



First update of the national air pollution control programme 2030

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Katja Ohtonen, Mikko Savolahti, Pia Anttila, Birgitta Vainio-Mattila,
Petri Liljaniemi

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First update of the national air pollution control programme 2030

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Abstract

Compared to many European cities, the levels of air pollutants are low in Finland. In recent decades, both emissions and levels of pollutants have for the most part decreased. As a whole, the situation with respect to air pollution control is good, but atmospheric pollution still causes health and environmental harm in Finland as well.

In accordance with the EU Directive on the reduction of national emissions of certain atmospheric pollutants (National Emission Ceilings Directive 2016/2284), Finland drew up the National Air Pollution Control Programme 2030 in 2019. The programme sets out the measures by which the emission reduction commitments for sulphur dioxide, nitrogen oxides, volatile organic compounds, fine particulate matter and ammonia laid down in the directive are implemented. The National Emission Ceilings Directive obliges Member States to update their national air pollution control programmes at least every four years. This is the first update of Finland's National Air Pollution Control Programme 2030. The emission inventories, emission scenarios, air quality data, and information on the national policy framework, division of responsibilities and ecosystem monitoring have been updated. The National Air Pollution Control Programme adopted in 2019 remains in force and this update will be read side by side with it.

The implementation of the programme is progressing as planned and in a well-organised manner. The impacts are monitored through emission inventories, air quality monitoring and ecosystem monitoring.

The emission inventory data shows that in 2020 Finland achieved all emission reduction commitments with respect to air pollutants listed in the National Emission Ceilings Directive. Based on the scenario calculations, Finland should meet the new stricter emission reduction commitments in 2030 as well. This is why the update report does not propose any new measures to reduce emissions. The implementation of the additional measures included in the National Air Pollution Control Programme adopted in 2019 will continue. The implementation of the separate programme to reduce ammonia emissions from agriculture will continue as well.

Keywords air pollution control, air quality, air pollutants, emissions, health impact, environmental impact, agriculture, street dust, fine particulate matter, small-scale combustion, wood combustion

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Kansallisen ilmansuojeluohjelman 2030 ensimmäinen päivitys

Ympäristöministeriön julkaisuja 2023:24
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Tekijä/t Katja Ohtonen, Mikko Savolahti, Pia Anttila, Birgitta Vainio-Mattila, Petri Liljaniemi
Kieli englanti **Sivumäärä** 80

Tiivistelmä

Ilman epäpuhtauksien pitoisuudet Suomessa ovat matalia moniin eurooppalaisiin kaupunkeihin verrattuna. Viime vuosikymmenten aikana niin päästöt kuin pitoisuudetkin ovat pääosin laskeneet. Ilmansuojelutilanne on siis kokonaisuutena hyvä, mutta ilmansaasteista aiheutuu edelleen terveys- ja ympäristöhaittoja Suomessakin.

EU:n päästökattodirektiivin (2016/2284) mukaisesti Suomi laati vuonna 2019 Kansallisen ilmansuojeluohjelman 2030. Ilmansuojeluohjelma sisälsi ne toimet, joilla direktiivissä säädetyt rikkidioksidin, typenoksidien, haihtuvien orgaanisten yhdisteiden, pienhiukkasten ja ammoniakkin päästövähennysveloitteet toteutetaan. Päästökattodirektiivi velvoittaa jäsenmaat päivittämään ilmansuojeluohjelman vähintään neljän vuoden välein. Tämä selvitys on Kansallisen ilmansuojeluohjelman 2030 ensimmäinen päivitys. Päästöinventaarit, päästöskenaariot, ilmanlaatutiedot sekä tiedot kansallisesta politiikkakehyksestä, vastuunjaosta ja ekosysteemiseurannasta on päivitetty. Vuoden 2019 ilmansuojeluohjelma jää edelleen voimaan, ja tätä päivitystä luetaan sen kanssa rinnakkain.

Ilmansuojeluohjelman toteutus on käynnissä suunnitellusti ja organisoidusti. Vaikutuksia seurataan päästöinventarioiden, ilmanlaadun seurannan ja ekosysteemiseurantojen avulla.

Päästöinventaaritiedot osoittavat, että Suomi saavutti kaikkien päästökattodirektiivin mukaisten ilmansaasteiden päästövähennysveloitteet vuonna 2020. Skenaario-laskelmat osoittavat, että Suomen ennustetaan saavuttavan uudet, tiukemmat päästövähennysveloitteet myös vuonna 2030. Näin ollen tässä ilmansuojeluohjelman päivityksessä ei esitetä toimenpiteitä päästöjen vähentämiseksi. Vuoden 2019 ilmansuojeluohjelmassa esiteltynä lisätoimenpiteiden toimeenpanoa jatketaan. Erillisen maatalouden ammoniakkipäästöjen vähentämishojelman toimeenpanoa jatketaan.

Asiasanat ilmansuojelu, ilmanlaatu, ilman epäpuhtaudet, ilmansaasteet, päästöt, terveysvaikutukset, ympäristövaikutukset, maatalous, katupöly, pienhiukkaset, pienpoltto, puunpoltto

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Första uppdatering av det nationella luftvårdsprogrammet 2030

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Referat

Koncentrationerna av luftföroreningar är låga i Finland jämfört med många europeiska städer. Under de senaste årtiondena har såväl utsläppen som koncentrationerna för det mesta minskat. Trots att läget inom luftvården generellt sett är gott orsakar luftföroreningar fortfarande både hälso- och miljölägenheter även i Finland.

I enlighet med EU-direktivet om nationella utsläppstak ((EU) 2016/2284, takdirektivet) utarbetade Finland år 2019 ett nationellt luftvårdsprogram 2030. Luftvårdsprogrammet innefattade de åtgärder som krävs för att de åtaganden om minskning av utsläppen av svaveldioxid, kväveoxider, flyktiga organiska föreningar, fina partiklar och ammoniak som fastställts i direktivet ska fullgöras. Enligt takdirektivet ska medlemsstaterna uppdatera sina nationella luftvårdsprogram minst vart fjärde år. Denna redovisning utgör den första uppdateringen av det nationella luftvårdsprogrammet 2030. Uppdateringen omfattar utsläppsinventeringarna, utsläppsscenarierna, luftkvalitetsuppgifterna samt informationen om den nationella politiska ramen, ansvarsfördelningen och ekosystemövervakningen. Luftvårdsprogrammet 2019 fortsätter att gälla, och uppdateringen ska läsas jämsides med programmet.

Genomförandet av luftvårdsprogrammet fortskrider på ett organiserat sätt och enligt plan. Programmets effekt övervakas med hjälp av utsläppsinventeringar, luftkvalitetuppföljning och övervakning av ekosystem.

Uppgifterna från utsläppsinventeringen visar att Finland år 2020 uppfyllde åtagandena för minskning av utsläppen av de luftföroreningar som omfattas av takdirektivet. Enligt scenarier kommer Finland också att uppfylla de nya och mer krävande minskningsåtagandena 2030. I denna uppdatering av luftvårdsprogrammet presenteras därför inga strategier och åtgärder för utsläppsminskning. Genomförandet av de ytterligare åtgärder som presenterades i luftvårdsprogrammet 2019 fortsätter. Genomförandet av det separata programmet för minskning av ammoniakutsläppen från jordbruket fortsätter.

Nyckelord	luftvård, luftkvalitet, luftföroreningar, utsläpp, hälsoeffekter, miljökonsekvenser, jordbruk, gatudamm, små partiklar, småskalig vedeldning, vedeldning
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PREFACE

Finland has reduced its air pollutant emissions in accordance with international agreements, EU directives and national legislation. Compared to many European cities, the levels of air pollutants in Finland are low. In recent decades, both emissions and levels of pollutants have decreased for the most part. As a whole, the situation with respect to air pollution control is good, but atmospheric pollution still causes health and environmental harm in Finland as well. Further efforts are needed to reduce emissions. The occasional poor air quality caused by transport is a result of exhaust gas emissions and street dust. Small-scale wood combustion is a significant source of emissions of fine particulate matter and can cause local air quality problems. Ammonia emissions mainly originate from agriculture, and their decrease has been slow.

Finland drew up the National Air Pollution Control Programme 2030 in accordance with the EU Directive on the reduction of national emissions of certain atmospheric pollutants (National Emission Ceilings Directive, NEC Directive) in 2019. The NEC Directive obliges Member States to update their national air pollution control programmes (NAPCPs) at least once every four years. This is the first update of Finland's National Air Pollution Control Programme 2030. The emission inventories, emission scenarios, air quality data, and information on the national policy framework, division of responsibilities and ecosystem monitoring have been updated. The NAPCP adopted in 2019 remains valid, and this update will be read side by side with it.

The main authors of the update are Katja Ohtonen from the Ministry of the Environment, Mikko Savolahti from the Finnish Environment Institute (Chapters 6 and 9) and Pia Anttila from the Finnish Meteorological Institute (Chapters 7 and 10). Birgitta Vainio-Mattila from the Ministry of Agriculture and Forestry and Petri Liljaniemi from the Ministry of the Environment contributed to the report in their areas of expertise (Chapters 5 and 8). The Implementation Network of the National Air Pollution Control Programme 2030 (Section 4.1) served as the steering group for the preparation of the update. Key stakeholders were asked to issue opinions on a draft of the update, and those not included in the distribution list were also given the opportunity to provide their opinions (Appendix 1). The authors thank all those who contributed comments and opinions.

The Finnish Government adopted the first update of the NAPCP in the government plenary session held on 2 March 2023.

The NAPCP update must be submitted to the European Commission within two months of its adoption at the government plenary session.

1 Introduction

The Directive (EU) 2016/2284 of the European Parliament and of the Council on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC (NEC Directive), obliges Member States to draw up NAPCPs. In Finland, the NAPCP was prepared by the Ministry of the Environment and the working group appointed by the ministry, which included representatives of all relevant stakeholders from various ministries, expert institutions, interest groups, the Association of Finnish Municipalities and the Finnish Association for Nature Conservation. The Finnish Government adopted the National Air Pollution Control Programme 2030 on 7 March 2019 (Ministry of the Environment 2019).

The NAPCP includes measures to be used to achieve the directive's air pollutant emission reduction commitments set for sulphur dioxide, nitrogen oxides, volatile organic compounds (VOCs), fine particulate matter and ammonia. According to the calculations made, Finland will achieve the reduction commitments with the measures already agreed. As a result, the NAPCP did not propose any binding emission reduction policies and measures (PaMs). However, the NAPCP (Chapter 6) included additional measures to further reduce emissions, improve air quality and reduce exposure. The measures are aimed in particular at combatting the adverse effects of exhaust gases and street dust, as well as reducing emissions from small-scale combustion. In addition, Finland prepared an Action Plan to Reduce Ammonia Emissions from Agriculture in Finland for the years 2018–2020 in 2018 and for the years 2021–2027 in 2021 (Ministry of Agriculture and Forestry 2018 and 2021).

The NEC Directive also obliges Member States to update their NAPCPs at least once every four years. This is the first update of Finland's National Air Pollution Control Programme 2030. The emission inventories, emission scenarios, air quality data, and information on the national policy framework, division of responsibilities and ecosystem monitoring have been updated. The NAPCP adopted in 2019 remains valid, and this update will be read side by side with it.

The content requirements of the update are defined in Part 1 of Annex III to the NEC Directive. The update must be submitted to the Commission in the Common Format, which involves additional content requirements. In accordance with the requirements, this update contains the following sections:

- assessment of progress in the implementation of the NAPCP;
- national air quality and pollution policy framework;
- progress made in reducing emissions through existing policies and measures and compliance with emission reduction commitments;
- progress in improving air quality achieved with the current policies and measures, and the degree of compliance with air quality commitments;
- projected further evolution of emissions;
- projected development of air quality;
- assessment of the need for additional emission reduction measures.

In addition, the update includes progress reports on the implementation of the Action Plan to Reduce Ammonia Emissions from Agriculture and on ecosystem monitoring.

Emissions from the autonomous region of Åland are included in the NAPCP and in this update, but Åland decides independently on its emission reduction policies and measures.

2 National air quality and pollution policy framework

The national policy priorities concerning air pollution control and air quality remain largely unchanged from the time of the publication of the National Air Pollution Control Programme 2030 in 2019. This chapter covers the main features of the policy as well as any changes.

2.1 Objectives

Finland aims to reduce national emissions at least in accordance with the emission reduction commitments set out in the NEC Directive (2016/2284). The achievement of the target and the projected evolution are examined in Chapters 6, 7, 9 and 10.

The general aim of Finland's air pollution control policy is to improve human wellbeing by ensuring good air quality, safeguarding biodiversity and preventing the acidification and eutrophication of ecosystems. This aim contributes to fulfilling the public authorities' obligation to guarantee for everyone the right to a healthy environment laid down in the Constitution of Finland (731/1999). The importance of this goal is also apparent in the Environmental Protection Act (527/2014), which pays special attention to safeguarding good air quality. Under the Environmental Protection Act, the aim for all activities is to achieve a level of air quality where the quantity of hazardous or harmful substances or compounds in ambient air, or in the deposition of these, is not present at a level that would cause harm to health, nature and related functions, or issues such as the comfort of the environment.

The quality of the environment is improved by reducing the adverse effects caused by air pollutants on health and the environment. The adverse effects are reduced by preventing the emergence of emissions, reducing emissions with the best available techniques, such as emission limit value regulation, and designing and implementing living environments that minimise people's exposure to air pollutants.

A further goal of Finland's air pollution control policy is to promote international measures for reducing air pollutant emissions. Finland sees it as important that other countries also reduce their emissions as a significant share of the air pollutants in Finland consists of long-range transboundary air pollution.

One of the objectives of the Ministry of the Environment's strategy (until 2035) published in autumn 2022 is "Carbon-negative Finland has stopped biodiversity loss and pollution". In terms of air pollution control, this means that, in 2035, emissions into the air will no longer impair the state of the environment. According to the strategy, emissions into the environment are prevented through economic, legal and informational instruments. (Ministry of the Environment 2022a)

The Directive on ambient air quality and cleaner air for Europe (Ambient Air Quality Directive, 2008/50/EC) and the Directive relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air (Heavy Metals Directive, 2004/107/EC) are implemented nationally by the Environmental Protection Act (527/2014), the Government Decree on Air Quality (79/2017) and the Government Decree on Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air (Heavy Metals Decree, 113/2017). The World Health Organization updated its air quality guideline values in autumn 2021 (WHO 2021). For the most part, the guideline values were significantly tightened compared to the previous WHO guidelines. The Ambient Air Quality Directive is currently being updated. The Commission presented its legislative proposal for an update of the Ambient Air Quality Directive in October 2022, recommending the tightening of limit values to better correspond to the new WHO guideline values.

2.2 Linkage to climate policy and reducing emissions in key sectors

Climate change mitigation and a sustainable energy policy are closely linked to air pollution control. Section 2.2.1 reviews climate change mitigation and energy policy from the perspective of air pollution control.

In Finland, emissions into the air are generated particularly by industry, energy production, transport, small-scale combustion and agriculture. Emissions are reduced in Finland mainly by implementing sector-specific emission regulations. In many sectors, the emissions regulation is based on EU-level legislation. (More information: Ministry of the Environment's "Air pollution control legislation" page) In addition, many sectors have emission reduction strategies and action plans. Sections 2.2.2 to 2.2.5 deal with the reduction of emissions from key sectors.

2.2.1 Climate change mitigation and energy policy

Many climate change and energy policies, strategies and programmes also have an impact on air pollution control and air quality. The key ones are listed below.

The Climate Change Act (609/2015) set the frame for planning Finland's climate policy and monitoring its implementation. The reformed Climate Change Act (423/2022) entered into force in July 2022. The aim of the Climate Change Act reform was to strengthen the steering effect of regulation and to ensure that Finland achieves carbon neutrality by 2035. The act also laid down emission reduction targets for 2030 and 2040 and updated the emission reduction target set for 2050. In addition, the act provided for the objective of strengthening sinks. The planning system under the Climate Change Act was extended to the land use sector. The second stage of the reform of the Climate Change Act entered into force at the beginning of 2023. The amendment requires municipalities to draw up climate change plans, update them at least once per council term and monitor their implementation.

The Finnish Government adopted a new Medium-Term Climate Change Policy Plan (KAISU 2) in June 2022 and submitted it to Parliament as a Government report. KAISU 2 includes, among other things, measures to reduce greenhouse gas emissions from transport, non-road mobile machinery and agriculture. The measures in the plan to strengthen a just transition include grants for giving up oil heating, purchase and conversion subsidies for low-emission vehicles, and subsidies for the construction of charging points for electric cars. Municipal climate work will be strengthened. In most cases, reducing greenhouse gas emissions also reduces air pollutant emissions. (Ministry of the Environment 2022b)

The Government adopted the new National Climate and Energy Strategy 2035 in June 2022 and submitted it to Parliament as a Government report. The strategy outlines actions that will enable Finland to fulfil the EU's 2030 commitments and achieve the national goal of carbon neutrality by 2035. Three quarters of the greenhouse gases that warm the climate originate from the production and consumption of energy, including transport, so energy policy and climate policy are closely intertwined. This is most evident in the promotion of energy efficiency and clean sources of energy. The emissions trading system and a long-term predictable climate and energy policy are key steering instruments in the strategy. The strategy examines the five dimensions of the EU's energy union: decarbonisation (including renewable energy), energy efficiency, internal energy market, energy security, and research, innovation and competitiveness. (Ministry of Economic Affairs and Employment 2022)

As part of the preparation of the Climate and Energy Strategy, sector-specific climate roadmaps were prepared, which also have a national impact on air pollution control. The roadmaps were prepared in a sector-oriented manner, which helps to ensure that

companies in the sector feel comfortable with the roadmaps and can genuinely commit to them. (More information: The Ministry of Economic Affairs and Employment's page on published roadmaps)

The Government adopted the Climate Plan for the Land Use Sector in July 2022 and submitted it to Parliament as a Government report. Prepared for the first time, the climate plan covering the entire land use sector brought together effective and cost-effective measures to reduce emissions from agricultural land, forestry and other land use and to strengthen carbon sinks and reservoirs. The plan contributes to the achievement of Finland's carbon neutrality target by 2035. (Ministry of Agriculture and Forestry 2022a)

Finland's municipalities are engaged in active climate work. A total of 138 municipalities (out of 309) have municipal or sub-regional climate targets. Some 4.5 million Finns live in these municipalities. In other words, about 80 % of Finns live in a municipality that has set a climate target. The most common climate target for municipalities is an 80 % reduction in greenhouse gas emissions by 2030. Different carbon neutrality targets by a specific year are also common. Municipalities are motivated to set climate targets by both economic and image factors. Municipalities cooperate extensively with each other in climate matters. Large cities have the resources and opportunities to make the most of different kinds of climate expertise, while small and medium-sized municipalities rely on each other and on regional councils. Municipalities have made particular efforts to reduce emissions from transport and the energy consumption of buildings. Measures in education and training as well as in communication and advisory services are also general climate measures. The best results have been achieved in reducing the emissions caused by the energy consumption of buildings, especially the emissions from district heating, while reducing emissions from transport is considered the most challenging area. (Association of Finnish Municipalities 2022)

2.2.1.1 Methane and black carbon

The purpose of the reduction of black carbon and methane emissions is to slow down climate change by intervening in carbon dioxide emissions and in short-lived air pollutant emissions affecting climate. The measures used to reduce black carbon emissions also cut emissions of fine particulate matter, improving air quality. Methane measures, in turn, can prevent the formation of ground-level ozone.

For a long time now, Finland has been active in several international fora that touch on methane activities at a more technical level, such as the Climate and Clean Air Coalition (CCAC, from 2012), the Global Methane Initiative (GMI, from 2008) and the Arctic Council. In the Enhanced Black Carbon and Methane Emissions Reductions: An Arctic Council

Framework for Action (2015), Finland and other Arctic countries committed to reducing methane emissions and to reporting on emissions and policy measures at the national level every two years.

Finland's methane emissions decreased by more than 40 % between 1990 and 2020. It is estimated that the emissions will continue to decrease until 2030. The main methane emission source sectors in Finland are waste and agriculture, while the energy sector is not as significant source. National emission reduction measures are implemented as part of climate and air pollution control policy.

The evolution of black carbon emissions by emission source is described in Chapter 6 and the expected evolution of emissions in Chapter 9.

Established in 2021, the Global Methane Pledge aims to reduce global methane emissions by at least 30 % from 2020 levels by 2030. The emission reduction target should not be interpreted as a national or sectoral target. According to the IPCC, achieving the Paris Agreement's 1.5-degree target by the end of the century will require reaching carbon neutrality by mid-century and significant emission reductions for methane and black carbon. The commitment aims at this development path for methane and also sets a quantitative target to support concrete work in other processes concerning methane. So far, 150 countries have joined the initiative, Finland in autumn 2021. In 2022, Finland submitted a compilation of national methane emission reduction measures based on existing climate and air pollution control policy strategy documents (such as KAISU and the National Air Pollution Control Programme 2030).

The EU updated its methane strategy in 2020 and is preparing a proposal for a regulation on methane in the energy sector. Through the methane regulation, the EU aims to contribute to the global challenge of reducing methane emissions and to the international commitments and obligations undertaken. The EU Fit for 55 package also calls for a reduction in methane emissions. The proposed regulation aims at more accurate measurement, monitoring and reporting of methane emissions, leak detection and repair measures in the network, and limits to flaring. In addition, there are obligations to measure and report methane emissions from fossil fuels imported into the EU. The methane regulation will affect Finland's national framework.

More information: Ministry of the Environment's page on short-term climate pollutants

2.2.2 Industry and energy production

The key pieces of EU legislation on industry and energy production are the Directive on industrial emissions (IED, 2010/75/EU) and the Directive on the limitation of emissions of certain pollutants into the air from medium combustion plants (MCP, 2015/2193/EU). The directives have been implemented in Finland by provisions concerning the environmental permit and registration procedure, as well as by Government decrees containing emission limit values and other detailed requirements (Government Decree 936/2014, Government Decree 1065/2017, Government Decree 151/2013 and Government Decree 64/2015).

In April 2022, the Commission presented a proposal to amend the IED. The objective of the directive is to reduce emissions from industrial installations through the use of best available techniques. The update proposes extending the scope of the directive. In quantitative terms, the largest extension of the scope would concern animal shelters (Section 2.2.5). In addition, the Commission's proposal would extend the scope to mining of metallic and industrial minerals. The general environmental permit requirements would be supplemented to take better account of material efficiency and water reuse and, if necessary, the environmental impacts of the entire production lifecycle. Industrial plants would need to introduce an environmental management system. The public's access to information on permit procedures and ability to influence them would also be improved. (More information: EU Commission 2022)

Energy efficiency measures also have the potential to reduce emissions from industry and energy production. When energy efficiency is improved, the need for energy production decreases. Energy efficiency agreements have become the primary means of promoting energy efficiency in Finland.

2.2.3 Transport

Below is a list of key transport legislation, policies, strategies and programmes that have an impact on air pollution control and air quality.

Vehicular emissions affecting air quality have been continuously reduced in accordance with the periodic tightening of the emission requirements for new cars, the Euro emission standards. Recently, EU-level regulations have also focused on the conditions for monitoring the conformity of vehicles and the requirements for effective monitoring in the Member States.

In addition, average CO₂ emission limit values set per car manufacturer have an indirect impact on air pollutant emissions, as zero-emission and low-emission vehicles become more common as the limit values become stricter. In the summer of 2021, the European Commission proposed tightening the limit values.

The Act on Environmental and Energy Efficiency Requirements for Vehicle and Transport Service Procurements (740/2021) applies to public procurements of vehicles and passenger transport services. In accordance with the Directive (EU) 2019/1161 on the promotion of clean and energy-efficient road transport vehicles, Finland must ensure that a minimum share of the of vehicles and transport services procured are ecological and energy efficient. The requirements cover both Euro emission standards and CO₂ emissions.

The Finnish Transport and Communications Agency's (Traficom) regulation on the technical requirements for and type-approval of studded tyres for vehicles requires the reduction of road wear in studded tyres sold from 2025/2027. Reduced road wear reduces the generation of street dust and helps to curb the harms caused by street dust. (Finnish Transport and Communications Agency 2021)

Finland's national target is to halve greenhouse gas emissions from domestic transport by 2030 from 2005 levels. The means for achieving this goal are defined in the Government resolution on reducing domestic transport's greenhouse gas emissions adopted on 6 May 2021 (Roadmap to fossil-free transport). Many of the measures in the roadmap, such as subsidies for the purchase of full electric cars and electric vans and lorries, also reduce emissions of air pollutants. The conditions for walking and cycling in municipalities will be improved with funding from an investment programme for walking and cycling. (Ministry of Transport and Communications 2021)

Programme for the Promotion of Walking and Cycling aims to improve the conditions for walking and cycling in Finnish municipalities and to support the reduction of transport emissions and the improvement of public health in Finland. Key measures include the development of infrastructure and land use planning, the allocation of funding for the promotion of walking and cycling, and the influencing of attitudes and mobility habits. (Ministry of Transport and Communications 2018)

Transport 12 is a national transport system plan from 2021 to 2032. The plan is aimed at improving people's opportunities to choose more sustainable modes of mobility, particularly in urban sub-regions. The framework of the plan covers development of the railway network, cooperation with land use planning in urban areas, pedestrian and bicycle traffic, park-and-ride facilities, public transport, travel chains and digital services. (Finnish Government 2021)

The transport and street dust measures of the NAPCP are described in Section 4.3.1.

Finland's municipalities engage in active work to reduce transport emissions. City-level measures in Helsinki, the capital of Finland, are described in Appendix 2 as a local example.

2.2.4 Fireplaces and small-scale combustion

Requirements for new solid fuel boilers (2015/1189) and prefabricated fireplaces (2015/1185) adopted under the Directive establishing a framework for the setting of ecodesign requirements for energy-related products (Ecodesign Directive, 2009/125/EC) entered into force in 2020 and 2022. The requirements set a lower limit for energy efficiency and upper limits for fine particulate emissions, organic carbon, carbon monoxide and nitrogen oxides. However, the regulations do not apply to wood-burning sauna stoves or on-site masonry fireplaces.

Solid fuel boilers and fireplaces are also subject to EU energy labelling regulations. The energy label attached to the product helps consumers to choose an energy-efficient product from the range available on the market. An energy label has been a requirement for solid fuel boilers since 1 April 2017 (2015/1187/EU) and for fireplaces since 1 January 2018 (2015/1186/EU). (Ministry of the Environment 2022c)

Small-scale combustion appliances are also subject to the Regulation laying down harmonised conditions for the marketing of construction products (Construction Products Regulation, 2011/305/EU). According to the Construction Products Regulation, manufacturers may not make available on the market construction products falling within the scope of a harmonised standard if the construction products do not bear the CE marking. The CE marking affixed to the construction product indicates that the product has been tested in accordance with a harmonised standard and that the product complies with the declared performance. Harmonised standards exist for all the most common types of appliances for small-scale combustion, including sauna stoves, and they define the properties to be determined from products by product group, the requirements for quality control of manufacturing and the information to be declared on the CE marking.

The requirements of the product standards in accordance with the EU Construction Products Regulation and the product regulations in accordance with the Ecodesign Directive must be compared on a product-by-product basis. If the regulations contain similar requirements, the stricter ones apply. In this case, the product automatically also meets the requirements of less stringent legislation. Such requirements include, for example, efficiency and carbon monoxide (CO) emission values.

The product standards for combustion equipment are currently being updated. At present, the standards have requirements for efficiency and the CO content of flue gas. The revised standards will also likely include requirements for the concentration of particulate mass, total hydrocarbons and nitrogen oxides in flue gas. (Ministry of the Environment 2022c)

The entry into force of the regulations presented above will reduce emissions from combustion appliances, but the reduction will take time, as the regulations only apply to new, prefabricated combustion appliances, and the combustion appliance stock will be replaced slowly.

The small-scale combustion measures of the NAPCP are described in Section 4.3.1.3.

2.2.5 Agriculture

About 90 % of the ammonia emissions in Finland originate from agriculture, so the measures to reduce ammonia emissions are mainly directed at agriculture.

Legislative means to reduce ammonia emissions from agriculture include environmental permits and notification decisions concerning animal shelters (YSL 527/2014), as well as the Government Decree on Limiting Certain Emissions from Agriculture and Horticulture (Nitrates Decree, 1250/2014). Environmental permits and notification decisions can include orders to restrict ammonia emissions. The Nitrates Decree requires animal holdings to have enough manure storage space, to cover new manure storages and to incorporate soil within 24 hours of the application of manure (with the exception of application with trailing hose or broadcast over vegetation).

Under the lead of the Ministry of Agriculture and Forestry, an Action Plan to Reduce Ammonia Emissions from Agriculture in Finland was prepared in 2018 for the years 2018–2020 and in 2021 for the years 2021–2027. The action plans include measures aimed at reducing ammonia emissions from agriculture, the most effective ones relating to manure, its storage and application. It is also possible to influence ammonia emissions through measures related to the feeding of livestock, for example. In addition, advisory services and research must be increased and made more effective. (Ministry of Agriculture and Forestry 2018 and 2021)

On 31 August 2022, the Commission approved Finland's national Common Agricultural Policy (CAP) Strategic Plan for 2023–2027. Its implementation started at the beginning of 2023. The plan includes proven measures to reduce ammonia emissions. Investments promoting the state of the environment and sustainable production methods can be

used to support procurements that reduce ammonia and other emissions. These include covering manure storage places and purchasing slurry injection equipment and different types of precision farming equipment. Support for covering manure storage places will also remain a type of production investment. Overall, the selection of investments to be supported will place more emphasis on environmental criteria. In the new environmental compensation system, slurry injection is part of the measure to promote the circular economy. The animal welfare payment scheme includes a measure for improving the living conditions of poultry, which also involves monitoring the ammonia concentration in the animal shelter and keeping it at a sufficiently low level. Advisory services can also provide advice on reducing air pollutant emissions. (Ministry of Agriculture and Forestry 2022b)

In quantitative terms, the most significant extension of the scope of the update of the IED (Section 2.2.2) would concern animal shelters. In addition to pig and poultry farms, cattle farms would also be regulated, as they emit significant amounts of ammonia and methane. The update would significantly increase the number of animal holdings covered by the directive, so the Commission proposes introducing a lighter permit procedure, the minimum content of which would be laid down in a directive. In addition, the Commission proposes that it be empowered to adopt a delegated act laying down operational rules for animal shelters as regards emission limits, monitoring requirements, manure application practices and emission control measures. (More information: EU Commission 2022)

The implementation of the Action Plans to Reduce Ammonia Emissions from Agriculture is discussed in more detail in Chapter 5.

3 Responsibilities at the national, regional and local level

The responsibilities of key authorities and other operators involved in air pollution control in Finland are indicated in Table 1.

Table 1. Key authorities and other operators involved in air pollution control in Finland.

National	
<p>Ministry of the Environment</p> <ul style="list-style-type: none"> • Tasks related to the development of operating policy • Tasks related to implementation • Reporting and monitoring tasks • Coordination tasks 	<ul style="list-style-type: none"> • Preparation of the national objectives for air pollution control, participation in international cooperation and development and preparation of legislation on air pollution control and other environmental protection • National focal point of the Convention on Long-range Transboundary Air Pollution (LRTAP) • National coordinator of the Medium-term Climate Change Policy Plan • Property-specific energy production and use and national preparation of implementing legislation for the Ecodesign Directive for construction products
<p>Ministry of Economic Affairs and Employment</p> <ul style="list-style-type: none"> • Tasks related to the development of operating policy 	<ul style="list-style-type: none"> • Responsibility within the administrative branch, including the National Energy and Climate Strategy, industrial and energy policy measures
<p>Ministry of Social Affairs and Health</p> <ul style="list-style-type: none"> • Tasks related to the development of operating policy 	<ul style="list-style-type: none"> • Responsibility within the administrative branch, including reducing the adverse health effects of air pollutants
<p>Ministry of Transport and Communications</p> <ul style="list-style-type: none"> • Tasks related to the development of operating policy 	<ul style="list-style-type: none"> • Responsibility within the administrative branch, including reducing transport emissions, transport policy measures

Ministry of Agriculture and Forestry <ul style="list-style-type: none"> • Tasks related to the development of operating policy 	<ul style="list-style-type: none"> • Responsibility within the administrative branch, including reducing ammonia emissions from agriculture
Ministry of Finance <ul style="list-style-type: none"> • Tasks related to the development of operating policy 	<ul style="list-style-type: none"> • Responsibility within the administrative branch, including financial steering measures related to cutting emissions, such as and transport taxes
Finnish Safety and Chemicals Agency (Tukes) <ul style="list-style-type: none"> • Tasks related to oversight of enforcement 	<ul style="list-style-type: none"> • Market surveillance of prefabricated fireplaces • Market surveillance of paints and varnishes containing VOCs
Finnish Transport and Communications Agency <ul style="list-style-type: none"> • Tasks related to oversight of enforcement 	<ul style="list-style-type: none"> • Market surveillance of internal combustion engines to be installed in non-road mobile machinery
Finnish Transport Infrastructure Agency <ul style="list-style-type: none"> • Tasks related to implementation 	<ul style="list-style-type: none"> • Responsibility for the development and maintenance of the state-owned road network, railways and waterways • Tasks related to the prevention of street dust formation

Regional authorities

Regional State Administrative Agencies (AVI) <ul style="list-style-type: none"> • Tasks related to implementation • Coordination tasks 	<ul style="list-style-type: none"> • Issuance of environmental permits for installations within their competence (Environmental Protection Act 527/2014; large installations and some medium-sized installations) • Promotion of wellbeing, health (including environmental health) and safety; guidance on the legality of municipalities and wellbeing services counties
Centres for Economic Development, Transport and the Environment (ELY) <ul style="list-style-type: none"> • Tasks related to implementation • Tasks related to oversight of enforcement • Reporting and monitoring tasks 	<ul style="list-style-type: none"> • Steering and promotion of air pollution control in their region; monitoring of the environmental permits granted by the state permit authority (AVI). Air pollution control is carried out in connection with the supervision of energy production plants and industrial plants, in particular. • Promotion of a good environmental status • Work on air pollution control in connection with environmental impact assessment procedures and the task of promoting land use • For some ELY Centres, responsibility for national tasks, such as the ELY Centre for Lapland and coordination of environmental cooperation in Arctic areas

Local authorities

Municipalities

- Tasks related to implementation
 - Tasks related to oversight of enforcement
 - Air quality monitoring in urban areas
 - Safeguarding and promotion of local air quality
 - Issuance of environmental permits for installations within their competence (small installations and some medium-sized installations)
 - Processing of notifications in accordance with the general notification procedure of the Environmental Protection Act (authority over small chemical warehouses and medium-sized animal shelters)
 - Processing registrations in accordance with the Environmental Protection Act (authority over fuel distribution stations and medium-sized energy production plants)
 - Supervision of registered installations subject to declaration with environmental permits
 - Decisions on city planning, transport and energy production that have a major impact on emissions, air quality and exposure
 - Tasks of the environmental health authority
-

4 Assessment of progress in the implementation of the NAPCP

The implementation of the NAPCP is progressing as planned and in an organised manner. Implementation is monitored systematically. Impacts are monitored through emission inventories, air quality monitoring and ecosystem monitoring.

The NAPCP does not include measures to reduce ammonia emissions; they are included in a separate Action Plan to Reduce Ammonia Emissions from Agriculture (Chapter 5). However, the implementation of the measures and the evolution of ammonia emissions are monitored through the monitoring methods and organisation of the NAPCP.

No significant changes have been made to the NAPCP or its implementation schedule.

4.1 Implementing organisation

The Minister of the Environment appointed the implementation network of the National Air Pollution Control Programme 2030 for a term from 7 September 2020 to 31 March 2023. The implementation network is composed of members from

- the Ministry of the Environment,
- the Ministry of Transport and Communications,
- the Ministry of Social Affairs and Health,
- the Ministry of Agriculture and Forestry,
- the Ministry of Economic Affairs and Employment,
- the Finnish Environment Institute,
- the Finnish Institute for Health and Welfare (THL),
- the Finnish Meteorological Institute,
- the ELY Centre for Southwest Finland,
- the Association of Finnish Municipalities,
- the Finnish Association for Nature Conservation,
- Finnish Energy,
- the Finnish Forest Industries Federation,
- the Central Union of Agricultural Producers and Forest Owners,
- the Helsinki Region Environmental Services HSY, and
- the City of Helsinki.

The task of the implementation network was to plan, support, execute and monitor the implementation of the NAPCP and, if necessary, to prepare proposals for updating it.

The implementation network established four thematic groups to support the implementation of the NAPCP: agriculture, small-scale combustion, street dust, and transport and non-road mobile machinery. The thematic groups promote the implementation of the NAPCP in their respective fields of activity. Expert members were gathered for the thematic groups from different interest groups, including the following bodies:

- ministries: the Ministry of the Environment, the Ministry of Agriculture and Forestry, the Ministry of Transport and Communications and the Ministry of Social Affairs and Health;
- specialist institutions, authorities and agencies: the Finnish Environment Institute, the Finnish Transport and Communications Agency, the National Institute for Health and Welfare (THL), the National Supervisory Authority for Welfare and Health (Valvira), the Finnish Transport Infrastructure Agency, the ELY Centre for Uusimaa, the Finnish Meteorological Institute, the University of Eastern Finland, VTT Technical Research Centre of Finland, the Central Association of Chimney Sweeps, Motiva, the Finnish Association for Nature Conservation and the Central Union of Agricultural Producers and Forest Owners;
- the Association of Finnish Municipalities, joint municipal authorities and municipalities: the Association of Finnish Municipalities, Helsinki Region Environmental Services HSY, Helsinki Region Transport, Espoo, Helsinki, Kuopio and Vantaa.

More than 70 experts and their deputies are participating in the implementation network and thematic groups, some in more than one group.

4.2 Progress in reducing emissions, improving air quality and reducing ecosystem impacts

The progress and effectiveness of the NAPCP are assessed, in particular through emission inventories (Chapter 6) and air quality monitoring (Chapter 7). The adverse effects of air pollution are also monitored through ecosystem monitoring (Chapter 8).

In addition, Section 4.3.1 describes the progress of the implementation of the additional measures listed in Chapter 6 of the NAPCP.

4.3 Additional measures in Chapter 6 of the NAPCP

During the preparation of the NAPCP in 2019, it was estimated that the emission reduction commitments under the NEC Directive would be achieved. Due to this, it was decided not to include any binding, complementary policies and measures (PaMs) to reduce emissions in the NAPCP. However, air pollution was still estimated to cause harm to health and the environment. For this reason, additional measures to further improve air quality and reduce the number of people exposed to poor air quality, especially in areas with the highest exposure, were compiled in Chapter 6 of the NAPCP. Additional measures will be taken, in particular, to reduce the emissions of transport exhaust gases and street dust, to reduce emissions from small-scale wood combustion, and to take air pollution control into account in the planning and decision-making of other sectors. In addition, general additional measures concerning the development and communication of air pollution control were included in the NAPCP. (Ministry of the Environment 2019)

Finland will achieve its emission reduction commitments even without these additional measures so, in that sense, the additional measures are not binding. However, because the NAPCP was prepared in broad stakeholder cooperation and approved by the Government, Finland is committed to implementing the additional measures on the level of principle.

Detailed information on the additional measures can be found in tables 12a, 12b, 13, 14, 15 and 16 on pages 74–80 of the NAPCP. (Ministry of the Environment 2019)

4.3.1 Progress in the implementation of the additional measures

Information on the implementation of the additional measures of the NAPCP has been compiled on an annual basis in a monitoring table in cooperation with experts of different fields. Almost all the additional measures are under way. Below is a summary of the launch of the measures by topic.

4.3.1.1 Road transport

Measures to reduce emissions from road transport are set out in Table 12a of the NAPCP. The measures aim in particular at accelerating the renewal of the car fleet, increasing the share of zero-emission and low-emission vehicles, and reducing the performance of passenger car transport. The measures are strongly related to climate change mitigation and are mainly implemented in a climate-driven manner. Street dust is dealt with separately in Section 4.3.1.2. Below are highlights of the progress of the measures.

- Emission requirements for vehicles are becoming increasingly stringent through the requirements of the Euro emission standards. At present, new passenger cars must meet the requirements of the Euro 6 standards. The Euro 7 standards are currently being prepared.
- The CO₂ emission limit values set for vehicle manufacturers are constantly becoming stricter as a result of the evolving EU regulation. The EU reached an agreement on updating the CO₂ emission targets for cars and vans in autumn 2022. In addition, the Commission is expected to propose tightening the CO₂ emission limits for heavy-duty vehicles in early 2023.
- National funding has been allocated for the purchase of electric and gas-powered vans and lorries and battery electric cars. The electrification of the passenger car fleet, in particular, has accelerated considerably since the last part of 2021.
- National funding has been allocated for the construction of public and private (housing companies, workplaces) charging infrastructure. The construction of the charging infrastructure has accelerated, and public fast charging in particular is developing rapidly.
- The Act on Environmental and Energy Efficiency Requirements for Vehicle and Transport Service Procurements entered into force in autumn 2021.
- A scrapping premium campaign has promoted the deregistration of old cars, and the benefit could also be used to purchase an electric bike or a public transport ticket.
- The car tax payable for the purchase of electric cars has been abolished.
- The taxable value of company electric cars has been reduced for the years from 2021 to 2025. A charging benefit for electric cars at workplaces and public charging points is being provided as a tax-free benefit from 2021 to 2025.
- Official instructions have been issued on the presentation of consumption and emissions data when selling passenger cars.
- Agreements concerning land use, housing and transport (MAL) are widely used in various urban areas. MAL agreements have stipulated many measures to promote the realisation of a sustainable community structure and the use of sustainable forms of mobility, such as the development of public transport services and infrastructure, the improvement of infrastructure for walking and cycling, the streamlining of travel chains, solutions for park-and-ride facilities and land use solutions that enable the growth of public transport and the attractiveness of sustainable modes of mobility.
- The investment programme for walking and cycling was funded to the tune of EUR 30 million in 2020 and 2021, and approximately EUR 6 million in 2022.

In addition to the measures in Table 12a, the 'Transport and non-road mobile machinery' thematic group has promoted the reduction of local emissions from non-road mobile machinery, for example as follows:

- An online training course on low-emission non-road mobile machinery was designed and implemented. The training is aimed at, for example, users of non-road mobile machinery, contractors and procurement officers. The training covers reducing emissions through work and procurement planning, maintenance of non-road mobile machinery, good orientation and economical driving.
- A study project on cost-effective emission reduction measures for non-road mobile machinery sought ways to promote alternative propulsion for non-road mobile machinery and investigated information needs and possibilities for expanding the registration obligation for non-road mobile machinery.

4.3.1.2 Street dust

Measures to reduce emissions from street dust are set out in Table 12b of the NAPCP. Below are highlights of the progress of the measures.

- Continuous and purposeful work is being done at different levels of government to coordinate land use and transport. The impact of speed limits on emissions of nitrogen oxide and fine particulate matter, for example, has been investigated.
- Recommendations were drawn up to develop work contracts and cooperation from the point of view of reducing exposure to street dust. The topics covered include measures in the priority areas, the development of cooperation between operators in nearby contract work areas, assessment of dust suppression needs and implementation of the necessary measures, implementation of winter maintenance and collection of monitoring data.
- A comprehensive website was compiled on best practices in anti-skid and anti-dust activities and sand and dust removal. The site was promoted in, for example, municipal engineering events, professional journals and social media.
- An ongoing project on weather-appropriate tyres promotes the use of friction tyres instead of studded tyres. The project has produced a tyre portal, newsletters and information bulletins for television.
- As part of the City of Helsinki's long-term goal of promoting the use of friction tyres, Helsinki started a three-year trial of a studded tyre ban on Lönnrotinkatu street in autumn 2022.

The measure “determining the quality of surface materials” has not been launched.

In addition to the measures in Table 12b, the reduction of the generation of street dust has been promoted by developing legislation on studded tyres, for example as follows.

- A regulation on the technical requirements for and type-approval of studded tyres for vehicles was issued in 2021. The regulation requires the reduction of road wear in studded tyres sold from 2025/2027.
- The market surveillance authority tests the wear characteristics of studded tyres.

4.3.1.3 Small-scale wood combustion

Measures to reduce emissions from small-scale wood combustion are set out in Table 13 of the NAPCP. Below are highlights of the progress of the measures.

- Information and guidance on good wood combustion practices has been provided to citizens and information has been disseminated to municipalities in many different ways. Materials were compiled in the redesigned Burn Wood Cleanly website to better meet users’ information needs on good wood combustion practices. Wood combustion courses have been organised for residents. Good practices for storing and using firewood have been communicated through press releases and webinars. The subject has also been written about in newspapers, and interviews have been given to newspaper journalists. Paid advertising space in social media and magazines has also been used to enhance communication.
- Various means of communication have been utilised, such as videos on wood combustion, straightforward leaflets and social media communications (Facebook, Twitter).
- There has been cooperation with new operators, in particular in the events of the Home Owners’ Association and by writing in the Home Owners’ Association paper. This cooperation directly reaches owners of detached houses. The correct way to light a campfire has been addressed in the Scouts.
- Cooperation with municipal climate projects has been promoted, for example, in the KILTOVA project, which added air pollution and its health effects to the greenhouse gas emissions scenario tool for municipalities. In addition, the Medium-term Climate Change Policy Plan describes the connections between air pollution control and climate issues and discusses the climate work of municipalities extensively.
- The KIUAS2 project has developed a test and measurement method and defined criteria for determining the emissions of wood-burning sauna stoves.

If a product standard in the process of being updated ends up including emission requirements for sauna stoves, they should be sufficient to reduce the emissions of sauna stoves, and national technical requirements will not be needed.

- The aim is to launch a study on the incentives for replacing fireplaces in 2023.
- The guide “Handling of Smoke Harm Situations Caused by Small-scale Wood Combustion – Guide for Authorities” was completed (Ministry of the Environment 2022c).
- The BC Footprint and HOPE projects have tested compact measuring instruments for measuring the concentrations of combustion-derived components in outdoor air that could be used to monitor incidents of smoke harm. Product development and further research are still needed
- A guide on recommendations on construction guidance methods for preventing the smoke hazards of wood combustion was completed (Environment Centre of Central Uusimaa 2022). It recommended, for example, using heating methods that are not based on wood combustion, placing grill shelters and hot tubs at a sufficient distance from the property line, and having wood sheds for houses with fireplaces.

The measure “Investigating the possibility of concluding voluntary agreements (e.g. Green Deal) with wood-burning sauna stove manufacturers” has not been launched. Once the update of the product standard for combustion equipment (including wood-burning sauna stoves) is completed around 2024, this measure can be better promoted.

In addition to the measures in Table 13, the working group on small-scale combustion has promoted good practices in the use of fireplaces through chimney sweep cooperation.

4.3.1.4 Taking air pollution control into account in the planning and decision-making of other sectors

Table 14 of the NAPCP shows the connections and effects of the current strategies, programmes and projects on air quality, as well as measures for taking air pollution control into consideration in these contexts better than it currently is. Table 15 of the NAPCP lists current projects linked to the air pollution control efforts by municipalities and measures proposed for taking air pollution control better into account in this context. These measures have been promoted through the following means.

- The study “Health impacts of transport in Finland and in the largest cities” concluded that increasing active mobility (walking and cycling) and reducing motor transport would achieve great health benefits. The study took into account the health hazards caused by fine particulate matter exposure,

noise exposure and traffic accidents, as well as the health benefits of active mobility. (Finnish Environment Institute SYKE 2021)

- The KILTOVA projects have developed tools for assessing the non-climate impacts of urban climate programmes. In the autumn of 2022, a calculation was also added to the municipalities' greenhouse gas emission scenario tool (Finnish Environment Institute's AlasSken model) for the health damage costs of fine particulate matter.
- IHKU and KuntalHKU are calculators that can be used to calculate the health benefits of reducing air pollutant emissions in monetary terms at the national or municipal level. The cost estimates include both costs to society, such as medical costs and lost working days, and costs related to the valuation of deteriorating quality of life or premature death. (Finnish Environment Institute's IHKU and KuntalHKU)
- A guide on air quality in land use planning summarises the common rules for taking air quality into account in land use planning. The guide proposes air quality zones, that is, distances depending on the traffic volume between the road and residential buildings and sensitive sites. The greater the traffic volume, the more distance is needed between the road and a residential building/sensitive site. The guide discusses the combined effects of noise and air quality, as well as the effects of vegetation and noise barriers on air quality. It also includes example regulations intended for city plans and similar documents to promote healthy conditions. (ELY Centre for Uusimaa 2015)

4.3.1.5 Other measures

Other measures concerning the development and communication of air pollution control have been compiled in Table 16 of the NAPCP. Below are highlights of the progress of the measures.

- Municipal air pollution control work has been supported, for example, by presenting national air pollution control work at street dust seminars and environmental monitoring seminars. Municipalities are asked for opinions on legislative and non-legislative projects concerning air pollution control.
- A new website on best practices in air pollution control was developed and produced content for in 2022. It contains tips and information on the promotion of air pollution control aimed at different target groups, such as citizens and municipalities. The website will be published when the entire ymparisto.fi website is ready for publication.
- Numerous (> 10) presentations on the NAPCP have been given to stakeholders (such as people who live in detached houses) and experts (municipalities, air pollution control, transport). The themes of the NAPCP

have been the subject of columns, newspaper articles, newspaper interviews and online news items.

- The Helsinki Region Environmental Services HSY published a map of air quality (NO₂) annual concentrations for the Helsinki Metropolitan Area. The map is based on a modelling that combines data on air quality measurements, weather, emissions, land use and long-range transport.
- New network-specific or regional real-time air quality websites were launched for the Imatra-Lappeenranta region (ekilmanlaatu.net) and the Kuopio-Varkaus-Jyväskylä region (aqverkkokuopio.net).
- A map-based search service was published for all Finnish emissions (such as NO_x, PM_{2.5}, PM₁₀, metals, NMVOC). The map service can be searched for emissions from a specific municipality or based on a specific emission sector (for example, transport or energy production and industry). The time series is from 1990 to 2020.
- Emissions into the air from the largest emission sources from Finnish industry and agriculture were published in the map service prtr.fi. Emissions data can be viewed at installation or municipal level.
- A Finnish representative participated in the WHO's scientific assessment to review the air quality guidelines. The new WHO guidelines were published in autumn 2021. (WHO 2021)
- The Commission presented its legislative proposal for an update of the Ambient Air Quality Directive in October 2022, and a Finnish representative participates in the negotiations concerning the proposal.

The measures overlap in part, and development and communication are also partly described by topic in Sections 4.3.1.1–4.3.1.4.

5 Assessment of progress in the implementation of the Action Plan to Reduce Ammonia Emissions from Agriculture

Finland achieved its ammonia emission reduction commitments in 2020 (Chapter 6). In previous years, Finland did not always meet its emission reduction commitments for ammonia. Achieving the emission reduction commitments for ammonia will also be challenging in the coming years, so the measures to reduce ammonia emissions are of great importance.

About 90 % of the ammonia emissions in Finland originate from agriculture, so the measures to reduce ammonia emissions are mainly directed at agriculture. Under the lead of the Ministry of Agriculture and Forestry, an Action Plan to Reduce Ammonia Emissions from Agriculture in Finland was prepared in 2018 for the years 2018–2020 and in 2021 for the years 2021–2027. (Ministry of Agriculture and Forestry 2018 and 2021)

The progress and effectiveness of the measures to reduce ammonia emissions from agriculture are assessed through emission inventories (Chapter 6), in particular. The adverse environmental impacts of ammonia are also monitored through ecosystem monitoring (Chapter 8).

In addition, Sections 5.1 and 5.2 analyse the implementation of the measures in the action plans.

The NAPCP does not include measures to reduce ammonia emissions, as they are included in these separate Action Plans to Reduce Ammonia Emissions from Agriculture.

5.1 Planning period 2018–2020

The Action Plan to Reduce Ammonia Emissions from Agriculture included the following measures.

- Support for manure spreading by the injection method is continued as part of the environment payment scheme in 2017–2020.
- Investment aid continues to be granted for covering manure stores, cooling manure channels and acquisition of manure treatment equipment as well as to other investments promoting the environment.
- Support for balanced use of nutrients continues to be paid in 2017–2020.
- Advisory services stress the importance of reducing excessive protein feeding in the effort to reduce ammonia emissions and of optimising the handling, storage and spreading of manure.
- The animal welfare payment scheme is continued in 2017–2020.
- Studies on the applicability of the acidification method and its impacts on ammonia emissions in the Finnish conditions are continued.
- An environmental protection guide is prepared for fur farming.
- More advice is provided on climate protection in fur farming, with particular focus on means to reduce ammonia emissions in the handling and storage of manure.

In addition, the reduction of ammonia emissions was promoted through the Nitrates Decree (1250/2014) and environmental permits. It was also noted that the structural change in agriculture has an effect on reducing emissions, especially due to the decrease in the number of animals.

The most important measures to reduce ammonia emissions are the injection of slurry and urine, application with a trailing hose and the rapid incorporation of liquid manure and urine applied to the surface. Covering manure storage places also significantly reduces emissions. In addition, measures such as more precise feeding, gas scrubbers, more frequent manure removal to storage places, manure cooling and measures in fur production can reduce emissions. Newer technologies, such as the acidification of manure, are also being developed. (Natural Resources Institute Finland 2019)

In addition to the provisions of legislation, ammonia emissions from agriculture were reduced by the measures of the European Union's Common Agricultural Policy (CAP). The most significant measures in the CAP Rural Development Programme for Mainland Finland 2014–2020 (Ministry of Agriculture and Forestry 2014) to reduce ammonia emissions were the injection of slurry in fields, balanced use of nutrients and investment subsidies. The slurry injection measure covered approximately half of the amount of slurry. The

measure proved important in reducing ammonia emissions and will be continued in the programming period starting in 2023. The investment aid under the rural development programme supported, for example, the construction and covering of manure storage places, cooling of manure channels, injection equipment, and manure separation and processing equipment. In addition, advisory visits to reduce ammonia emissions were carried out under the rural development programme's advisory measure. The animal welfare payment scheme was also used to promote measures to reduce ammonia emissions.

5.2 Planning period 2021–2027

The Action Plan to Reduce Ammonia Emissions from Agriculture includes the following measures.

- T1: Promoting the inclusion of provisions to reduce ammonia emissions in environmental permits and notification decisions.
- T2: Updating the report Paras käytettävissä oleva tekniikka kotieläintaloudessa ("Best available technology in livestock farming in Finland"; Mikkola et al. 2002).
- T3: Continuing with the support for application by means of injection as part of the agricultural support scheme in 2021–2027. Preparation of the CAP strategy plan for 2023–2027 is ongoing.
- T4: Continuing the granting of investment aid to cover manure storages, cooling of manure channels and acquire manure treatment equipment, as well as to implement other investments that will reduce emissions.
- T5: Promoting research on new manure storage cover materials. Investigating the practical performance of the new cover materials that have performed well in studies.
- T6: Continuing to support the balanced use of nutrients in 2021 and 2022. Preparation of the CAP strategy plan for 2023–2027 is ongoing.
- T7: Handling through advice the importance of reducing excessive protein feeding to reduce ammonia emissions, as well as the optimal processing, storage and application of manure and organic fertiliser products, and the manner in which the nutrients in manure must be considered when fertilising plants. In investment-related advice, emphasising the significance of the covering of manure storages and the injecting of slurry in the reduction of ammonia emissions.
- T8: Continuing with the animal welfare payment scheme in 2021 and 2022. Preparation of the CAP strategy plan for 2023–2027 is ongoing.

- T9: Continuing with the studies on the suitability of various acids, the application techniques, and the effects on the ammonia emissions from manure under the Finnish conditions.
- T10: Promoting the implementation of measures in the environmental protection guide for fur farms.
- T11: More advice is provided on climate protection in fur farming, with particular focus on means to reduce ammonia emissions in the handling and storage of manure.

In addition to the 11 measures listed above, the reduction of ammonia emissions will also be promoted during the period 2021–2027 through the Nitrates Decree (1250/2014), environmental permits and notification decisions. The structural change in agriculture has an effect on reducing emissions, especially due to the decrease in the number of animals.

The biggest reductions in ammonia emissions are estimated to occur when application through injection and with a trailing hose become more common, broadcast manure is incorporated within 24 hours, the covering of manure storage places becomes widespread and the number of animals decreases. The increase in the cattle productivity has increased their nitrogen excretion, which slightly increases ammonia emissions.

Implementation of the action plan is at an early stage, but some of the measures T1–T11 have already been launched. The measures under the EU's Common Agricultural Policy will be in place during the CAP period 2014–2020 and the transition period 2021–2022:

- support for application by means of injection (T3);
- granting of investment aid to cover manure storages, cooling of manure channels and acquire manure treatment equipment, as well as to implement other investments that will reduce emissions (T4);
- support for the balanced use of nutrients (T6);
- advisory services (T7);
- animal welfare payment scheme (T8).

In autumn 2022, the Commission approved Finland's national CAP Strategic Plan for 2023–2027. The CAP Strategic Plan includes the measures found the most effective for reducing ammonia emissions, such as support for injection of manure, investment aid to cover manure storages and other investments that reduce emissions, as well as the measures of the animal welfare payment scheme. The implementation starts in 2023. (Ministry of Agriculture and Forestry 2022b)

6 Progress made in reducing emissions and compliance with emission reduction commitments

This chapter presents the progress made in reducing emissions through existing policies and measures and compliance with emission reduction commitments.

Tables 2 and 3 indicate the reduction commitments compared to the base year 2005 and the actual emission reductions. Table 2 shows that Finland achieved all emission reduction commitments with respect to air pollutants listed in the NEC Directive in 2020. Figure 1 presents the evolution of emissions of different air pollutants by sector from 2005 to 2020.

Table 2. National emission reduction commitments (%) and actual reductions (%). Both are calculated compared to the base year 2005.

	SO ₂	NO _x	NM VOC	NH ₃	PM _{2,5}
Reduction commitment 2020–2029	30	35	35	20	30
Actual decrease in 2020	67	52	47	21	46

Table 3. The emission levels* (kt/a) in accordance with the reduction commitment to be achieved in 2020, and the actual emissions.

	SO ₂	NO _x	NM VOC	NH ₃	PM _{2,5}
Maximum permitted emission level 2020–2029	49	129	85	31	18
Actual emissions 2020	24	96	69	31	14

* As the calculation methods evolve, new reports may also bring changes to the emission estimates of previous years (including the base year 2005), which is why no tonnage ceilings are set for emissions. Tonnes are displayed in this table to illustrate the point. The figures in the table are based on reporting for 2022 (Finnish Environment Institute 2022).

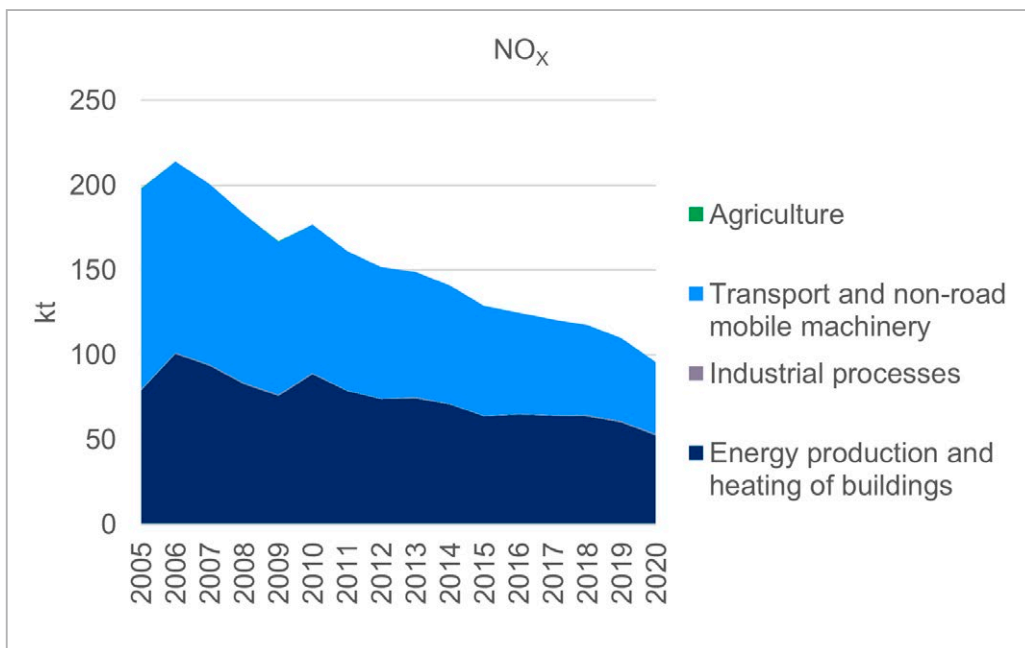
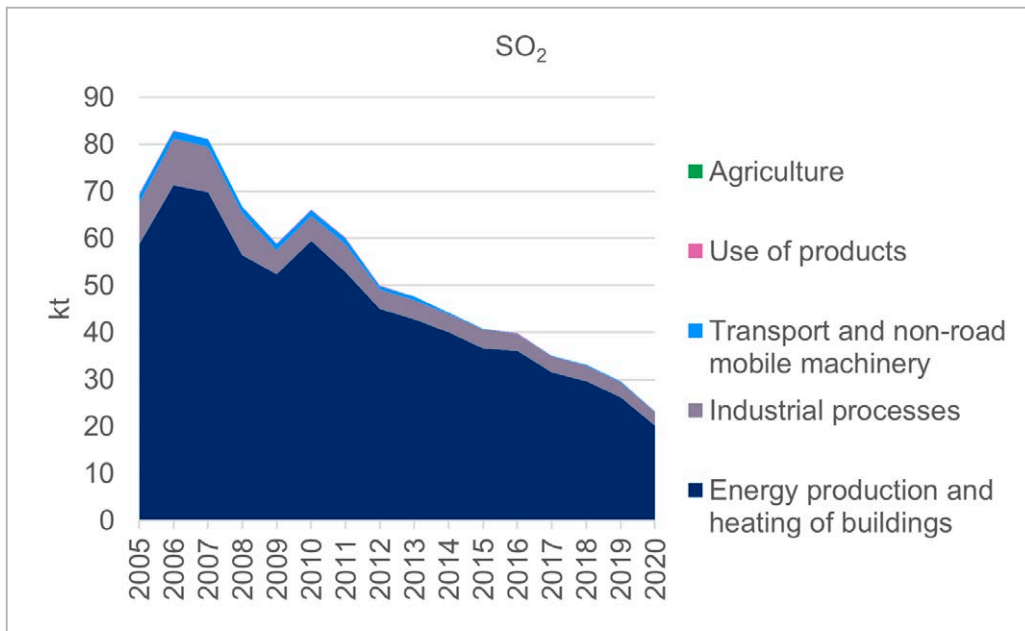
Most air pollutant emissions originate from the combustion of fuels, but emissions are also produced by evaporation and mechanical abrasion, for example. The evolution of emissions is influenced by the technology used and separate reduction measures, as well as changes in fuel use, animal numbers and other activities. The development of emission measurements and air quality measurements contributes to the visibility of emission reduction efforts and creates an understanding of air quality and the impact of emissions on it, as well as possible new emission reduction needs.

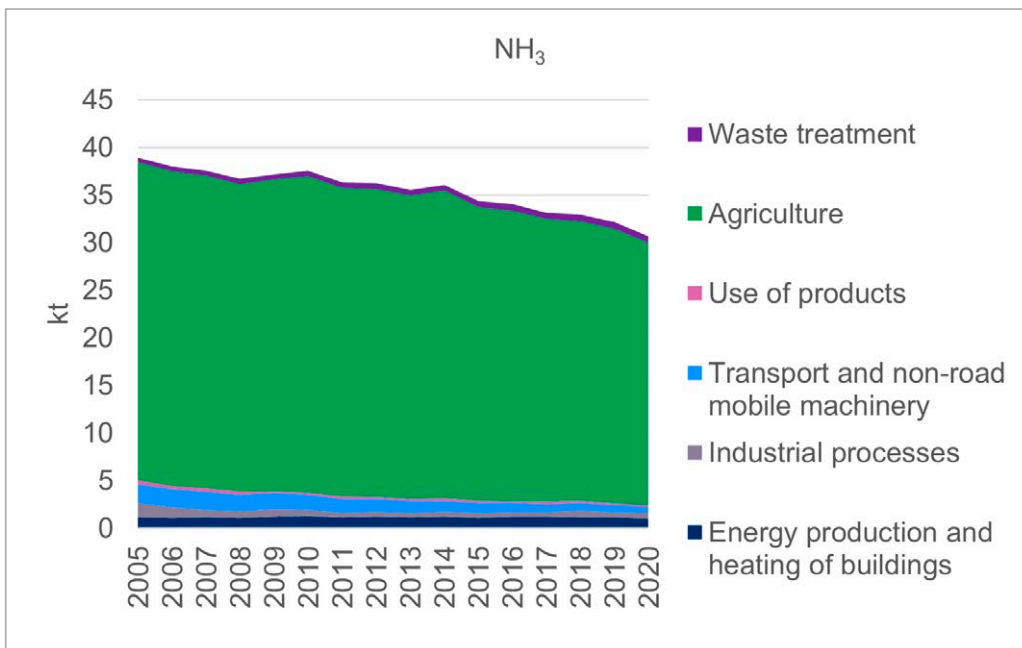
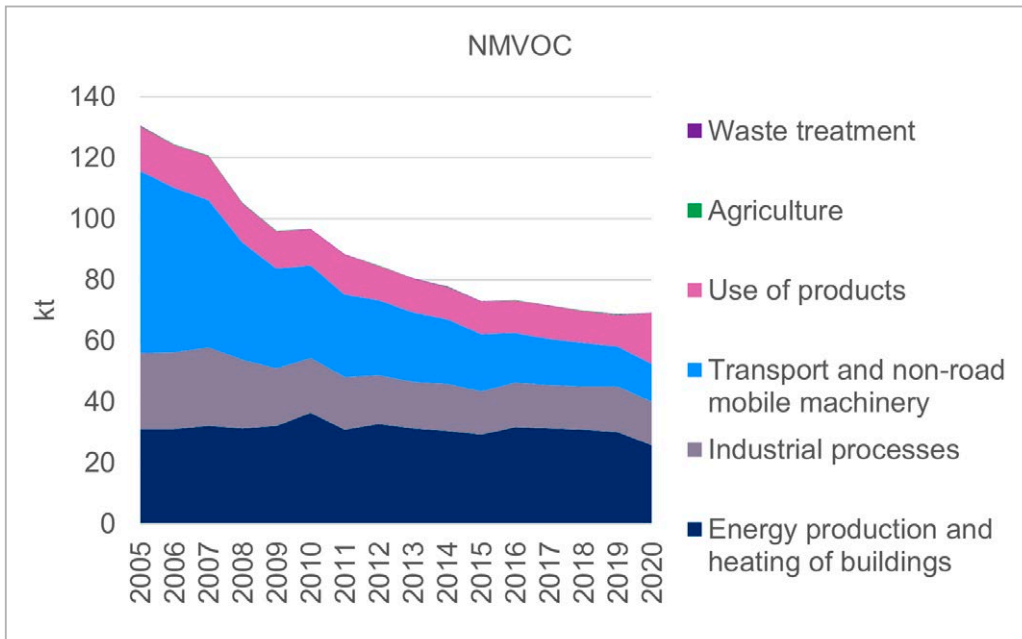
Advancements in engine technology driven by legislation (in particular the Euro emission standards) have led to a significant reduction in emissions from transport and non-road mobile machinery in the 21st century, which is reflected in the overall picture, especially in the development of NO_x , NMVOC and particulate matter emissions. Emissions from energy production and industry have also decreased thanks to new cleaning technologies that have achieved emission levels required by legislation (such as the IED). In addition to technology, the reduction in SO_2 emissions has been particularly affected by the decreasing use of coal. Fine particulate matter emissions from small-scale wood combustion were not restricted by means of legislation before 2020. As heating with wood has also been on the rise in recent decades, small-scale combustion has become the most significant source of fine particulate matter and black carbon in Finland. However, the technology of small-scale combustion equipment is also constantly advancing and the amount of firewood used seems to have stabilised in the 2010s, so emissions from small-scale combustion have also started to decline.

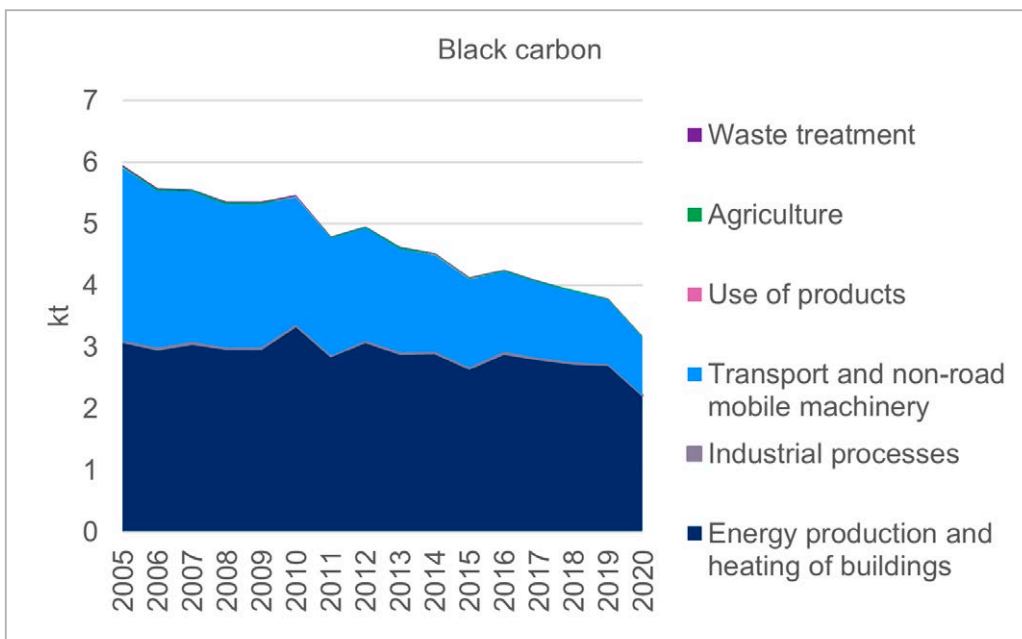
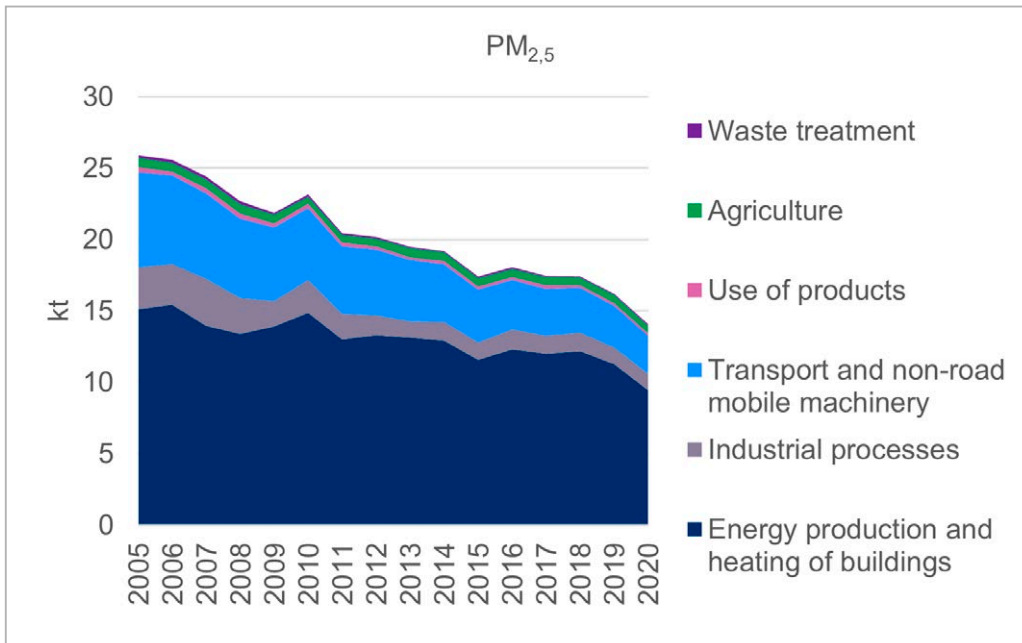
Agricultural ammonia emissions have dropped in the 21st century, partly due to a reduction in the number of livestock and partly due to an increase in the use of emission-cutting manure processing technology, such as the injection of slurry and urine. An increasing number of manure storage places are also covered, which contributes to reducing ammonia emissions. In addition to these factors, emissions are influenced by the amount of nitrogen passed by animals into manure each year, which is dependent on factors such as the animal material and feeding. As the productive capacity of livestock has increased, the amount of nitrogen emitted per animal has also climbed, which has in turn slowed down the decline of ammonia emissions originating from manure. The number of farmed fur animals has decreased slightly in recent years, which has reduced ammonia emissions. The reasons for the drop in the number of fur animals include a fall in demand in the main market areas and increased production costs.

The year 2020 was characterised by containment measures related to the COVID-19 pandemic and a particularly warm winter. Its special characteristics are reflected in lower than normal emissions for some emission components. On the other hand, NMVOC emissions in the year in question showed a visible peak in the category of products (mainly solvent use, including hand sanitiser).

Figure 1. Development of Finland's air pollutant emissions (SO_2 , NO_x , NH_3 , NMVOC, $\text{PM}_{2.5}$ and black carbon) by emission source. Non-combustion related NO_x and NMVOC emissions from agriculture are not covered by the NEC Directive, so they have been excluded from the graphs.







7 Progress achieved in improving air quality, and the degree of compliance with air quality commitments

This chapter presents progress in improving air quality achieved with existing measures, and the degree of compliance with air quality commitments.

The development of air quality during the review period from 2005 to 2021 is examined based on the measurement results produced by Finnish air quality monitoring networks. The monitoring is carried out by municipalities and the Finnish Meteorological Institute (rural background stations). There are currently about 100 monitoring stations in operation in different parts of Finland, but measurement data for the entire review period is only available from about 20 to 30 stations, depending on the compound. An annual percentage change in concentrations is also presented for annual averages if the change is statistically significant ($p < 0.05$) (Salmi et al. 2002).

In addition to the time evolution of concentrations, the figures show comparisons with the key EU air quality standards (Government Decree 79/2017 and 113/2017) and, where applicable, with the World Health Organization's recently updated guidelines (WHO 2021). The air quality measurement data was obtained from the national air quality part of the air pollution control information system maintained by the Finnish Meteorological Institute (Government Decree 79/2017).

In general, air quality has developed in a favourable direction. The reduction in exhaust emissions from road transport is clearly visible in the reduction in nitrogen dioxide and benzene concentrations in cities. The concentrations of fine particulate matter throughout the country have also decreased. Sulphur dioxide concentrations have continued to decline close to background levels. However, urban PM_{10} concentrations related to street dust have not yet fallen clearly everywhere. Concentrations of PAHs related to small-scale wood combustion are also relatively high in some areas with low-density housing, with no downward trend observed. Changes in ozone concentrations are minimal or non-existent.

While the EU air quality limit values are not being exceeded in Finland, concentrations of nitrogen dioxide, fine particulate matter and respirable particles exceed the WHO guidelines in many places. The WHO guidelines for ozone are being exceeded throughout the country.

Figures 2–9 below show the evolution of concentrations in different locations during the review period by pollutant and examine the reasons for the evolution and the most important emission sources. The figures summarise measurement results from different types of environments to establish an overview. Detailed examination, for example by pollutant or by locality, is possible in the Finnish Meteorological Institute's air quality service.

7.1 Nitrogen dioxide NO₂

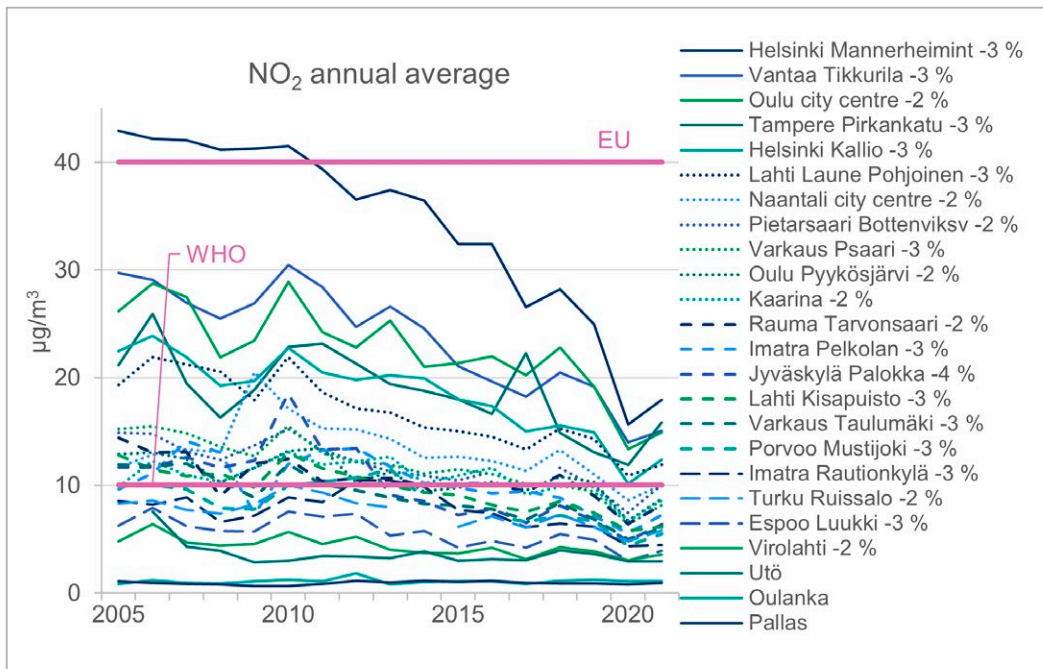
Nitrogen dioxide concentrations decreased at urban monitoring stations by 2 % to 3 % per year, or by around 28 % to 58 % over the entire review period. The only stations without a statistically significant trend are three background monitoring stations of the Finnish Meteorological Institute (Utö, Oulanka and Pallas).

Weather conditions cause some annual variation in concentrations. In 2020, there was a consistent dip in nitrogen dioxide concentrations due to reduced mobility related to COVID-19 restrictions (such as teleworking). The situation in 2021 also may not yet represent the development trajectory prior to the pandemic.

Road transport is highly relevant to urban air NO_x concentrations, as exhaust emissions take place at the level of breathing air. Consequently, most urban monitoring stations have been set up to monitor concentrations caused by transport emissions, in particular. There are large differences in concentration levels, and the highest concentrations are observed in the central streets of Finland's largest cities, where daily traffic volumes can reach tens of thousands of cars. However, the decrease in concentrations is quite consistent at all monitoring stations. A common reason is the decrease in emissions resulting from the renewal of the car fleet and the development of exhaust gas cleaning technologies.

Due to the positive development, exceedances of the EU's annual limit value are no longer detected at any monitoring station in Finland. However, larger cities (such as Helsinki, Tampere, Vantaa, Oulu and Lahti) exceed the WHO guideline value, and some smaller cities (such as Naantali, Pietarsaari and Varkaus) also come quite close to exceeding it.

Figure 2. Comparison of annual concentrations of nitrogen dioxide (NO₂) with air quality standards (Directive 2008/50/EC and WHO 2021) between 2005 and 2021. In the figure, the percentage after the station name indicates the annual change, if it is statistically significant.

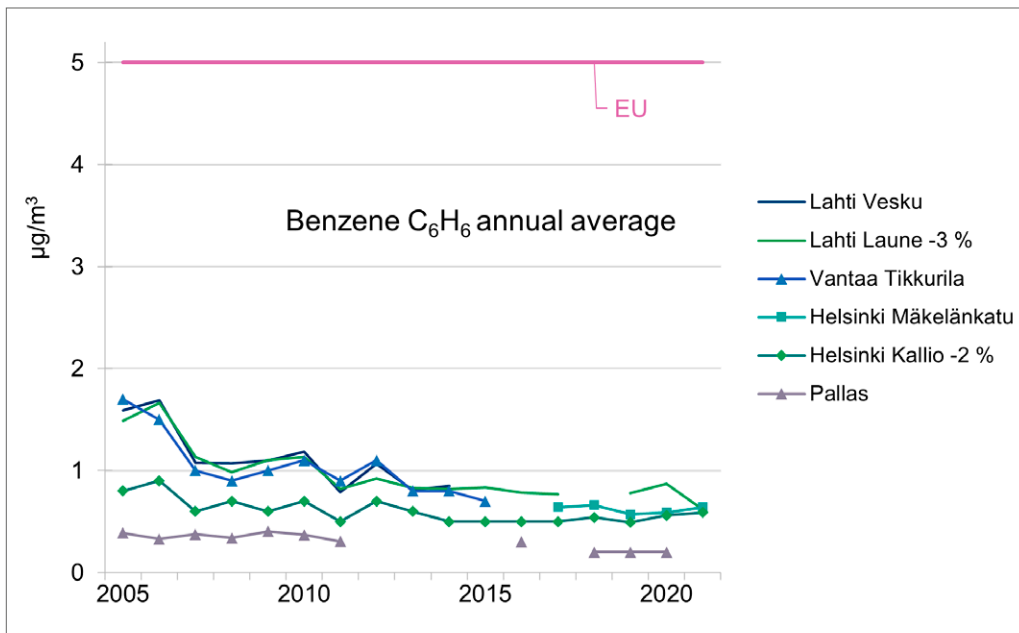


7.2 Volatile hydrocarbons NMVOC

Benzene is the only volatile hydrocarbon that has been set an air quality standard in the EU, so long-term monitoring results are only available for benzene.

In urban areas, the main sources are probably exhaust emissions and evaporation losses from motor vehicles, as well as evaporation losses in fuel processing, distribution and storage. The few measurement results (Figure 3) indicate that benzene concentrations decreased especially in the first half of the review period but have remained fairly stable since. The annual limit value for benzene is 5 µg/m³, so the concentrations are well below it.

Figure 3. Annual concentrations of benzene (C_6H_6) and comparison with an annual limit value set by the EU (Directive 2008/50/EC) between 2005 and 2021. In the figure, the percentage after the station name indicates the annual change, if it is statistically significant.

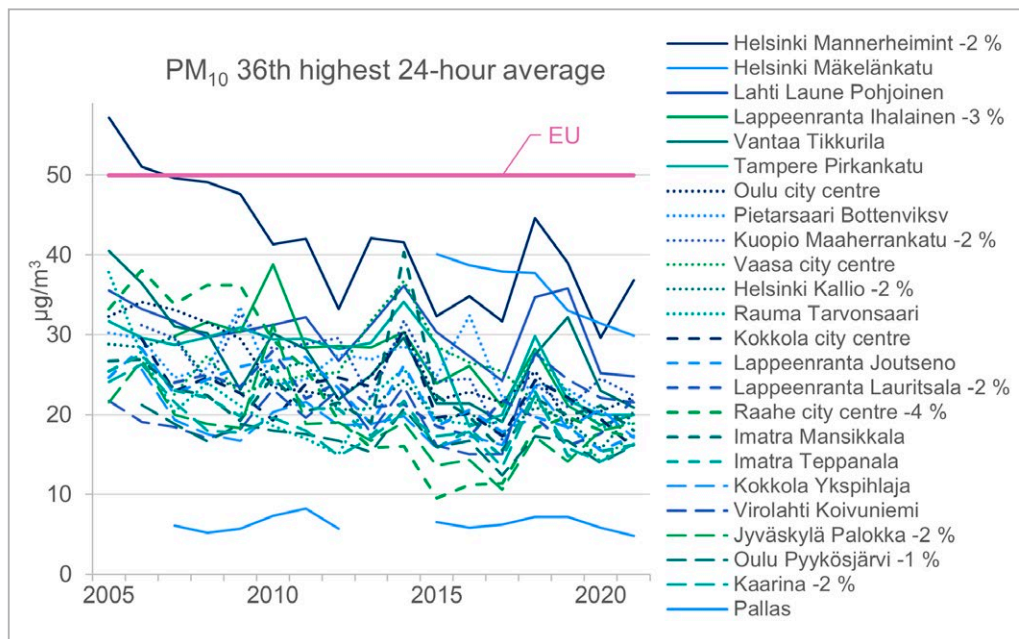
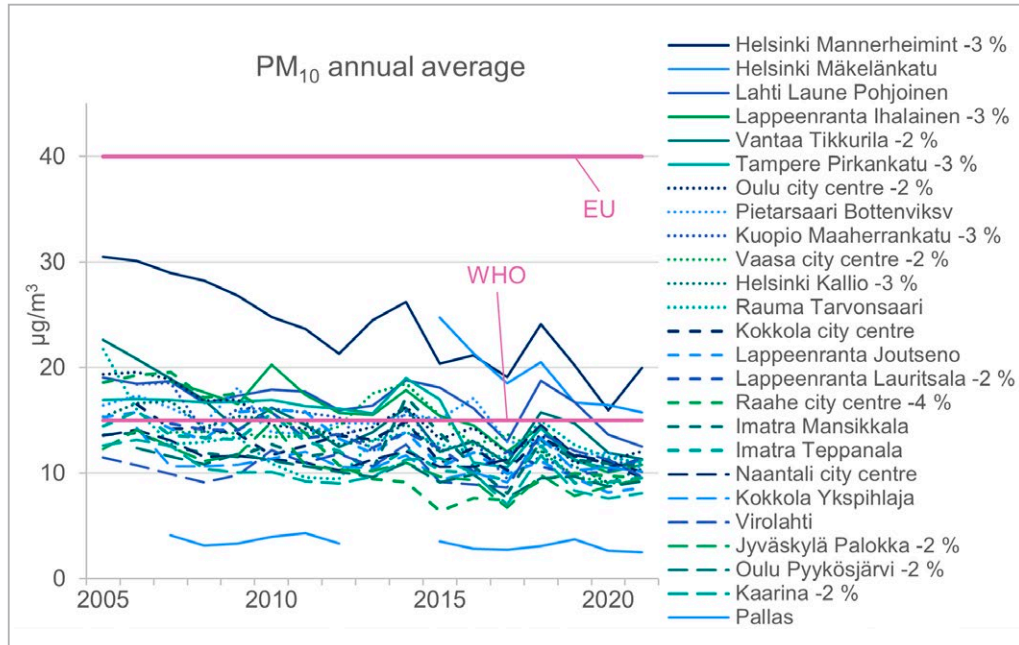


7.3 Respirable particles PM_{10}

In Finland, the concentration of respirable particles in the air can be clearly attributed to springtime street dust. Street dust comprises road surface material broken down by tyres (especially studded tyres), brake and tyre dust, fine ground grit sand and other material accumulated on the road surface and shoulder.

The Finnish climate makes it impossible to clean the streets all year round, so dust and dirt accumulate along the roads in wintertime. March and April are the months with the lowest precipitation, and when the rising temperature melts the snow, the roads and sidewalks dry out and the dust season begins. Cleaning at full power can only start when the threat of night frosts subsides. The amount of street dust depends very much on the weather conditions in spring, and the dust season can last from a few weeks up to a few months. Figure 4 shows the measurement results of respirable particles over the review period.

Figure 4. Comparison of annual and 24-hour concentrations of respirable particles (PM₁₀) with air quality standards (Directive 2008/50/EC and WHO 2021) between 2005 and 2021. In the figure, the percentage after the station name indicates the annual change, if it is statistically significant.



The evolution of the concentrations of respirable particles is also an indication of the challenges in combatting street dust. Only about half of the monitoring stations showed a statistically significant downward trend during the review period. On the other hand, the street dust season is relatively short and the PM₁₀ concentrations during the rest of the year are quite low, so the annual limit value is nowhere near exceeded. However, the WHO annual guideline value is exceeded at a few stations.

The daily limit value level (50 µg/m³) is exceeded at most stations a few times a year, at worst typically about twenty times a year (allowed 35 times). Finland has not exceeded the limit value since 2006.

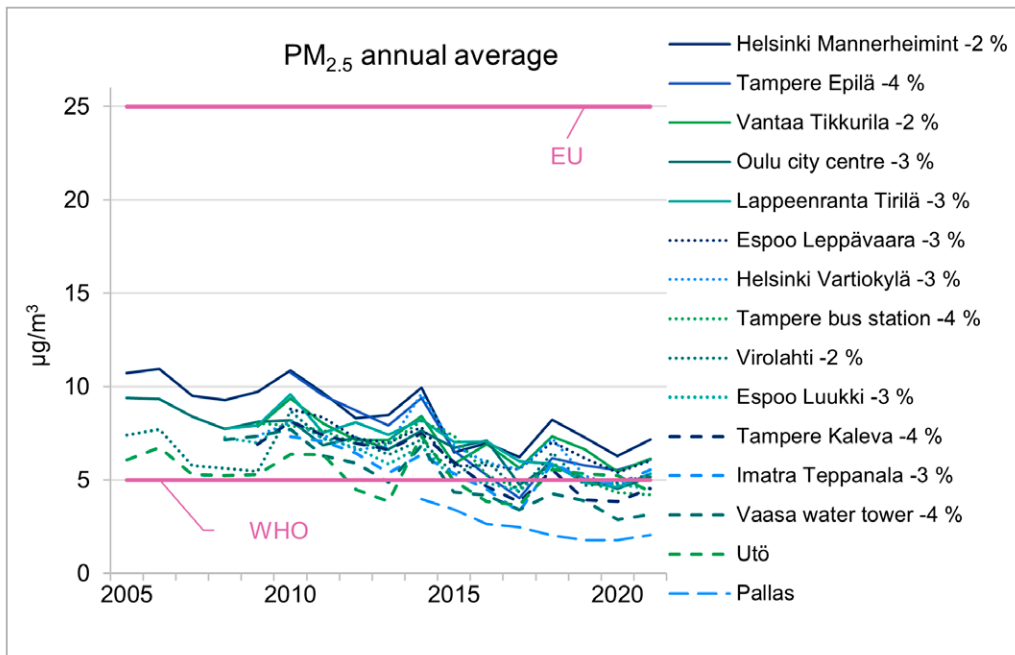
7.4 Fine particulate matter PM_{2.5}

Typically, concentrations of fine particulate matter decreased by 2 % to 4 % per year, or by 29 % to 65 % over the entire period. In the time series of more than ten years, only Utö's decrease in concentrations was not statistically significant. The concentration level is quite low, having been below 10 µg/m³ everywhere for a decade already. (Figure 5)

In addition to direct particulate emissions (such as black carbon), fine particulate matter in the air is largely made up of secondary particles, that is, particles formed from gases. These include sulphate and nitrate particles formed from SO₂ and NO₂, as well as organic particles formed from volatile hydrocarbons. Emissions of these precursors are clearly decreasing in Finland and elsewhere in Europe, so it is natural that the mass concentrations of PM_{2.5} are also decreasing.

Particles of this size are highly susceptible to long-range transport. In Finland, long-range transport plays a very significant role in the mass of fine particulate matter, especially in southern Finland. It should also be noted that the background concentrations in southern Finland (Utö and Virolahti) are in the range of 5 µg/m³, at the level of the WHO guideline value.

Figure 5. Comparison of annual concentrations of fine particulate matter (PM_{2.5}) with air quality standards (Directive 2008/50/EC and WHO 2021) between 2005 and 2021. In the figure, the percentage after the station name indicates the annual change, if it is statistically significant.

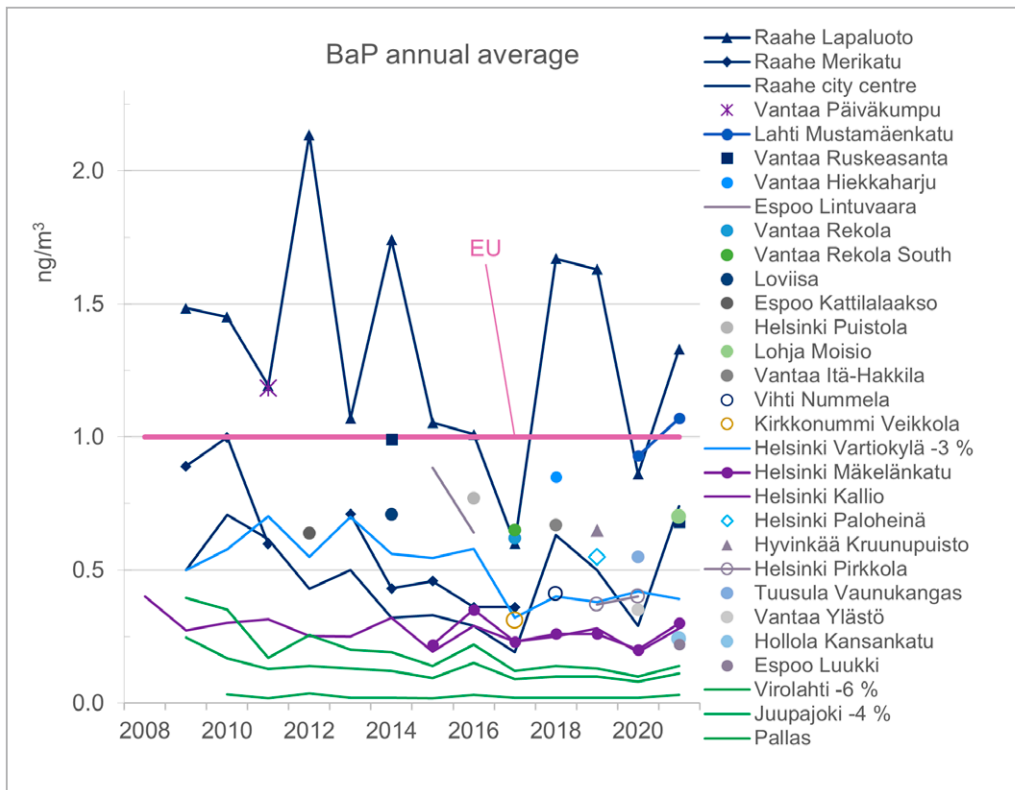


7.5 Benzo(a)pyrene BaP

Benzo(a)pyrene belongs to polycyclic aromatic hydrocarbons (PAHs), many of which are carcinogenic. They are produced and released into the air in poor combustion, in Finland especially through small-scale wood combustion.

There are only seven measurement time series of more than ten years (Figure 6), three of them with statistically significant downward trend. Most of the measurements are one-year measuring periods in residential areas with mainly low-density housing. The highest concentrations, close to the target value, come from these stations and are associated with abundant small-scale wood combustion. The results at the Lapaluoto monitoring station in Raahе are also affected by emissions from nearby steel industry.

Figure 6. Comparison of the annual concentrations of benzo(a)pyrene with the target value (Directive 2004/107/EC) between 2005 and 2021. In the figure, the percentage after the station name indicates the annual change, if it is statistically significant.



7.6 Ozone O₃

Ozone concentrations are evolving quite differently compared to all other air pollutants mentioned in this report. At most of the stations, the ozone concentration level remained broadly unchanged, but upward and downward trends are also present (Figure 7).

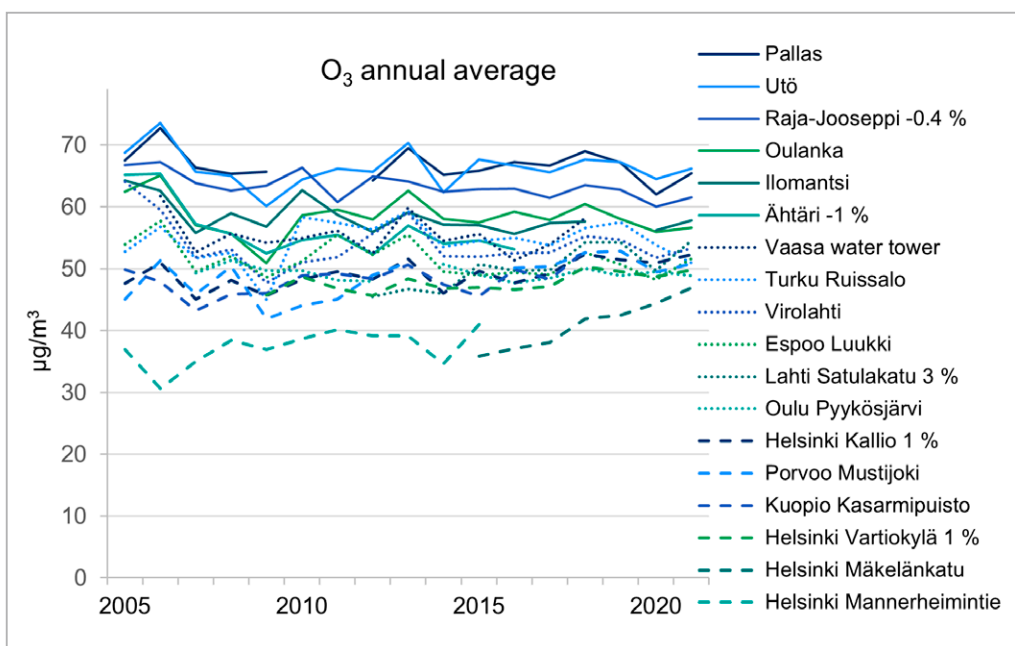
Ozone is not emitted into the air directly from emissions but is formed in the atmosphere by sunlight from both natural and anthropogenic emissions, especially nitrogen oxides (NO_x) and hydrocarbons (VOC). Methane (CH₄) and carbon monoxide (CO) also play a role in ozone formation. On the other hand, some of the reactions of these compounds also deplete ozone. Ozone formation and depletion are in competition with each other. The concentration of ozone observed in the air at any given time therefore depends on the quantities of compounds involved in the reactions and on the environmental conditions.

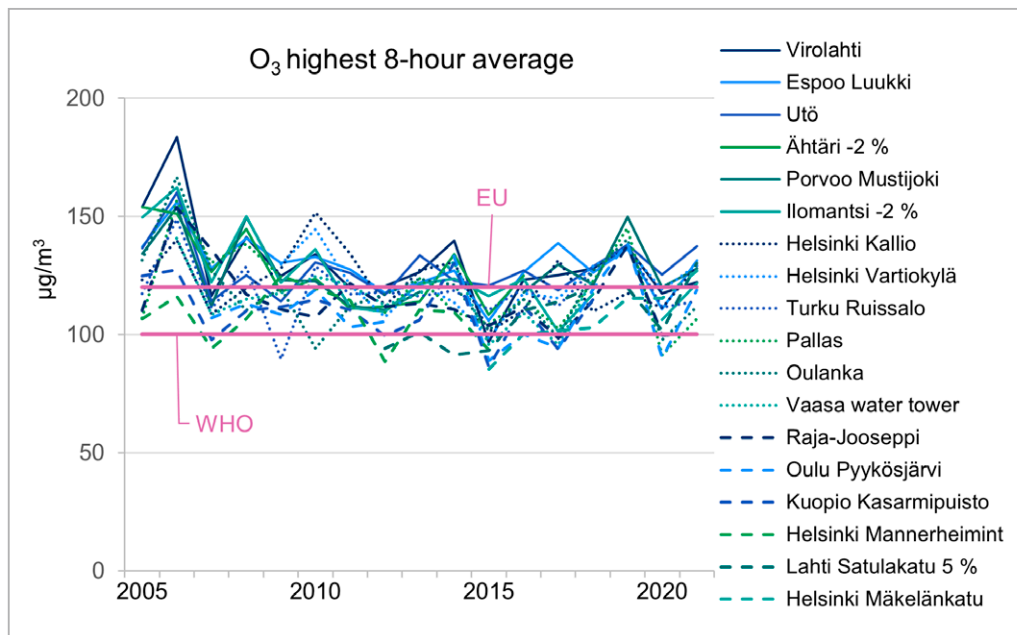
The slightly rising trends in ozone at three urban stations are related to lower NO_x concentrations leading to lower ozone consumption by nitrogen oxides, which increases the ozone concentration. The NO_x concentrations at most Finnish monitoring stations are already so low that their significance to ozone concentration is minor and ozone concentration is determined by long-range transport.

Another special characteristic of ozone is that the highest concentrations occur at the stations in Lapland. There are many reasons for this. Firstly, Lapland has practically no nitrogen oxides, or chemical ozone sinks. High altitude stations, such as Pallas at +565 m, are more susceptible to ozone transfer from the upper atmosphere (troposphere). In summer, the scarcity of vegetation reduces the deposition of ozone on surfaces, as does the long snow cover season, as ozone settles poorly in snow or water.

In fact, the EU target level for the protection of human health (maximum daily 8-hour moving average = $120 \mu\text{g}/\text{m}^3$) is exceeded at many stations almost every year. However, with 24 permitted exceedances per year, the actual target value was not exceeded anywhere during the review period.

Figure 7. Annual averages for ozone (O_3) and comparison of 24-hour concentrations (highest 8-hour average) with air quality standards (Directive 2008/50/EC and WHO 2021) between 2005 and 2021. In the figure, the percentage after the station name indicates the annual change, if it is statistically significant.



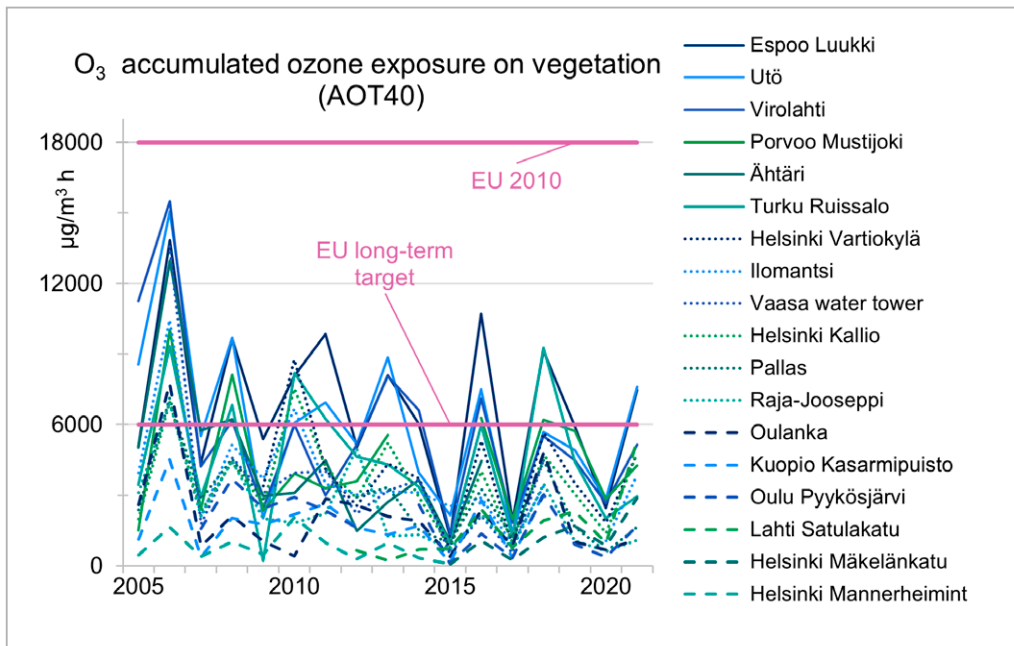


However, summertime high ozone episodes in Finland and elsewhere in Europe have decreased since 2006 as a result of the Europe-wide reduction in NO_x and VOC emissions. (Anttila 2020)

Ozone is also harmful to vegetation. Its harmfulness depends on high ozone concentrations during the growing season and their duration. For this reason, the target value for ozone is based on the exposure period. The ozone exposure index (AOT40) is calculated as the difference between the cumulative sum of the hourly concentrations of ozone above $80 \mu\text{g}/\text{m}^3$ and $80 \mu\text{g}/\text{m}^3$. The amount is accumulated annually from 1 May to 31 July, and its calculation takes into account hourly concentrations measured between 9.00 and 21.00 (Figure 8).

The ozone exposure of vegetation depends very much on the weather conditions of the year. However, since the peak year of 2006, ozone exposure has remained fairly stable, though with high annual variation.

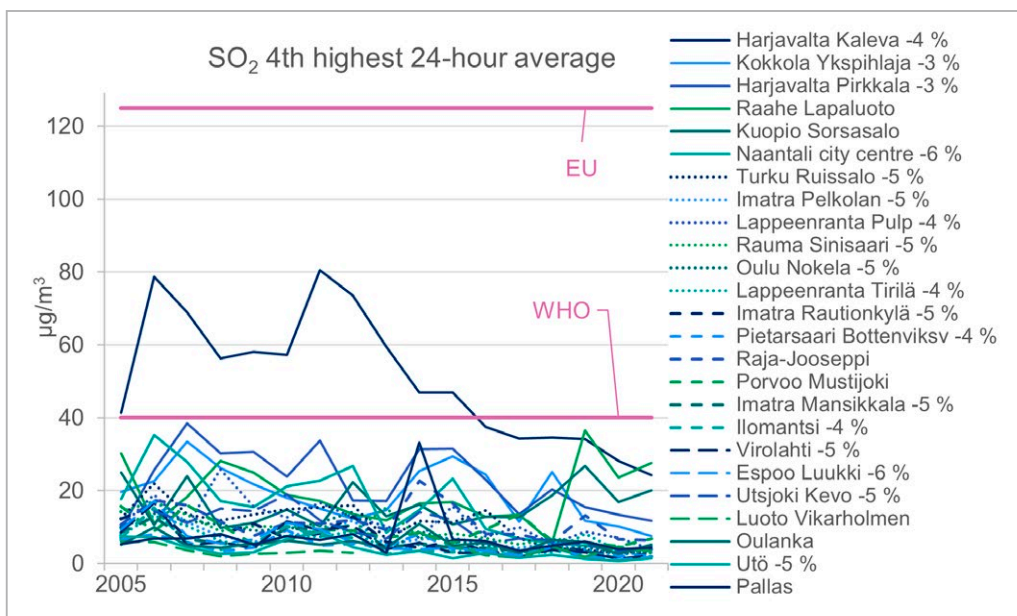
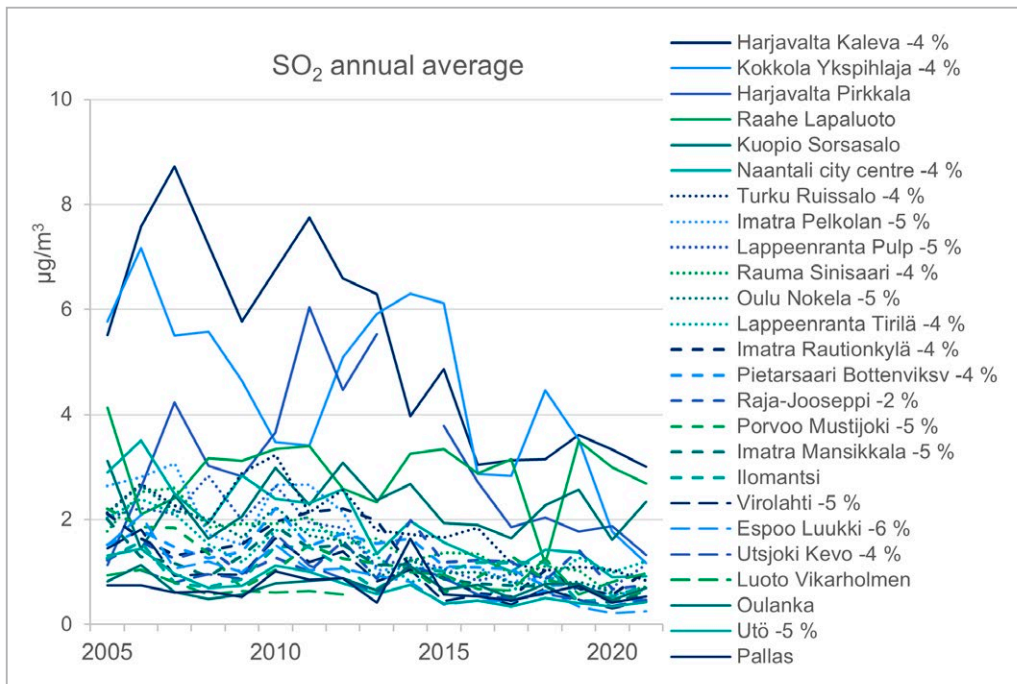
Figure 8. Comparison of the ozone exposure index (AOT40) with the target value (Directive 2008/50/EC) between 2005 and 2021.



7.7 Sulphur dioxide SO_2

Sulphur dioxide concentrations have continued to decline (Figure 9). Today, only a few industrial cities stand out with slightly elevated SO_2 concentrations. Elevated sulphur dioxide concentrations are typically short-lived local episodes related to industrial disturbances or other abnormal situations. The limit value for 24-hour concentrations ($120 \mu\text{g}/\text{m}^3$, three permitted exceedances) was not exceeded during the review period. In practice, concentrations are also below the WHO's strict guideline value.

Figure 9. Annual concentrations sulphur dioxide and comparisons with air quality standards set for 24-hour concentrations (Directive 2008/50/EC and WHO 2021) between 2005 and 2021. In the figure, the percentage after the station name indicates the annual change, if it is statistically significant.



8 Ecosystem monitoring

The NEC Directive requires the implementation of monitoring and reporting of the negative impacts of air pollution on ecosystems. Ecosystem monitoring is used to assess the effectiveness of the directive.

In order to monitor the effectiveness of emission reductions, Member States must arrange for the monitoring of the adverse effects of air pollution on different habitats or ecosystems that are significant in their territory. Such habitats include water, forests and fully or partly natural areas (peatlands, heaths, meadows and agricultural land). The monitoring must be carried out in a cost-effective manner, utilising existing monitoring programmes and highlighting risk areas. Member States are free to organise the monitoring as they wish as long as it meets the requirements of Article 9 of the NEC Directive.

The monitoring required by the directive concerns changes caused by atmospheric acidification, eutrophication and ozone stress. The monitoring indicators are sulphur and nitrogen compounds and ground-level ozone concentration, which are key in relation to the above-mentioned stress, as well as the changes they cause in the ecosystem and biodiversity in various elements (water, soil, vegetation, biota). The monitoring frequency of the variables varies from monthly (e.g. acidity, sulphate, nitrate, basic water quality variables) to observations repeated every 5 to 15 years (e.g. soil chemistry, needle damage). For ozone, the modelled cumulative load is monitored.

The number of ecosystems subject to the monitoring in the Member State depends on its biogeographical status and the ecosystem types in the country. Finland is part of a less heavily stressed peripheral region, and the concentrations monitored in most of the country are low and correspond to natural reference values. According to the classification system used, Finland belongs almost entirely to the boreal zone, and the number of ecosystems with a significant area is quite limited, so the scope of monitoring for Finland is considered to include fresh surface waters, forests and peatlands for open lands. In the case of agricultural land, no damage caused by atmospheric deposition has been observed, so separate monitoring is not considered necessary.

The required number and frequency of monitoring sites depend on the amount of stress and the sensitivity of the area to the effects of deposition. As a rule, sites should be located in heavily stressed, sensitive areas and clearly reflect the effects of atmospheric acidification, eutrophication or ozone exposure. Fewer observation sites are needed for natural or low-impact areas. The monitoring makes use of existing monitoring networks based on other directives and related to monitoring programmes, such as the Directive establishing a framework for Community action in the field of water policy (Water Framework Directive), the Directive on the conservation of natural habitats and of wild fauna and flora (Habitats Directive), the Long Term Ecological Research Network LTER and the UNECE CLRTAP programmes ICP Forest, ICP Waters and ICP Integrated Monitoring. For Finland, most of the monitoring commitments under the directive are covered through these networks. When interpreted according to the guidelines, Finland's location in and beyond the periphery of stressed acidification and eutrophication areas does not necessitate close monitoring in terms of area or time. Consequently, the establishment of new monitoring sites was only necessary in a few peatlands. The monitoring sites are shown on a map in Figure 10.

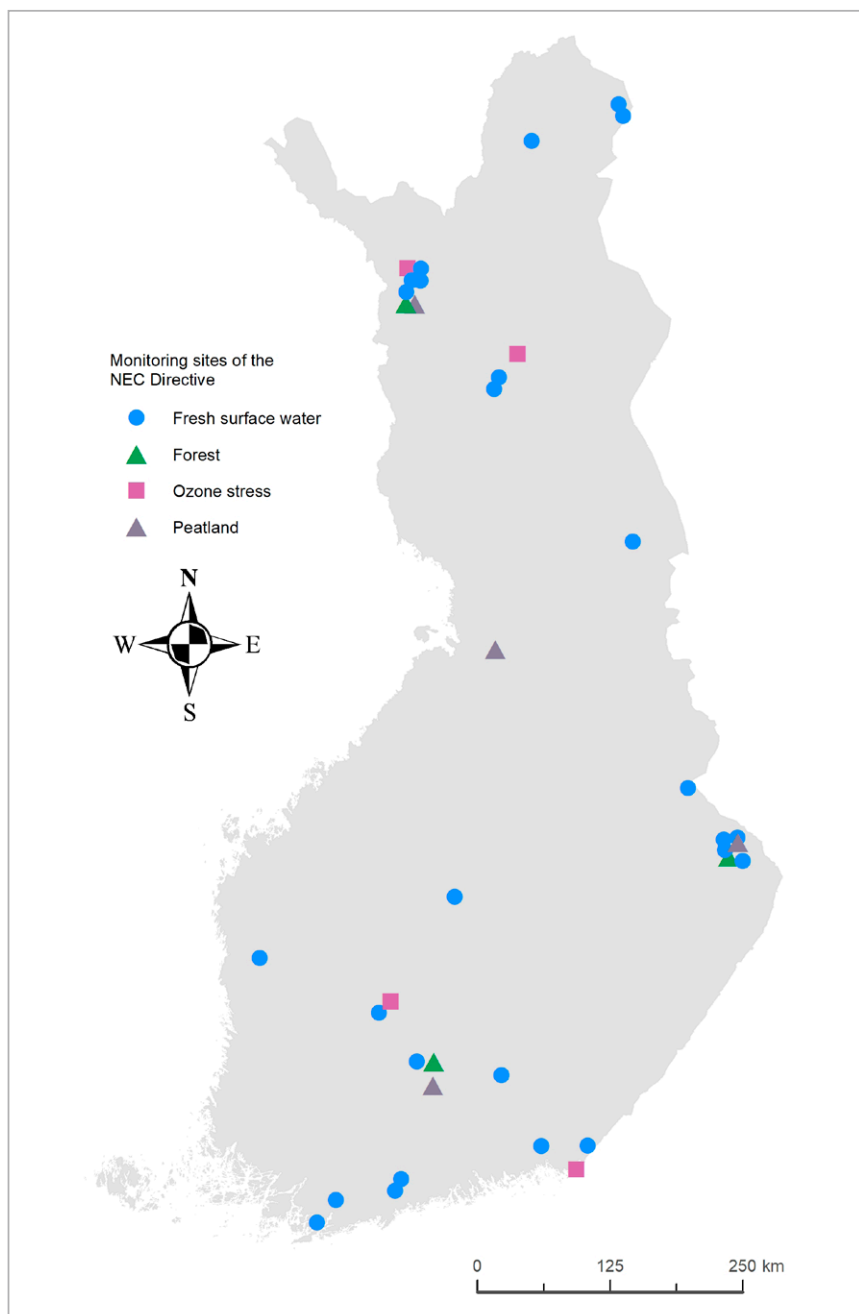
The monitoring to be carried out is managed by the Finnish Environment Institute, the Natural Resources Institute Finland, the Finnish Meteorological Institute and regional ELY Centres. The Finnish Environment Institute is responsible for the planning and coordination of the monitoring of surface waters together with regional ELY Centres. The ELY Centres are responsible for the practical implementation of water monitoring. The responsibilities are based on the Act and Decree on the Organisation of River Basin Management and the Marine and the legislation on the responsibilities of the Finnish Environment Institute. The Natural Resources Institute Finland is in charge of the planning and implementation of monitoring concerning forests and peatlands, and the monitoring of fish populations in surface waters. The Finnish Meteorological Institute monitors air quality and models ozone stress.

Monitoring site data (location data, monitored parameters) and the results of the monitoring are reported to the EU Commission every four years through the European Environment Agency's (EEA) reporting system. The compilation and reporting of data in Finland is the responsibility of the Finnish Environment Institute. Data on monitoring locations was first reported in 2018 and monitoring results in 2019. The reporting format of location data was changed in 2022. The next monitoring results will be reported in accordance with the monitoring schedule in 2023.

As only the results of the first reporting period are currently available, no reliable estimates of the ecosystem effects of airborne pollutants or the effectiveness of the NEC Directive can yet be established. Analysis of the results is also complicated by the different monitoring methods and practices of the Member States, which will probably

require harmonisation of the methods between the countries in order to improve the comparability of the data collected. The results of the second reporting in 2023 will hopefully make it possible to assess the effects of airborne pollutants on the basis of the data produced by the established monitoring network.

Figure 10. Ecosystem monitoring sites pursuant to the NEC Directive in Finland (Figure: the Finnish Environmental Institute)



9 Projected further evolution of emissions

This chapter deals with the projected evolution of emissions until 2030. The emission projection was prepared in accordance with the With Existing Measures (WEM) scenario in the background report of the Energy and Climate Strategy (VTT Technical Research Centre of Finland Ltd 2022). The Russian invasion of Ukraine has implications for the energy system (availability, price, energy raw materials), but the WEM scenario does not consider these effects, so the effects are not shown in the emission projection.

As Finland has already achieved all the emission reduction targets set for 2020–2029 in recent years, this chapter focuses on the 2030 targets. Tables 4 and 5 indicate the reduction commitments compared to the base year 2005 and the estimated evolution of emissions for 2030. Finland is still expected to meet its emission reduction commitments in 2030 even though the commitments, with the exception of ammonia, will be stricter than those listed in Table 2. Figure 11 shows sector-specific emissions between 2005 and 2020 and the estimated evolution from 2020 to 2030. The evolution of emissions is presented at five-year intervals, where the numbers for the period 2005–2020 are from the national emissions inventory (year of reporting 2022) and the subsequent projections are modelled figures.

Table 4. National emission reduction commitments and estimated emission reduction with existing measures as a percentage (compared to base year 2005)

	SO ₂	NO _x	NM VOC	NH ₃	PM _{2,5}
Reduction commitment from 2030 (%)	34	47	48	20	34
Estimated decrease in 2030 in the WEM scenario (%)	65	60	58	24	57

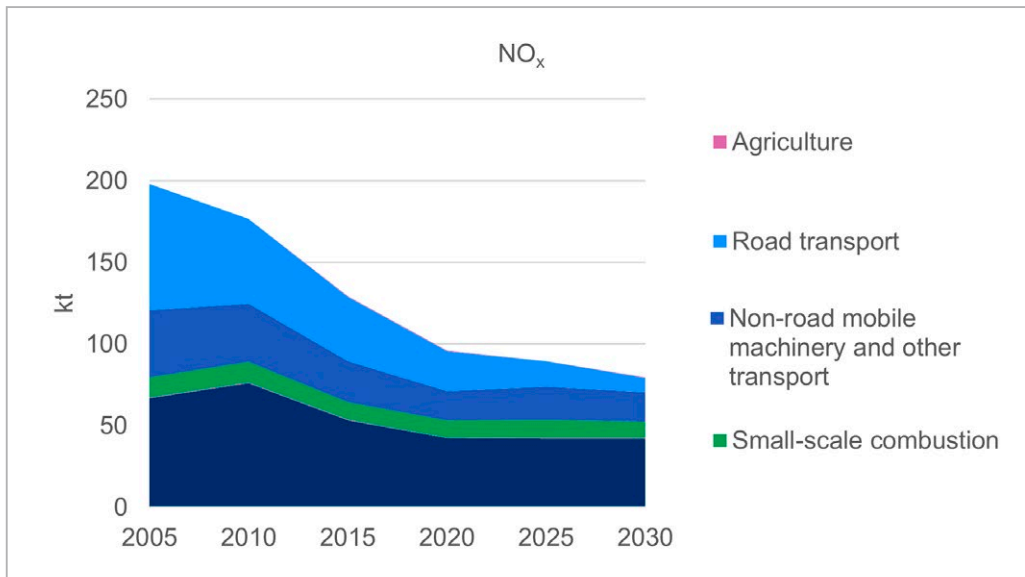
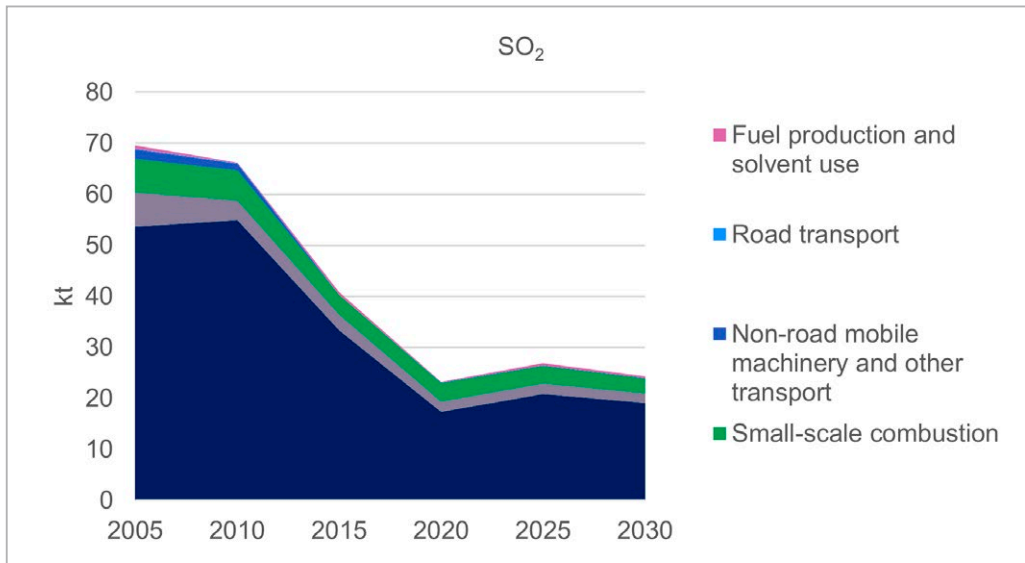
Table 5. The emission levels* (kt/a) in accordance with the reduction commitment and the estimated emissions in 2030.

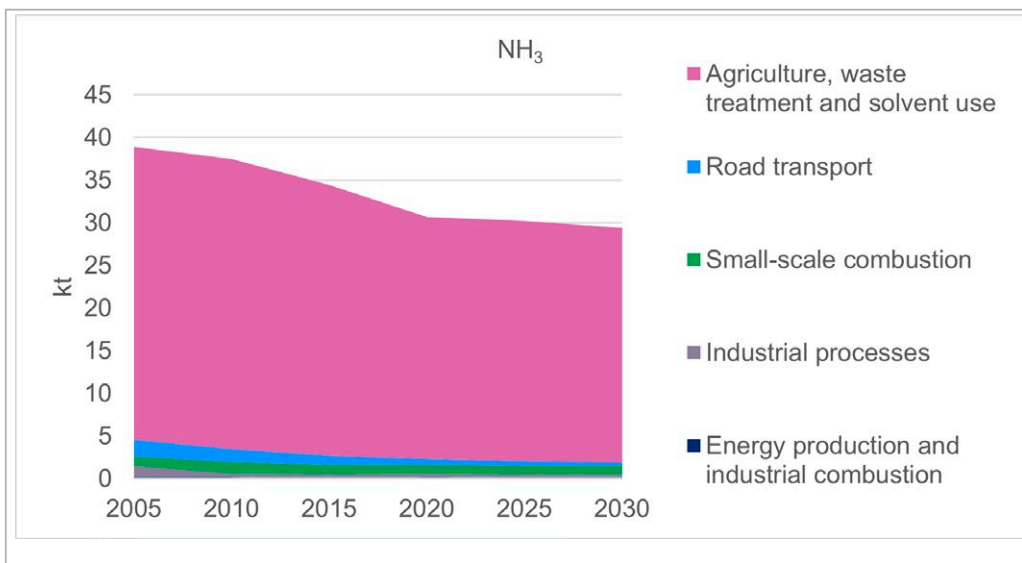
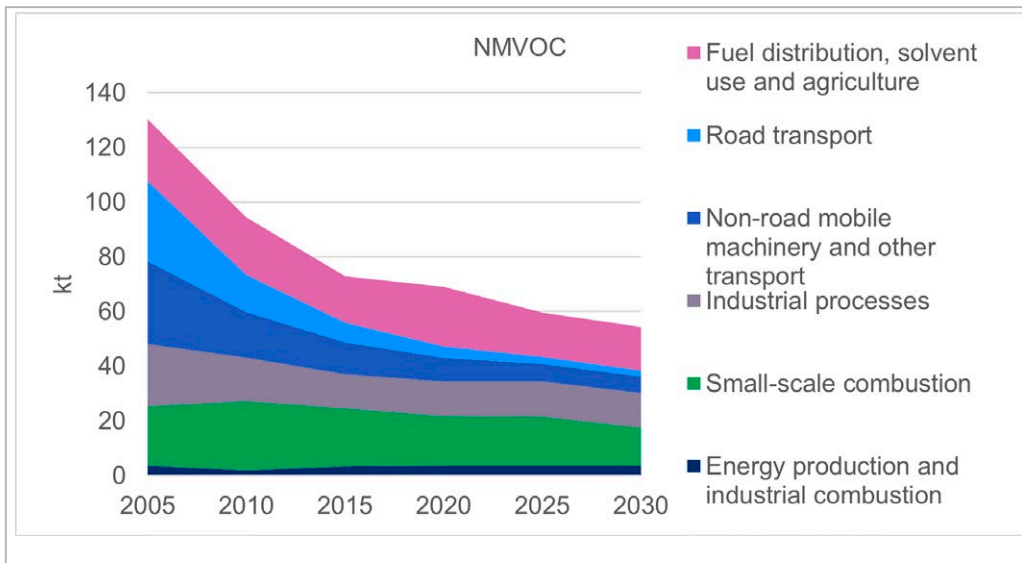
	SO ₂	NO _x	NM VOC	NH ₃	PM _{2,5}
Maximum allowable emission levels from 2030	46	105	68	31	17
Estimated emissions in 2030	24	80	54	29	11

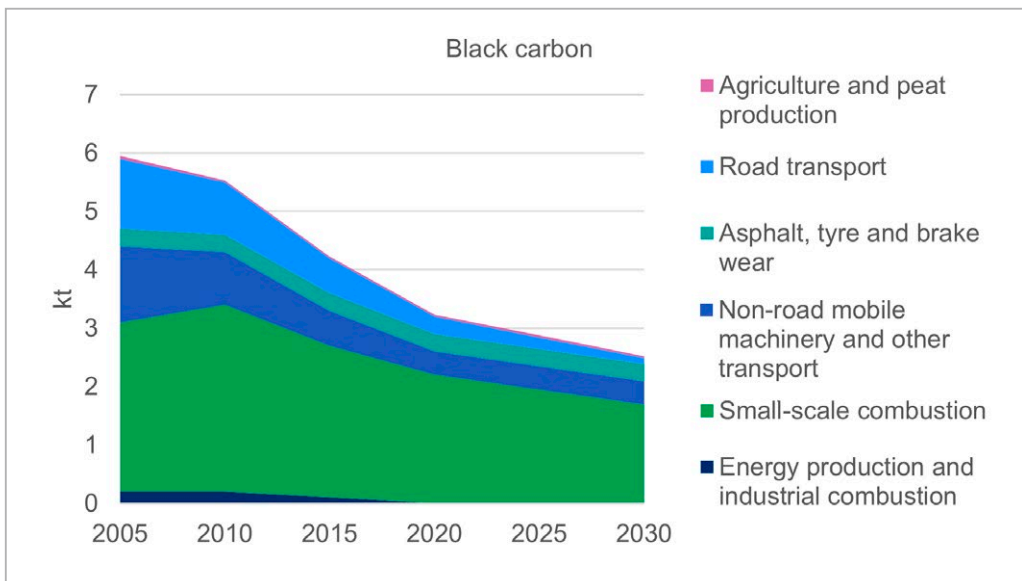
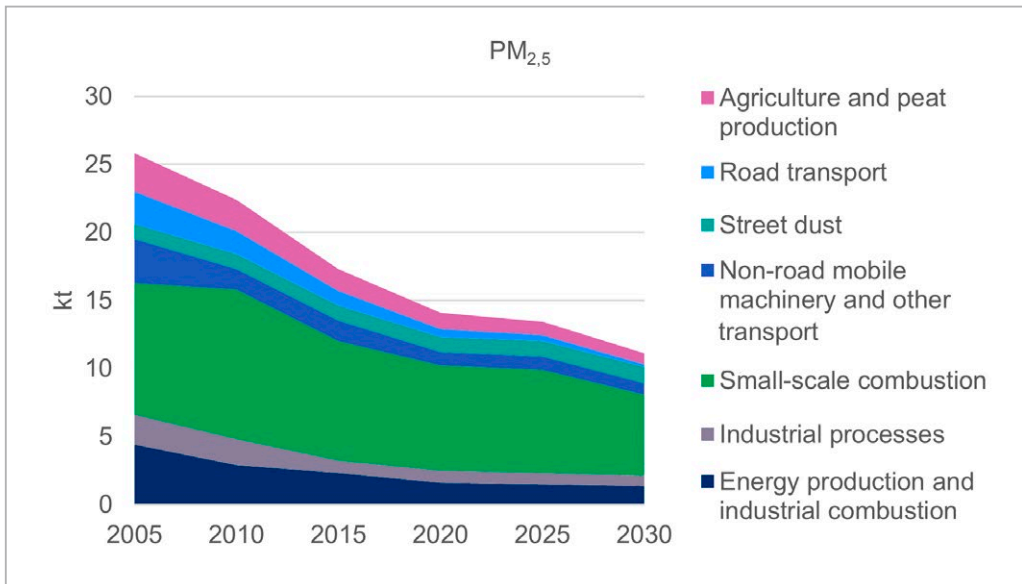
* As the calculation methods evolve, new reports may also bring changes to the emission estimates of previous years (including the base year 2005), so no tonnage ceilings are set for emissions. The comparison level in this table is based on the reporting for 2022 (Finnish Environment Institute, 2022).

For most air pollutants, the 2020 emissions were exceptionally low due to the containment measures during the COVID-19 pandemic and the warm winter. Despite this, the emissions of all air pollutants under review, except sulphur dioxide, are estimated to continue to decrease from 2020 to 2025 and further until 2030. However, sulphur dioxide emissions will also decrease from 2019 to 2025. Emission trends are not expected to change significantly compared to the National Air Pollution Control Programme 2030. The main reasons for the reduction in emission levels are changes in fuel use and technology, as well as the stricter emission limit values set by legislation.

Figure 11. Development of Finland's air pollutant emissions (SO_2 , NO_x , NH_3 , NMVOC, $\text{PM}_{2.5}$ and black carbon) by emission source. Non-combustion related NO_x and NMVOC emissions from agriculture are not covered by the NEC Directive, so they have been excluded from the graphs. Small-scale combustion includes property-specific use of wood, oil and gas.







10 Projected development of air quality

The development of air quality in Finland depends not only on national measures but also on the evolution of emissions in Europe and in the entire northern hemisphere. Local problems that can clearly be solved by national and local measures include the problems of nitrogen dioxide and street dust in cities. As nitrogen oxide emissions continue to decrease (Chapters 6 and 9), urban nitrogen dioxide concentrations also continue to fall. Results in Finland are already well below the EU limit values for nitrogen dioxide, but achieving the WHO guidelines remains a challenge.

The projection for street dust concentrations is not quite as favourable. While positive developments have been achieved in some places, in other words PM_{10} concentrations have decreased, the decrease is not yet consistent. The concentrations are certainly below the EU's health protection limit values throughout Finland, but the annual very intense street dust season in spring also causes environmental pollution and a decrease in comfort and visibility. Consequently, street dust causes a great deal of dissatisfaction even among citizens who do not suffer actual health problems from it.

Reducing the use of studded tyres and adopting best practices for combating street dust nationwide would be effective measures to reduce street dust. The NAPCP promotes these activities.

The decrease in sulphur dioxide concentrations is also a success at the local level. With a few exceptions, SO_2 concentrations have already fallen close to background levels. The concentrations in Finland are already below the WHO guidelines.

The evolution of concentrations of fine particulate matter is a more complex problem. Of course, the direct particulate emissions regulated by the NEC Directive are decreasing and, to a small extent, are also reducing $PM_{2.5}$ concentrations in the air. A large part of direct particulate emissions originates from small-scale wood combustion, so their reduction (Chapters 6 and 9) should also have a positive effect on the increased PAH concentrations in areas with low-density housing.

The bulk of fine particulate matter is long-range transported (e.g. sulphate and nitrate), and therefore the quantity depends on the evolution of emissions in the rest of Europe. The concentrations in Finland are already below the WHO guidelines, but national measures are not enough to get below the WHO guidelines – long-range transport must also be reduced.

As in other parts of Europe, Finland's ozone concentration levels have not decreased significantly despite the reduction in emissions of the most important precursors (NO_x and VOC). A slight increase in ozone concentrations has been observed in the centres of major cities due to a reduction in the NO_x sink. However, most of Finland has ozone background concentrations typical of these latitudes. There is a great deal of uncertainty surrounding the forecasting of future developments, both in Europe and throughout the northern hemisphere, but it is quite clear that no rapid changes are in sight and that national measures are not enough to reduce ozone concentrations. (More information on the NO_x sink: the Finnish Meteorological Institute's ozone page)

In conclusion, national emission reductions (Chapter 9) continue to have a positive impact on the development of air quality in Finland. The EU limit values are not currently being exceeded, and even the WHO guideline values can be regarded as reasonable, albeit challenging, targets. However, to reduce concentrations of fine particulate matter and ozone, we also need a reduction in emissions in Europe or even in the entire northern hemisphere.

This air quality projection is mainly based on the emission scenario in Chapter 9. As stated at the beginning of Chapter 9, the Russian invasion of Ukraine has implications for the energy system (availability, price, energy raw materials), but these effects are not included in the WEM scenario, so they are also not included in this air quality projection.

11 Assessment of the need to introduce emission reduction measures

11.1 Policies and measures (PaMs)

The emission inventory data shows that, in 2020, Finland achieved all emission reduction commitments with respect to the air pollutants listed in the NEC Directive (Chapter 6). Based on the scenario calculations, Finland should meet the new stricter emission reduction commitments in 2030 as well (Chapter 9). Therefore this update of the NAPCP does not propose any binding policies or measures to reduce emissions (PaMs). However, Finland will continue to implement the additional measures decided in the 2019 Air Pollution Programme (Section 11.2).

11.2 Additional measures

The implementation of the additional measures presented in Chapter 6 of the NAPCP will be continued (Ministry of the Environment 2019). Finland already achieves the emission reduction commitments without these additional measures, which are not called for or required by the NEC Directive. However, because the NAPCP was prepared in broad stakeholder cooperation and approved by the Government, Finland is committed to implementing the additional measures on the level of principle.

The implementation of the Action Plan to Reduce Ammonia Emissions from Agriculture in Finland 2021–2027 will be continued. (Ministry of Agriculture and Forestry 2021)

Appendix 1: Summary of the public consultation

Requests for an opinion

Authorities whose field of activity and duties are essentially related to the NAPCP were asked for an opinion on the draft NAPCP. Those not included in the distribution list of the requests for an opinion were also given the opportunity to read the draft and issue an opinion. Opinions could be submitted from 24 November to 30 December 2022 at [Lausuntopalvelu.fi](https://lausuntopalvelu.fi) ([link to Lausuntopalvelu.fi](https://lausuntopalvelu.fi)) and at the Registry Office of the Ministry of the Environment. Opinions were requested in good time so that the content of the draft could still be genuinely influenced.

The following bodies were asked for an opinion: the Association of Finnish Municipalities, the AVI for East Finland, the AVI for Lapland, the AVI for Northern Finland, the AVI for Southwest Finland, the AVI for Western and Inland Finland, the Central Association of Chimney Sweeps, the Central Union of Agricultural Producers and Forest Owners, the Chemical Industry Federation of Finland, the City of Espoo, the City of Helsinki, the City of Kuopio, the City of Oulu, the City of Porvoo, the City of Riihimäki, the City of Tampere, the City of Turku, the City of Vantaa, the Confederation of Finnish Industries, the ELY Centre for Central Finland, the ELY Centre for Häme, the ELY Centre for Kainuu, the ELY Centre for Lapland, the ELY Centre for North Karelia, the ELY Centre for North Ostrobothnia, the ELY Centre for North Savo, the ELY Centre for Ostrobothnia, the ELY Centre for Pirkanmaa, the ELY Centre for Satakunta, the ELY Centre for South Ostrobothnia, the ELY Centre for South Savo, the ELY Centre for Southeast Finland and ELY Centre for Southeast Finland, the ELY Centre for Uusimaa, the Finnish Allergy, the Skin and Asthma Federation, the Finnish Association for Nature Conservation, the Finnish Cyclists' Federation, the Finnish Energy, the Finnish Environment Institute, the Finnish Fireplace and Chimney Association (TSY), the Finnish Forest Industries Federation, the Finnish Home Owners' Association, the Finnish Meteorological Institute, the Finnish Sauna Society, the Finnish Society for Nature and Environment, the Helsinki Region Environmental Services HSY, the Ministry of Agriculture and Forestry, the Ministry of Defence, the Ministry of Economic Affairs and Employment, the Ministry of Education and Culture, the Ministry of Finance, the Ministry of Interior, the Ministry of Justice, the Ministry of Social Affairs and Health, the Ministry of Transport and Communications, the National Institute for Health and Welfare, the Organisation for Respiratory Health in Finland, the Prime Minister's Office, the Provincial Government of Åland, the Regional State Administrative Agency (AVI) for Southern Finland, the Technology Industries of Finland, the University of Eastern Finland.

Communication

The requests for an opinion were sent to the bodies to be consulted on 24 November 2022.

The possibility to submit an opinion was announced on 30 November 2022 in Finnish and Swedish in Helsingin Sanomat and in Swedish in Hufvudstadsbladet. Both are national newspapers in Finland.

A news item about the possibility to submit an opinion was published on the website of the Ministry of the Environment on 8 December 2022 and shared on social media channels on the same date.

The opportunity for influencing was communicated in good time so that the content of the draft could still be genuinely influenced.

Opinions received and their consideration

Eighteen opinions on the draft were submitted by the Finnish Meteorological Institute, the ELY Centre for Pirkanmaa, the Central Union of Agricultural Producers and Forest Owners, Helsinki Region Environmental Services HSY, the Ministry of Employment and the Economy, the Ministry of Social Affairs and Health, the Ministry of Transport and Communications, the Finnish Environment Institute, the City of Helsinki, the National Institute for Health and Welfare, the Home Owners' Association, the Ministry of the Interior, the Ministry of Agriculture and Forestry, the Ministry of Education and Culture, Aeromon Oy, the Finnish Forest Industries Federation, the Communist Party of Finland's Environmental Group and the Finnish Cyclists' Federation.

All opinions are available at Lausuntopalvelu.fi ([link to Lausuntopalvelu.fi](https://lausuntopalvelu.fi)).

The specific amendments proposed in the opinions and their impact on Chapters 1 to 11 are summarised in Table 6.

Table 6. Specific amendments proposed in the opinions and the resulting changes to Chapters 1–11.

Proposed amendment	Comments and changes to Chapters 1–11
<p><i>Aeromon Oy. Chapter 2:</i> It would be good to note that the regulation of methane emissions is under discussion at EU level with regard to the proposed directive on methane, which will also affect the national framework.</p>	<p>Text was added, for example on the EU proposal for a regulation on methane (Section 2.2.1.1 Methane and black carbon).</p>
<p><i>The ELY Centre for Pirkanmaa. Section 2.2.1:</i> Finland’s National Climate Change Adaptation Plan, which is currently being updated, should also be added to the national plans. While the adaptation plan does not deal with energy policy, it is a national plan that is significant in terms of air quality and the state of the environment.</p> <p>The plan should also recognise the sector-specific climate roadmaps prepared as part of the preparation of the Climate and Energy Strategy, which also have a national impact on air pollution control.</p> <p>In addition, it could be assessed whether attention has been paid to air pollution control issues at municipal or regional level as part of carbon neutrality roadmaps and whether it is necessary to combine these assessments in the future or at least conceptually clarify the similarities and differences between the topics. This assessment would contribute to the implementation of the objectives of the NAPCP.</p>	<p>The chapter includes mainly programmes aimed at emission reduction. No changes.</p> <p>Added in accordance with the suggestion.</p> <p>The links between climate protection and air pollution control in municipalities are promoted in connection with the implementation of the NAPCP. Climate projects related to municipal air pollution control work have been compiled in Table 15 of the NAPCP. No changes.</p>
<p><i>The Central Union of Agricultural Producers and Forest Owners. Sections 2.2.1 and 2.2.3.1:</i> Section 2.2.1 describes climate change mitigation and energy policy and provides two examples at the local level (Helsinki and Lahti).</p> <p>Helsinki is also an example in the section on transport (2.2.3.1). However, there should be examples from all over Finland as well as from cities and municipalities of different sizes, as climate work is carried out extensively throughout the country.</p>	<p>The examples of Helsinki and Lahti were deleted from Section 2.2.1. A paragraph that describes the climate work of municipalities was added to the section.</p> <p>The text was moved from Section 2.2.3.1 to Appendix 2. Section 2.2.3.1 was deleted.</p>

Proposed amendment	Comments and changes to Chapters 1–11
<p><i>The ELY Centre for Pirkanmaa. Sections 2.2.1 and 2.2.3.1:</i> Descriptions of climate work in the cities of Helsinki and Lahti are included in the programme as examples at the local level. However, it remains unclear why these examples were selected, as similar roadmaps and action plans for mitigating climate change exist in a large number of Finnish municipalities and regions and are also actively implemented. The list could at least be supplemented with information on projects of the HINKU network and projects funded by the Ministry of the Environment’s programme to accelerate climate action in municipalities and regions.</p>	<p>The examples of Helsinki and Lahti were deleted from Section 2.2.1. A paragraph that describes the climate work of municipalities was added to the section.</p> <p>The text was moved from Section 2.2.3.1 to Appendix 2. Section 2.2.3.1 was deleted.</p>
<p><i>The ELY Centre for Pirkanmaa. Section 2.2.3:</i> The section should also discuss the Transport 12 plan.</p>	<p>Added in accordance with the suggestion.</p>
<p><i>The Finnish Cyclists’ Federation. Section 2.2.3:</i> There are essential elements missing from this section: transport performance, the modal split of passenger transport, speed limits and the legislative framework to reduce the use of studded tyres.</p> <p>The programme for the promotion of walking and cycling, which aims to increase walking and cycling by 30 % between 2016 and 2030, is also an important programme aimed at reducing air pollution. If this goal is achieved, car use will decrease, especially in cities. The programme should therefore be renewed, as its measures are ending in 2023.</p>	<p>Section 2.2.3 presents a list of key transport legislation, policies, strategies and programmes that have an impact on air pollution control and air quality. The transport performance, modal split of transport, speed limits and studded tyres highlighted in the comment can be found in the NAPCP’s measure Tables 12a and 12b. The comments will be taken into account in connection with the implementation of the NAPCP. The realisation of the measures is described in Sections 4.3.1.1 and 4.3.1.2 of this update. The programme for the promotion of walking and cycling was added to Section 2.2.3. There is still no policy on the promotion of walking and cycling after the end of the current programme.</p>
<p><i>The National Institute for Health and Welfare. Section 2.2.4:</i> The Ecodesign Directive applies to new prefabricated fireplaces. It would be a good idea to add a clarification on prefabrication to the updated report.</p>	<p>Qualifiers were added in accordance with the suggestion.</p>

Proposed amendment	Comments and changes to Chapters 1–11
<p><i>The ELY Centre for Pirkanmaa. Chapter 3:</i> With regard to the ELY Centres, the table should be supplemented to include the promotion of a good environmental status as the basic task of the agencies. In addition, a lot of promotion and assessment work on air pollution control is done in connection with environmental impact assessment procedures and the task of promoting land use. Some ELY Centres also carry out more extensive development work related to the promotion of air pollution control, such as the ELY Centre for North Karelia’s monitoring of bioindicators and the role of the ELY Centre for Lapland in Arctic cooperation to reduce emissions.</p> <p>In terms of national operators, the Finnish Transport Infrastructure Agency could also be added to the table on responsibilities. Environmental health should also be mentioned in the tasks of both municipalities and regional state administrative agencies (AVIs).</p>	<p>Details were added to Table 1 in accordance with the suggestion.</p>
<p><i>The Ministry of the Interior. Chapter 3:</i> Table 1 could mention that the Finnish Safety and Chemicals Agency (Tukes) is also the market surveillance authority for prefabricated fireplaces in Finland.</p>	<p>Tukes was added to Table 1 in accordance with the suggestion.</p>
<p><i>The Ministry of Transport and Communications. Section 4.3.1.1:</i> One of the measures mentioned is CO₂ emission limit values set for vehicle manufacturers. In order to ensure up-to-date information, the Ministry of Transport and Communications notes that a preliminary agreement on the proposal for a regulation on tightening the emission limits was reached during the autumn. The Ministry proposes that the paragraph concerning the measure in question be amended as follows: “The CO₂ emission limit values set for vehicle manufacturers are constantly becoming stricter as a result of evolving EU regulation. An agreement on updating the CO₂ emission targets for cars and vans was reached in the EU in autumn 2022. In addition, the Commission is expected to propose tightening the CO₂ emission limits for heavy-duty vehicles in early 2023.”</p>	<p>The text was amended in accordance with the suggestion.</p>
<p><i>The National Institute for Health and Welfare. Section 4.3.1.1:</i> The section states that, in addition to the measures in Table 12a, the thematic group on Transport and non-road mobile machinery has promoted the reduction of local emissions from non-road mobile machinery. It would be good to describe this in more detail in the report, perhaps with examples.</p>	<p>Examples were added in accordance with the suggestion.</p>

Proposed amendment	Comments and changes to Chapters 1–11
<p><i>The National Institute for Health and Welfare. Section 4.3.1.2:</i> The section states that, in addition to the measures in Table 12b, the reduction of the generation of street dust has been promoted by developing the legislation on studded tyres. It would be good to describe this in more detail in the report, perhaps with examples.</p>	<p>Examples were added in accordance with the suggestion.</p>
<p><i>The Ministry of the Interior. Section 4.3.1.3:</i> The section states that the aim is to launch a study on incentives for replacing fireplaces in 2023. In the view of the Ministry of the Interior, conducting the study is very necessary, as “scrapping premiums” for fireplaces have been in the news on several occasions in the past couple of years. The Ministry of the Interior notes that it would be advisable to include in the report the official procedures related to the replacement of fireplaces, as the permit and notification procedures may vary from municipality to municipality and may be different for different types of fireplaces.</p>	<p>The comment applies to the implementation of the NAPCP. The comment will be taken into account when planning and implementing the study project in question. No changes.</p>
<p><i>The National Institute for Health and Welfare. Section 4.3.1.3:</i> According to the updated report, several measures have been taken to reduce the emissions of small-scale wood combustion. The Finnish Institute for Health and Welfare considers it important to ensure that the measures are promoted and, for example, that citizens’ information guidance on small-scale combustion is carried out throughout Finland.</p>	<p>The comment applies to the implementation of the NAPCP. In the implementation of the NAPCP, efforts to reduce emissions of fine particulate matter from wood combustion by many different means will continue nationwide. No changes.</p>
<p><i>The Ministry of Agriculture and Forestry. Section 5.2:</i> The sentence “Changes in nitrogen production in animals lead to a slight increase in ammonia emissions.” gives the impression that nitrogen production in all animals has increased. It is our understanding that the refinement and phasing of the feeding of poultry and pigs has kept their ammonia emissions in check and even reduced them. Only in the case of dairy cows has the change been significant, and it is closely linked to the increase in yield levels. We propose that the sentence be amended as follows: “The increase in the yield level of dairy cows has increased their nitrogen excretion, which slightly increases ammonia emissions.”</p>	<p>The increase in yields and nitrogen excretion concerns cattle in general and not dairy cows, so the paragraph in question has been changed as follows: “The increase in the cattle productivity has increased their nitrogen excretion, which slightly increases ammonia emissions.”</p>

Proposed amendment

Comments and changes to Chapters 1–11

The Ministry of Agriculture and Forestry. Section 5.2: T8: Continuing with the animal welfare payment scheme in 2021 and 2022. Preparation of the CAP strategy plan for 2023–2027 is ongoing. It is proposed to change the wording to “Finland’s CAP Strategic Plan 2023–2027 also includes the measures of the animal welfare payment scheme.”

This section lists the measures of the Action Plan to Reduce Ammonia Emissions from Agriculture in Finland as such, and no changes to these measures are possible here. Instead, concrete examples (in italics) were added at the end of chapter 5.2: “The CAP Strategic Plan includes the measures found the most effective for reducing ammonia emissions, such as support for injection, investment aid for covering manure storage places and other investments that reduce emissions, as well as animal welfare compensation measures.”

The Ministry of Agriculture and Forestry. Section 5.2: For measures under the EU’s Common Agricultural Policy, it is proposed that the Finnish expression for “animal welfare payment scheme” (T8) be changed to the plural form indicating more than one payment.

The Finnish text was amended in accordance with the suggestion.

Aeromon Oy. Chapter 6: “The evolution of emissions is influenced by the technology used, separate reduction measures and changes in fuel use, animal numbers and other activities.” It might be good to note that monitoring also has an impact on the evolution of emissions. Only monitored emissions can be reduced.

Added in Chapter 6: “The development of emission measurements and air quality measurements contributes to the visibility of emission reduction efforts and creates an understanding of air quality and the impact of emissions on it, as well as possible new emission reduction needs.”

Proposed amendment	Comments and changes to Chapters 1–11
<i>The Ministry of Agriculture and Forestry. Chapter 7:</i> The colours chosen for the diagrams make it impossible to connect them to localities.	The colours are in accordance with the Government’s publication guidelines. The idea of the diagrams is to show the overall picture of the situation, and a locality-specific examination is not the purpose. Text was added to Chapter 7: “The figures summarise measurement results from different types of environments to establish an overview. Detailed examination, for example by pollutant or by locality, is possible in the Finnish Meteorological Institute’s air quality service.” In addition, a link to the service was added to the sources.
<i>The National Institute for Health and Welfare. Chapter 7:</i> In addition to the concentration variation, the figures also present the WHO guideline value issued in 2021. The text of the report itself states that the figures use the new WHO guidelines. However, this clarification is not included in the caption, although the concentration variation in the figures is from a period where the previous 2005 WHO guidelines were in force. The Finnish Institute for Health and Welfare recommends adding a clarification on the WHO guidelines to the captions and proposes that, in addition to the new guidelines for 2021, the old guidelines should also be presented in the figures, as they were in use during the period depicted in the figures.	Further clarifications were added to the captions in Chapter 7 in accordance with the suggestion. The 2005 WHO guidelines were not included in the figures, as they are no longer valid. They were also not binding legislation before the publication of the new WHO guidelines (2021).
<i>The National Institute for Health and Welfare. Chapter 7:</i> In Figures 2–9, the percentage after the station name indicates the annual change, which is mentioned in the caption for Figure 2 but not for Figures 3–9. For the sake of clarity, the Finnish Institute for Health and Welfare also recommends adding the clarification to Figures 3–9.	The clarification was added to the captions for the figures with percentages.
<i>The National Institute for Health and Welfare. Chapter 9:</i> “As Finland has already gone below all the emission reduction targets set for 2020–2029 in recent years. . .” Instead of the “gone below,” a better term would be “achieved” or “fulfilled.”	“Gone below” has been replaced with “achieved.”

Proposed amendment

The National Institute for Health and Welfare. Chapter 9: “The emission projection was prepared in accordance with the With Existing Measures (WEM) scenario in the background report of the Energy and Climate Strategy (VTT Technical Research Centre of Finland Ltd 2022). The Russian invasion of Ukraine has implications for the energy system (availability, price, energy raw materials), but the WEM scenario does not consider these effects, so the effects are not shown in the emission projection.” The National Institute for Health and Welfare notes that, according to general estimates at the moment, wood combustion will increase at least in the winter of 2022–2023, and considers it important that the impact of this be addressed in the update. It would be a good idea to add monitoring of the increase in wood combustion due to the energy crisis to the update, and to consider measures to achieve a downward trend in combustion in the coming years.

The Ministry of the Interior. Chapters 9 and 10: Chapters 9 and 10 refer to future developments. For example, an addition could be made to the end of page 57 (Chapter 9) concerning the effects of the increase in the price of purchased energy and electricity. In order to save electricity and heat buildings during possible power outages, small-scale wood combustion is expected to increase significantly, at least in the short term. But because old fireplaces are currently being used at record rates and new fireplaces are being installed at record rates, it can be expected that small-scale wood combustion will also increase in the longer term.

Comments and changes to Chapters 1–11

The WEM scenario is behind the emission projection, and it is not possible to make a separate change due to Russia’s war of aggression without opening the entire WEM scenario. Dealing with the effects of an increase in wood combustion in a single winter (2022–2023), monitoring the increase in wood combustion, and measures to reverse the decline in combustion rates are not relevant for this update. The content requirements of the update are specified (Chapter 1) in the NEC Directive and in the form to be used to submit the information to the Commission. No changes.

See also the previous row. The beginning of Chapter 9 states: “This figure shows the projected evolution of emissions until 2030. The emission projection was prepared in accordance with the With Existing Measures (WEM) scenario in the background report of the Energy and Climate Strategy (VTT Technical Research Centre of Finland Ltd 2022). The Russian invasion of Ukraine has implications for the energy system (availability, price, energy raw materials), but the WEM scenario does not consider these effects, so the effects are not shown in the emission projection.” The emission projection is the background for the air quality assessment in Chapter 10. No changes.

Proposed amendment

Comments and changes to Chapters 1–11

The ELY Centre for Pirkanmaa. Chapter 10: It should be noted that climate change may also have an impact on air quality in the future. Adaptation to climate change as a perspective is missing from the update and would be an important entity, especially in terms of future goals. Climate change will have an impact on air quality through changes in temperature and precipitation as well as changes in ecosystems. In particular, the effects of periods of heat and drought and the increasing need for anti-skid measures in cities should be taken into account when considering future developments.

The timeframe of the NAPCP and this update extends to 2030. Over a period of less than ten years, the changes in Finland's climate are still likely to be minor compared to natural variation. For this reason, the impact of climate change on the development of air quality has not been assessed separately. No changes.

The Ministry of Agriculture and Forestry. Chapter 10: The report makes no mention of the impact of the current energy situation, which is expected to increase small-scale wood combustion for heating.

Text was added to the end of Chapter 10: "This air quality projection is mainly based on the emission scenario in Chapter 9. As stated at the beginning of Chapter 9, the Russian invasion of Ukraine has implications for the energy system (availability, price, energy raw materials), but these effects are not included in the WEM scenario, so they are also not included in this air quality projection."

The ELY Centre for Pirkanmaa. Chapter 11: The update highlights the fact that the emission targets are being achieved. From the point of view of legibility, it could be useful to clarify that the emissions in question are those that have an impact on air quality, whereas the situation in terms of greenhouse gas emissions is more challenging.

Text was added to Section 11.1. and in the summary: "... with respect to the air pollutants listed in the NEC Directive..."

Proposed amendment

Comments and changes to Chapters 1–11

The Ministry of Social Affairs and Health: The energy crisis in the European Union, combined with the Russian sanctions imposed as a result of the war in Ukraine, is also likely to increase small-scale combustion significantly in urban areas in the coming years. Special attention must be paid to this in the coming years, as the new WHO guideline values for fine particulate matter can easily be exceeded in Finland's urban areas due to the likely significant increase in small-scale combustion. The Ministry of Social Affairs and Health emphasises that the additional measures to be implemented will not hamper citizens' access to heating. In the opinions it has issued on air pollution control, the Ministry of Social Affairs and Health has always considered it important for dwellings to have heat-storing fireplaces in case of power outages.

The comment mostly applies to the implementation of the NAPCP. In the implementation of the NAPCP, efforts will be made to reduce emissions of fine particulate matter from wood combustion by, for example, promoting good wood combustion practices, renewing fireplaces and developing chimney sweep cooperation (Section 4.3.1.3). In other words, emission reductions are not sought through measures and policies that reduce wood combustion or the number of fireplaces. No changes.

The Communist Party of Finland's Environmental Group: The atmosphere is an entity that is influenced by many factors and emissions other than the chemical substances mentioned in the directive. Therefore, the NAPCP must address all factors that have an adverse effect on the atmosphere. It is essential to take into account emissions of carbon dioxide and other greenhouse gases that cause climate change. The emissions must be drastically reduced. The need for reduction is particularly emphasised now that, as a result of continuous overfelling, forests have changed from a carbon sink to a source of emissions.

Linkages to climate policy have been identified, and they are described in Section 2.2, for example. The content requirements of the update are specified (Chapter 1) in the NEC Directive and in the form to be used to submit the information to the Commission. The reduction of greenhouse gas emissions is carried out within the framework of other programmes and strategies (Section 2.2), and it is not appropriate to include the reduction of greenhouse gas emissions in the broader update of the NAPCP. No changes.

Consideration of the autonomous region of Åland

A request for an opinion was sent to the autonomous region of Åland on 24 November 2022.

The Provincial Government of Åland decided on 12 December 2022 not to issue an opinion on the matter.

Emissions from the autonomous region of Åland are included in the NAPCP and in this update, but Åland decides independently on its emission reduction policies and measures.

Appendix 2: Examples of transport emission reduction programmes at local level, Helsinki

The Air Quality Plan of the City of Helsinki 2017–2024 promotes better air quality in Helsinki. The Air Quality Plan sets targets, indicators and measures for exhaust emissions, street dust and small-scale wood combustion. Examples of measures and policies in the transport sector include updating the parking policy, promoting electrification and low-emission propulsion in bus transport and the city's own fleet, and developing city logistics. The Air Quality Plan has been statutory: According to section 145 of the Environmental Protection Act (527/2014), a municipality is required to draw up an air quality protection plan if the limit values of the Government Decree on Air Quality (38/2011) are exceeded or at risk of being exceeded. Helsinki continues to update and revise its Air Quality Plan even though the improvement on air quality has removed the legal obligation to have such a plan. (City of Helsinki Environmental Protection 2016)

The ports of Helsinki supply power from the shore to all liner ships staying in the city centre. A shore power connection for cargo vessels is also being planned for Vuosaari. A new EU regulation will also increase shore power requirements for all EU ports at the end of the decade. (Port of Helsinki Ltd 2022)

The City of Helsinki is involved in the region's strategic planning for land use, housing and transport (MAL), which outlines long-term sustainable solutions. The MAL agreement describes the shared intention of the state and municipalities to coordinate land use, housing and transport. The measures of the agreement promote a sustainable community structure and a transport system that supports it, and enable smooth everyday life, the functioning of the labour market and the vitality of business life. (More information: HSL's MAL 2023 website)

The Bicycle Action Plan is a programme approved by the Helsinki City Board, which aims to increase the modal share of bicycle transport in Helsinki to 20 % by 2035. The growth of the modal share corresponds to approximately 2 % of the emission reductions in accordance with the objectives of the Carbon Neutral Helsinki Action Plan. (City of Helsinki Urban Environment 2020)

The Walking Promotion Programme adopted by the Helsinki City Board recognises the role of walking in reducing greenhouse gas emissions, especially as part of travel chains. This is one of the reasons why the programme identifies railway station areas (the city centre areas of the local master plan) as core areas for walking. The quality of the walking environment plays an important role in achieving transport emission reductions, as studies show that in a comfortable environment people are also happy to use other sustainable modes of transport and walk longer distances, for example to public transport stops. (City of Helsinki Urban Environment 2022)

LEGAL REFERENCES

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