by phasing out fossil fuels altogether. In 2030, 34% of the remaining fuel consumption will be covered by renewable fuels such as liquid biofuels produced from sustainable raw materials, biogas and possibly also hydrogen and/or electrofuels made from hydrogen.

Status

The consumption of fossil petrol and diesel has generally decreased in recent years as transport performance growth has been slowing and the share of renewable energy has been increasing. In 2021, the total consumption of fossil fuels in road transport was 35.9 TWh. Fossil petrol consumption was 13.2 TWh, fossil diesel consumption 22.6 TWh and natural gas consumption 0.1 TWh. The figures for 2022 were 12.5 TWh, 23.2 TWh and 0.01TWh, respectively, totalling 35.7 TWh. The total consumption of these fuels in 2005 was around 44 TWh.

The consumption of renewable fuels and electricity in road transport totalled around 7.2 TWh in 2022. New energy sources accounted for around 17% of the total energy consumed in domestic road transport. The aggregate share of liquid biofuels was 15%. The share of electricity was 1.1%, natural gas 0.02% and biogas 0.7%.

The public charging network for electrically powered passenger cars has developed rapidly in recent years and has reached a rather extensive coverage across the country. The network is the densest in urban areas and alongside key main roads. The number of high-power charging points has also increased in these areas. There were a total of around 7,700 public charging points in late 2022. Of these, around 1,500 were high-power fast-charging points. So far, there is no public charging infrastructure for heavy-duty vehicles, with electric buses in urban transport and short-range electric delivery vehicles currently using private charging infrastructure.

The number of gas filling stations has also increased in Finland. In late 2022, there were a total of 73 compressed biogas (CBG) and compressed natural gas (CNG) filling stations and 14 liquefied biogas (LBG) and liquefied natural gas (LNG) filling stations in Finland. The share of biomethane in total methane in transport use increased significantly in 2022.

Its share was 56% in 2021 and 98% in 2022. The key factor explaining this was the price of natural gas, which in 2022 rose higher than the price of biogas mainly due to Russia's war of aggression and the resulting energy crisis.

Key measures implemented and assessment of their ability to have effects

The Distribution Obligation Act, which regulates the use of renewable energy in transport, was amended twice in 2022. The first amendment lowered the obligation level for 2022 by 7.5 percentage points (from 19.5% to 12%). The second amendment lowered the obligation level for 2023 by 7.5 percentage points (from 21% to 13.5%) and raised the obligation levels for 2024–2030. The lower distribution obligation for 2022 caused an estimated emissions increase of around 0.85 Mt compared to the baseline projection for GHG emissions from transport (2021).

An infrastructure support programme for the transport use of electricity and biogas has been in use in Finland since 2018. Support to a total of around EUR 35 million has been allocated to public electricity and gas distribution infrastructure for 2022–2023. The construction of biogas filling stations could not, however, be supported in 2022, as the Commission did not notify Finland's distribution infrastructure support programme (concerning gas) early enough for the programme to be implemented. The appropriations reserved for support for gas filling stations were transferred for use as support for charging points. In 2022, a total of EUR 11.79 million was granted in support for the construction of 1,060 charging points. Some of the supported projects also included public charging points suitable for the charging of heavy-duty electric vehicles. Hydrogen filling stations were included in the support programme in 2022, and the Energy Authority granted a total of EUR 1.6 million in support for the construction of hydrogen filling points.

Since 2018, Finland has also supported the construction of electric car charging points in housing companies. From the beginning of 2022, the support has been granted not only to housing companies but also electric car charging equipment installed at workplaces. A total of EUR 32.5 million has been allocated for 2022–2023 for charging grants for housing companies and workplaces. The grants have been very popular. By 31 December 2022, a total of around 2,100 positive grant decisions had been made, with the aggregate amount granted totalling around EUR 31 million. Grants had been or are being used to construct around 46,500 units with readiness for electric vehicle charging.

According to an estimate by VTT Technical Research Centre of Finland (2020), in 2030 support for public charging infrastructure could create an emissions reduction effect of around 0.01–0.02 Mt and grants for charging at housing companies and workplaces an

emissions reduction effect of around 0.02–0.1 Mt. These estimates are based on the 2020 support level, which was lower than the 2022 level. Higher amounts of support may have a greater emissions reduction effect.

Energy-efficiency of means of transport

Objectives

The Roadmap to Fossil-Free Transport and the Medium-term Climate Change Policy Plan (MTCCPP) set the objective of the share of zero- or low-emission new technologies in new passenger cars sold growing from the current around 20% to as close to 100% as possible by 2030. There should be around 750,000 electrically powered passenger cars, with at least half of these pure electric ones, in circulation in 2030. The target for gas-powered cars is around 130,000 vehicles. As regards heavy-duty vehicles, the target is around 4,600 electrically powered lorries, buses and coaches and around 6,200 gas-powered ones.

Status

Alternative propulsion (in this context electric, off-vehicle charging (plug-in) hybrid and gas) accounted for around 6.2% of Finland's passenger cars commissioned for traffic use at year-end 2022. The number of electrically powered passenger cars in particular has increased rapidly in recent years. At year-end 2022, there were around 44,900 pure electric cars and around 104,000 off-vehicle charging (plug-in) hybrids in circulation, totalling around 148,900 electric vehicles. The number of gas vehicles in circulation was around 15,600 at year-end 2022.

Passenger cars with an alternative propulsion system accounted for around 38.3% (electric 37.6%, gas 0.7%) of first-time registered passenger vehicles in 2022. In January-March 2022 their share had already risen to 50.2% (electric 49.7%, gas 0.5%). With these rates of growth, it would appear likely that the 2030 target for electric cars will be reached. According to data received from the automotive sector, however, the number of orders of electric cars has declined significantly since autumn 2022. Since the waiting periods for cars are long, this is yet to be reflected in first-time registrations but will be reflected in the figures during 2023. If the decline in demand persists for a long time, it is less likely the electric car target is reached. It appears highly unlikely that the gas car target is reached. This is due to decisions made by several car manufacturers to phase out the development of gas-powered vehicles.

Vehicles with an alternative propulsion system accounted for around 3.3% (electric around 0.5%, gas 2.8%) of first-time registered lorries and around 69.8% (electric 66.9% and gas 2.9%) of first-time registered buses and coaches at year-end 2022. At year-end 2022, there were a total of 25 electrically powered and around 500 gas-powered lorries as well as around 550 electrically powered and around 70 gas-powered buses and coaches in traffic use in Finland. Reaching the targets set for 2030 would require a considerably more rapid rate of growth in the shares of both electrically and gas-powered vehicles sold.

Key measures implemented and assessment of their ability to have effects

The proposal for new CO_2 emission standards binding on vehicle manufacturers was adopted by the EU in March 2023. Under the new rules, vehicle manufacturers in the EU must reduce the CO_2 emissions of their new passenger cars by an average of 55% and from their new vans by an average of 50% in 2030 compared to the 2021 level. The manufacture of new vehicles running on fossil fuels will end completely in 2035.

In February 2023, the Commission also tabled a proposal for a revision of the Regulation on CO_2 emission standards for heavy-duty vehicles. The Commission proposed a tightening of the CO_2 emission standards so that emissions from new heavy-duty vehicles would decrease at the EU level by 45% from 2030 onwards, by 65% from 2035 onwards and by 90% from 2045 onwards compared to 2019. If implemented, this would steer development strongly towards heavy-duty vehicles also running on electricity and hydrogen. Negotiations on the new regulation proposal have only just begun in the EU.

According to an estimate by VTT Technical Research Centre of Finland (2021), the Regulation setting CO_2 emission performance standards for passenger cars and vans will reduce GHG emissions from transport by around 0.041 Mt in 2025. The existing Regulation setting CO_2 emission performance standards for heavy-duty vehicles will reduce emissions by around 0.018 Mt in the same year. The emissions reduction effects of the new regulation in Finland have yet to be assessed.

In 2018, Finland introduced a purchase subsidy for pure electric cars and a conversion subsidy for converting old cars to run on ethanol or gas. The subsidies were originally intended to be open for applications in 2018–2021, but the subsidy period was extended in 2022. So far, an appropriation totalling around EUR 50 million has been allocated to purchase and conversion subsidies. A total of EUR 37 million was allocated to purchase and conversion subsidies for pure electric cars in 2018–2022.

In 2022, a total of EUR 13.5 million was available for purchase and conversion subsidies for passenger cars. In 2023, these subsidies are no longer available. A total of almost 8,800 subsidised electric cars were purchased in 2022. There were a total of around 1,400 conversions (ethanol 1,240, gas 164).

A purchase subsidy for gas-powered lorries was taken into use in December 2020 and a purchase subsidy for electrically powered lorries was taken into use from the beginning of 2022. A total of EUR 6 million has been reserved for subsidies for lorries for 2022–2023. The number of subsidised electrically and gas-powered lorries purchased in 2022 totalled around 100 (electric 34, gas 67) in 2022.

In 2022, a new purchase subsidy was also taken into use for electrically and gas-powered vans, too. An appropriation totalling EUR 6 million has been allocated for purchase subsidies for vans for 2022–2023. The number of subsidised electric vans purchased in 2022 totalled 473.

According to an estimate by VTT Technical Research Centre of Finland (2021), the purchase subsidy for electric cars will reduce GHG emissions from transport by around 0.017 Mt in 2025. According to an estimate made on the basis of a survey by the Finnish Transport and Communications Agency (Traficom), the emissions reduction achieved in 2022 by means of purchase subsidies for pure electric cars was around 0.01 Mt. According to an estimate by VTT Technical Research Centre of Finland (2021), purchase subsidies for electrically and gas-powered lorries would reduce emissions by around 0.009 Mt in 2025. Purchase subsidies for electrically and gas-powered vans would reduce emissions by around 0.004 Mt.

The electrification of transport was also supported in 2020–2022 by means of various taxation changes. The taxable value of zero- and low-emission company cars has been reduced for a fixed term, and the fringe benefit of charging electric cars at the workplace is exempt from tax for a fixed period. The tax exemption limit of employer-subsidised commuter tickets has been raised and employer-provided bicycles have been made tax-free to up to EUR 750 per year. The car tax for pure electric cars has been abolished starting from 1 January 2022, but the amendment applies to car tax retroactively from the beginning of October 2021. In that context, the basic tax in vehicle taxes was increased for pure electric cars purchased after the amendment.

According to an estimate by the Ministry of Finance, the abolition of the tax on pure electric cars will result in an emissions reduction of around 0.01 Mt in 2030.

Trend in transport performance or kilometres driven

Objectives

The Roadmap to Fossil-Free Transport and the Medium-term Climate Change Policy Plan (MTCCPP) set the objective of passenger car performance, that is, the kilometres driven by passenger cars, no longer increasing in the 2020s. If people's mobility needs still grow in Finland, the aim is for this growth to be directed to sustainable modes in urban regions and inter-urban transport. This would mean an increase of around 10% in the performance of each sustainable mode of transport in 2030. In rural areas, passenger car performance may still grow with regard to individual households, but with the population concentrated in urban regions, the nationwide aggregate household performance will remain at the 2019 level.

Status

According to Fintraffic data, highway performance in 2022 remained at roughly the same level as in 2021. Data is not yet available on the trend in street performance. In 2021, the total number of kilometres driven on Finnish roads was 48.3 billion kilometres, down 0.5% year on year. In 2021, road traffic volumes increased on highways by 2% and decreased on streets and private roads by 7%.

The COVID-19 pandemic had a negative impact on sustainable transport modes. The recovery of public transport passenger volumes has been slow, with it being likely to take several years to reach the pre-pandemic levels in urban regions. It is unclear whether the decline in public transport passenger volumes can be attributed more to remote work having become more common or to the use of passenger cars having become more popular.

According to the 2022 National Travel Survey, 62% of all trips within Finland were made by passenger car. The second most common mode was walking, accounting for 23% of trips. Cycling accounted for 7% and public transport for 6% of trips made. Sustainable travel modes accounted for a total of 12.8% of kilometres travelled, while in 2016 the corresponding figure was 15.2%.

Key measures implemented and assessment of their ability to have effects

The implementation of land use, housing and transport (LUHT) agreements continued in 2022. The agreements with the urban regions of Helsinki, Tampere, Turku and Oulu were concluded in 2020 and the agreements with Lahti, Jyväskylä and Kuopio in 2021. This means the LUHT agreements cover 55% of the population of Finland. The agreements

seek stronger mitigation of climate change through the integrity of urban structure and through sustainable transport modes. The aim is to coordinate measures to develop urban structure and the transport system in a way that creates capacities for a sufficient and diverse supply of plots and housing production, a denser urban structure and a well-functioning, safe and sustainable transport system.

Monitoring relating to the LUHT agreements shows a slight downward trend in GHG emissions from transport in the regions covered by the agreements. The emissions reductions in the period between 2005 and 2020 totalled around 15%. It is, however, unclear how much of the emissions reduction resulted from an increase in the share of renewable fuels and improvements in the energy-efficiency of the fleet of vehicles in the region concerned and how much from the increased efficiency of the transport system.

According to the Roadmap to Fossil-Free Transport, central government will direct EUR 30 million per year in funding for the investment programme for walking and cycling in 2022–2024. The funding is subject to the municipalities using an equivalent amount to finance walking and cycling projects. These projects improve the conditions and attractiveness of walking and cycling and, consequently, increase the amount of trips made by walking and cycling and their share of travel modes.

In 2020, EUR 32.9 million and in 2021 almost EUR 30 million was allocated for grants to municipalities. The funding available for 2022 amounted to EUR 6.5 million. The total amount of support granted by Traficom was, however, EUR 15.4 million, as funding transferred from previous years or recovered from projects was also available.

According to a Traficom estimate (2020), the investment programme for walking and cycling could generate emissions reductions totalling around 0.004 Mt per year if assuming an annual budget of EUR 30 million for the programme. In addition to emissions reductions, clear public health benefits would also be achieved.

Alongside walking and cycling, public transport is the foundation for sustainable urban transport. Central government provides annual support for public transport in large and mid-sized urban regions. In 2022, the public transport support to large urban regions totalled EUR 12.25 million and to mid-sized urban regions EUR 8.625 million. According to the Roadmap to Fossil-Free Transport, the public transport support to large and mid-sized urban regions for 2022–2024 will be doubled. The measure was only partly implemented in 2022, as the increase in appropriations to large and mid-sized urban regions totalled EUR 3 million.

In addition to support earmarked for public transport, in 2022 urban regions were also provided with around EUR 19 million in support for implementing climate-based measures. The appropriation is used for climate-based public transport grants and other climate-based measures in accordance with the LUHT agreements. The majority of the climate-based support granted in 2022 was allocated to the introduction and operation of a clean public transport fleet, especially electric buses. In addition, around EUR 1 million was granted for marketing projects promoting the use of public transport.

According to a Traficom estimate (2020), public transport support could generate emissions reductions totalling around 0.008 Mt in 2030.

Various studies indicate that fuel prices have a major impact on the amount of transport performances. Fuel prices were affected significantly in 2021–2022 by Russia's attack against Ukraine, the appreciation of the US dollar against the euro, and the post-COVID-19 increase in demand. The world market price of crude oil increased by around 87% from June 2021 to June 2022. The pump prices of diesel increased by around 57%, by a total of EUR 0.85 per litre, over the same period. The price of crude oil has subsequently (from July 2022 onwards) dropped almost to the pre-war level. Fuel prices also took a downturn in July 2022, with the downtrend continuing until the turn of the year. January-February saw a slight increase in prices, but since then the prices have flattened out at around EUR 2 per litre.

In addition to the world market price of crude oil, fuel prices in Finland are also affected by the Finnish distribution obligation. An estimate by AFRY shows that the 34% distribution obligation currently in force would increase pump prices of diesel by around EUR 0.17–0.32 per litre in 2030, depending on the scale of new transport policy measures implemented to reduce fuel consumption. A larger scale of additional measures would result in a lower increase in prices, whereas a smaller scale would result in a higher increase in prices.

VTT Technical Research Centre of Finland has estimated that a fuel price increase of around EUR 0.11–0.13 per litre would result in an emissions reduction of around 0.3–0.4 Mt in 2030. The Finnish Climate Change Panel in turn has estimated that a price increase of EUR 0.80 would result in an emissions reduction of around 0.15 Mt and a price increase of EUR 0.34 in an emission reduction of around 0.6 Mt in 2030.

Estimate of achievement of transport emission reduction targets in 2030

Under the targets set in the Medium-term Climate Change Policy Plan, transport emissions should be cut by 50% by 2030. If the emissions reductions took place in equal annual amounts in 2022–2030, emissions would need to be reduced by around 0.4 Mt each

year. In 2020 and 2021, the transport emission reductions were sufficient in terms of the targets, but this was partly due to the exceptional circumstances of these years (COVID-19 pandemic, Russia's attack against Ukraine and higher fuel prices). Proxy estimate data for 2022 shows a considerable slowdown in reductions of transport emissions. There is a risk of emissions reductions slowing down or even an upturn in emissions. There are also risks involved in, for example, the future trend in electric vehicle sales.

Table 3. Transport sector – key policy measures in place

Policy measure	Implementation status
Biofuel distribution obligation	The obligation to distribute biofuels under the current Act (446/2007) will increase to 34% in 2030. In 2023, the obligation is 13.5%. In 2024, the obligation will increase to 28%.
Support for distribution infrastructure	A total of EUR 35 million has been reserved for support for the construction of public charging points and filling stations for 2022–2023. The support authority is the Energy Authority. The Government Decree on Infrastructure Support for Electric Transport, Biogas and Renewable Hydrogen in 2022–2025 entered into force in March 2022. A total of EUR 32.5 million has been allocated for 2022–2023 for charging grants for housing companies and workplaces. The support authority is the Housing Finance and Development Centre of Finland (ARA). The support is granted on the basis of the budget entry and the criteria determined by ARA.
Purchase subsidies and conversion subsidies for electrically and gas-powered vehicles	So far, a total of EUR 50 million has been allocated for 2018–2024 for purchase and conversion subsidies for passenger cars, vans and lorries. The Act on Fixed-Term Subsidies for Purchasing and Converting Vehicles to Use Alternative Fuels or Propulsion Systems (1289/2021) entered into force on 1 January 2022. The subsidy programme for passenger cars ended at the end of 2022.
Transport taxation changes	Changes to taxation of transport-related fringe benefits from employment were decided in the government budget sessions of autumn 2020 and spring 2021. These changes encourage the purchase of low-emission company cars as well as employer-provided bicycles and employer-subsidised commuting tickets. In autumn 2021, a decision was made to exempt pure electric cars from car tax.
Land use, housing and transport (LUHT) agreements	The agreements with the urban regions of Helsinki, Tampere, Turku and Oulu were concluded in 2020 and the agreements with Lahti, Jyväskylä and Kuopio in 2021.

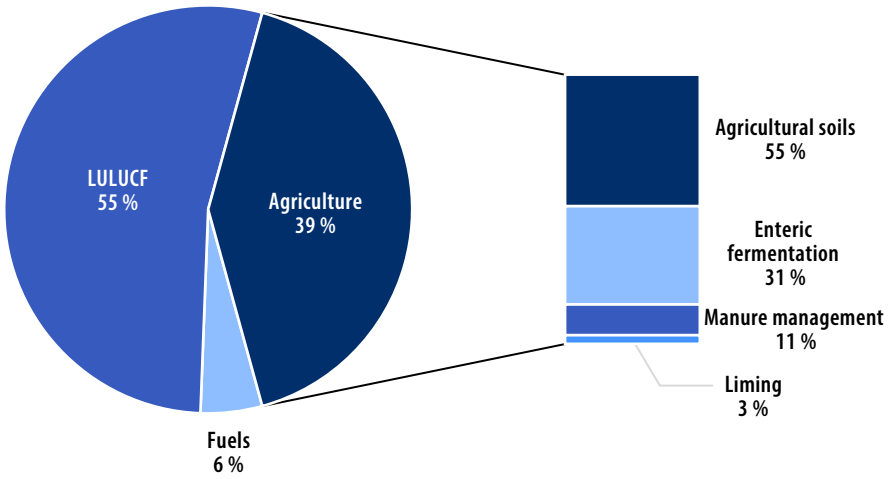
Policy measure	Implementation status
Investment programme promoting walking and cycling	The investment programme promoting walking and cycling improves walking and cycling conditions in the municipal street network. The funding available for 2022 amounted to EUR 6.5 million.
Public transport support	In 2022, the support to large urban regions totalled EUR 12.25 million and to mid-sized urban regions EUR 8.625 million. In addition, Traficom granted public transport authorities climate-based support amounting to around EUR 19 million in 2022.

5.2 Agriculture

Agricultural emissions have remained stable

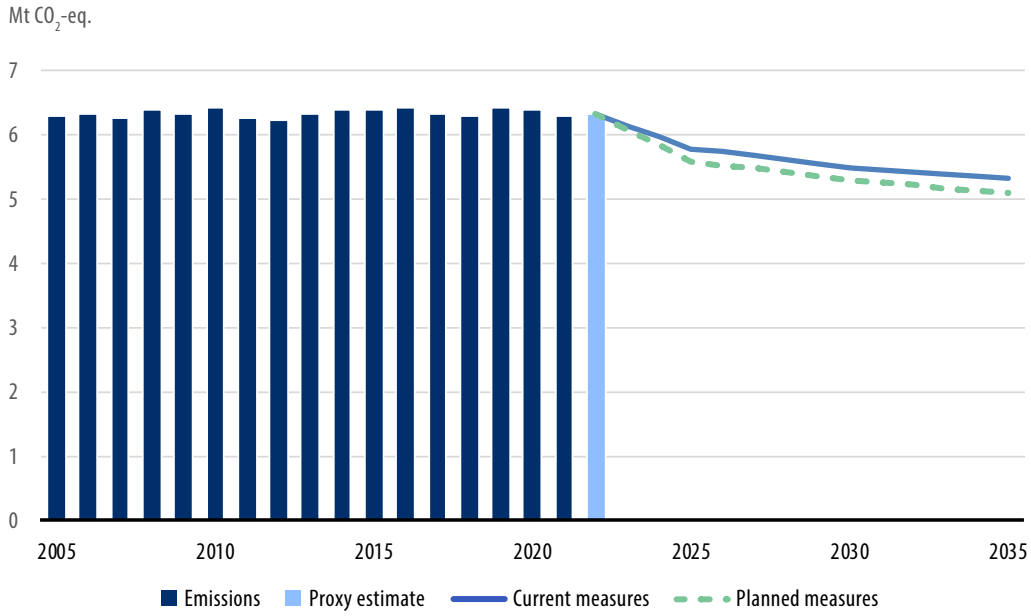
Greenhouse gas (GHG) emissions from agriculture are reported under several reporting sectors. The effort sharing sector covers methane and nitrous oxide emissions from agriculture, mostly from livestock, manure and soil, as well as CO_2 emissions from liming. Small quantities of emissions are also generated from urea fertilisation. CO_2 emissions from cropland and grassland are reported in the land use, land use change and forestry (LULUCF) sector. Furthermore, emissions from the use of fuels in agricultural machinery, building-specific heating and grain dryers are reported under the energy sector of the effort sharing sector (Figure 8).

Figure 8. Breakdown of greenhouse gas emissions from agriculture into the effort sharing sector (agriculture and fuels) and LULUCF sector based on proxy estimates for 2022.



Emissions from agriculture accounted for under the effort sharing sector, excluding emissions from the use of energy, have remained relatively stable in recent years. In 2021, agricultural emissions remained at the previous year's level and were around 6.3 Mt CO_2eq. (Figure 9.) According to the proxy estimate, emissions remained at the same level in 2022, too. A slight decrease in the number of bovine animals and pigs reduced emissions from enteric fermentation and manure management, whereas higher crop yield levels increased soil emissions from crop residues so that the total emissions from agriculture remained at the previous year's level.

Figure 9. Emissions from agriculture in 2005–2022 and an estimated emissions trend that can be achieved with existing measures in 2023–2035. Data for 2022 is based on a proxy estimate.



Emissions reported in the LULUCF sector have also remained more or less at the same level since 2005. Around three quarters of total agricultural emissions are soil-related emissions when not only LULUCF sector CO_2 emissions but also nitrous oxide emissions from the agricultural sector are included. Of these emissions, again around three quarters are related to organic soils, that is, peatland. Because studies show that the most effective emissions reduction measures in agriculture are related to organic soils, emissions reduction measures in the Medium-term Climate Change Policy Plan are mainly aimed at these soils. The measures reduce emissions from both the effort sharing and the LULUCF sector.

With regard to agriculture, it is worth noting that it is not only a source of GHG emissions but also one of the few sectors alongside forests capable of removing carbon from the atmosphere and sequestering it in soil. This is made possible by favourable agricultural practices, such as winter plant cover, perennial grass and reduced tillage.

Several actions underway to reduce emissions from agricultural sector

Under the Climate Act, preparation of climate policy plans must take account of any impacts of the plans on domestic food security. GHG emissions from agriculture are reduced by means of actions specified in the Medium-term Climate Change Policy Plan and the Climate Plan for the Land Use Sector. The effort sharing sector's emissions reduction measures aimed at agriculture also have considerable impacts in the LULUCF sector, making it difficult to separate these from each other. This is why actions proposed in the Medium-term Climate Change Policy Plan overlap with actions concerning agriculture presented in the Climate Plan for the Land Use Sector.

Emissions reduction measures associated with land use changes presented in the Medium-term Climate Change Policy Plan include restricting land clearing for agriculture, restricting the transition of previous peat production areas to agricultural use, afforestation of non-productive land and converting agricultural land into climate wetlands. Measures associated with arable land use include cultivation of wet peatlands (paludiculture), adding carbon into arable land by growing grass instead of annual crops, and introducing precision farming methods. In addition, efforts are made to reduce methane emissions from dairy cows through feeding strategies.

The Medium-term Climate Change Policy Plan also presents a number of measures that are likely to contribute towards GHG emission reductions in agriculture in the future, but the magnitude of the effects of these cannot currently be calculated. These include improving the real estate composition of fields, changing the age range of cattle, increasing the use of sexed semen, improving carbon sequestration with various soil improvers, increasing compliance with nutrition recommendations, reducing edible food waste, developing public procurement, promoting carbon markets and enhancing cooperation between actors in the food system.

In the Climate Plan for the Land Use Sector, emissions reduction measures focus on peatland fields. The climate-sustainable and climate-resilient use of peatland fields is promoted by raising the groundwater table level of peatland fields to prevent the decomposition of peat or to establish paludiculture. Conversion of forests into other land use is managed in ways including developing the real estate structure of arable land, applying EU Common Agricultural Policy (CAP) rules and preparing a land use change fee. In addition, the afforestation of non-productive land and low-yield fields is promoted.

Measures to reduce emissions from agriculture are mainly implemented by means of measures under Finland's Common Agricultural Policy (CAP) Strategic Plan, but sufficient national measures are also needed alongside these.

Measures under the new CAP funding period commence in 2023. The aim is for 40% of the total EU funding for CAP measures to be targeted at climate measures at the EU level. Member States must use 30% of their rural development allocations to fund environmental and climate measures at the national level. The main aims of Finland's CAP Strategic Plan are to safeguard active food production, achieve climate- and environmentally smart agriculture and strengthen the vitality of regenerating rural areas.

Finland's CAP Strategic Plan contains measures that, in addition to impacts on water bodies, also contribute to adding carbon into and storing carbon in soil. There are emissions reduction impacts both in the LULUCF sector and in the agricultural sector. These measures include promoting a circular economy, investment and management support for controlled subsurface drainage, winter plant cover of arable land, and growing grasses in peatland fields.

In March 2022, the Ministerial Working Group on Preparedness decided on measures to safeguard security of supply. As part of this security of supply package, the Ministerial Working Group outlined measures to be implemented in 2022–2026 to step up, over a rapid timeframe, the transition from fossil fuels to renewable forms of energy. Additional investment support was proposed for alternative energy sources and other investments and changes relating to security of supply as well as for advanced processing techniques for biogas digestates. To improve self-sufficiency in nutrients and energy, additional funding was granted for a pilot programme in nutrient recycling and investment support was granted for measures including advanced nutrient recovery technologies and related investments in machinery, equipment, buildings and installations. Funding was also granted for paludiculture.

In late 2021, the Government set a target for the reduction of GHG emissions from agriculture. The target is to reduce aggregate agricultural emissions from the effort sharing and LULUCF sectors by 29% from the 2019 level by 2035. In April 2022, the carbon euro programme for food production was adopted. The programme integrates climate and environmental action in agriculture into a single set of actions where the emissions reductions pathway to 2035 is specified in more detail.

The national biogas programme was completed in January 2020. The most important challenges in the biogas sector are still to do with the low profitability of the activity. According to the working group, profitability could be improved by lowering investment costs, boosting the price obtained for end products sold, and increasing the efficiency of

sourcing of feedstocks obtained from agriculture. High investment costs are a slowdown factor for small-scale plants in particular. It was estimated in spring 2022 that the discontinuation of natural gas imports from Russia will strengthen the position of biogas in Finland.

Investment support for farms and rural enterprises is included in the rural development programme for mainland Finland, implemented by the Ministry of Agriculture and Forestry, that ended in 2022 and in Finland's CAP Strategic Plan in force from the beginning of 2023. Since May 2021, it has been possible to grant investment support for agriculture amounting to up to half of the eligible investment costs of a biogas plant or other renewable energy installation of a farm, and the support will continue under the new CAP Strategic Plan. The selection criteria for energy investments focus on the project's impacts on the environment and climate.

Rural enterprise support co-funded by the EU has been granted for biogas plants under the rural development programme in 2014–2020 as well as during its transition period in 2021–2022. In addition, Recovery and Resilience Facility (RRF) funding from the European Agricultural Fund for Rural Development (EAFRD) was also available to biogas plants during the transition period. Biogas plant investments (50% of eligible costs) can still be supported under Finland's CAP Strategic Plan for 2023–2027. Micro and small enterprises operating in rural areas can apply for the support. In addition, fully national funding for energy investments, such as biogas, is also available in the 2023–2027 funding period.

There are different incentive schemes for research, experiments, advisory services and investment relating to manure management and increased efficiency of nutrient recycling. The Ministry of Agriculture and Forestry pilot programme for nutrient recycling provides funding for biogas, manure management, nutrient recycling and carbon sequestration investments and innovations. The call for applications for funding from the national pilot programme opened in summer 2020 and continues until the end of 2025. The pilot programme follows on from a programme launched in 2016–2018. In addition, support for operations relating to nutrient cycling is also being prepared. This support is aimed at biogas plants producing biogas and high value-added nutrient products from manure. EUR 4 million has been allocated for the support for 2023–2025. The support is due to commence during 2023. In addition, investment support under the CAP Strategic Plan amounting up to 40% of eligible total costs can be granted for environmental investments promoting efficient manure management.

Variety of means employed to seek more sustainable nutrition habits

The Medium-term Climate Change Policy Plan highlights the reduction of edible food waste and promotion of eating in accordance with nutrition recommendations as measures related to food consumption. Due for publication in summer 2023, the Nordic Nutrition Recommendations are currently being updated. The aims of the new recommendations include clarifying the interlinkages between diet and sustainable development. Finnish nutrition recommendations are based on the Nordic Nutrition Recommendations, so the reform of the national recommendations will begin after the adoption of the Nordic ones.

Finland's National Waste Plan sets the target of halving food waste by 2030. The Finnish Waste Act (646/2011) and the Government Decree on Waste (978/2021) lay down further provisions on how food sector actors must keep records of the amount and treatment of food waste generated in their activities.

The Natural Resources Institute Finland has coordinated the work to develop a national edible food waste monitoring system for Finland. The actors in the food system have formulated a joint roadmap with key ways to reduce food loss and waste throughout the food chain.

Reducing edible food waste and changing nutrition habits do not directly reduce emissions reported in Finland for the agricultural sector and the LULUCF sector. Instead, emissions reductions require these to also result in changes in Finnish food production.

The national Climate-Friendly Food Programme was prepared under the leadership of the Ministry of Agriculture and Forestry. The programme aimed at reducing the climate footprint of food consumed and increasing understanding about food production as well as supporting society's transition towards a climate-sustainable food system taking account of all of the dimensions of sustainable development: social, economic, cultural and ecological sustainability. The Climate-Friendly Food Programme aimed to increase the share of fish, mushrooms and plant products in the diet, steer the consumption of meat and dairy products and ensure that the products consumed are more sustainably produced, reduce edible food waste, increase the use of seasonal produce, and generate added value from side streams of the food system. The Climate-Friendly Food Programme was not published, but the plan is to launch, under the leadership of the Ministry of Agriculture and Forestry, the preparation of a programme of objectives and actions into 2040 for an economically, ecologically and socially sustainable agriculture and food system in accordance with the EU legislative framework for sustainable food systems (FSFS).

Public procurement and public food services play a key role in improving the sustainability of the food system. The aim set for these is to increase the share of plant-forward food, which is also the objective of official nutrition and meal recommendations. The meal recommendations for primary, lower secondary, upper secondary and higher education recommend that vegetarian food should be offered as a free option for everyone every day or a weekly vegetarian food day should be added to the menu. In addition, adding more fish and vegetables to the menu is encouraged. Many municipalities are already applying these recommendations and have also increased the offering of vegetarian food more broadly to reach their climate targets.

The Development Programme for School Meals was published in December 2022. One of the development proposals highlighted by the programme to make school meals more responsible and sustainable was to offer a vegetarian meal option as one of the main dish options freely available to everyone.

The National Public Procurement Strategy also sets an objective concerning food and food service procurement promoting an ecologically sustainable food system. The Ministry of Agriculture and Forestry has implemented the objective by means of measures including updating the Guide to Responsible Food Procurement and organising training and events supporting responsible food procurement by food service providers. In addition, a Guide to Responsible Food Service Procurement has been produced to promote the organisation and procurement of food services ensuring overall sustainability in compliance with sustainability objectives.

Led by the Natural Resources Institute Finland, a project under the Development Fund for Agriculture and Forestry aims to harmonise and develop life cycle assessment methods for food products and the food system to enable more reliable and comparable calculation data for purposes such as carbon footprinting. In addition, the Ministry of Agriculture and Forestry is funding a project implemented by the Natural Resources Institute Finland creating generic, product-specific carbon footprint data for the food service and restaurant industry to serve the low-carbon goals of the industry's operators. The material will cover the most important domestic and imported raw materials and be compatible with the industry's manufacturing execution systems.

Table 4. Agriculture – key policy measures in place

Policy measure	Implementation status
Finland's Common Agricultural Policy (CAP) Strategic Plan	Measures relating to climate change mitigation and adaptation were reviewed in conjunction with the preparation of Finland's CAP Strategic Plan. Finland's CAP Strategic Plan was approved by the European Commission on 31 August 2022. National legislation concerning the CAP reform entered into force on 1 January 2023, and the implementation of the reform began as planned and in phases from the beginning of 2023.
Reducing methane emissions from bovine animals through feeding strategies	Currently implemented under the Catch the Carbon research and innovation programme, the climate smart feeding solutions for Finnish milk production project focuses on the use of a feed additive – 3-Nitrooxypropanol (3-NOP, trade name Bovaer®) – in the Finnish feeding system. 3-NOP is the first additive approved in the EU for reducing ruminal methane emissions. The project aims to solve issues relating to the introduction of 3-NOP relevant from the Finnish perspective.
Raising the groundwater table level and promoting the sustainable use of peatland fields	The implementation of the CAP reform began as planned and in phases from the beginning of 2023. The use of the appropriation of EUR 30 million for paludiculture decided in conjunction with the security of supply package is being prepared. The preparation of the roadmap to the use of peatland fields is beginning.
Afforestation of low-yield fields suitable for afforestation	Preparation is underway.
Promoting biogas production	The national biogas programme was completed in 2020. The implementation of the measures proposed by the working group is underway. CAP Strategic Plan: investment support for agriculture and rural enterprise support. The RDI and investment support under the pilot programme for nutrient recycling of the Ministry of Agriculture and Forestry for 2020–2025 is underway. Production support for biogas based on nutrient recycling is currently being prepared and estimated to be launched in autumn 2023. In spring 2023, a project on sustainable practices in biogas production process chains was completed under the Government's analysis, assessment and research activities (VN TEAS).
Food consumption, edible food waste and nutrition recommendations	The Nordic Nutrition Recommendations are currently being updated and will be published in 2023. The national edible food waste monitoring system was published in 2021.

5.3 Building-specific heating

There has been a downward trend in emissions from building-specific heating in recent years, but annual variation can still be seen due to reasons including heating needs. This downward trend is caused by a reduction in the use of oil heating and an improvement in the energy-efficiency of buildings. The majority of emissions from building-specific heating arise from oil heating. Emissions from building-specific heating amounted to 2.2 Mt CO_2eq in 2021, with residential buildings accounting for 41%, commercial and service buildings for 40% and agricultural buildings for 19% of the total (Figure 10). Emissions from building-specific heating have decreased by 55% from the 2005 level (Figure 11).

Figure 10. Breakdown of emissions from building-specific heating in 2021.

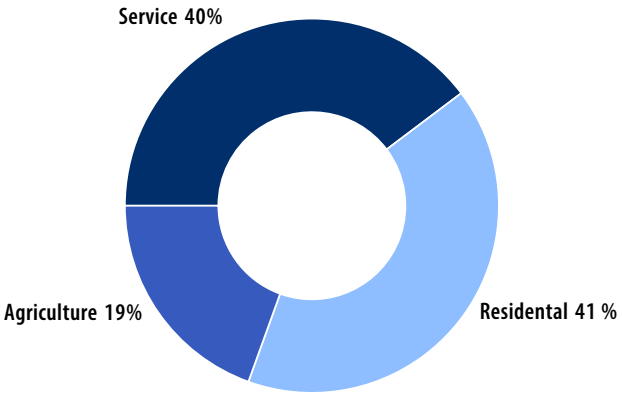
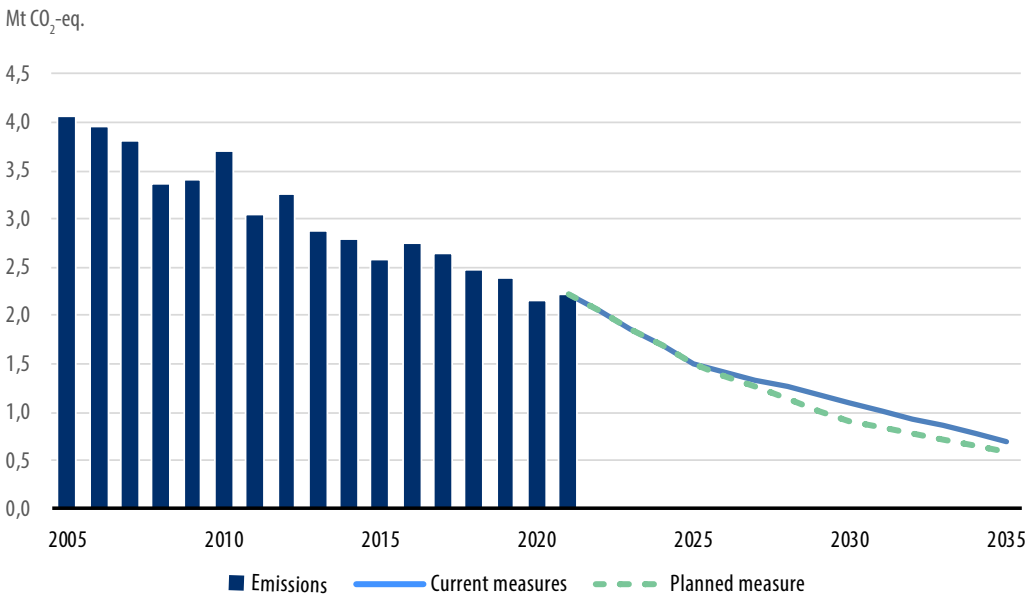


Figure 11. Greenhouse gas emissions from building-specific heating in 2005–2021 and estimated emissions trends that can be achieved with existing measures and with measures under the Medium-term Climate Change Policy Plan in 2022–2035.



The oil sector and the government have entered into an Energy Efficiency Agreement on the distribution of liquid heating oils that aims to improve the energy efficiency of oil-heated buildings and promote the use of renewable energy forms in oil heating. The agreement covers the 2017–2025 period.

Under the scenario with existing measures (WEM), emissions are projected to decrease further owing to building stock replacement, repair construction and heating system changes. Significant emissions reductions arise from the distribution obligation of biofuel oil and the replacement of fossil oil heating with other heating forms.

GHG emissions from oil heating of residential buildings amounted to 0.8 Mt CO_2eq in 2019, with around 80–90% of these being from detached and semi-detached houses. Around 40% of the total emissions from detached and semi-detached houses in turn arise from oil heating. According to a 2019 housing survey, 133,000 detached and semi-detached houses in Finland used an oil boiler in 2019. According to the survey, an oil-heated house consumed an average of 2,220 litres of oil per year. Households consume only around 5% of the total consumption of oil in the energy sector.

According to the latest data from the Finnish Gas Association for 2019, there are around 4,800 residential buildings heated with gas, of which around 4,000 are detached and semi-detached houses and around 750 terraced houses or blocks of flats. The number of natural gas stove users, which includes households as well as services, totalled around 25,400. The number of households using natural gas heating, totalling up to around 13,000 households, is all in all small considering the total number of household-dwelling units (2.8 million) in Finland. In the service sector, there are around 1,200 buildings heated with natural gas.

The phase-out of oil in residential properties is promoted by grants introduced by the government. Grants aimed at detached and semi-detached houses are available for costs arising from the removal of the oil heating system of a house in round-the-year residential use and its replacement by another heating system. The grant is available at EUR 4,000 per oil heating system of a detached or semi-detached house when the oil heating system of the house is removed and oil heating is replaced by a district heat, ground-source heat pump or air-to-water heat pump system, or EUR 2,500 per oil heating system of a detached or semi-detached house when the oil heating system of the house is removed and replaced by another heating system. In summer 2022, the grant scheme for detached and semi-detached houses was expanded to also apply to phasing out natural gas heating.

The grant for switching away from oil heating provided a considerable boost to heating system conversions. By early June 2023, already 28,357 owners of a detached or semi-detached house had applied for the phase-out grant, with a positive decision received by 24,101 applicants. The phase-out grant for gas heating had been applied for by 951 house-owners, with 889 applicants having received a positive decision. Around EUR 100 million in grant appropriations have been committed to the decisions. EUR 143.94 million has been allocated by Parliament for the grant scheme. So far, the estimated effect of the heating form conversion carried out by the recipients of a positive decision is around 0.14 Mt CO_2eq. The tax credit for household expenses available in income taxation is an alternative support form for owners of a detached or semi-detached house planning to upgrade their heating system. An increased tax credit at a maximum of EUR 3,500 per person is available in 2022–2027 on the basis of costs of work related to switching away from oil heating. This means that spouses and partners can together benefit from a tax credit totalling up to EUR 7,000.

Efforts are made to reduce emissions from residential buildings also by means of energy grants for projects improving energy efficiency. The estimated impact on annual emissions is around 0.16 Mt CO_2eq. The impact concerns emissions from all residential buildings, not just oil-heated properties. This means some of the emissions reduction impacts fall under the EU ETS sector. The 2023 Budget provided an additional budget authority totalling EUR 98.67 million for energy grants, and grants can also be received for converting heat exchangers of residential buildings to ones suitable for low-temperature district heating.

The phase-out of oil heating and switching to other forms of heating in municipally owned buildings has been expedited by grants since October 2020. In Finland, there are around 9,300 oil-heated buildings owned by municipalities and unincorporated municipal enterprises, with around 4,300 of these buildings being occupied and around 5,000 unoccupied. Even unoccupied buildings often need to be heated. The grant accounts for 30% of the approved and actual costs of the investment under the grant decision. The grant is increased by 5 percentage points if the municipality has joined a voluntary Energy Efficiency Agreement. In the 2023 Budget, EUR 10.86 million has been re-budgeted for the grant, with the targeted annual emissions reduction being around 11 kt CO_2eq.

The second supplementary budget for 2022 includes an appropriation of EUR 9.86 million for phasing out fossil oil and gas heating in buildings owned by municipalities, parishes and associations. The grant represents 30% of the investment for municipalities and 20% for parishes and associations of the actual costs approved for support in the grant decision. The grant for a municipality is increased by 5 percentage points if the municipality has joined a voluntary Energy Efficiency Agreement.

Table 5. Building-specific heating – key policy measures in place

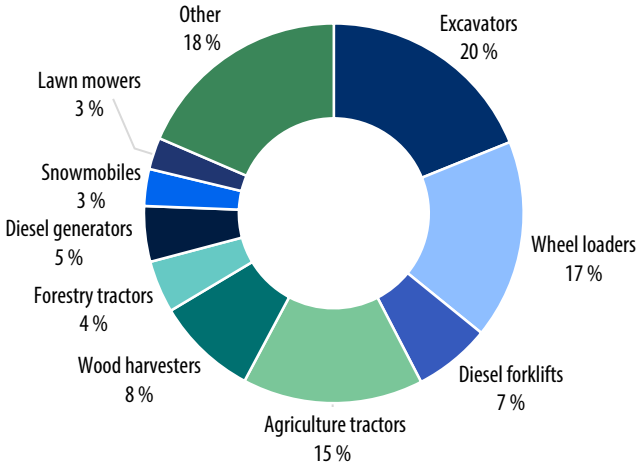
Policy measure	Implementation status
Grant to phase out oil and gas heating in residential properties.	The grant scheme for detached and semi-detached houses was launched in September 2020. In April 2022, a decision was made to expand the grant scheme to also apply to phasing out natural gas heating. The grant decisions are made by the Centre for Economic Development, Transport and the Environment for Pirkanmaa. In 2020–2023, a total of EUR 143.94 million was allocated for the grants in the Budgets. Changes to Finland's Recovery and Resilience Plan may change the situation.
The phase-out of fossil oil and gas heating is supported in buildings owned by municipalities, parishes and associations	Switching from fossil oil and gas heating to other heating forms in buildings owned by municipalities has been supported with grants since October 2020. An appropriation of EUR 14.9 million has been allocated for the grants. The second supplementary budget for 2022 includes an appropriation of EUR 9.86 million for phasing out fossil oil and gas heating in buildings owned by municipalities, parishes and associations. The grant decisions are made by the Housing Finance and Development Centre of Finland ARA.
Energy grant for residential buildings to improve energy efficiency and reduce emissions	The grant scheme was launched in 2020, and around EUR 244.4 million was available in appropriations for 2020–2023. The grant decisions are made by the Housing Finance and Development Centre of Finland (ARA).
Tax credit for household expenses when switching away from oil heating	In 2022, heating form conversions are supported with regard to switching away from oil heating by increasing the maximum amount of the tax credit for household expenses from EUR 2,250 to EUR 3,500 and the percentage of costs covered from 40% to 60%. The credit is only available for costs of work. The change is temporary and effective in 2022–2027.
Light fuel oil distribution obligation	Under the Act on Promoting the Use of Biofuel Oil (418/2019) in force since 2019, the distribution obligation for the bio-component of light fuel oil is 3% in 2021 and will increase to 10% by 2028. The government proposal on an increase in the distribution obligation of the bio-component of light fuel oil was submitted to Parliament in autumn 2022. Parliament did not, however, have time to consider the proposal by the end of the parliamentary term, which is why the proposal lapsed.

5.4 Non-road mobile machinery

GHG emissions from non-road mobile machinery (NRMM) in 2021 totalled 2.5 Mt CO_2eq, accounting for around 5% of Finland's total emissions and 9% of the effort sharing sector's emissions. NRMM emissions have remained more or less at the same level in recent years (Figure 13). The proxy estimate for 2022 shows emissions at 2.5 Mt CO_2eq. Of NRMM emissions, 46% were from industry, 12% from the service sector, 36% from agriculture and forestry and 7% from households.

NRMM includes machinery intended for a vast variety of uses from heavy excavators, road graders and agricultural and forestry machinery to forklifts, quad bikes and lawn mowers (Figure 12). NRMM emissions vary from year to year depending on factors such as business cycle fluctuations in industry and construction.

Figure 12. Breakdown of greenhouse gas emissions from non-road mobile machinery in 2022.

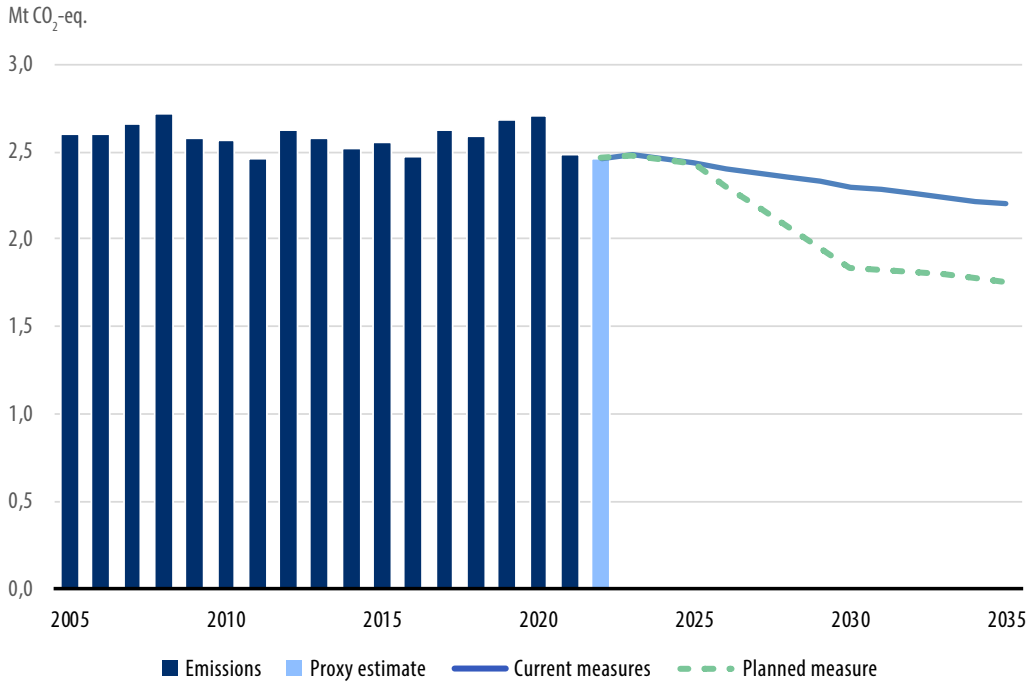


The majority of GHG emissions from NRMM in Finland are from diesel-powered machinery. The age range of NRMM is vast in Finland, and there is a considerable amount of old machinery in use, although NRMM with a high utilisation rate is significantly newer than NRMM with a low utilisation rate.

The most significant part of the environmental impacts of NRMM arises during operation and is affected in particular by the characteristics of the machinery, but a role is also played by the way the machinery is driven or operated and the work phases are planned. The most significant of these in-service environmental impacts are CO_2 emissions and exhaust emissions harmful to health. Exhaust emissions from NRMM are usually

considerably higher than those from passenger cars. Figure 13 shows the actual NRMM emissions trend and the trend in the baseline scenario with existing measures (WEM) and scenario with additional measures (WAM) until 2035.

Figure 13. Emissions from non-road mobile machinery in 2005–2022 and estimates of emissions trends according to the scenarios.



Several measures are being used to reduce CO_2 emissions from non-road mobile machinery

Under the Act on Promoting the Use of Biofuel Oil (418/2019), the distribution obligation for the bio-component of light fuel oil is 3% in 2021 and will increase to 10% by 2028. The government proposal (297/2022) included an increase in the distribution obligation for the bio-component of light fuel oil to 30% by 2030 in line with the policy outlined in the Medium-term Climate Change Policy Plan of June 2022. Parliament did not, however, have time to consider the proposal by the end of the parliamentary term, which is why the proposal lapsed. The emissions reduction impact of the increase in the distribution obligation for NRMM is estimated to be around 0.4 Mt CO_2eq in 2030.

With regard to NRMM, replacing light fuel oil with other energy sources is considerably more difficult than in building-specific heating, and the availability of, for example, electrically powered NRMM has so far been very limited. Focusing the allocation of biofuel oil on use in NRMM rather than in heating can be regarded as providing higher benefits, as there are plenty of non-oil-based systems available for heating.

The Government outlined in the September 2021 budget session that emissions reductions of 0.1 Mt CO_2eq by 2030 are sought through the promotion of biogas in the effort sharing sector. Part of this (0.04 Mt CO_2eq) also applies to NRMM. Adding biogas to the distribution obligation was assessed in a study on cost-effective means to reduce emissions from NRMM. The conclusion of the study was to not recommend the inclusion of biogas in the distribution obligation of biofuel oil, as no likely direct positive impacts or impacts promoting its use in NRMM were identified in this case. Government Proposal 297/2022 omitted biogas from the scope of the distribution obligation system.

Government Proposal 152/2022 determined the energy content tax for biogas at the EU minimum tax level of EUR 1.20 per megawatt hour when the biogas is sustainable as referred to in the Act. The scale of biogas use in NRMM is minor.

To increase the share of pure electric and other low-emission NRMM, the Ministry of the Environment and the Association of Finnish Technical Traders entered into a Green Deal agreement for the NRMM sector. Through the voluntary commitments made under the agreement, actors in the sector seek to increase the supply of pure electric and other low-emission NRMM and encourage their wider utilisation. The aim of the emission-free worksites – Green Deal on sustainable procurements agreement is for no fossil fuels being used on the worksites of the participating municipalities and Senate Properties after 2025. In addition, by 2030, at least 50% of the non-road mobile machinery used on the worksites as well as the worksite transport will be powered by electricity, biogas or hydrogen. The aims of the agreement are currently promoted through measures such as developing procurement criteria, trying out new operating models and promoting market dialogue.

Efforts are made to promote the achievement of the emissions reduction targets for the NRMM sector in particular by including new categories of machinery in the Green Deal for the NRMM sector and by new actors joining the Green Deal for emission-free worksites. The training package included in the Green Deal is a process where the contents of the training created in 2021 will be developed by taking account also of the experiences gained from the use of the training package.

The conversion of tractors to biogas is supported as an environmental investment through agricultural investment support. No support is available for the acquisition of the tractor itself. Instead, support is available for the conversion and equipment required for it to

be powered by biogas. Support is available for 40% of eligible costs, which comprise the costs of the purchase and installation of the new equipment. The Medium-term Climate Change Policy Plan published in June 2022 also outlines that the possibility of introducing procurement support for electrically and biogas-powered tractors and other NRMM will be looked into.

The impacts of the EU ETS being extended to road transport and heating of buildings and other sectors will in part also apply to emissions from NRMM.

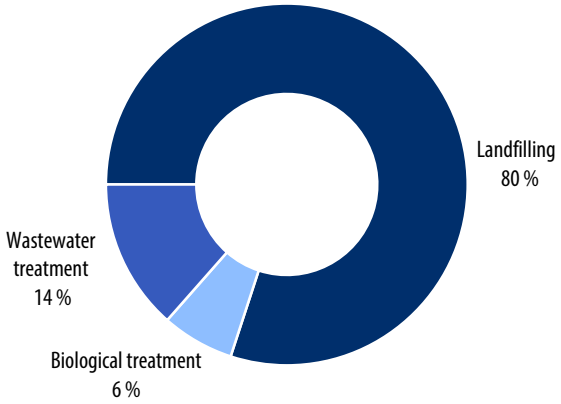
Table 6. Non-road mobile machinery (NRMM) – key policy measures in place

Policy measure	Implementation status
Light fuel oil distribution obligation	Under the Act on Promoting the Use of Biofuel Oil (418/2019), the distribution obligation for the bio-component of light fuel oil is 3% in 2021 and will increase to 10% by 2028. The government proposal on an increase in the distribution obligation of the bio-component of light fuel oil was submitted to Parliament in autumn 2022. Parliament did not, however, have time to consider the proposal by the end of the parliamentary term, which is why the proposal lapsed.
Green Deals for emission-free worksites and NRMM sector and training package for NRMM	The Ministry of the Environment and the Association of Finnish Technical Traders entered into a Green Deal agreement for the NRMM sector in 2019. The Ministry of the Environment, Senate Properties and the cities of Espoo, Helsinki, Turku and Vantaa entered into a Green Deal agreement for the reduction of emissions from worksites. A training package for the energy-efficient use of NRMM has been produced by the Ministry of the Environment together with Motiva Ltd and the Association of Finnish Technical Traders. The training package was developed and deployed in 2022 and the work continues in 2023.
Conversion of tractors to biogas and procurement support for NRMM	The conversion of tractors to biogas is supported as an environmental investment through agricultural investment support.
Developing the knowledge base – emissions calculations and review of policy instruments	The development of emissions calculations for NRMM continues as part of a project implemented by Statistics Finland.

5.5 Waste management

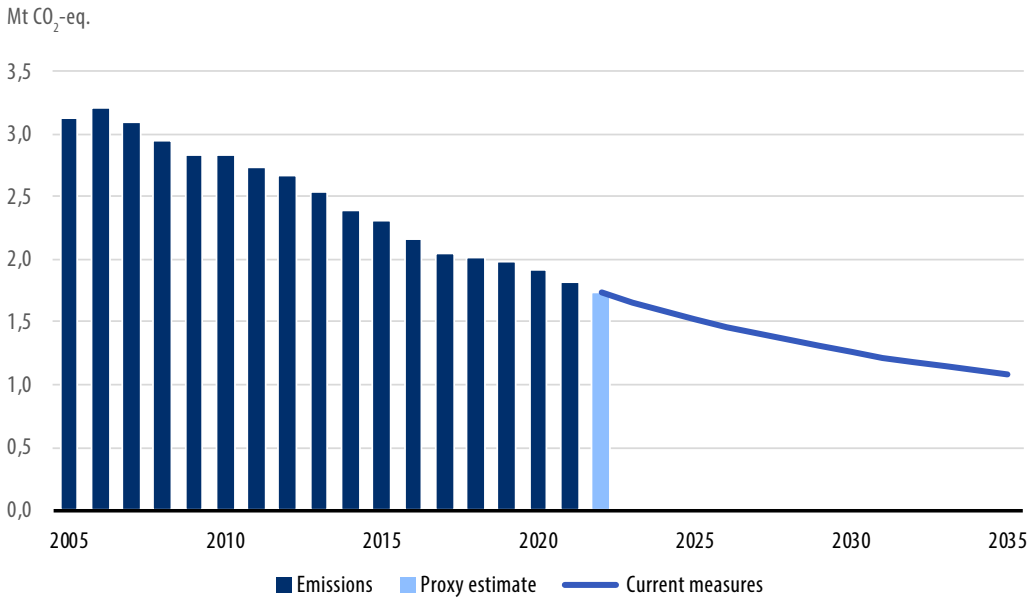
GHG emissions from waste treatment amounted to 1.8 Mt CO_2eq in 2021 and, based on proxy estimate data, to 1.7 Mt CO_2eq in 2022 (Figure 15). This accounts for around 6% of emissions from Finland's effort sharing sector. Emissions from waste treatment have decreased steadily since the 1990s. The decrease since 2005 is 45%. Methane generated by landfill sites is the most significant emission source in waste treatment. Other emission sources include the biological treatment of waste, that is, composting and anaerobic digestion, and wastewater treatment (Figure 14).

Figure 14. Breakdown of greenhouse gas emissions from waste treatment in 2022.



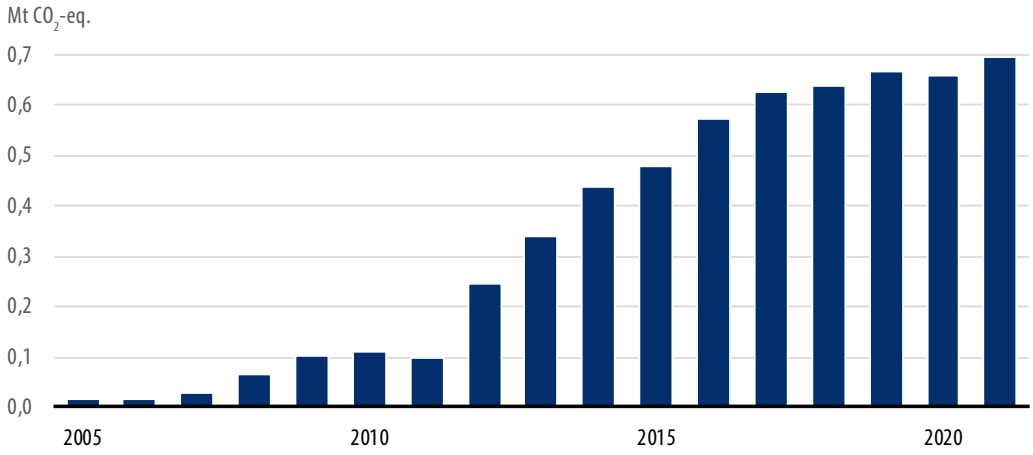
Since 2005, the biggest reduction has been seen in methane emissions from landfill sites, as the landfilling of organic waste has been reduced so that, in practice, municipal waste is no longer landfilled. The landfilling of municipal waste has been replaced almost entirely by the energy recovery and recycling of waste. The recovery of landfill gas has also reduced emissions. The downtrend in emissions is projected to continue in the near future, as the decree restricting the landfilling of organic waste that entered into force in 2016 will further reduce GHG emissions from landfill sites while at the same gas generation at old landfill sites is decreasing. Methane emissions from anaerobic digestion have increased slightly due to an increase in anaerobic digestion, whereas GHG emissions from composting have decreased correspondingly due to a decrease in composting. The emission trend in wastewater treatment has been relatively stable, and emissions are projected to remain more or less unchanged.

Figure 15. Trend in emissions from waste treatment in 2005–2022 and an estimate based on the baseline scenario of the emissions trend that can be achieved with existing measures in 2023–2035. Data for 2022 is based on a proxy estimate. The figure excludes greenhouse gas emissions from waste incineration.



Emissions from energy recovery of waste, that is, waste incineration, are reported as energy-related emissions and are therefore not included in the waste treatment emissions data presented above. Emissions from municipal waste incineration plants are accounted for mainly in the effort sharing sector, whereas emissions from co-incineration plants come under the EU ETS sector. Emissions from waste incineration in the effort sharing sector have increased very significantly since 2005 (Figure 16). The increase is due to an increase in the energy recovery of municipal waste. Around 62% of the municipal waste generated in 2021 was recovered as energy, whereas the corresponding figure in 2008 was only 17%. Emissions from waste incineration are projected to still increase slightly in the next few years but to flatten out after that.

Figure 16. Trend in emissions from waste incineration in the effort sharing sector in 2005–2021.



A study conducted in 2020 explored the opportunities offered by a tax on waste incineration and voluntary agreements relating to waste incineration – a Green Deal of the Ministry of the Environment – in terms of promoting a circular economy and reducing climate impacts. The negotiations on a Green Deal on waste incineration commenced in autumn 2021. In spring 2023, however, the negotiations ended, as changes had taken place during the negotiations in the operating environment and the planned Green Deal would not have achieved the desired objectives.

The inclusion of waste incineration in the EU ETS is planned to be effective from 2028 and, from the beginning of 2024 onwards, municipal waste incineration plants must monitor and report on their GHG emissions in compliance with the EU ETS rules. In addition, several waste incineration plants have plans for carbon capture and utilisation (CCU) from waste incineration. When realised, these would reduce emissions from waste incineration in the future, but it is currently challenging to estimate any concrete emissions reductions.

Finland's waste legislation was largely reformed in 2021. The reform aims to reduce the amount of waste and to increase re-use and recycling. Obligations concerning the separate collection of waste become stricter, which means the aim is for increasing amounts of municipal waste to be taken to recycling instead of waste incineration. Updated in 2022, the National Waste Plan seeks increasingly to prevent the generation of waste and, together with legislative amendments, to increase the recycling rate. These policy measures will reduce GHG emissions from the waste sector indirectly over the longer term, but it is difficult to estimate their emissions reduction potential.

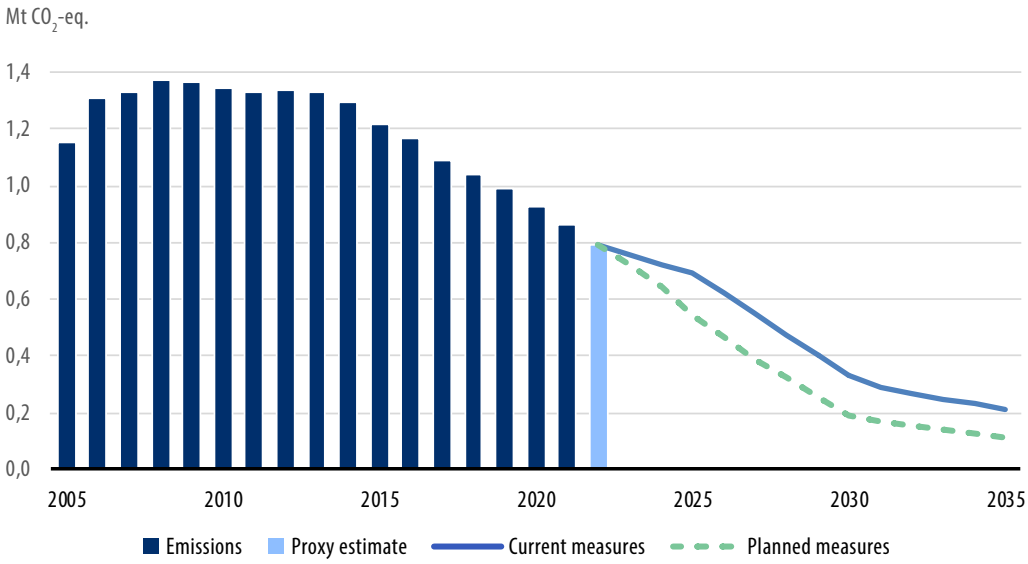
5.6 F-gases

Emissions from the use of fluorinated greenhouse gases (F-gases) increased from the 1990s until 2008, after which the rate of increase peaked and a downward trend has been seen in recent years (Figure 18). F-gases are mainly used in refrigeration and air-conditioning equipment, heat pumps, electrical switchgear, fire protection, foam blowing and as aerosols and solvents (Figure 17). The most significant reason for the increase in F-gas emissions since the 1990s is the replacement of ozone-depleting substances with F-gases in refrigeration and air-conditioning equipment and other applications. Usage volumes are also increased by the higher number of air-conditioning equipment and heat pumps used.

Figure 17. Breakdown of F-gas emissions in 2022.

F-gas emissions decreased by just over 7% in 2021 year on year, amounting to 0.9 Mt CO_2eq. According to the proxy estimate, the figure for 2022 was 0.8 Mt CO_2eq. The emissions have decreased by just over 40% from the peak seen in 2008 but still remain almost 15 times higher than in 1990.

Figure 18. F-gas emissions in 2005–2022 and estimates of the trend in emissions that can be achieved by means of the existing and planned measures in 2023–2035. Data for 2022 is based on a proxy estimate.



In large refrigeration plants in the trade sector, refrigerants with high Global Warming Potential (GWP) have already been replaced with CO_2 and, to a smaller extent, by propane in new equipment. In vehicle air-conditioning systems, hydrofluorocarbon (HFC) refrigerants have already been replaced with a low-GWP refrigerant in the air-conditioning systems of new passenger cars and small vans. The regulation of Fgases has increased at the EU level under the F-Gas Regulation (517/2014), for example, which aims to gradually reduce the quantities of F-gases placed on the market (Appendix 3, Figure 39).

Some F-gases are per- and polyfluoroalkyl substances (PFAS) a restriction on the manufacture, placing on the market and use of which has been proposed under the REACH Regulation (EC) No 1907/2006) of the EU. The specific contents and entry into force of the restriction are not yet known. If implemented in the proposed form, the restriction is projected to result in significant emissions reductions.

Table 7. F-gases – key policy measures in place

Policy measure	Implementation status
Revision of the EU F-Gas Regulation	The Regulation to be revised implements the commitments concerning HFC substances under the global Montreal Protocol to reduce the production and consumption of HFC substances after 2030 and adapts F-gas regulations to the EU's increased climate ambition. Negotiations on the new F-Gas Regulation are likely to be completed during 2023.
Better management and more efficient recovery of F-gas stocks in equipment and products	The estimates of amounts of F-gases and ozone-depleting substances in existing equipment and various products are being updated. The assessment will be completed during 2023. Based on the results, the preparation of guidelines will begin, after which training will be provided and implementation will be monitored. Awareness among consumers and enterprises of the importance of F-gas recovery and its appropriate organisation will be promoted through measures including the provision of information, guidelines and training by the authorities as well as by the industry. After the completion of the report in 2023, the preparation of the guidelines will begin, followed by a separate project to launch training and monitoring of implementation.
Avoiding equipment containing F-gases in public-sector procurements	This will be guided by the criteria for public procurement on alternatives to HFCs. Communications and deployment are underway. The uptake of natural refrigerants will be promoted by updating procurement criteria as technologies are rapidly evolving, and by promoting voluntary commitments.
Promoting the uptake of alternative technologies through training and information provision	The Finnish Environment Institute has stepped up the provision of information and guidance on alternative substances.

5.7 Other emissions

Energy-related non-ETS emissions are addressed by means of energy taxation, energy support, energy-efficiency measures and the distribution obligation concerning light fuel oil as described above.

A voluntary energy audit system has been developed for small and medium-sized enterprises (SMEs). Energy audits are comprehensive site audits of energy consumption and energy-saving potential carried out and reported in accordance with separate instructions. The Ministry of Economic Affairs and Employment supports the voluntary energy audits of SMEs and municipalities. Motiva Ltd is responsible for all of the practical matters relating to subsidised audits. The annual emissions reduction resulting from subsidised energy audits is estimated to have been 0.31 Mt CO_2 in 2021. In 2040, the annual emissions reduction is estimated to decline and amount to 0.11 Mt CO_2. The majority of emissions reductions are created in the EU ETS sector, as most energy savings come from lower consumption of electricity and district heat.

The electricity tax for industry was reduced to the minimum level allowed by the EU at the beginning of 2021. In addition, an act on lowering taxes on electricity used by heat pumps producing district heating or cooling also to the minimum level entered into force in 2022. These measures have an incentive effect to electrify processes and production currently using fossil fuels also in non-ETS industry and district heat production. However, the overall impact in the effort sharing sector is limited, as the majority of industry and district heat production is covered by the EU ETS.

Policy measures targeting non-ETS energy-related emissions and the status of their implementation are grouped together with the EU ETS measures in Table 8 in Section 5.8.

5.8 EU Emissions Trading System sector

In the EU ETS sector, GHG emission reductions are primarily carried out using the pricing mechanism created by the EU ETS. The EU ETS is a policy mechanism at the EU level and cannot be regulated at a national level. Emission trends in the Finnish EU ETS sector are described in more detail in Section 3.2.

The EU ETS covers large-scale industrial installations, installations with a thermal input exceeding 20 MW as well as smaller installations within the same district heating network with them, and aviation within the European Economic Area. In Finland, the EU ETS applies to more than 500 installations. Installations included in the EU ETS and situated in Finland must have a greenhouse gas emissions permit issued by the Energy Authority. The

permit involves emissions monitoring and reporting obligations as well as the obligation to surrender annually to the Energy Authority an amount of allowances equal to the installation's emissions for the previous calendar year. In 2020, the emission allowance price did not exceed EUR 30 per tCO_2. The price started to rise during 2021 and has since then typically ranged between EUR 70 and EUR 100 per tCO_2 (see Appendix 3, Figure 24), except for a temporary price drop following Russia's attack against Ukraine.

Alongside the EU ETS, Finland also has in place national policy instruments that can influence emission trends in ETS installations located in Finland. These include energy taxation, energy and other support, energy-efficiency measures and measures to phase out the use of coal for energy. As the majority of electricity and district heat production falls within the EU ETS, emissions from the EU ETS sector also reduced when electricity or district heat consumption decreases, for example as a result of energy efficiency measures.

Installations falling within the scope of the EU ETS are also covered by the energy tax system and subject to the same tax rates and rules as non-ETS entities. Peat is subject to lower energy taxes than other fossil fuels. However, a floor price mechanism for energy peat entered into force at the beginning of 2022, increasing peat taxation if the emission allowance price falls below EUR 21.20 per tCO_2. This is to ensure that the price of energy peat remains high enough in all circumstances to encourage a shift towards lower-carbon energy sources. At the beginning of 2021, taxation of industry and other electricity in tax category II was reduced to the minimum level set by the EU to encourage industry to electrify its processes in order to reduce its GHG emissions.

Separate electrification aid for energy-intensive industries introduced in 2022 may also be granted retroactively for the period from 2021 to 2025. The sectors eligible and the criteria for granting the aid are in line with the guidelines on certain State aid in the context of the system of greenhouse gas emission allowance trading (2020/C 317/04). It has been agreed nationally that beneficiaries must use at least 50% of the aid received for development measures that promote cuts in GHG emissions, increased efficiency in the use of energy, increased share of renewable energy, or electrification. The total amount of aid granted is estimated to be EUR 344 million. In 2022, there were 50 aid decisions made and a total of EUR 63 million granted in aid. The aid seeks to accelerate the reductions sought by industry low-carbon roadmaps. At the same time, the level of excise duty refunds for fossil fuels used by energy-intensive enterprises will be gradually reduced over the 2021–2024 period before being completely abolished. Total fuel consumption in energy-intensive industries corresponds to just under 3 Mt CO_2 emissions per year, but no precise impact assessment has been made of the reduction in consumption.

An act on lowering taxes on electricity used by heat pumps and electric boilers producing district heating or cooling to the above-mentioned EU minimum level entered into force in 2022. The change also includes heat pumps outside the district heating sector with a total output of at least 0.5 MW, circulators at geothermal heating plants and some data centres.

The Energy Authority administers and steers energy-efficiency measures within the administrative branch of the Ministry of Economic Affairs and Employment, the most important of which are Energy Efficiency Agreements, energy audits, regional energy advisory services and preparation of ecodesign and energy labelling for specific product groups.

Energy Efficiency Agreements are a means jointly chosen by central government and the participating sectors to meet the international energy-efficiency obligations imposed on Finland. The agreements cover more than 740 enterprises and their 7,200 sites as well as more than 140 municipalities and joint municipal authorities. In 2021, the estimated annual emissions reduction achieved under the Energy Efficiency Agreements was 7.5 Mt CO_2. Assuming that similar activity will continue after the 2017–2025 agreement period, the annual emissions reduction in 2040 is estimated to total 9.1 Mt CO_2. The vast majority (around 95%) of the emissions reduction is estimated to be created in the EU ETS sector due to the high share of electricity and district heating in all energy saving.

The Energy Efficiency Act lays down the obligation for all large-scale enterprises to conduct an enterprise energy audit every four years to establish the enterprise's energy consumption profile and identify its energy-saving potential. The annual emissions reduction impact of the mandatory energy audits launched in late 2015 was an estimated 0.22 Mt CO_2 in 2021 and is projected to be 0.24 Mt CO_2 in 2040. Most of the emissions reductions relating to the mandatory audits are also within the scope of the EU ETS.

The Ministry of Economic Affairs and Employment, and Business Finland, the Finnish funding agency for innovation, may allocate discretionary aid to innovative energy projects. Two types of national aid are available: energy aid for investment projects and studies (granted by the Ministry of Economic Affairs and Employment/Business Finland) and investment aid for projects to replace use of coal for energy (granted by the Ministry of Economic Affairs and Employment).

Energy aid is available for projects to promote renewable energy production or use, energy savings or energy efficiency, or conversion into a low-carbon energy system by other means. Investment aid for new energy technologies and large demonstration projects may be granted to projects pursuing future energy solutions with a budget of more than EUR 5 million that contribute towards the achievement of the national and

EU targets set for 2030. In 2022, a total of around EUR 95.3 million was granted in energy aid and almost 2,000 aid decisions were made. The total amounts awarded to renewable energy projects and energy efficiency projects stood at around EUR 72.1 million and EUR 23.2 million, respectively. The majority of the total amount of aid, around EUR 51.7 million, was allocated to large demonstration projects. As a rule, energy aid will not be granted to projects falling within the scope of the Emissions Trading Act. However, aid may be granted to the extent that the project involves new technologies or the investment only results in modest financial benefits from emissions trading.

In addition, the Sustainable Growth Programme for Finland, which is Finland's plan for the use of the EU Recovery and Resilience Facility (RRF) funding, is in force. In the programme, Finland has allocated around EUR 695 million to the green transition, including RDI supporting the green transition, energy system projects and industry's low-carbon and circular economy projects. Funding is used in particular for demonstrating new solutions. In 2022, almost 2,000 support decisions concerning renewable energy were made, with around EUR 280.3 million in funding granted. Of this, EUR 85.5 million was allocated to projects involving new energy technologies, EUR 127 million to production of low-carbon hydrogen, EUR 15.7 million to electrification of industry, and EUR 52.1 million to energy-infrastructure projects.

The Act on the Prohibition of Energy Use of Coal approved in 2019 applies in practice to energy production installations operating within the scope of the EU ETS. The ban enters into force on 1 May 2029. In order to speed up decarbonisation, in March 2020 the Finnish Government issued a decree on investment aid for projects accelerating the replacement of coal in energy production in 2020–2025. The aid is intended to promote the voluntary, accelerated phase-out of coal use by the end of 2025. A total of EUR 90 million was allocated to the aid programme in the General Government Fiscal Plan for 2020–2021. In 2020 and 2021, aid decisions were made for seven projects, with a total of around EUR 30.5 million granted in aid. The unused Budget Authority of just under EUR 60 million will be allocated in full to other energy support projects related to, for example, photovoltaics and energy efficiency, waste heat and other heat pump systems, biogas production, small-scale renewable energy production and large-scale investment grants for demonstration projects in new energy technologies.

Table 8. EU ETS sector and certain non-ETS energy-related emissions – key policy measures in place

Policy measure	Implementation status
Act on Discontinuing the Use of Coal in Energy Production	The Act entered into force in April 2019. The energy use of coal will be banned from May 2029 onwards.
Investment support for energy projects to replace coal in 2020 and 2021	The Government issued the decree in March 2020. Support totalling around EUR 30.5 million was granted to seven projects in 2020 and 2021.
Floor price mechanism for energy peat	The Act entered into force at the end of 2021. If the emission allowance price falls below EUR 21.20 per tonne, the taxation of energy peat is increased. The mechanism has been in use since the beginning of 2022.
Reduction of electricity tax category II to the EU minimum	The Act entered into force at the end of 2020. The change has been in force since the beginning of 2021.
Abolishment of the energy tax refund for energy-intensive enterprises	The Act entered into force at the end of 2020. The partial refund of the energy content tax on fossil fuels will be phased out over 2021–2024.
Moving heat pumps producing district heat or cooling, other heat pumps of sufficient size and some data centres under electricity tax category II	The change entered into force in 2022.
Energy Efficiency Agreements	Agreement period 2017–2025 is underway. The agreements cover more than 740 enterprises and their 7,200 sites as well as more than 140 municipalities/joint municipal authorities.
Sustainable Growth Programme for Finland	Several ongoing calls for applications for funding, with the first of these opened in 2021. Supports, for example, green transition RDI projects as well as low-carbon and circular economy projects.
Energy aid	A support form available until further notice. Supports the green transition in the energy sector, such as increasing the use of renewable energy.

5.9 Land use, land use change and forestry sector

Annual changes in the carbon balance of the LULUCF sector have typically been big compared with other sectors. Fluctuations have occurred particularly in the sink of forest land as a result of fluctuations in commercial felling. The rate of commercial felling depends on the global demand for forest industry products. Emissions from other land use categories in the sector have remained more or less at the same level. Based on the statistics, the annual sink level of forest land primarily reflects the actual felling volume. (Appendix 2, Figure 40.) The decline in the annual increment detected in the most recent National Forest Inventory (NFI 13) carried out by the Natural Resources Institute Finland also affects the LULUCF carbon balance.

To strengthen the LULUCF sector's sink development, a variety of projects have been launched since summer 2022, which is when the preliminary data on the decline in the sink trend was received. This resulted in, for example, the launch of the preparation of a land use change fee, the commissioning of a report from the Natural Resources Institute Finland on why the LULUCF sector had turned into an emissions source in the proxy estimates concerning 2021 and what this means to the fulfilment of the Finland's EU LULUCF commitment for 2021–2025, and in agreeing that the Ministry of Agriculture and Forestry will carry out by March 2023 a climate assessment of the Forest Act and establish by which measures the Forest Act could promote the increase of the sink over the short and the long term. After the completion of the report of the Natural Resources Institute Finland, new measures have been agreed upon in late 2022 and early 2023. In December 2022, the Ministerial Working Group on Climate and Energy Policy agreed on setting up a working group of public officials to explore and prepare measures to strengthen net sinks in the LULUCF sector. In January 2023, the Ministerial Working Group on Climate and Energy Policy agreed on a few rapid measures to strengthen LULUCF sector net sinks. In that context, it was agreed that steering will take place in commercial forests administered by central government towards forest management methods that strengthen the net sink, and the objective of strengthening net sinks will also be taken into account in setting performance targets for Metsähallitus, the agency governing the use of state-owned land. It was also agreed that attention will be paid to first thinnings so that these will be carried out in compliance with the recommendations and legislation throughout the country, and on increased information guidance to reduce peatland soil emissions.

The first Climate Plan for the Land Use Sector was completed in summer 2022. The plan is prepared in every other government term. During those government terms when there is no obligation to prepare a plan, the up-to-dateness of the plan in force and the need for new measures are assessed. Some measures may have impacts on both LULUCF emissions

and sinks as well as on agricultural emissions accounted for in the effort sharing sector. This is why some measures are included in both the Climate Plan for the Land Use Sector as well as in the Medim-term Climate Change Policy Plan.

The Climate Plan for the Land Use Sector includes a large number of measures of different types that seek to reduce LULUCF sector emissions or strengthen the sector's sink. Emissions reduction impacts have also been estimated for some of the measures. There are several measures to reduce emissions from peatlands. Measures are also proposed to reduce deforestation, increase the forest area and safeguard forest growth. As part of the set of measures, new land use forms for areas no longer used for peat production are explored and their impacts on carbon sequestration are assessed. The projects produce deliverables including tools and operating models for planning the further use of peat production sites.

Increasing the use of wood in construction, structures and furnishings is one way of increasing carbon pools in Finland if the total roundwood removals remain unchanged, that is, if the product portfolio changes. LULUCF sector measures supplement the Wood Building Programme of the Ministry of the Environment by promoting the use of wood in context such as building and structures of farms and sparsely populated areas. In addition, the projects have promoted the use of wood in transport infrastructure, such as bridges and structures for pedestrian and cycle traffic, hiking and other recreational routes as well as facilities for physical exercise and tourism.

The set of measures for the LULUCF sector also includes measures to strengthen the knowledge base. The implementation of the Climate Plan for the Land Use Sector is monitored in the Annual Climate Report. The implementation of the first Land Use Plan for the Land Use Sector began as part of the set of climate measures for the LULUCF sector. The set of measures has been coordinated with the measures and projects under the Government Programme of the previous Government, including the Climate-Friendly Food Programme, the set of measures for nutrient recycling, the development programme on the structure of arable land, and measures concerning flood protection and water management in arable soils. The set of measures also implements the objectives of the National Forest Strategy 2035. Other measures included in the set are implemented through EU Common Agricultural Policy (CAP) measures.

The large-scale implementation of the Climate Plan for the Land Use Sector requires that funding is secured. For example, additional funding will be required for the afforestation of low-yield fields suitable for afforestation, development of a monitoring system, wetting of low-yield, thick-peat fields and cut-over peatlands to establish climate wetlands, and continuation of the Catch the Carbon research and innovation programme and development projects.

The nature of the LULUCF sector differs from the other sectors particularly in terms of the long response time of the climate impacts of many measures, that is, in how long it takes for the impacts to be verified at all or how long it takes for a measure to produce climate benefits. The measures of the Catch the Carbon package already launched under funding allocated for 2020–2023 are included in the Climate Plan for the Land Use Sector. These measures can therefore be considered as already being implemented. The Climate Plan for the Land Use Sector does not define any separate baseline scenario. Instead, the baseline scenario of the Catch the Carbon project for the LULUCF sector is used.

Table 9. LULUCF sector – key policy measures in place

Policy measure	Implementation status
Land use change fee	In September 2022, the Ministry of Agriculture and Forestry and the Ministry of the Environment appointed an inter-administrative working group to prepare legislation on a land use fee concerning construction and land clearing for agricultural use in order to minimise deforestation and climate emissions.
Metsähallitus ownership policy	Updated in 2020 for a stronger emphasis on carbon sequestration and strengthening biodiversity.
Afforestation support for non-productive land	A new support scheme for the afforestation of non-productive land entered into force in 2021. Support can be granted for private landowners for the afforestation of non-productive land, such as arable parcels no longer in agricultural use and areas no longer in peat production. The support scheme is available for a fixed term and the aim is to continue it from the beginning of 2024. Opportunities to expand the support scheme in the future to also cover the afforestation of low-yield fields is also being examined.
Support for ash fertilisation	The Act on the Financing of Sustainable Forestry (43/2015) currently in force and the upcoming Act on a Temporary Forestry Incentive Scheme (71/2023) include support for ash fertilisation. The former is in force until the end of 2023 and the aim for the latter is to enter into force from the beginning of 2024. This is subject to approval by the EU.
Catch the Carbon research and innovation programme	There are 15 multidisciplinary projects underway, producing research-based information to support the reduction of carbon emissions from land use and the maintenance of and increase in carbon sinks and carbon pools. The continuation of the R&I programme in 2024–2025 calls for additional funding.

Policy measure	Implementation status
LULUCF sector information programme	The information programme contains proposed measures to acquire LULUCF sector datasets, develop their use and promote their efficient utilisation, including information products and services as well as modelling. The information programme is implemented by means of projects funded from sources including the Catch the Carbon package. Among other things, projects refine soil data as required for carbon market measures and climate policy needs, and develop emission factors.
Catch the Carbon development projects	The set of development projects launched in 2020 has provided funding for more than a hundred projects supporting the introduction of climate-resilient methods in agriculture and forestry and other land use. Current funding will be available until 2024, but additional funding is required for the project activities to continue after that. The third open call for applications for the development projects takes place in April 2023.
Development of LULUCF sector training, advisory services and competence	A report was commissioned on competence, training and advisory services as a whole in the LULUCF sector, and the recommendations provided in the report are implemented though development projects, among others.

Forest policy steering primarily takes place by means of the National Forest Strategy. The new National Forest Strategy 2035 was adopted in December 2022. The revised strategy has aims including the active, sustainable and diverse use of forests and stronger vitality, biodiversity and adaptability of forests. The aim is for active and more diverse forest management to increase forest growth. Another aim is to strengthen the climate resilience of forests and to manage risks of damage.

The Growth of Forests key project of the new strategy aims to increase carbon sequestration and wood yield profitably, sustainably and responsibly. The Biodiversity in Commercial Forests key project uses measures under the Climate Plan for the Land Use Sector and Finland's National Climate Change Adaptation Plan (NCCAP 2030) to strengthen the climate resilience and adaptive capacity of forests. Important aspects in the Renewal and Competitiveness of the Forest Sector key project are foresight and knowledge-based management as well as multidisciplinary coordination.

The National Forest Strategy is closely linked with the Bioeconomy Strategy. The Forest Strategy covers the production of sustainably produced wood raw material, whereas the Bioeconomy Strategy is responsible for increasing the value added of wood raw material by developing new products and services. The Forest Strategy implements the measures of the Bioeconomy Strategy concerning the forest sector.

Forest harvesting volumes are, above all, determined by the demand for forest industry products in the world market. Forest management can increase the carbon sink as well as the carbon pool of forests. Forest management measures have not been targeted directly at maintaining the carbon sinks of forests, but the carbon pool of forests has also increased as a side effect of the measures.

Forestry practices are guided by the Forest Act and the Best Practices for Sustainable Forest Management. The Best Practices play an important role in particular in the activities of organisations providing advisory services in forestry and, consequently, forest owners. These recommendations provide a broad set of means for different types of forestry in line with the forest owner's objectives.

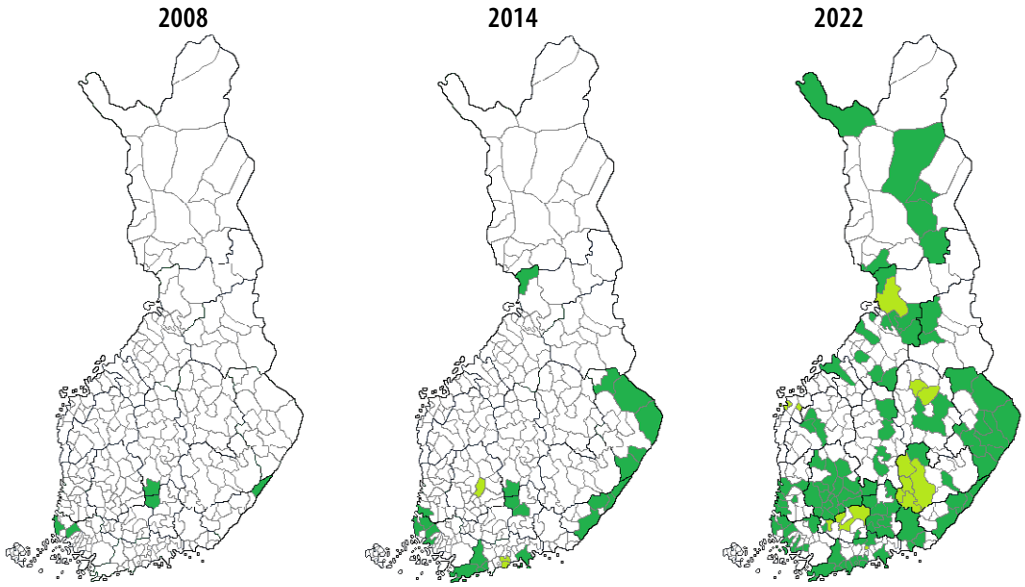
Climate resilience in now an element of the Best Practices for Sustainable Forest Management. The Climate-Resilient Forestry project was implemented in 2020–2022. The work continues in a training and further development project for climate-resilient forestry in 2023–2024. The aim is to ensure awareness and rapid deployment of the new Best Practices for Climate-Resilient Forestry in forestry measures. Recommendations concerning the establishment and cultivation of mixed forests, sustainable practices in energy wood harvesting, and high-quality forestry and harvesting will also be specified in more detail. Thinning models will also be revised.

6 Cross-cutting measures

6.1 Climate action of municipalities and regions

Municipalities play a key role in Finland's efforts to achieve carbon neutrality by 2035. Municipalities can actively influence the amount of their GHG emissions. They also have many ways to promote and accelerate the emissions reductions of municipal residents, enterprises, communities and other stakeholders in their area. Municipalities are responsible for statutory land use planning, land use, transport planning, ownership steering of municipality-owned energy companies, heating choices for many buildings, and public procurement, for example. A total of 138 of Finland's 309 municipalities have set themselves a municipal or regional climate target (Climate Report of the Association of Finnish Local and Regional Authorities 2021). A total of 4.5 million people or around 80% of Finland's population live in these municipalities. Around two in three people in Finland live in municipalities seeking to reduce emissions by 80% over the 2007–2030 period (particularly those in the Towards Carbon Neutral Municipalities network) or to achieve post-2030 carbon neutrality (Figure 19).

Figure 19. Municipalities with a carbon neutrality target or a target of reducing emissions by at least 80% by 2030 (dark green) or post-2030 (light green). The figure shows the situation in 2008, 2014 and 2022.



According to the emissions data service of the Finnish Environment Institute, the effort sharing sector's aggregate regional emissions in the whole of Finland, and therefore also those of municipalities, decreased by 22% in 2005–2021 (proxy estimate), but there were significant differences between municipalities. Although Finland has many municipalities that are leading the way in climate action, many others have yet to take part in active climate work. Municipalities have very different starting points. The larger the municipality's population, the more likely it is that the municipality has set a climate target and is already actively engaged in climate action. According to the 2021 Climate Report of the Association of Finnish Local and Regional Authorities, the biggest challenge in terms of achieving municipal climate targets is the lack of financial and human resources across the board.

In recent years, municipalities and regions have been able to apply to various sources for grants for their climate action. A monthly updated list of suitable calls for funding applications for the promotion and acceleration of local and regional climate action is available on the websites of Motiva Ltd and the Finnish Environment Institute. Support has been available for sector-specific climate action, such as phasing out oil heating, adopting various energy solutions and promoting walking and cycling. In addition, municipalities have been able to apply for grants for various climate action development projects and small-scale experiments, for example through the Ministry of the Environment's Municipal Climate Change Solutions Programme and Sustainable City Programme. The climate action of Finland's seven largest urban regions is also supported by the agreement procedure on land use, housing and transport (LUHT).

The Municipal Climate Change Solutions Programme of the Ministry of the Environment funds municipalities' and regions' own climate projects and solutions supporting their climate action at national level. The total appropriation for the programme for 2018–2024 is EUR 9 million, which by year-end 2022 had already funded 141 projects to strengthen the climate action of municipalities around Finland. Another 20 new local and regional projects received funding from the 2022 appropriation (EUR 1 million). A new call for applications for grants promoting climate action of municipalities and regions will be open in summer 2023.

At the regional level, the programme has funded the national climate action development project of the Centres for Economic Development, Transport and the Environment, the most important deliverable of which is a roadmap tool that promotes and strengthens the internal and external climate efforts of the Centres. In addition, programme funding has been used to launch, in most regions, projects that support all municipalities in the region, but especially the smallest ones, in cascading down climate action.

The Energy Efficiency Agreement for the Municipal Sector is an agreement between the Ministry of Economic Affairs and Employment, the Energy Authority and the Association of Finnish Local and Regional Authorities on more efficient use of energy in the municipal sector, with the current agreement covering the 2017–2025 period. Activities under the Energy Efficiency Agreements are a key element of Finland's energy policy and an important means of meeting both the EU's and international energy efficiency and emissions reduction targets to which Finland is committed. A total of 141 (situation on 6 April 2023) municipalities (129) and joint municipal authorities (12) networking with each other and covering more than three quarters of Finland's population have joined the agreement.

Regional energy counselling (2018–2025) funded by the Energy Authority is an important way to promote the achievement of energy and climate targets locally. These advisory services provide objective information about energy, enabling the implementation of energy efficiency and emissions reduction targets.

In March 2023, an obligation for Finnish municipalities to draw up their climate plans and update them at least once in every term of the municipal council was added to the Climate Act (423/2022). A municipality may also prepare the plan together with other municipalities in the region. Under the Act, the plan must be drawn up and adopted no later than during the municipal council term beginning in 2025. Grants for the preparation of the plans are, however, already available from the Ministry of the Environment during the current term subject to certain criteria. EUR 2.6 million per year has been allocated for the grants. The call for applications and the guide to preparing the municipal climate plan will be published in spring 2023.

6.2 Carbon footprint of consumption

Consumption-based emissions were calculated for the first time in 2022 for all municipalities and regions in Finland. In January 2023, the Finnish Environment Institute released regional data on consumption-based emissions from household consumption and emissions from procurement and investments of municipal organisations. Of emissions calculated in this way, 83% arise from household consumption, 11% from municipal procurement and the remaining 6% from investments including all investments of municipal organisations as well as private sector investments in residential buildings. Emissions from municipal procurements arise mainly from the purchase of services, which accounts for 60% of all municipal procurement emissions. In investments, emissions from construction stand out. Municipal consumption-based emissions also include emissions due to the consumption of imported goods. This means the results make visible the climate emissions from consumption that extend beyond municipal boundaries: elsewhere in Finland as well as abroad.

Municipality- and region-specific data is openly available from the emissions data service at kulutus.hiilineutraalisuomi.fi/. The consumption-based GHG emissions calculation supplements the municipal and regional emissions data service opened in 2020.

Opportunities related to household consumption to reduce people's consumption-based emissions in Finland have been explored in two projects. A Finnish Climate Change Panel project studied the role of consumer choices in the realisation of Finland's emissions reductions and climate targets. The Policy Instruments for Sustainable Consumption project in turn examined ways to influence consumption in order to halve the carbon footprint of consumption by 2035.

Consumer choices evaluated in the 2022 report of the Finnish Climate Change Panel would reduce emissions by 3.7–4.3 Mt CO_2eq in total and 0.7–0.8 t CO_2-eq per capita compared to the emissions trajectory based on current climate policy measures. Significant additional emissions reduction potential was identified particularly in switching to an increasingly plant-based diet. Additional emission-reduction potential was identified in all components of consumption: housing, transport, food and other goods and services. With regard to the consumption of goods, it is noteworthy that a significant share of their emissions is generated outside of Finland. By reducing consumption-based emissions we can contribute towards climate emission reductions outside Finland, too.

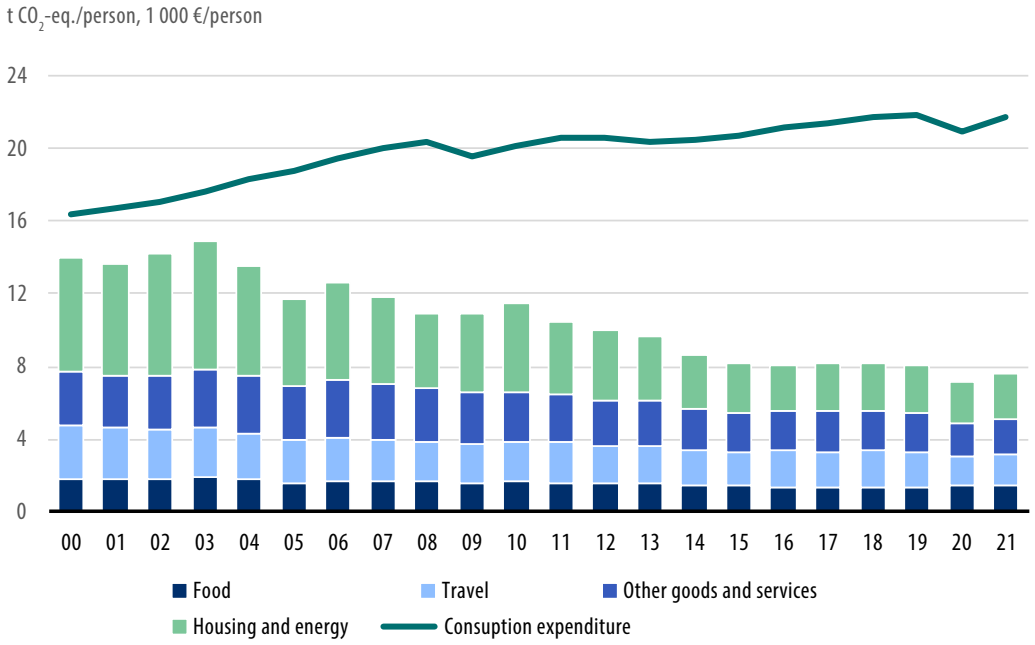
The Policy Instruments for Sustainable Consumption study formed combinations of policy instruments to strengthen climate steering in order to halve the carbon footprint of household consumption. In addition to emissions reductions, the study examined the acceptability, feasibility, legal aspects and costs of the policy instruments. Changes in the carbon footprint of household consumption in 2016–2035 were analysed first on the basis of an emissions trend in line with the Medium-term Climate Change Policy Plan. The climate and energy policy measures included in the plan reduce the carbon footprint of consumption particularly in housing and transport. Climate steering can be strengthened in all components of consumption. Many policy instruments are already in place regarding housing and transport, however, and the study identified the need to support a transition to a more plant- and fish-based diet and to enable the long life of products by supporting ecodesign as well as repair and maintenance services.

A key role in research into consumption-based climate emissions is played by the environmentally extended input-output model for the Finnish economy (ENVIMAT). The model has been developed further and updated in 2022–2023. With regard to imported products, for example, the model now takes more detailed account of the emissions trend of imported products by making use of the international EXIOBASE model. The ENVIMAT model was updated to reflect the structure of the economy in 2019, with the time series of the carbon footprint of household consumption expenditure for 2000–2021 also reviewed

in this context. The carbon footprint of household consumption expenditure in 2021 totalled around 42.5 million tonnes of CO_2-eq, down by around 40% during the period under review. The carbon footprint was at its highest in 2003 (around 78 million tonnes of CO_2-eq). Although household consumption expenditure has increased by around 43% during the period under review (at 2019 prices), the reduction of GHG emissions in Finland and abroad has reduced the carbon footprint.

A similar trend can be seen in the carbon footprint calculated per capita (Figure 20), which is down by around 45%. The difference compared with the total change in the carbon footprint is explained by the 7% population growth. The greatest change has taken place in emissions from housing and housing-related energy consumption. In 2021, the per-capita carbon footprint was around 7.7 tonnes of CO_2-eq. The level has remained at around 8 tonnes of CO_2-eq since 2015. An exception to this is the first COVID-19 year, 2020, when both consumption expenditure and carbon footprint were at a level below the trend seen in recent years.

Figure 20. Consumption expenditure and carbon footprint of Finnish households per capita in 2000–2021, EUR thousand (at 2019 prices) and tonnes of CO_2-eq. (Source: Finnish Environment Institute 2023 / data from ENVIMAT19 modelling.)



6.3 Public procurement

Low-carbon public procurement is promoted by the national Procurement Finland strategy aiming at procurement to support Finland's carbon neutrality target. In the municipal sector, some municipalities have set emission targets for procurement in their climate or procurement strategies, and procurement is one of the development areas particularly in the Toward Carbon Neutral Municipalities network. The Competence Centre for Sustainable and Innovative Public Procurement (KEINO) is a key competence and operating model developer and coach in low-carbon procurement. Its priorities for 2022 and 2023 are low-carbon circular economy procurements.

The Act on Public Procurement and Concession Contracts strengthens the role of taking the environmental perspective into account. The Carbon and Environmental Footprint in Procurement – Legislation and Measuring project of the Government's analysis, assessment and research activities examined how legislation and operating models of public procurement should be developed in order to take the carbon and environmental footprint into account in public procurement in a cost-effective manner. The project produced an assessment of the need to develop legislation and of the impact and effectiveness of possible legislative changes.

The Government submitted a proposal for the amendment of the Act in autumn 2022. The amendments emphasise taking account of the environmental perspective in procurement. Environmental offences are also proposed for inclusion in the criteria of the Act on the basis of which tenderers may be excluded from competitive tendering.

Low-carbon circular economy procurement

A key promoter of low-carbon procurement is the Competence Centre for Sustainable and Innovative Public Procurement (KEINO), which has, among other things, implemented a low-carbon procurement development programme, developed criteria for emission-free construction sites with municipalities as part of the Green Deal and published a guide to low-carbon procurement.

Motiva Ltd is currently preparing a digital databank for sustainable procurement. The digital databank will act as a data repository for procurement criteria, a feedback and development channel and a source of procurement criteria for other information systems. The databank is intended for procurement units, enterprises tendering products and services, interest groups and other stakeholders interested in sustainable public procurement.

The HILMA system for public procurement enables the monitoring of energy efficiency and low carbon aspects in calls for tender. The competitive tendering system's classification system is a step forward not only in Finland but also internationally, with a checkbox currently required to be ticked if a call for tenders published in the HILMA system contains aspects promoting energy efficiency or low carbon emissions.

6.4 Circular economy

The circular economy provides solutions and operating models that can reduce GHG emissions and mitigate other environmental impacts of consumption and production. The circular economy generally refers to an operating model that minimises the amount of natural resources taken into the economy by changing production patterns to circular ones, increasing resource efficiency, and adopting new business models and consumption patterns. Circular economy models can reduce both consumption- and production-based emissions.

Emissions from consumption can be most effectively cut by reducing material consumption in general and by extending the useful life of goods by repairing, maintaining, servicing and reusing, that is, buying and selling second-hand goods. Emissions from consumption can also be cut by reducing the need to produce new goods by increasing the number of times goods are used, for example by switching from buying products to using services and to renting and sharing items. Many of these circular economy measures are already in place, but significant emissions reductions can be achieved only when these operating models become mainstream. This development can be accelerated by promoting digitalisation.

Product design plays a key role in reducing production-based emissions, as good design can reduce as much as 80% of a product's life-cycle emissions. In a circular economy operating model, products are designed such that they are resource efficient and durable and can be repaired, reused, remanufactured and safely recycled. Remanufacturing uses parts of old products in the manufacture of new products, which saves materials and especially energy. At the end of a product's life cycle, its materials are recycled within the economy for as long as possible, retaining or even adding to its value. The utilisation of various side streams of production and more efficient recovery of valuable materials is also important for reducing emissions. The most significant emissions reductions are achieved in production by reducing the use of primary raw materials and developing energy-efficient production processes.

Promoting circular economy at EU level in 2021

A new Circular Economy Action Plan – For a cleaner and more competitive Europe was published in 2020. The European Commission has continued the implementation of this action plan that aims for a green transition towards sustainable and circular production and consumption patterns in Europe. In spring 2022, the Commission published a group of initiatives. The proposal for amendments to the Construction Products Regulation (CPR) and for an Ecodesign for Sustainable Products Regulation affect the climate impacts of new products. Going forward, products must be designed so that they consume minimal energy and natural resources, are as easy as possible to repair and recycle and have a useful life as long as possible. Currently in place concerning energy-related products, the new proposal seeks to extend ecodesign provisions to also apply to electronics, textiles, furniture and almost all products.

Circular Economy Programme measures support climate objectives

The Strategic Programme for Circular Economy was completed in January 2021, and a Government Resolution based on the programme was adopted in April 2021. The programme sets a vision and objectives for a circular economy, determines the measures and monitoring indicators required and proposes the resources necessary to promote a circular economy.

The programme aims to reduce the consumption of non-renewable natural resources and enable the sustainable use of renewable natural resources so that the total consumption of primary raw materials (excluding natural resources used to manufacture exported products) will not exceed the 2015 level in 2035. The aim is also to double resource productivity and the circular material use (CMU) rate. The implementation of the programme is coordinated by the Ministry of the Environment and the Ministry of Economic Affairs and Employment in cooperation with other ministries and stakeholders. The Circular Economy Cooperation Group accelerates the implementation of the objectives and measures of the programme and supports ministries in strategic guidelines and in the assessment of the Circular Economy Programme.

The implementation of the Circular Economy Programme has included the launch of the preparation of a Green Deal for the circular economy. There are 86 participating organisations, including almost all regions, largest cities, enterprise and industry organisations, the largest forest industry enterprises and construction sector actors. The most effective measures are explored in a research project and scenario work led by five research institutes. The commitments prepared based on the results aim to support the achievement of strategic objectives and climate targets relating to reducing the overconsumption of natural resources in Finland.

Funding for the circular economy has been provided in the Sustainable Growth Programme for Finland, which is allocating EUR 110 million to investments promoting the re-use and recycling of certain materials. The Carbon neutral Finland priority area of the EU regional structural policy programme Innovation and Skills in Finland 2021–2027 also aims to promote the transition to a circular economy with EUR 190 million.

6.5 Bioeconomy

An update to the Finnish Bioeconomy Strategy was published in April 2022, with the focus of the updated strategy moving to increasing the value added of bioeconomy in products as well as services. Measures to monitor bioeconomy development in more detail included the launch of a bioeconomy statistics development project that will end at the end of 2023. With regard to increasing the value added of bioeconomy, a project was launched to explore the development potential of ecosystem service value chains relating to water, agriculture as well as forests. A national research and development roadmap for bioeconomy was being prepared. Material supporting the preparation of regional bioeconomy implementation plans was being prepared and the preparation of the first regional implementation plans commenced. The independent Finnish Forest Bioeconomy Science Panel was appointed at the end of 2022.

7 Climate change adaptation

7.1 Finland's National Climate Change Adaptation Plan 2030

Under the Climate Act, climate change adaptation means measures taken to prepare for and adapt to climate change and its impacts, and measures that can be used to benefit from the impacts associated with climate change.

The Government adopted and submitted to Parliament a Report on Finland's National Climate Change Adaptation Plan until 2030 (NCCAP 2030) in December 2022. As laid down in the Climate Act, NCCAP 2030 is part of the climate policy planning system. The plan was prepared under the leadership of the Ministry of Agriculture and Forestry together with nine other ministries. The plan contributes towards Finland's preparedness for and adaptation to the impacts of climate change in accordance with the Climate Act. The ministries and administrative branches taking part in the work brought the prioritised adaptation targets and measures of their administrative branches into the plan.

7.2 Adaptation policy targets and implementation of the plan 2030

The objective of the Climate Act and the climate policy planning system based on the Act is to contribute to ensuring that national measures are taken to adapt to climate change by promoting climate change resilience and the management of climate risks. More specific adaptation targets and measures are presented in NCCAP 2030.

The plan sets 24 targets and outlines measures to achieve them. The targets are classified under ten themes based on which reporting in the Annual Climate Report takes place. The themes are 1) national-level strategic planning and foresight; 2) comprehensive security and general security of supply work; 3) food and nutrition security; 4) infrastructure and the built environment; 5) use and management of renewable natural resources, biodiversity, nature-based solutions and drought risk management; 6) health protection and promotion; 7) cultural heritage and the cultural environment; 8) climate risk management at the regional and municipal levels; 9) international cooperation; 10) knowledge base, communication and monitoring.

One or more targets and measures to promote each target are determined for each theme. There are two types of measures: those launched previously that are important to continue from the adaptation perspective, and new measures. The following presents their implementation status specifically for each target.

NCCAP 2030 also contains four themes that require further preparation: the Sámi Climate Change Adaptation Programme, competence development, development of occupational safety and health, and public procurements. The aim is for the additional preparation to commence in 2023–2025.

7.2.1 National-level strategic planning and foresight

There are two targets under the national-level strategic planning and foresight theme (Table 10).

Table 10. Implementation status of the national-level strategic planning and foresight theme

Target	Implementation in 2022
Integrating adaptation into the Government's and ministries' strategic planning and foresight by 2030	Reported from 2024 onwards.
Administrative branch-specific adaptation action will be based on plans and the conditions to implement it will have been secured by 2030	The Ministry of the Environment and the Ministry of Social Affairs and Health have a plan in force guiding adaptation in their administrative branches. The action plan of the Ministry of Agriculture and Forestry was being prepared. The adaptation plan of the administrative branch of the Ministry of Defence was adopted at the beginning of 2023. The Ministry of Finance takes account of adaptation in accordance with its Strategy on Climate and Nature published in 2022. In some administrative branches, adaptation planning is included in broader sets of measures. The Ministry of Economic Affairs and Employment guides adaptation as part of a broader update to its sustainable development policy in 2023 and the Ministry for Foreign Affairs as part of Finland's Action Plan for Climate Smart Foreign Policy, while the Ministry of Transport and Communications includes adaptation measures in the strategic policy documents of the administrative branch.

7.2.2 Comprehensive security and general security of supply work

The target for comprehensive security and general security of supply work is that the consequences of climate change and preparedness for and adaptation to them will have been identified as part of comprehensive security and integrated into the comprehensive security model and the objectives of security of supply by 2026.

The threat scenarios underlying the Security Strategy for Society are determined in the national risk assessment coordinated by the Ministry of the Interior. The national risk assessment was updated during 2022 and published in February 2023. It is linked with national preparedness and lays the foundation for preparedness in line with the Security Strategy for Society. In the risk assessment, climate change is described both as one of the factors shaping the operating environment and also integrated into all relevant threat scenarios as a potential underlying factor for the materialisation of the threat.

A report commissioned by the National Emergency Supply Agency on the impacts of climate change on the security of supply was published in 2022. Based on the report, the direct impacts of climate change will be minor in Finland compared with the rest of the world. The biggest impacts on security of supply appear to be reflected from elsewhere. The worst-case scenario identified is shortage of food, water and habitable living environment in the world, the impacts of which would also be reflected on Finland. Food and energy supply as well as logistics are perceived as the most vulnerable sectors.

7.2.3 Food and nutrition security

The targets for the food and nutrition security theme are that the operating conditions of agriculture for climate change adaptation will have developed by 2030 and that climate-resilient food production and consumption will maintain food and nutrition security throughout the NCCAP 2030 period (Table 11).

In agriculture, climate change mitigation and adaptation measures are closely interlinked. For example, diversifying agricultural production and improving arable soil hydrology and health can be used to curb GHG emissions from arable land and at the same time improve the adaptation of agriculture to changing weather conditions.

Measures to support the adaptation of agriculture to climate change are included in Finland's national Common Agricultural Policy (CAP) Strategic Plan for 2023–2027. In addition, national adaptation-related measures are taken to control plant pests and animal diseases and to breed more climate-resilient plants.

Table 11. Implementation status of the targets of the food and nutrition security theme.

Targets	Implementation in 2022
The operating conditions of agriculture for climate change adaptation will have developed by 2030 Climate-resilient food production and consumption will maintain food and nutrition security throughout the NCCAP 2030 period	Measures relating to climate change mitigation and adaptation were reviewed in conjunction with the preparation of Finland's CAP Strategic Plan. Finland's CAP Strategic Plan was approved by the European Commission on 31 August 2022. National legislation concerning the CAP reform entered into force on 1 January 2023, and the implementation of the reform began as planned and in phases from the beginning of 2023. Measures relating to issues such as plant pests, animal diseases and plant breeding have continued.

7.2.4 Infrastructure and built environment

There are four targets under the infrastructure and the built environment theme, relating to water services, transport and communications infrastructure, the built environment, energy infrastructure, industry and businesses (Table 12).

The target for water services is that the sector's preparedness for climate change impacts will have been improved by 2026. The target for the energy and industrial sectors and business activities is that awareness of climate change impacts, risk management and the innovation environment will have been strengthened by 2030. The implementation of measures relating to these will commence later.

Implementation with regard to transport and communications infrastructure and the built environment has commenced.

Table 12. Implementation status of the infrastructure and the built environment theme.

Target	Implementation in 2022
The vulnerabilities of the transport and communications infrastructure will have been identified by 2026 and climate resilience will have been improved by 2030	Based on a review of the current status of climate change adaptation conducted by the Finnish Transport Infrastructure Agency, key transport route network measures were identified to promote the adaptation of the transport system to direct and indirect impacts of climate change. Related review and development needs were included in the Agency's operational planning in 2023. The Finnish Transport Infrastructure Agency launched an R&D project to specify in particular the longer-term needs for reviews, development and measures concerning the transport route network. The Finnish Forest Centre launched a project to map out the condition and investment needs of Finland's most important private road network, including bridges in the network, and the energy wood terminal network and their usability and development. The project also produces information and operating models for use as tools in activating the maintenance of private roads. An interpretation method selected for road condition surveys was tested in 2022.
The built environment sector will have the capacity and capability to manage climate change-related risks and to adapt to changes taking place in the climate by 2030	The new Building Act was drafted, and the Act was adopted in March 2023. The Act aims to incorporate climate change adaptation into decrees concerning essential technical requirements. The impacts of sea level rise (SLR) on the Finnish coast were assessed. The projections of mean sea level (MSL) were based on three different scenarios representing future GHG emission pathways. The projections take account of the latest data on SLR, postglacial land uplift and changes in Baltic Sea wind climate. Based on the medium emission scenario, the projected MSL change at the end of the century (relative to 1995–2014) varies according to the most likely projection from -28 cm in the Bothnian Bay to 31 cm in the eastern Gulf of Finland. The results are employed in the updating of flood maps currently underway. In addition, the projections can be used to support reviews of long-term recommendations for the lowest construction elevations.

7.2.5 Use and management of renewable natural resources, biodiversity, nature-based solutions and drought risk management

There are four targets for the use and management of renewable natural resources, biodiversity, nature-based solutions and drought risk management theme (Table 13).

Table 13. Implementation status of the use and management of renewable natural resources, biodiversity, nature-based solutions and drought risk management theme.

Target	Implementation in 2022
Climate change adaptation in the use of renewable natural resources will have improved by 2030	Several projects and studies were implemented and launched in the set of measures relating to climate-resilient forestry during 2022. These are interlinked in many respects with the implementation of the Catch the Carbon project package. There were several projects underway aiming for forest damage management, prevention and preparedness. In these, simulations and piloting were employed to produce forest management, game management and land use solutions where damage risks and forest multifunctionality are better taken into account. In addition, a collaboration model was being developed to prevent the damage caused by the European spruce bark beetle (Ips typographus) and root rot fungi (Heterobasidion spp.), the potential to make use of data generated by forest harvesters to identify and prevent root rot fungi was explored, and capacities were created for spruce bark beetle risk management methods and models to anticipate changes in the distribution range of the beetle by making use of remote sensing. For the deployment of information, the projects prepared guides containing damage-related information and organised training and events relating to the topic. To promote forest growth, information was produced on the use of bred forest cultivation material and new forest cultivation methods were being developed. In addition, the protection and usability of genetic resources collections of deciduous (hardwood) trees was improved by determining practices for offering seeds for sale. Project activities also promoted preparedness for wildfire and forest fire prevention by scaling up fire risk and prevention maps for nationwide coverage. Parliament has passed a bill on a new Forestry Incentive Scheme, and the Act is undergoing the notification procedure in the European Commission. Following this, provisions on the entry into force of the Act from the beginning of 2024 will be issued by government decree in the autumn. A total of 31 agricultural and forestry waste management development and pilot projects were underway in 2022 under the programme to enhance the efficiency of water protection. Projects funded under the programme promote catchment-level based planning, implementation and cooperation in water management as well as adaptation to changing climate conditions. In addition, 2022 saw the preparation of four regional catchment area planning pilot projects in Uusimaa and Southwest Finland where catchment area planning approaches are being developed and monitoring data is being produced. The pilots were launched at the beginning of 2023.

Target	Implementation in 2022
Adaptation to climate change and halting biodiversity loss will be mutually supportive by 2030	The joint Helmi Habitats Programme of the Ministry of the Environment and the Ministry of Agriculture and Forestry has improved the status of mires, aquatic bird habitats, semi-natural grasslands and wooded pastures, forests, small water bodies and coastal habitats. The programme also aims to mitigate climate change and promote climate change adaptation. Programme measures in 2022 included mire restoration in government and private protected areas covering a total of 5,188 hectares and protected mires covering 5,338 hectares on the basis of voluntary negotiations with landowners. The protected area network of key importance with regard to climate change adaptation has been developed further by implementing the voluntary-based Forest Biodiversity Programme for Southern Finland (METSO) at the Centres for Economic Development, Transport and the Environment and the Finnish Forest Centre. Around 5,000 hectares were protected permanently or for a fixed term under the programme in 2022. In addition, fixed-term environmental aid agreements and nature management projects were implemented for around 4,000 hectares. Implemented by the Finnish Environment Institute, the project on the design of the Finnish protected area network in a changing climate continued to study the impacts of climate change on the planning and implementation of the protection of species and habitat types. The project ended at the end of 2022, and the results will be put into practice during 2023. Since the beginning of 2023, the national coordination group of the nature data development programme, convened by the Finnish Environment Institute, has been tasked with proposing how the long-term monitoring of biodiversity and related coordination, planning and implementation will be developed in the future, taking account also of climate change impacts. The Ministries of the Environment, Agriculture and Forestry and Finance are also taking part in this work. In 2022, the Ministry of the Environment continued the preparation of the National Biodiversity Strategy and related Action Plan. The strategy aims to contribute to improving the policy coherence of the adaptation measures of the different administrative branches concerning biodiversity.

Target	Implementation in 2022
Nature-based solutions will have become established and will have increased society's preparedness for climate risks, improved water protection and at the same time increased biodiversity by 2030	The Ministry of Agriculture and Forestry transferred support for arterial drainage projects to make it part of CAP funding. In this context, climate resilience was introduced as an additional criterion for support, and the incentive trap relating to two-stage channels was eliminated. Two-stage channels are climate resilient particularly from the perspective of flood and drought risk management and they also promote the status of water bodies and biodiversity.
Drought risk management will have developed from the 2022 situation by 2030	The Finnish Environment Institute carried out a nationwide drought risk analysis. The Ministry of Agriculture and Forestry strengthened drought risk management as part of the work of the National Steering Group for Flood and Drought Risk Management.

The risk of forest damage involved in climate change was reduced in many different ways in 2022. Together with the Natural Resources Institute Finland, the Ministry of Agriculture and Forestry launched the preparation of updates to the national Contingency Plan for Forest Damage. The drafting of a preparedness plan for the European spruce bark beetle (*Ips typographus*), the insect causing the worst damage to trees occurring in Finland, began under a Natural Resources Institute Finland project.

Updates to the Forest Damage Prevention Act (1087/2013) in force since the beginning of 2022 amended the obligation to remove fresh Norway spruce timber including bark. For example, in separately specified new areas, the time limit for removing spruce timber from forests was brought forward. In addition, the next update to the Forest Damage Prevention Act was prepared in 2022, concerning the extension of the validity of the support scheme included in the Act until the end of 2027. The support scheme enables landowners to receive compensation for the costs of prevention measures ordered by the Ministry of Agriculture and Forestry against large-scale forest damage and for damage that has occurred.

Flood risk management will be implemented in six-year cycles in conjunction with water management planning. A nationwide flood risk assessment will take place every six years. Also drawn up every six years, the management plans drawn up for the highest-risk areas will take account of the impacts of climate change and the adaptation measures taken and, where necessary, the efficiency of adaptation will be increased. The management plans for areas with a significant flood risk were adopted in December 2021. The process is statutory, functions well and has resulted in national progress in flood preparedness. That is why NCCAP 2030 does not contain any specific targets or measures for flood risk adaptation. The indicators for flood risk management can be found in Appendix 3 (Figure 41 and Figure 42). The most important indicator for flood risk management is the number of people living in flood risk areas.

7.2.6 Health protection and promotion

The target for the health protection and promotion theme is that health hazards from heat will have been recognised and adaptation to them at the various levels as well as monitoring will have developed by 2030. Preparedness for and adaptation to other health risks relating to climate change is strengthened by the Climate Change Adaptation Plan of the Ministry of Social Affairs and Health adopted in 2021.

In 2021–2022, a project was implemented under the Government's analysis, assessment and research activities (VN TEAS) by Tampere University, the University of Eastern Finland, Aalto University and the Finnish Institute for Health and Welfare on moisture damage and high temperatures in buildings in changing climate. The results of the project are utilised by the Ministry of Social Affairs and Health in the updating of the Housing Health Decree under NCCAP 2030.

The Finnish Institute for Health and Welfare will launch the preparation of a national action plan for the prevention of health hazards from heat once funding is secured.

7.2.7 Cultural heritage and the cultural environment

The target for the cultural heritage and the cultural environment theme is that the protection of cultural heritage and the cultural environment against the impacts of climate change will have improved, taking these into account in climate change adaptation policy will have been strengthened and the utilisation of knowledge included in cultural heritage and the cultural environment in adaptation-related solutions will have developed by 2030.

In 2022, Sitowise conducted a study funded by the Ministry of the Environment entitled Climate Change and the Cultural Environment: Identified impacts and ways to promote mitigation and adaptation, according to which key issues include the adaptation of buildings to changing conditions and preparedness for flood risks. Going forward, cooperation between experts on cultural environments and climate experts must be intensified, harmonised calculation and monitoring must be developed and data on costs arising from measures must be collected. Climate change adaptation measures may pose risks to buildings and sites of cultural historical value, but good management of cultural environments as well as knowhow may also mitigate climate change and increase resilience against extreme weather events.

In 2022, the Ministry of Education and Culture supported the development of the interoperability of cultural environment data of museums by means of grants to 14 museums totalling EUR 403,000. The Finnish Heritage Agency was granted EUR 173,000 in funding for the development of 3D digitisation of World Heritage Sites, including the 3D modelling of Petäjävesi Old Church and its publication in the Finna.fi search service. Due to the risks posed by climate change, cultural heritage and the cultural environment must be better documented digitally, for example by 3D modelling of important cultural heritage sites and by ensuring the recording, monitoring, long-term preservation, interoperability and usability of the data.

In other respects, the implementation of this target will commence later.

7.2.8 Climate risk management at regional and municipal levels

There are three targets under the climate risk management at the regional and municipal levels theme, seeking to create guides and guidelines and develop competence, develop guidance and direction provided by central government to municipalities and regions, and promote increased funding opportunities relating to adaptation and better monitoring of funding (Table 14).

Table 14. Implementation status of the climate risk management at the regional and municipal levels theme

Target	Implementation in 2022
Regional and municipal actors will have access to the guides and guidelines as well as the competence to make use of them in planning concerning the various sectors by 2030 The adaptation-related guidance and direction of the regions and municipalities will be consistent and appropriate by 2030 Funding opportunities will encourage regional- and municipal-level actors to strengthen adaptation action and the monitoring of the allocation of funding will be possible by 2030	Tampere urban region produced and compiled a variety of tools that help to identify climate risks and the impacts and support preparedness and adaptation planning in different sectors and organisations. At the regional level, the Centres for Economic Development, Transport and the Environment play a key expert and authority role in climate change adaptation, production and management of related data, and translating national plans into practice. The Ministry of Agriculture and Forestry has funded the national climate action development project of the Centres for Economic Development, Transport and the Environment with regard to climate change adaptation. The most important outcome of the work is a roadmap tool promoting and strengthening the internal and external climate work of the Centres for Economic Development, Transport and the Environment. It has identified the adaptation interfaces of the Centres' statutory tasks and developed the adaptation competence of their staff. Experts have been provided with both open and sector-specific adaptation training. Training has been provided for around 100 persons, with participants representing all areas of responsibility. The publication of all of the deliverables of the project has continued in an online tool. The climate change adaptation, risk prevention and disaster preparedness and resilience target was included in the Carbon neutral Finland theme of the European Regional Development Fund (ERDF). Funding allocated for the target totals around EUR 38 million.

In addition to measures under NCCAP 2030, progress has also been made in other ways in adaptation at the regional and municipal levels. Some cities and municipalities have already formulated comprehensive plans for climate change adaptation. Participating cities and municipalities in the international Covenant of Mayors for Climate and Energy have prepared Sustainable Energy and Climate Action Plans (SECAP) also containing an assessment of risks and vulnerabilities as well as targets and actions for climate change adaptation. Among large Finnish cities, a SECAP has been prepared by cities including Helsinki, Lappeenranta and Tampere, and among smaller municipalities by Vihti.

In North Savo, Savonia University of Applied Sciences coordinates the North Savo climate security network aiming to increase preparedness and resilience relating to extreme weather events in agriculture and forestry in North Savo. The aim is also to influence people's everyday lives and human security such as water, food and health security.

The project will create a climate security business network and climate security learning environment that supports North Savo's agriculture and forestry industries. The project contributes to the development of the competitiveness and vitality of the business of the North Savo agriculture and forestry sector and to the sustainable use of renewable natural resources.

7.2.9 International cooperation

The targets for the international cooperation theme focus on both strengthening international climate finance coordinated by the Ministry for Foreign Affairs and adaptation of developing countries as well as international cooperation funded by several ministries to strengthen Finland's adaptive capacity and weight in international arenas and to expand the knowledge base.

The need to adapt is a growing topic in international climate policy, including international climate finance required for adaptation measures. As a party to international climate treaties, Finland supports developing countries in climate change adaptation and promotes, through climate diplomacy, increases in the quantity, quality and availability of adaptation finance.

Prime Minister Marin's Government made a commitment to increase the level of climate finance and to allocate half of the finance channelled in the form of grants to adaptation. Of the record-high international climate finance figure of EUR 175 million in 2021, adaptation accounted for 47% (climate finance figures for 2022 will be available in September 2023). Finland uses a variety of instruments for climate change adaptation finance based on development cooperation funds. In addition, the cross-cutting objectives that Finland promotes in its development policy include climate-resilient and low-emission development as well as environmental protection, with an emphasis on safeguarding biodiversity. Finland's most recent contributions towards the adaptation of developing countries include the 2022 commitment to provide EUR 3 million in funding to the Systematic Observations Finance Facility (SOFF) of the World Meteorological Organization (WMO), which invests in weather and climate observation equipment and systems of Least Developed Countries (LDC) and Small Island Developing States (SIDS). Weather and climate observation data is essential for countries to know what to adapt to.

Together with the United Kingdom, the Netherlands, Ireland, Denmark and Sweden, Finland is a founding member of the Champions Group on Adaptation Finance. The group seeks to improve the quantity, quality and availability of adaptation finance flowing to LDC and SIDS in particular though their own funding as well as overall. The aim is also to contribute to climate talks relating to adaptation finance and restore trust between the parties to the talks by means including promoting a dialogue with developing countries. One of the key objectives of the Lahti Adaptation Finance Ministerial hosted by Finland in April 2022 was to bring the various actors together and jointly determine the key challenges and bottlenecks of adaptation finance. Successes included creating the direct and open dialogue sought between finance providers and main recipient countries of adaptation finance.

Finnish adaptation expertise is actively exported. For example, the Finnish Meteorological Institute (FMI) implements several projects related to preparedness for extreme weather events and climate change adaptation funded by the Ministry for Foreign Affairs, and Finland's international cooperation in meteorology funded by development cooperation funds is world-class. Finland's funding and the expertise of the FMI has helped the meteorological institutes of more than 50 developing countries to develop their weather and climate services and early warning systems. More than 430 million people benefit indirectly from weather and early warning systems that have been improved thanks to the projects underway in 2022.

The growth and internationalisation programme for water expertise with EU Recovery and Resilience Facility (RRF) funding decided on EUR 1.7 million in funding for innovations and partnerships that concretely promote the exports of Finnish water-related solutions. Coaching was employed to encourage cross-sectoral cooperation between the water sector, energy sector and digitalisation. The role of water-sector solutions in the work of the Team Finland network was enhanced.

Finland supports and participates actively in adaptation research and development of adaptation knowledge in the Arctic, Barents and Baltic regions. Key cooperation mechanisms include the northern regional councils (Arctic Council, Barents Euro-Arctic Council and Council of the Baltic Sea States) as well as the Northern Dimension Partnerships. Finland's participation in multilateral regional cooperation is guided by the policy objectives of Finland's Strategy for Arctic Policy, the European Union's Arctic Policy, Finland's Strategy for the Baltic Region, the European Union Strategy for the Baltic Region, and the Northern Dimension.

7.2.10 Knowledge base, communication and monitoring

NCCAP 2030 has three targets focusing on strengthening the knowledge base of climate risks and adaptation, communication and climate change adaptation, and monitoring of NCCAP 2030.

The target for strengthening the knowledge base is that the knowledge base relating to weather and climate change risks and adaptation will have been strengthened in a sensible manner, and the availability of research data to end users will have been ensured by 2027. Adaptation research takes place in many different research programmes, research institutes, universities and other higher education institutions. Examples from 2022 include the following:

- Projects promoting the management of risks relating to climate change in agriculture and forestry were funded from the Catch the Carbon research and innovation programme coordinated by the Ministry of Agriculture and Forestry.
- In the Climate Change and Health (CLIHE) programme, funded by the Academy of Finland, 13 project consortia examine and anticipate health risks caused by climate change research and their societal consequences and seek ways to combat adverse health effects and adapt to climate change. During 2022, the projects generated new data on aspects including the impacts of climate on mental and physical health, and absences due to ill health and mortality, explored technological solutions to reducing heat exposure and developed heatwave forecasts. The results help to select adaptation measures that are socially acceptable and economically sound and that efficiently reduce vulnerability to heatwaves in Finland. Projects have also sought to forecast the spread of new diseases in Finland and Europe. Once it is understood which factors affecting the distribution of diseases (such as Lyme disease and tick-borne encephalitis) are climate dependent, changes can be modelled and forecast and, consequently, measures can be taken to minimise these health threats.
- A joint development project of the Finnish Meteorological Institute and the National Emergency Supply Agency collected weather and climate impact data from past decades into a database. Data was collected on topics such as power supply disruptions, road network maintenance operations, damage control operations of rescue services, maritime search and rescue operations, and train delays. The database contains millions of individual impact events. The longest uninterrupted time series go back to the 1990s.
- The Ministry of the Interior coordinates the national cooperation network for disaster risk management, with one of the aims being to collect and communicate information relating to disasters. The current term of the network is until the end of 2023.

The target for adaptation communication is that communication will have strengthened awareness among society's actors of risks and adaptation measures relating to climate change. The Ministry of Agriculture and Forestry published the climate change newsletter four times in 2022. Adaptation communication was also carried out by many other actors.

The target for the development of the monitoring of NCCAP 2030 and, more broadly, of climate change adaptation is that adaptation monitoring will be systematic and support the development of activities. The implementation of the measures determined to reach these targets will commence during 2023 and 2024. This may affect the adaptation reporting of the Annual Climate Report from 2024 onwards.

8 Voluntary carbon market

According to international best practices, all operators should primarily reduce their own emissions and carbon footprint. Their own climate actions can be supplemented by supporting voluntary climate action of others that would otherwise not be taken.

Since the conclusion of the Paris Agreement, supporting voluntary climate action has become increasingly popular with enterprises and other operators. This support is typically made proportionate to the emissions, or carbon footprint, of the operator, product or service by purchasing a corresponding number of certified carbon credits from the voluntary carbon market. In many cases, these are also used as a basis for making claims about carbon neutrality or about offsetting, or compensating for, emissions as part of marketing that is targeted at consumers, funding providers and/or other stakeholders.

Voluntary carbon markets can support the achievement of binding climate goals and raise ambition by producing containment results that would otherwise not materialize. Through the voluntary carbon market, private funding can be channeled for reducing emissions and sequestering carbon.

An increasing number of non-state actors around the world and in Finland have climate targets and claims concerning carbon neutrality and net zero emissions, often involving the use of certified carbon credits. There are hundreds of enterprises in Finland that use carbon credits to offset their emissions. According to data from 2022, for example, around 4% of Finnish small and medium-sized enterprises (SMEs) buy and use credits as part of their climate action. Market players would primarily like to provide funding for climate action carried out in Finland.

Experience gained from voluntary carbon markets has shown that voluntary climate action can, at best, promote climate benefits and sustainable development but, at worst, be harmful due to evasion of the organisation's own climate action, misleading climate claims, or various adverse social and environmental effects.

The formulation of the regulatory framework for voluntary climate action is still in progress. The sector's practices, the legal framework and interpretations of public authorities are continuously reshaping and evolving.

Climate claims based on the voluntary use of carbon credits are used in Finland in the marketing of enterprises as well as products and services. However, these claims and their definitions involve much uncertainty and inconsistency among enterprises and consumers alike. Consumer confidence in environmental claims used in marketing is not high. At the same time, entrepreneurs have found that it is challenging to make environmental claims and that they need more specific guidance on making such claims.

The Ministry of the Environment, together with other ministries, has analysed the current situation with respect to the voluntary carbon market and the role it could play in climate change mitigation. Projects in the Finnish LULUCF sector have been examined in a preliminary study funded by the Ministry of Agriculture and Forestry on carbon offsetting projects in the LULUCF sector. The study identified 16 actors that implement offsetting projects in Finland and that provide offsetting services at the moment or intend to provide them in the near future.

There is very little publicly available material on Finnish voluntary climate action. None of the actors currently selling domestic voluntary offsetting services in Finland use international offsetting standards for their projects currently underway and are therefore not included in the data systems of these standards. Independent verification has so far been implemented by two Finnish providers of offsetting services: Puro.earth and Green Carbon.

Funded by the Ministry of the Environment in 2021, a project on the regulation of voluntary emissions offsetting examined how the provision of offsetting services should be regulated in Finland. According to the project report, the quality of the voluntary carbon market could be significantly improved by means of information guidance, such as by producing guidelines on best practices and criteria for the market, enabling enterprises to make voluntary commitments to compliance with these.

In February 2022, the Ministry of the Environment and the Ministry of Agriculture and Forestry published the Guide to Good Practices for Voluntary Carbon Markets. The guide compiles international good practices and minimum criteria and aims to promote compliance with good practices in Finland. For the purposes of the guide, the authors compared the guidelines and practices of different countries, international organisations and non-state actors. The guide aims to take into account, as far as possible, the regulation being drafted in the contexts of the Paris Agreement and the European Union, the good practices guidelines and recommendations prepared by key bodies concerning both the generation of high-quality carbon credits and presentation of credible claims relating to their voluntary use.

Funded by the Government and due to be implemented for 18 months from March 2023, a project on the emerging international framework for voluntary climate measures will examine the need to update national legislation, guidelines and reporting, and the impacts of changes in the international regulatory frameworks on national climate targets, consumer protection and operating conditions of enterprises.

9 Strengthening of climate policy dialogue

The Climate Policy Roundtable and the parliamentary monitoring group on Finland's climate policy have for their part supported the national preparation and implementation of climate policy and taken part in the dialogue on climate justice.

9.1 Climate Policy Roundtable

In February 2020, the Government appointed the Climate Policy Roundtable in conjunction with the Commission on Sustainable Development for the duration of the government term to create a common understanding on a just transition and the acceptability of climate action. The purpose of the Climate Policy Roundtable is to create a common view and understanding of how Finland can make a just and fair transition to a carbon neutral society by 2035.

The Climate Policy Roundtable has served as a new kind of high-level forum and brought together a broad group of key societal actors. Members have represented research, business, trade union and environmental organisations, municipalities, the Sámi Parliament and young people. The Climate Policy Roundtable has concretised pledges made during the previous government term concerning policy reform, including the pledges for a new kind of interaction, long-term policy and intergenerational justice. It has had a total of 20 members and 3 permanent experts. The Roundtable has been chaired by the Prime Minister and vice-chaired by the Minister of the Environment and Climate, the Minister of Economic Affairs, the youth representative of the Finnish National Youth Council Allianssi, and the enterprise representative from the Climate Leadership Coalition.

The Roundtable has provided stakeholders and experts with a channel for participation in the national preparation and implementation of climate actions and strengthened a broad societal debate on climate change. Roundtable discussions have covered the Government's key climate initiatives and legislative proposals and the various perspectives of justice concerning each topic. Topics discussed at meetings have included the Climate Act, the Medium-term Climate Change Policy Plan, the National Climate and Energy Strategy, the Climate Plan for the Land Use Sector, the Roadmap to Fossil-Free Transport and the EU Fit for 55 package. A total of 20 meetings have been held during the term of the Roundtable.

The Climate Policy Roundtable is part of a set of measures for a just transition and its preparation. The results of its meetings have been reported regularly to the Ministerial Working Group on Climate and Energy Policy and the public officials preparing the matter. In addition to meetings, the Roundtable has organised other events and activities supporting its work and promoting the dialogue for a transition to a carbon-neutral society. Events organised during the term of the Roundtable include two youth roundtable events on climate policy for discussions on Finland's climate policy and intergenerational justice and for explorations on how young people could participate more closely in climate policy-making.

9.2 Parliamentary monitoring group on Finland's climate policy

In the autumn 2021 discussions on the 2022 Budget, the Government adopted climate entries to achieve carbon neutrality in 2035. One of the measures decided by the Government was that "a parliamentary monitoring group will be set up to support the long-term and systematic implementation of the climate objectives."

The Government appointed the parliamentary monitoring group on climate policy in September 2022 to serve until June 2023. The parliamentary monitoring group on climate policy has been tasked with monitoring Finland's national climate policy and its implementation. It has sought to contribute towards the achievement of the carbon neutrality target and discussed the various perspectives of climate justice. The monitoring group has sought to form a shared situational picture of climate policy implementation and of measures and new solutions required in the years ahead.

The monitoring group has had five meetings during its term. The monitoring group has discussed climate action carried out during the parliamentary term and current challenges faced regarding progress towards Finland's climate targets. The monitoring group has made use of the 2022 Annual Climate Report and, based on the report, discussed broad sets of topics related to transport and energy as well as the situation concerning the declining carbon sink.

The monitoring group has been chaired by the Minister of the Environment and Climate and its members have comprised representatives appointed by nine parliamentary parties representing those parties or groups included in Parliament when Finland's new Parliament convened and began its work after the election in April 2019. The chair of the Finnish Climate Change Panel has been an expert member of the monitoring group.

Appendices

Appendix 1. Statistics and scenarios used

Inventory data

The emissions data presented for 2005–2021 in the Annual Climate Report is in accordance with Finland's official greenhouse gas (GHG) inventory and calculated according to IPCC Guidelines. Statistics Finland is responsible for the GHG inventory, and the methodological descriptions concerning the reporting are included the inventory reports of Statistics Finland. The statistical methods are constantly being developed, and emissions data can also be revised retroactively based on new developments. Changes in emissions excluding the LULCF sector are usually minor. Data for 2022 is based on proxy estimates. A proxy estimate is calculated at a rougher level than the actual inventory calculation. The proxy estimate is therefore not final, and emissions data will be revised when all the data used in the calculation is completed. The EU monitors the implementation of obligations in the effort sharing sector and commitments in the LULUCF sector over five-year periods (2021–2025 and 2025–2030). Accounting based on inventory data for these five-year periods will be reported in 2027 and 2032. Examinations of the achievement of EU obligations and commitments will use 2027 inventory data for 2021–2025 and 2032 data for 2026–2030, which means the final surplus/deficit may differ from the figures presented in this Annual Climate Report (Table 2).

There is significant annual fluctuation in emissions and sinks in the LULUCF sector. In addition, there are greater uncertainties involved in the ability to have effects and knowledge base of measures in the LULUCF sector than in other sectors. Retroactive revisions made to LULUCF data are usually larger than for other sectors. The estimates for the most recent years will typically become more accurate when further data on details such as the increment of growing stock and surface areas in different land use categories become available from the National Forest Inventory according to its inventory cycles. In particular, the proxy estimate for the LULUCF sector's net sink may differ considerably from the result subsequently calculated from revised baseline data. The 2022 inventory proxy estimate data is based on the latest National Forest Inventory that is still underway (NFI 13). Estimates concerning the LULUCF sector will be revised when updated data is received on the harvested wood products pool, surface area sizes and growing stock.

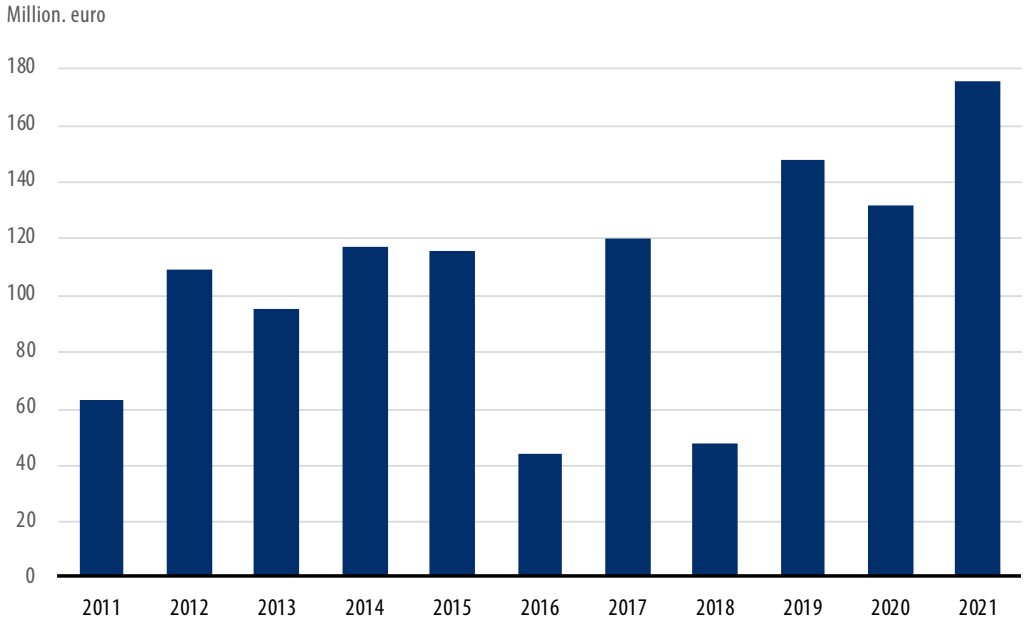
Scenarios used

The estimates presented in the Annual Climate Report on the achievement of the emissions reduction targets are partly based on scenario calculations. A scenario is a calculated estimate of how emissions will develop if the assumptions that formed the basis for the calculation materialise. Scenario calculation is subject to continuous updating and development, and the aim is to complement and specify the knowledge base for the scenarios. Scenario calculation typically utilises mathematical models. The scenario analysis of the Annual Climate Report is based on the scenario data (with some minor changes) reported in conjunction with the National Energy and Climate Plan Progress Report (NECPR) submitted to the EU in March 2023. The scenarios do not include any impacts of carbon capture on the emission level.

Appendix 2. Finland's International climate finance in 2021

Finland channels its climate finance – that is, supports activity where climate benefits are the main objective or a significant subobjective – through all of the different development cooperation channels from civil society organisation projects to development banks. Since data for each year is not completed until the autumn of the following year, this Annual Climate Report reports on 2021. In 2021, Finland's public climate finance channelled to developing countries totalled just under EUR 175 million. This follows a good growth trend and is record-high so far (see graph). The data takes account of returns from investments made from the appropriation for development policy loans and investments, totalling around EUR 1.6 million. Of the support, 53% was allocated to mitigation and 47% to adaptation. The breakdown of multilateral core funding and bilateral/regional funding was almost even (54% and 46%, respectively).

Figure 21. Finland's climate finance disbursements in 2011–2021. Source: Ministry for Foreign Affairs.



The robust policy of the previous and current Government allocating development policy loan and investments in climate action is reflected in the statistics. Grant-based cooperation accounted for almost half of climate finance in 2021, while the other half was channelled through investments and loans and the Finnish State-owned development finance institution, Finnfund. A target that more than half of its new investments must be allocated for climate projects has been set for Finnfund's activities.

The adaptation-mitigation balance is good considering that the share of development policy loans and investments of the whole is high and that they are so far less suitable for adaptation support, as it is easier to create mitigation projects on market terms (such as renewable energy projects or energy-efficiency projects).

Appendix 3. Sector-specific indicators

Energy and industry

Figure 22. Figure 22. Emissions from industrial processes in 2005–2022. Data for 2022 is based on a proxy estimate. Source: Statistics Finland.

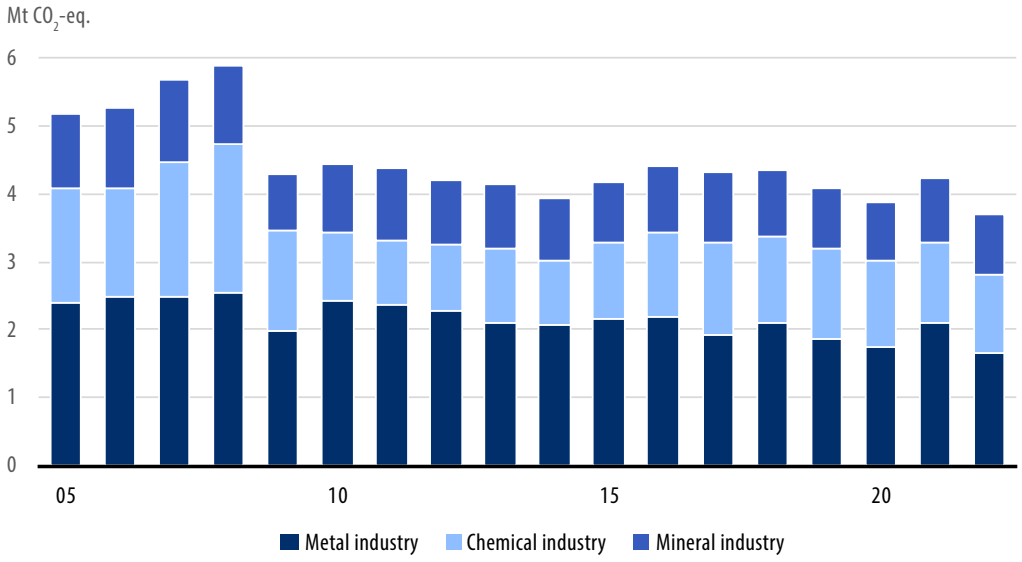


Figure 23. Total energy consumption by energy source in 2005–2022. Data for 2022 is preliminary data. Source: Statistics Finland.

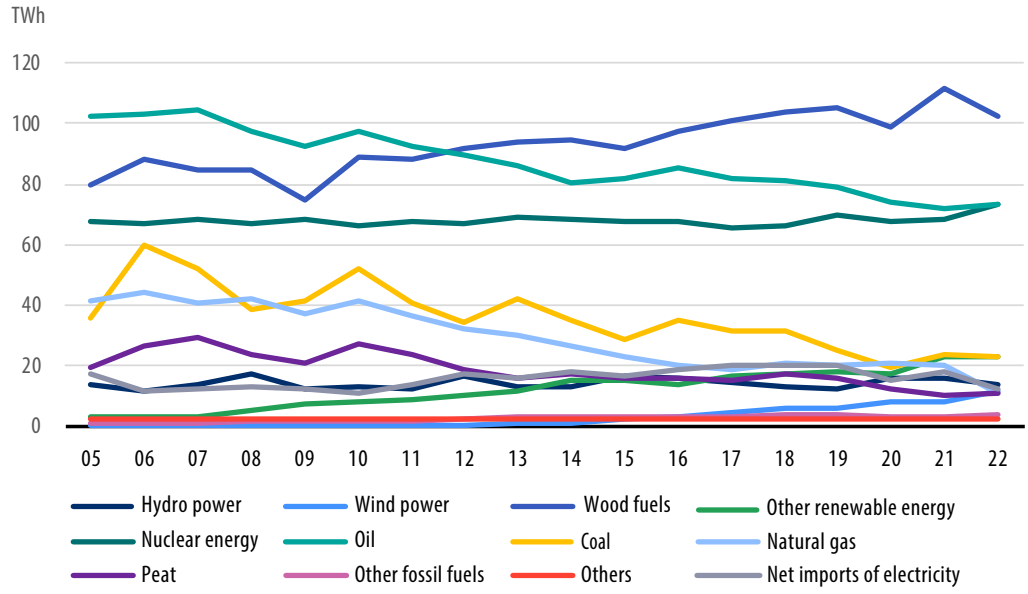
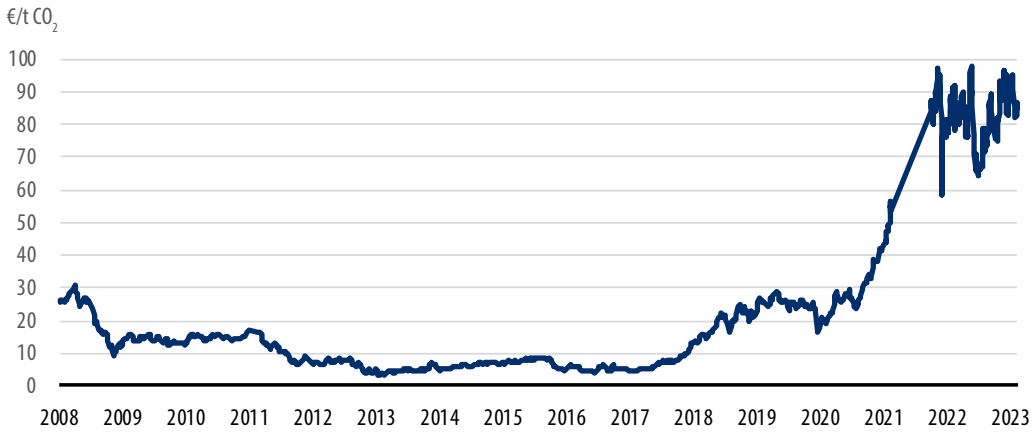


Figure 24. Emission allowance price in EU ETS from April 2008 to May 2023. Source: Ember.



Transport

Figure 25. Energy consumption in road transport by energy source in 2005–2021. Source: Statistics Finland.

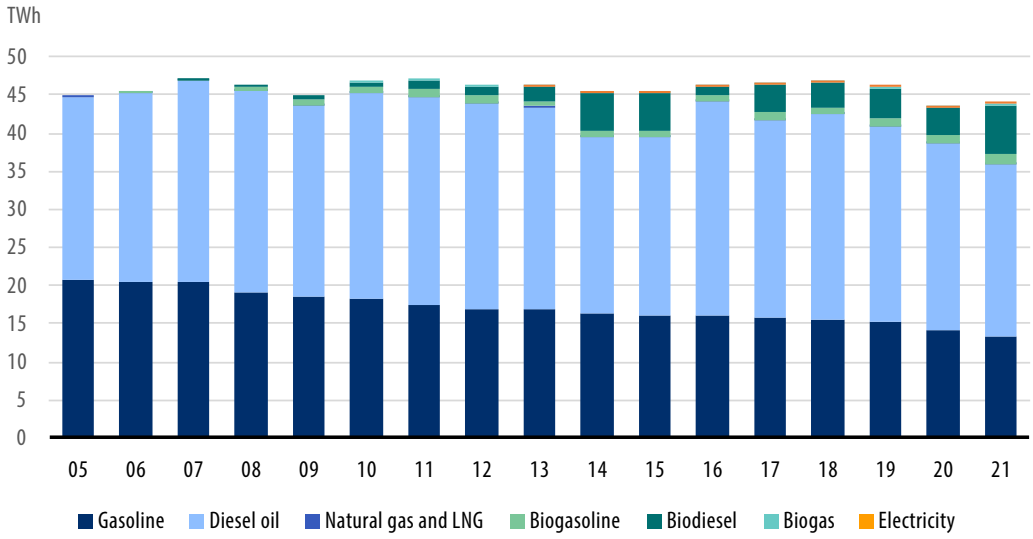


Figure 26. Road transport performance (million km) in 2000–2021. The statistical method for calculating street transport performance changed in 2016. Source: Statistics Finland.

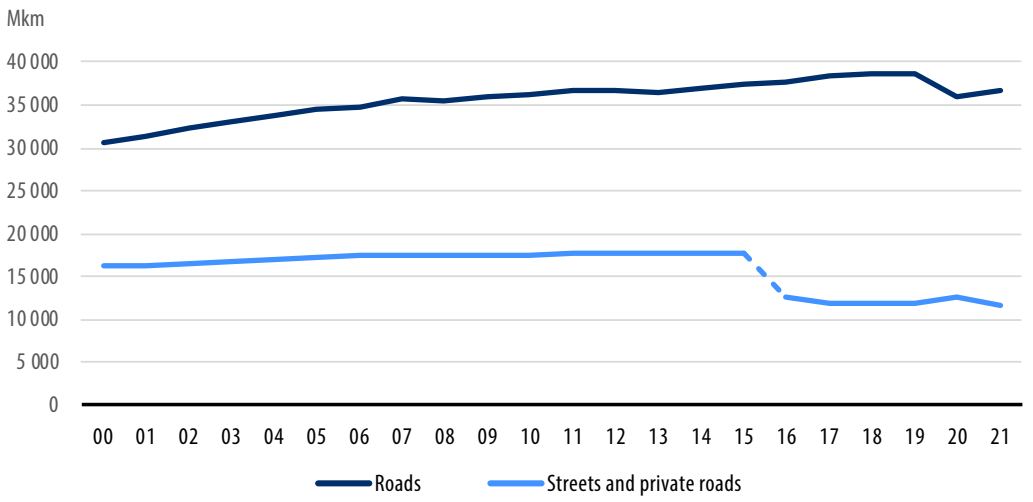


Figure 27. Share of biofuels in transport fuels (%). The targets for 2008–2020 take account of double counting, whereas the target for 2030 does not include double counting. From 2022 onwards, the distribution obligation also takes account of gas. Data for 2022 is preliminary data. Source: Statistics Finland and Ministry of Economic Affairs and Employment.

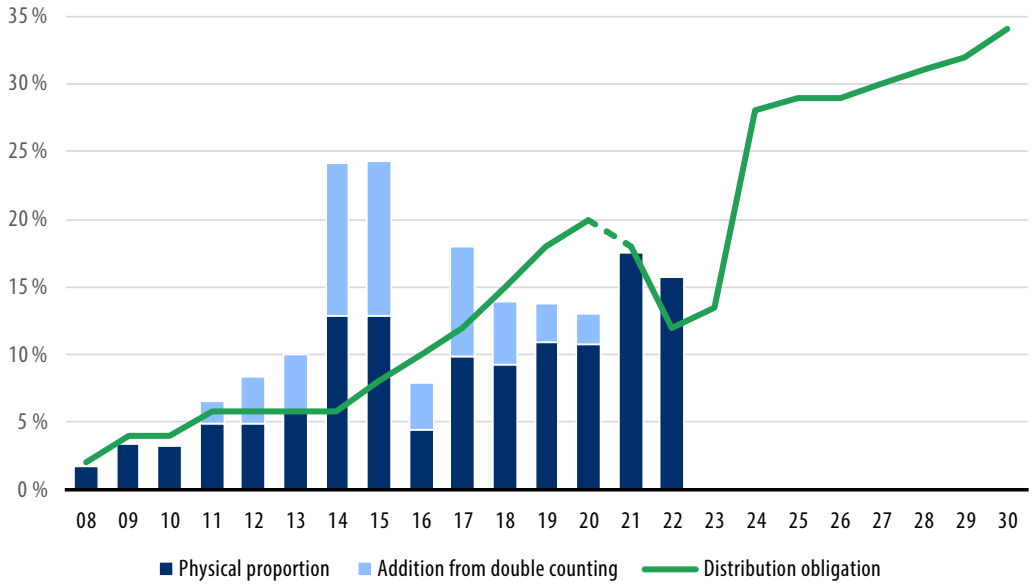


Figure 28. First registrations of passenger cars in 2005–2022 and imported used passenger cars in 2014–2022. Source: Finnish Transport and Communications Agency (Traficom)

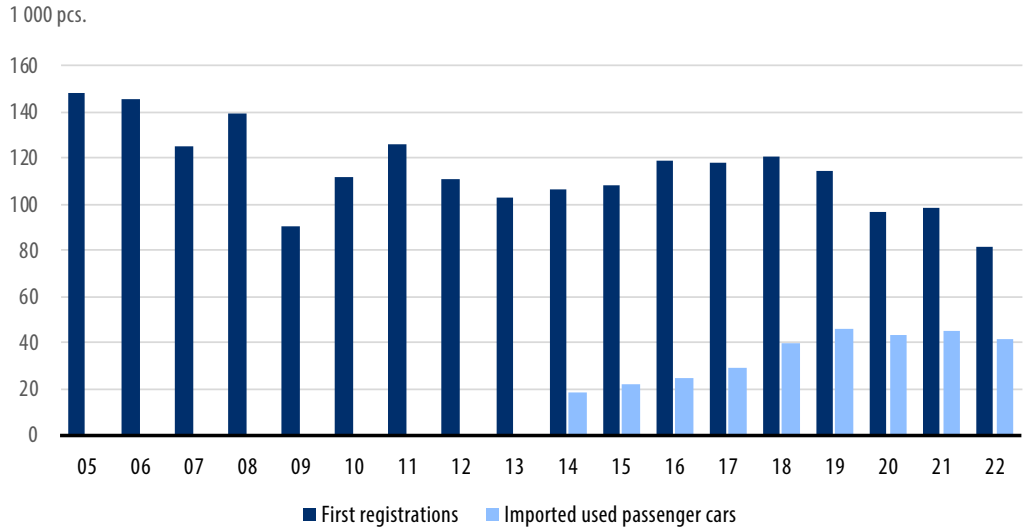


Figure 29. CO_2 emissions from passenger cars registered for the first time (g/km). Source: Statistics Finland

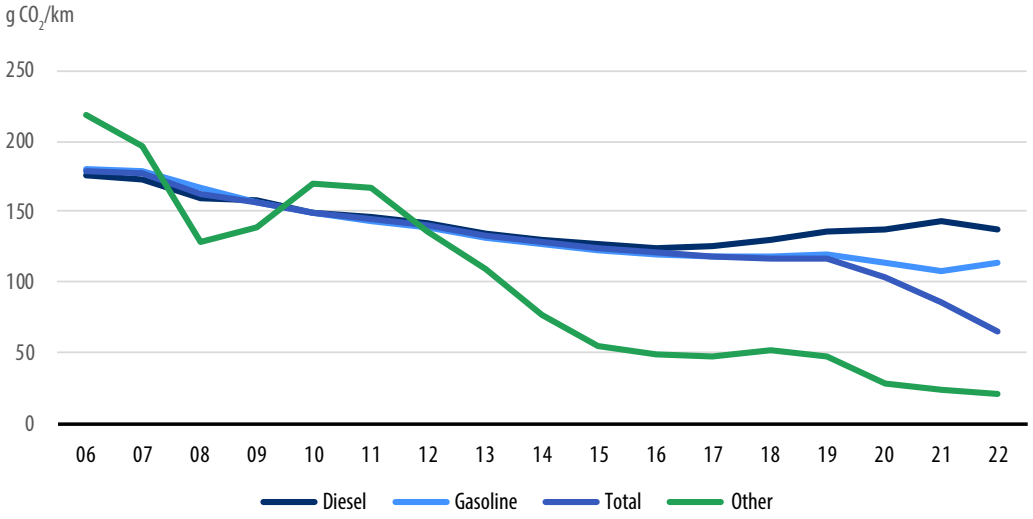


Figure 30. Number of electrically, gas- and ethanol-powered cars in Finland in 2010–2022. Source: Statistics Finland.

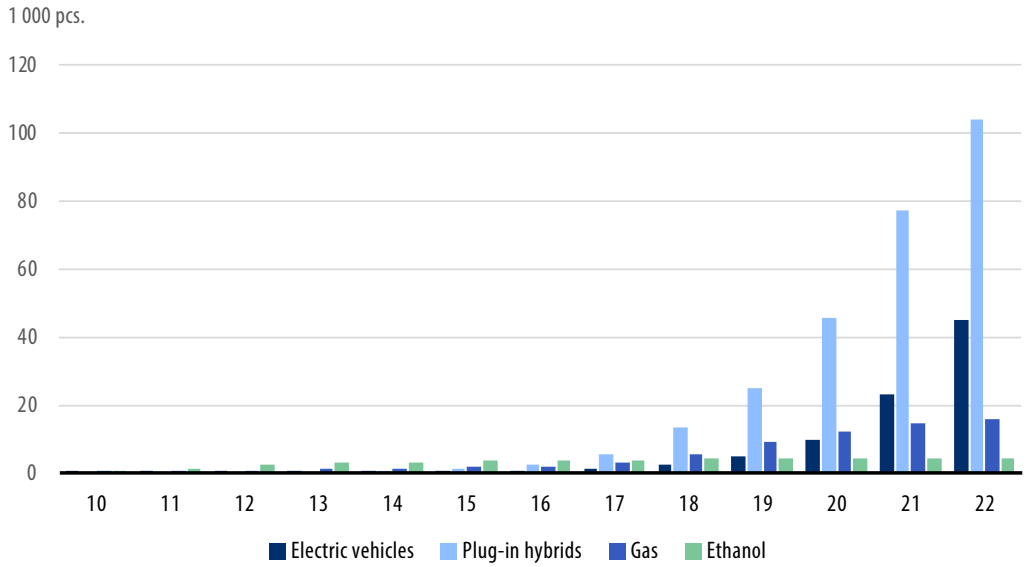


Figure 31. Average age of passenger cars in traffic use in 1990–2022. Source: Finnish Transport and Communications Agency (Traficom) and Finnish Information Centre of Automobile Sector

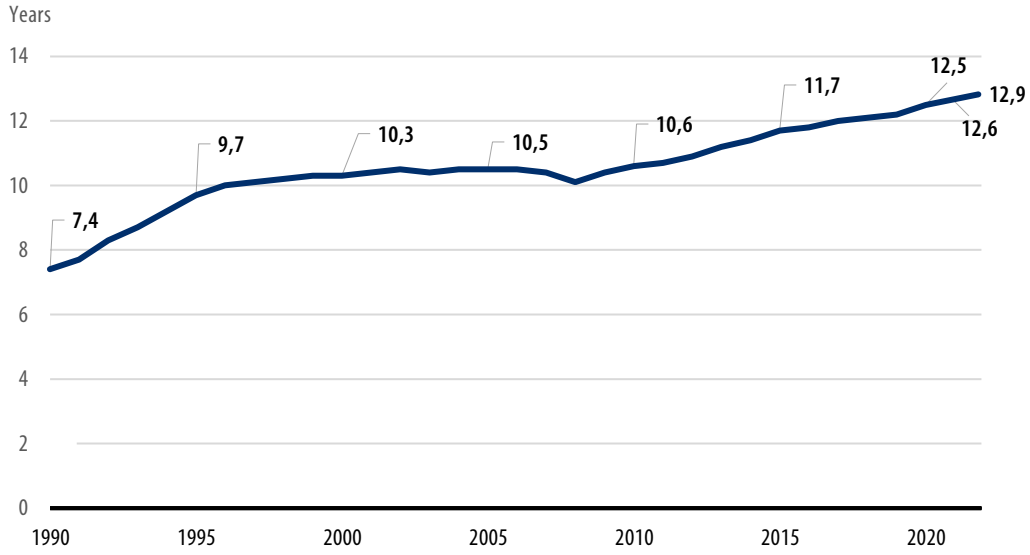


Figure 32. Use of conversion and purchase subsidies in 2018–2022. Source: Finnish Transport and Communications Agency (Traficom)

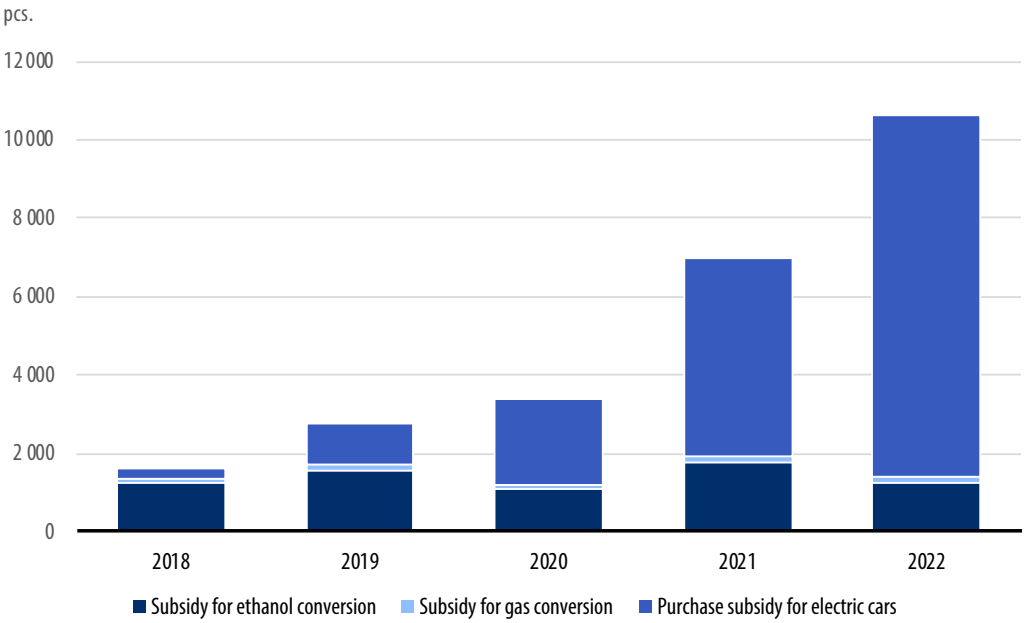
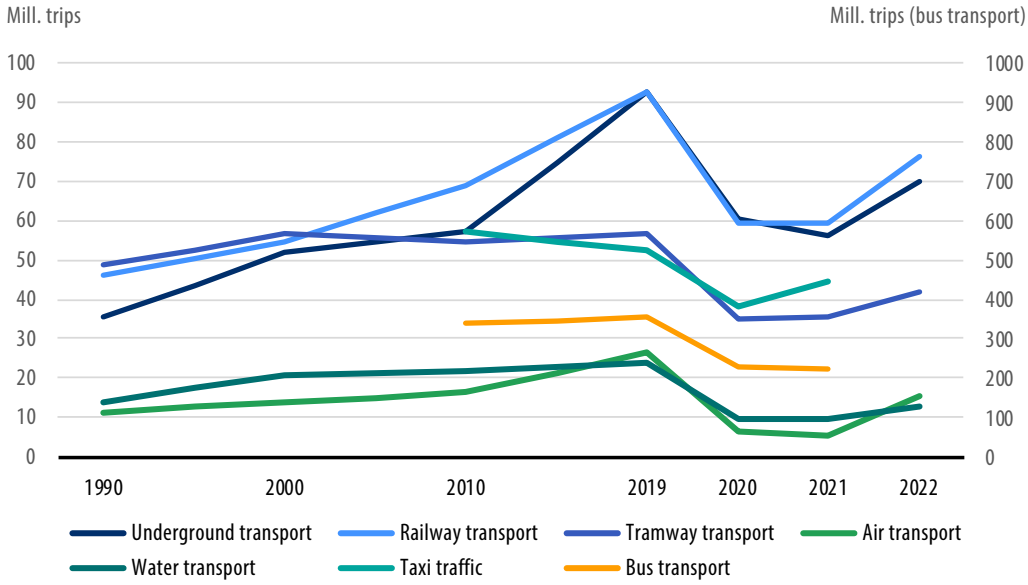


Figure 33. Passengers by mode of transport. Source: Statistics Finland.



Agriculture

Figure 34. Numbers of animals on farms in 2005–2022. Source: Natural Resources Institute Finland.

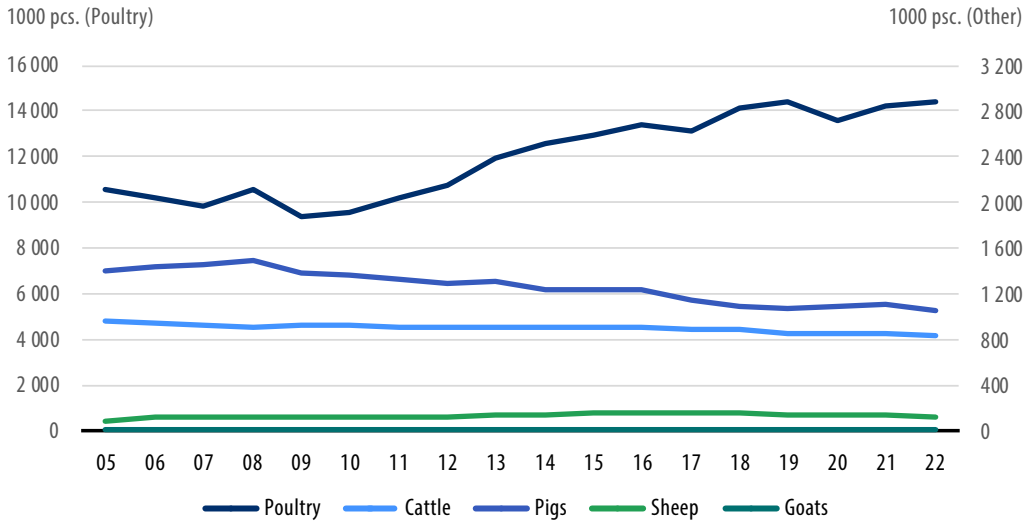
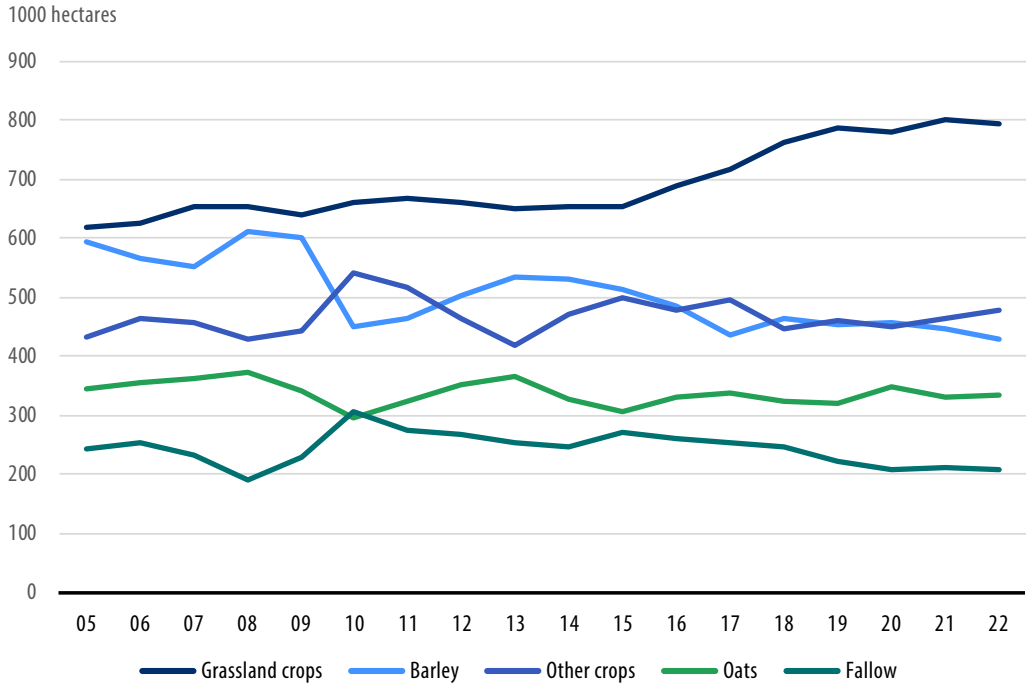
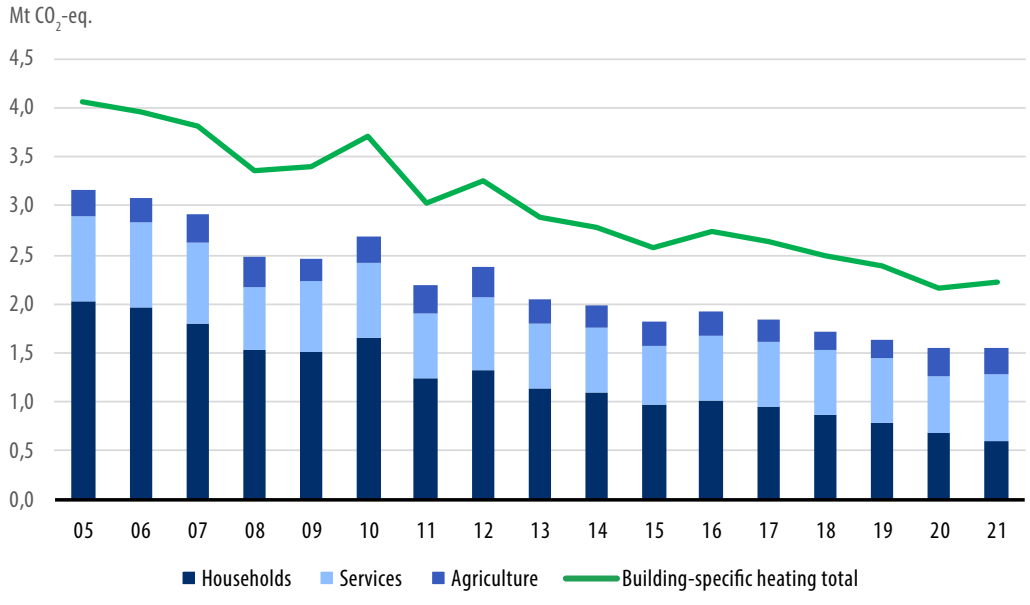


Figure 35. Use of arable area in 2005–2022. Source: Natural Resources Institute Finland.



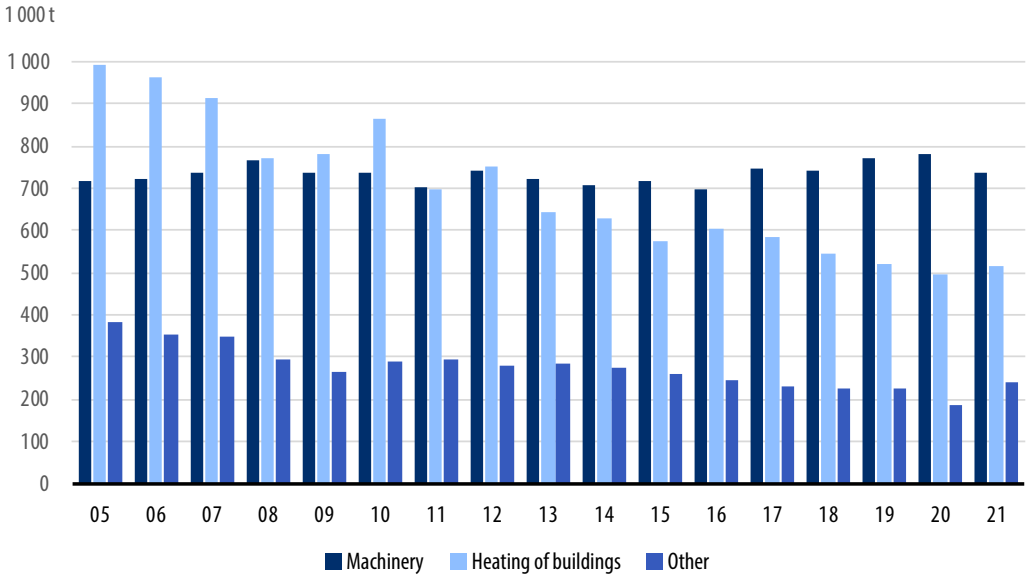
Building-specific heating

Figure 36. Emissions from light fuel oil by sector in building-specific heating and total emissions from building-specific heating in 2005–2021. Agriculture includes grain dryers. Source: Statistics Finland.



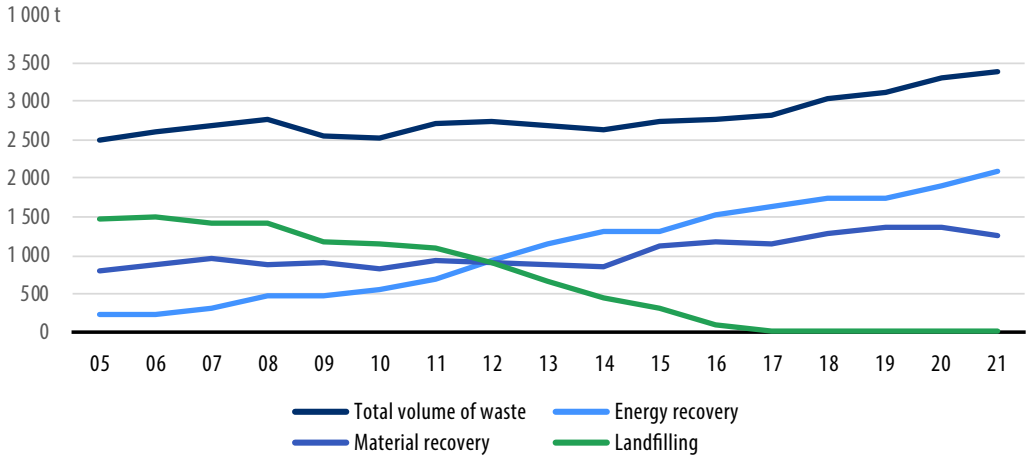
Use of light fuel oil

Figure 37. Consumption of light fuel oil in the effort sharing sector, broken down into non-road mobile machinery, building-specific heating and other use in 2005–2021. Other use includes oil use in industry for purposes other than oil use in non-road mobile machinery, rail transport, water transport and fishing vessels. Source: Statistics Finland.



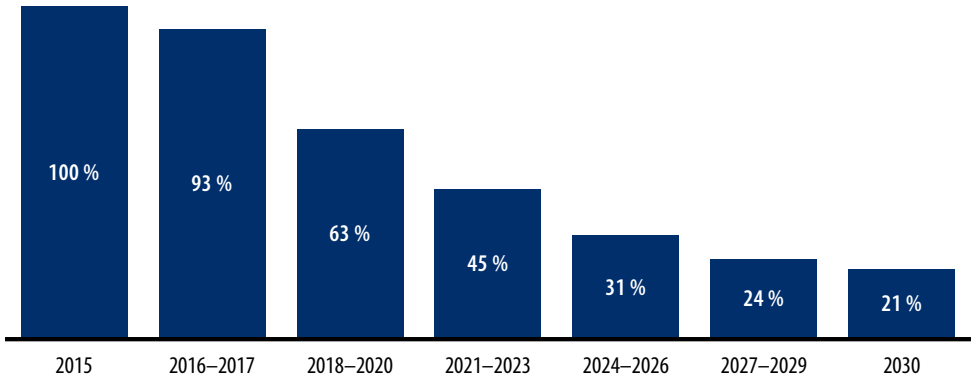
Waste management

Figure 38. Amount of municipal waste in Finland by treatment method in 2005–2021. Source: Statistics Finland and Finnish Environment Institute.



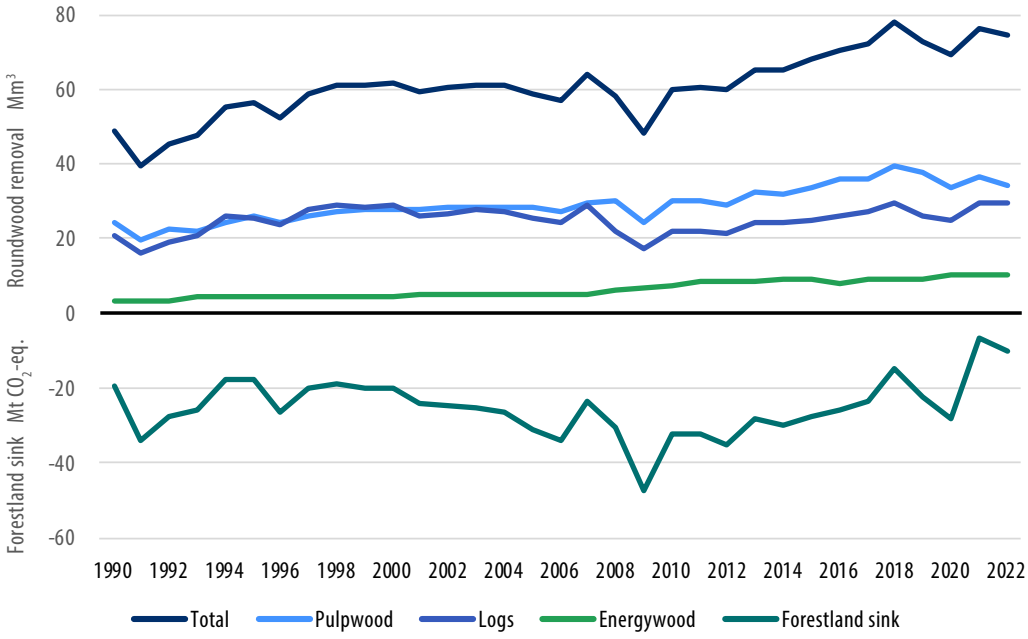
F-gases

Figure 39. Quota of HFCs placed on the market within the EU in 2015–2030 as a percentage of the 2009–2012 level. Source: Regulation (EU) No 517/2014.



Roundwood removal

Figure 40. Roundwood removal and forest land sink in Finland in1990–2022. Source: Natural Resources Institute Finland.



Adaptation

Figure 41. Number of residents in significant flood risk areas. Source: Finnish Environment Institute.

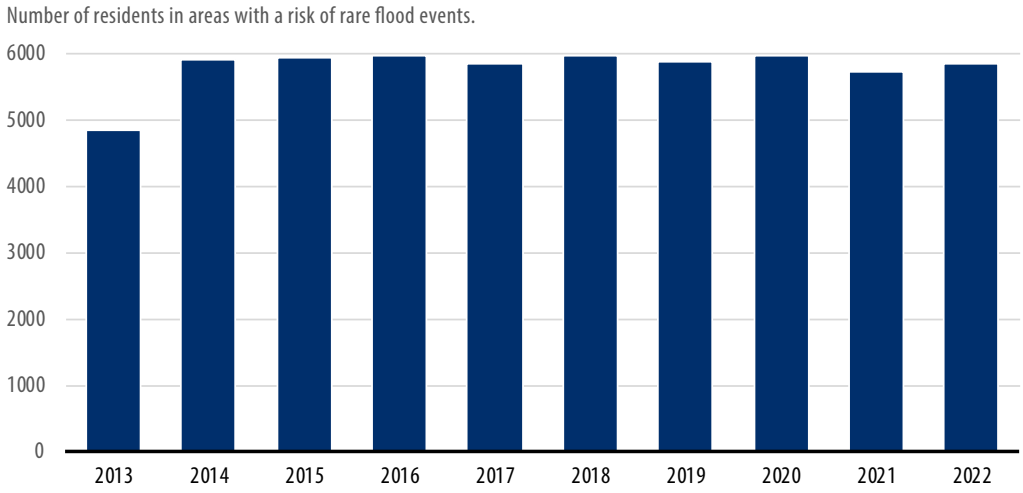
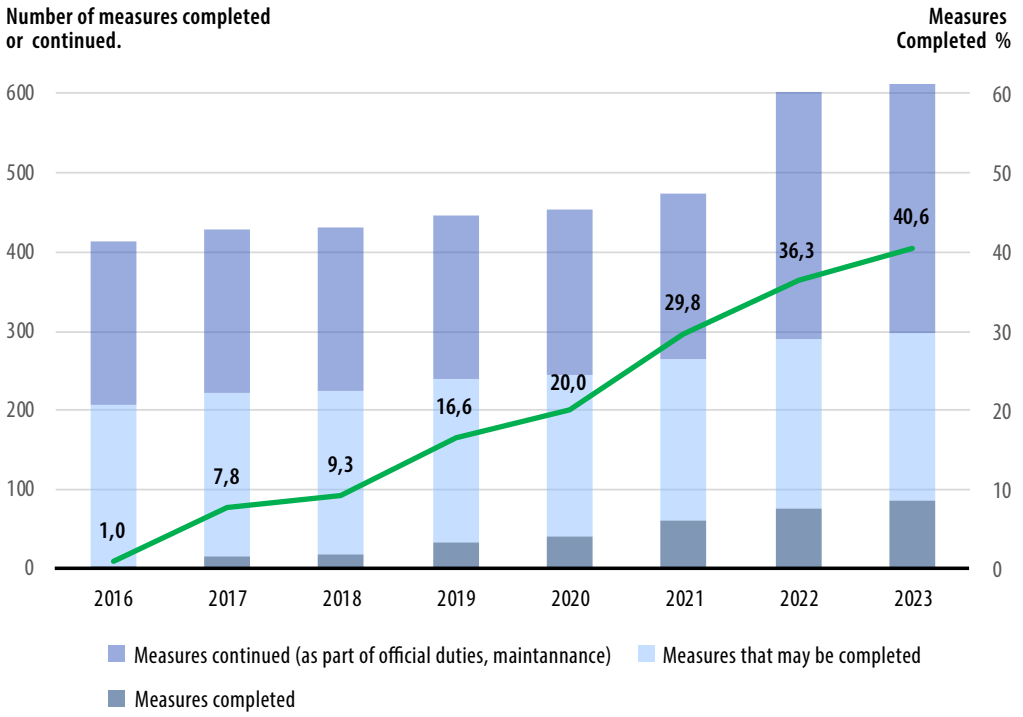
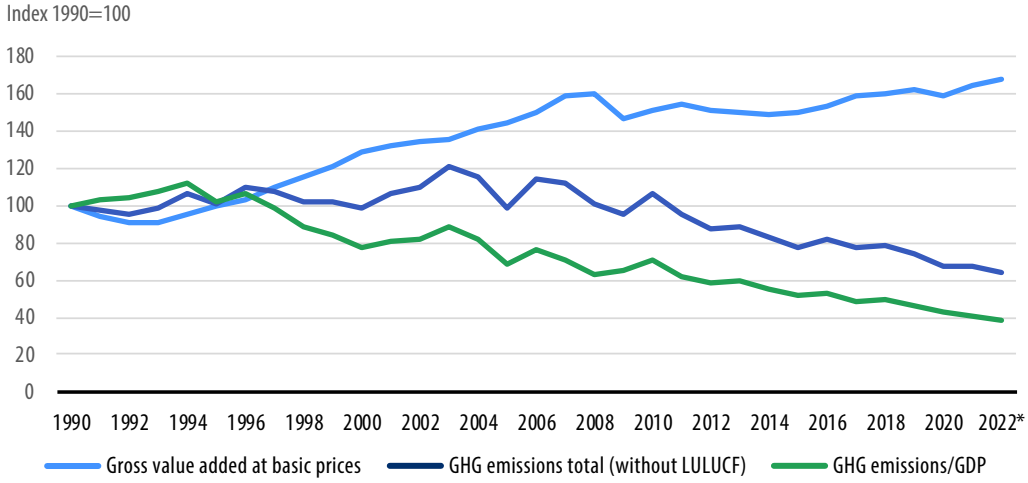


Figure 42. Implementation of flood risk management measures. Source: Finnish Environment Institute.



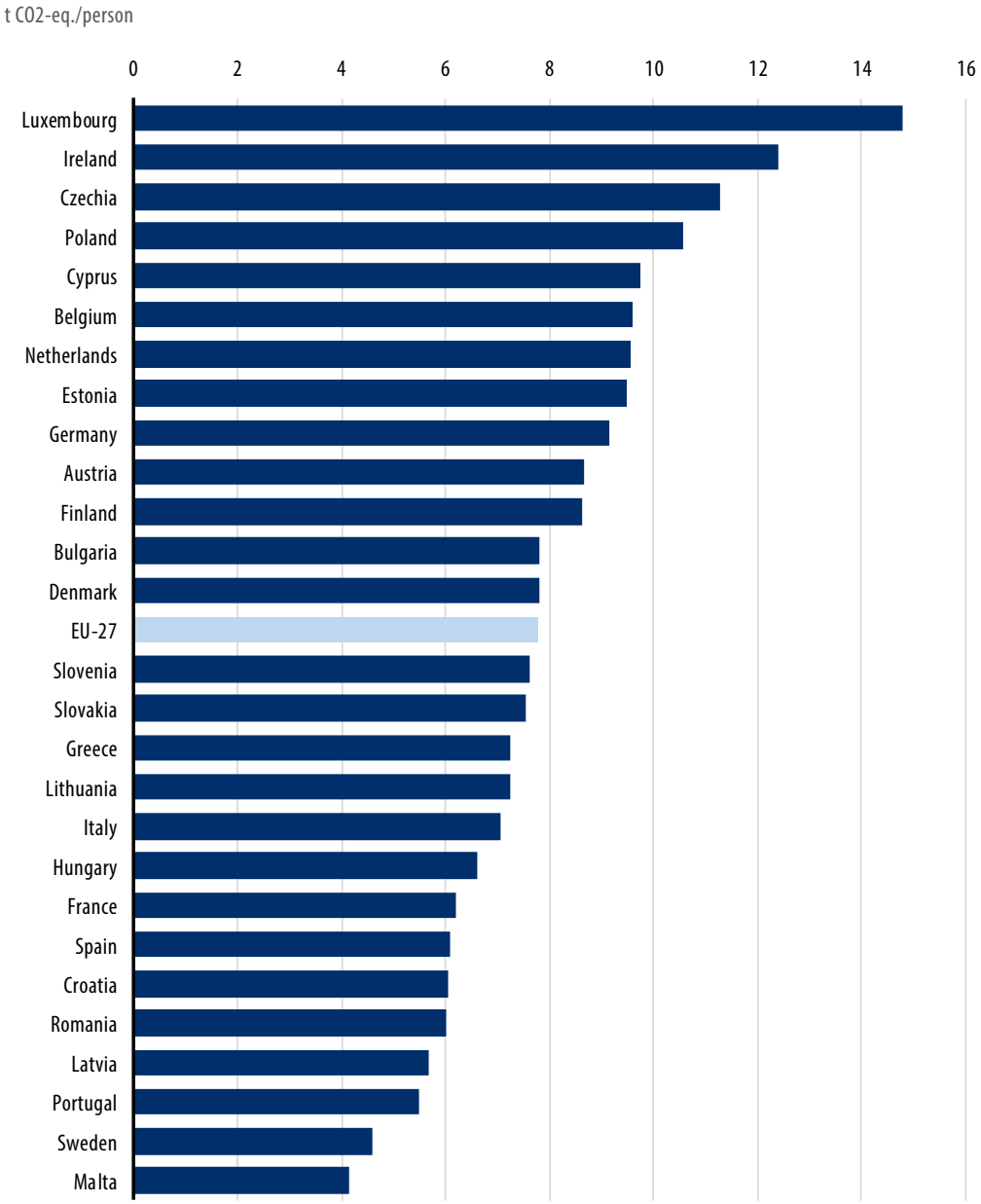
National economy

Figure 43. Trend in national economy (gross value added at basic prices, at 2015 prices) and in GHGs in Finland in 1990–2022. *GDP data for 2021 and 2022 is preliminary data. Emissions data for 2022 is based on proxy estimates. Source: Statistics Finland.



EU emissions

Figure 44. GHG emissions in the EU and EU-27 per capita in 2021. Source: EEA/UNFCCC.



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