



# 4

## POLICIES AND MEASURES

This chapter describes the Finnish climate policy framework, the policy-making process and domestic and regional legislative arrangements and procedures to implement the Kyoto Protocol. These are followed by a description of the national climate and energy strategies and plans for meeting the related targets. The policies and measures planned, adopted and implemented to achieve the emission reduction commitments under international agreements, including those under Articles 2 and 3.1 of the Kyoto Protocol, are presented by sector. Also, taxation and subsidies, use of Kyoto mechanisms, effect of policies and measures on long-term trends and mitigation benefits other than greenhouse gas reduction are discussed. The end of the chapter examines the economic impacts and minimising adverse effects in other countries.



## 4 POLICIES AND MEASURES

### 4.1 Climate policy framework in Finland

Effective climate change policies require global collaboration and actions. Consequently, Finland's climate policy is based on international agreements: the UNFCCC, the Kyoto Protocol and the Paris Agreement. The common policies of the European Union, such as the EU 2020 and 2030 Climate and Energy Packages have a key role in the implementation of the international agreements mentioned above. At national level Finland's climate policy is defined in government policies and programmes, and since 2003, strategic work has been steered by ministerial working groups. In addition, national energy and climate strategies have been prepared since 2001 to implement the international and EU commitments as well as national targets, and to define sectoral policies and measures.

#### 4.1.1 The Kyoto Protocol

In accordance with the Kyoto Protocol, the EU was committed to reducing its emissions by eight per cent in 2008 to 2012 compared to the base year. This commitment was shared among the EU Member States through the Council Decision of 25 April 2002<sup>1</sup> concerning the joint fulfilment of commitments pursuant to Article 4 of the Kyoto Protocol. Under this burden sharing agreement, Finland's commitment was defined as limiting its national average annual emissions to the 1990 level during the first commitment period of the Protocol, 2008 to 2012. The emission levels in terms of tonnes of carbon dioxide equivalent (tonnes CO<sub>2</sub> eq.) allocated to the Community and to the Member States were determined in 2006 via a Commission Decision<sup>2</sup>. Finland's 'assigned amount' of emissions for the first commitment period of the Kyoto Protocol (2008 to 2012) corresponded to 355,017,545 tonnes CO<sub>2</sub> eq. (or approximately 71 million tonnes CO<sub>2</sub> eq. per year).

Finland fulfilled its commitments under the first commitment period of the Kyoto Protocol. Based on the greenhouse gas inventory for 2008 to 2012, the greenhouse gas emissions were about five per cent below the assigned amount. The assessment for compliance was concluded in 2015, after the review of the final inventory submission and at the end of the true-up period for the first commitment period.

The Kyoto Protocol has been amended with new quantified emission limitation and reduction commitments for the second commitment period, 2013 to 2020, which continue the commitments established for the first period. By accepting the Kyoto Protocol's second commitment period in June 2015, the EU, its Member States and Iceland are committed to reducing their greenhouse gas emissions jointly by 20 per cent compared to the base year.

The EU and its Member States will fill their part of the joint commitment as follows. Emissions from categories covered by the EU emissions trading scheme (EU ETS) will

1 2002/358/EC

2 2006/944/EC

be reduced by 21 per cent by 2020 from their level in 2005 and emissions not covered by the EU ETS will be cut by approximately 10 per cent from the 2005 level by 2020 within the EU as a whole. The EU ETS emissions reduction commitment is an EU level commitment and Member State specific caps are not defined for the EU ETS emission reductions (for more information see Section 4.1.4 below).

Member States have individual binding annual emission reduction or limitation targets for the emissions not covered by the EU ETS (non-ETS emissions) the period 2013 to 2020. These are set in the EU Effort Sharing Decision (ESD)<sup>3</sup> (also addressed in Section 4.1.4 below). The ESD defines Finland's reduction obligation for the sources not covered by the EU ETS as 16 per cent of the 2005 emissions. This reduction obligation is determined in CO<sub>2</sub> equivalent tonnes in the Commission Decision<sup>4</sup>, and adjusted in the Commission Implementing Decision<sup>5</sup> to take into account changes in the coverage of the EU Emission Trading System from 2013 onwards. For Finland these annual adjustments increased the reduction commitment by 2020 by approximately five percentage units.

Finland's emission reduction target for the second commitment period of the Kyoto Protocol has been defined based on its emission reduction obligation under the ESD described above. This target amounts to 240,544,599 tonnes CO<sub>2</sub> eq. and covers the non-ETS emissions only. In addition, Finland will be responsible for the emissions and removals from the LULUCF activities as defined in Decision 2/CMP.7, during the second commitment period.

Finland accepted the Kyoto Protocol's second commitment period on 26 June 2015, soon after the EU.

#### 4.1.2 Legislation on the Kyoto Mechanisms

An administrative framework for participating in the Joint Implementation (JI) and Clean Development Mechanism (CDM) project activities and emissions trading under the Kyoto Protocol (Articles 6, 12 and 17) is provided by the Act on the Use of the Kyoto Mechanisms.<sup>6</sup> Decrees on JI<sup>7</sup> and the CDM<sup>8</sup> include guidance on the contents of the applications for project approvals and on authorisation for entities to participate in the projects.

The Ministry of the Environment decides whether or not to authorise legal entities to prepare for and participate in a JI project and it approves the JI projects. The Ministry of the Environment may also participate in international emissions trading on behalf of the state. The Ministry for Foreign Affairs authorises preparations for and participation in CDM projects and approves the projects.

In accordance with the Kyoto Mechanisms Act, it is possible to implement JI projects in Finland. The Act provides for the main elements of the national Track I procedures and authorises the Ministry of the Environment to enact more detailed regulations regarding further provisions on the monitoring of emissions, the report to be filed on the emissions, the verifier's statement, the approval procedure of the verifier, the evaluation of approval criteria and the implementation of the verification process. Authorisations for holding Kyoto units in a holding account in the national registry and making transfers under international emissions trading to and from the account are made by the Ministry of the Environment.

3 2009/406/EC

4 2013/163/EU

5 2013/634/EU

6 109/2007

7 9137/2007

8 915/2007

The Energy Authority is the competent authority for emission trading and the administrator of the national emission trading registry (see the section on the national registry in Chapter 3).

### 4.1.3 The Paris Agreement

The Paris Agreement was adopted in December 2015 and entered into force in November 2016. The EU ratified the agreement in October 2016. The Finnish national ratification was completed in November 2016.

The Agreement can be seen as a game-changer on the international climate change policy scene. It entails several uniform obligations for all Parties. Instead of specific top-down emission reduction commitments, the Agreement is based on nationally determined contributions to mitigate the emissions.

The EU's joint nationally determined contribution under the Agreement is to reduce the greenhouse gas emissions by 40 per cent by 2030 from the 1990 level. The details of the effort sharing between the Member States, including Finland, are being negotiated at present (more information on the negotiations and the associated policy framework beyond 2020 is presented in the next section).

### 4.1.4 Climate policy of the European Union

EU legislation and policy programmes have a major effect on Finland's greenhouse gas emissions.

In 2007, the EU heads of state or government agreed on targets to combat climate change via a commitment to reduce greenhouse gas emissions by 20 per cent by 2020 from the emission level in 1990. In the long term, or by 2050, the guideline target involves a reduction of emissions by 80 to 95 per cent. The EU 2020 Climate and Energy Package forms the framework for the EU's climate policy for the period 2013 to 2020.

In order to achieve the 2020 emission reduction target, the EU Member States adopted a binding renewable energy target prescribing that at least 20 per cent of the EU's gross final energy consumption and 10 per cent of the final energy consumed in the transport sector must come from renewable energy sources by 2020.

The EU emissions trading scheme (EU ETS) will deliver most of the emission reductions needed. In 2020, emissions from sectors covered by the EU ETS should be 21 per cent lower than in 2005. The Directive of the European Parliament and of the Council<sup>9</sup> on the emissions trading, which improves and extends the EU's greenhouse gas emission allowance trading scheme, has been implemented in Finland via the legislative arrangements. In Finland, approximately 600 installations are participating in the EU ETS.

The EU agreed in 2008 that all aircrafts taking off and/or landing in the EU would be included in the EU emissions trading starting from 2012. However, the EU has decided to reduce temporarily the scope of the aircrafts ETS to intra-EEA flights from 2013 until 2016. The Directive and its amendments have been implemented in Finland as part of the Act on Aviation Emissions Trading that entered into force on 1 February 2010. Negotiations on the scope of the aviation ETS from 2017 until 2020 are currently underway. The scope of the aviation ETS will most likely continue to be reduced to intra-EEA flights during the following years, too.

According to the EU 2020 Climate and Energy Package, emissions from sectors not included in the EU ETS — such as transport, housing, agriculture and waste — should be cut by approximately 10 per cent from the 2005 level by 2020 within the EU as a whole. The

9 2009/29/EC, amends Directive 2003/87/EC

Effort Sharing Decision (ESD)<sup>10</sup> established binding annual greenhouse gas emission targets for Member States for the period 2013 to 2020. It is up to each Member State to decide how its target will be achieved. Certified emission reduction units from the clean development mechanism and emission reduction units from joint implementation projects, as well as units transferred from other Member States, can be used to fulfil the targets, but only to a limit of three to four per cent of the total emissions for 2005. Domestic measures are also needed to meet the targets. A Member State that fails to meet its annual target will be penalised with an additional eight per cent emission reduction obligation for the following year.

Finland's reduction obligation under the EU ESD for the sectors not covered by the EU ETS is largely the same as the reduction commitment under the second commitment period of the Kyoto Protocol described in Section 4.1.1. However, there are also differences. The commitment under the Kyoto Protocol also covers emissions and removals from the land use, land-use change and forestry activities and applies to the whole commitment period whereas the EU ESD emission allocations are implemented on annual basis. Also, the annual emission allocations under the ESD were adjusted in 2017<sup>11</sup> to take into consideration changes introduced by the implementation of the 2006 IPCC guidelines for national greenhouse gas inventories on the emissions levels in the inventory as these guidelines were applied in inventory reporting after the annual emission allocations under the ESD were agreed upon. These adjustments will not affect the commitment under the Kyoto Protocol. The adjustments which increased Finland's annual emission allocations with more than one percentage unit will apply only to the ESD commitments for the years 2017 to 2020. Finland's target under the ESD is presented in detail in Table 4.1. The table also includes the emissions from non-ETS sectors for the years 2013 to 2015.

Table 4.1  
Finland's target path for non-ETS emissions in accordance with the EU Effort Sharing Decision and corresponding emissions for the years 2013 to 2015 (2016 emission data are preliminary).

	2013	2014	2015	2016	2017	2018	2019	2020
Finland's annual emission allocations including adjustments due to changes in the EU ETS coverage	31.8	31.3	30.8	30.3	29.8	29.3	28.8	28.4
Finland's annual emission allocations including also adjustments due to implementation of the 2006 IPCC guidelines					30.2	29.6	29.1	28.5
Non-ETS emissions <sup>1</sup>	31.6	30.1	29.9	31.3 <sup>3</sup>				
Distance to the target <sup>2</sup>	-0.2	-1.1	-0.9	1.0 <sup>3</sup>				

<sup>1</sup> Due to the annual implementation of the EU ESD, the emissions used for assessing compliance are not updated after the compliance assessment. Hence the emissions may differ from the most recent inventory data.

<sup>2</sup> Distance to the target is expressed as negative number when actual emissions are below annual emission allocations.

<sup>3</sup> Approximate data

The 2020 Climate and Energy Package also requires Finland to increase its use of renewable energy sources to 38 per cent of final energy consumption by 2020 and the share of biofuels in gasoline and diesel to 10 per cent by 2020. Finland's use of renewable energy already exceeded the 38 per cent target in 2014.

The EU has also agreed on other climate policy measures that strictly speaking do not fall under the 2020 Climate and Energy Package. In order to gather information on greenhouse gas emissions from ships and push forward discussions at the IMO, the EU

10 2009/406/EC

11 2017/1471/EU

has agreed on a regulation on monitoring, reporting and verification of these greenhouse gas emissions. The regulation entered into force on 1 July 2015. In addition, Finland has also been implementing several EU directives and regulations that aim at reducing greenhouse gas emissions from road transport. The process for renewal and updating of this legislation is currently underway.

The EU also has regulation on F-gases<sup>12</sup>, covering key applications in which F-gases are used. The revised regulation applies from 1 January 2015. It strengthens the existing measures and introduces a number of far-reaching changes by limiting the total amount of the most important F-gases that can be sold in the EU from 2015 onwards and phasing them down in steps to one-fifth of 2014 sales in 2030; banning the use of F-gases in many new types of equipment where less harmful alternatives are widely available, such as fridges in homes or supermarkets, air conditioning and foams and aerosols, and preventing emissions of F-gases from existing equipment by requiring checks, proper servicing and recovery of the gases at the end of the equipment's life. With the new F-gas Regulation, the EU's F-gas emissions will be cut by two-thirds by 2030 compared with 2014 levels.

The policy framework for the period beyond 2020 is currently in preparation in the EU. By the European Council conclusions in 2014, the EU is committed to reducing total greenhouse gas emissions by at least 40 per cent by 2030, compared to 1990. The reduction target from the 2005 levels in the emissions trading sector is 43 per cent and in the non-emissions trading sector it is 30 per cent. The share of renewable energy in the EU is to be increased to 27 per cent and energy efficiency improved, indicatively, by 27 per cent.

Legislative proposals on these have been presented by the Commission in 2015 and 2016, and they are currently being negotiated by the Member States and the European Parliament. In addition to the reform of the EU's emission trading scheme ETS and the Effort Sharing on non-ETS emissions, for the first time also the land-use, land-use change and forestry sector will be included in the EU's climate policy package. In the Effort Sharing Regulation, Finland's proposed target for emission reductions in 2030 compared to the 2005 level is 39 per cent. The legislative package includes flexibility mechanisms that allow Member States to achieve their targets in a cost-efficient manner.

In order to reach and implement the EU's 2030 Climate and Energy Package as well as the Energy Union targets, the Commission submitted in November 2016 the Clean Energy Package that included eight legislative proposals, a new eco-design working plan and a number of communications and reports, all related to the clean energy transition. The Energy Union policy programme aims at providing EU citizens with reasonably priced, secure and sustainable energy. Negotiations on these legislative proposals are currently underway.

It is also noteworthy that the Commission has the power to start an infringement proceeding against a Member State that fails to fulfil its commitments and obligations under the EU law.

## 4.2 Climate policy-making process in Finland

### 4.2.1 Government and the role of ministries

The Government and Parliament make the most important decisions concerning climate policy. Parliament approves Finland's international commitments and decides on their implementation according to the constitution (see also Chapter 2). Parliament also

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12 2014/517/EU

actively participates in the debate on how EU decisions are implemented nationally. The Ministerial Committee on European Union Affairs discusses and decides on Finland's positions on EU and international climate policy issues. In the international climate negotiations Finland negotiates as part of the European Union and consequently follows the common positions of the EU.

The Ministry of the Environment bears the responsibility for coordinating the preparatory work for the climate negotiations and is the national focal point for the UNFCCC. Preparatory work for the climate negotiations is carried out in a number of ministries.

Since 2003, every Finnish government has appointed ministerial working groups responsible for energy and climate policy with representatives from all government parties. These ministerial working groups have been responsible for preparing and updating the national strategies on energy and climate policy. The ministerial working group has a network of officials acting as its preparatory body, comprising representatives from the Ministry of Economic Affairs and Employment, the Ministry of Transport and Communications, the Ministry of Agriculture and Forestry, the Ministry of Education and Culture, the Ministry for Foreign Affairs, the Prime Minister's Office, the Ministry of Finance, and the Ministry of the Environment. The network of officials is led by the Ministry of Economic Affairs and Employment, which is in charge of the overall coordination of the strategy work. The current strategy on energy and climate policy, which was updated in 2016, is described in Section 4.3.1.

In Finland, climate policy is increasingly being integrated with the decision-making processes in energy production, transport, agriculture, forestry and land-use and other planning. For example, the transport sector has its own climate policy programme. Finland was also one of the first countries to prepare a national climate adaptation strategy in 2005. The strategy was evaluated in 2013 and the new Climate Change Adaptation Plan 2022 prepared based on the conclusion of the evaluation (more on the Adaptation Plan in Chapter 6). In addition, climate and energy issues are being taken into consideration in Society's Commitment to Sustainability<sup>13</sup>, which was updated by the National Commission on Sustainable Development in 2016. With this commitment, the public sector, together with other actors, pledges to promote sustainable development in all its work and operations. The commitment was updated to respond to the new global agenda for sustainable development, the UN Agenda 2030. In February 2017, the Government gave a report to the Parliament on the implementation of the UN 2030 Agenda for Sustainable Development. The aim is a carbon-neutral, resource-wise and competent Finland.

In terms of the reporting on policies and measures, including on their implementation and effects on emissions, and projections to the European Commission, and to the UNFCCC, the Ministry of Economic Affairs and Employment is responsible for overall co-ordination and compilation of information from different sectors. The sectoral ministries are responsible for the projections and impact assessments concerning their own field. Several expert organisations assist in acquiring data and in the assessments of policies and measures and modelling sector-specific projections. The network of officials gives the final approval concerning the information in the reporting tools and paper report to be submitted. The preparation of the Medium-term Climate Change Policy Plan and the Government's annual climate change report is coordinated by the Ministry of Environment and all relevant ministries are involved in the work. Also, Finnish Government reports to the Parliament once in a year, among other things, the progress of agreed measures in the energy sector.

The latest reporting requirements in the energy and climate sector were imposed by the Climate Change Act of 2015. This act contains provisions on climate policy plans on which

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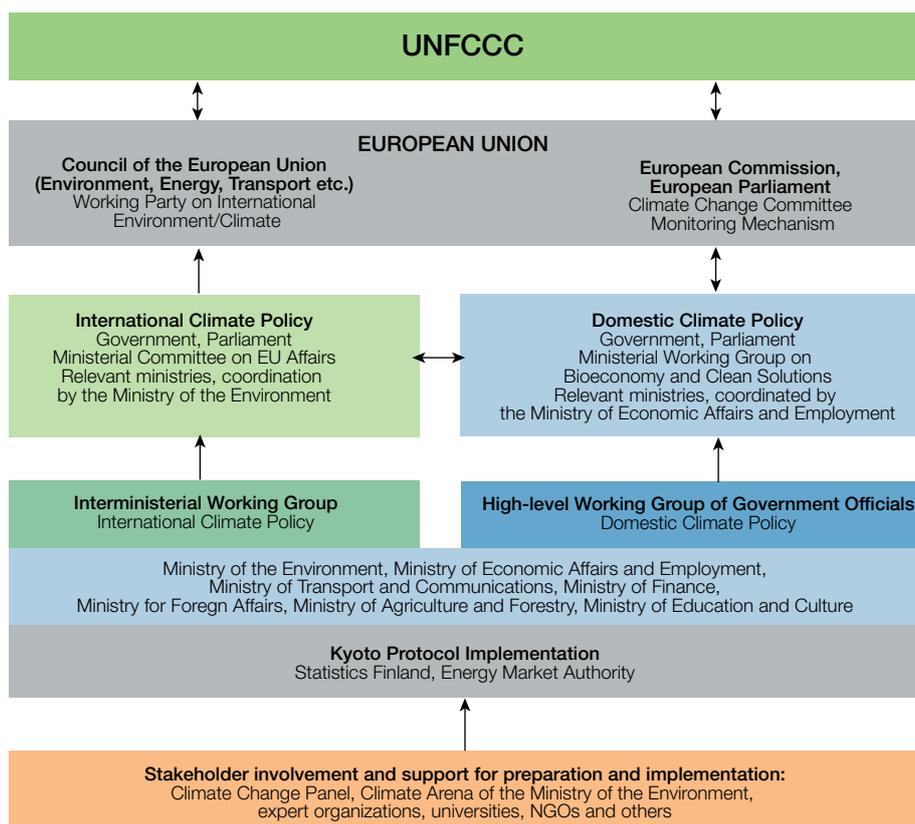
13 [http://www.ym.fi/en-US/The\\_environment/Sustainable\\_development](http://www.ym.fi/en-US/The_environment/Sustainable_development)

the Government will issue a report to the Parliament. The Government's annual climate change reports also inform the Parliament on the achievement of climate targets and the impact of the measures taken. The first annual climate change report will be issued in 2018.

Statistics Finland is the national entity responsible for compiling the Finnish greenhouse gas inventory. Statistics Finland publishes the greenhouse gas inventory data three times every year. The publications include information on monitoring progress with Finland's commitments to reduce its greenhouse gas emissions under the EU and the Kyoto Protocol. The Finnish Environment Institute (SYKE), the Natural Resources Institute Finland (Luke) and Technical Research Centre of Finland Ltd (VTT) participate in the inventory preparation as a part of the national system. The national system under Article 5, paragraph 1 of the Kyoto protocol and the inventory preparation process are described in Chapter 3.

The Energy Authority is the competent authority and the registry administrator for the national emissions trading registry under the Kyoto Protocol and the EU ETS. The institutional arrangements related to climate policy and its implementation in Finland are described in Figure 4.1.

Figure 4.1  
Institutional arrangements related to climate policy and its implementation in Finland



#### 4.2.2 The Finnish Climate Change Panel

The Finnish Climate Change Panel<sup>14</sup> was nominated by the Ministry of the Environment in December 2011. The initially 12-member Panel was tasked to strengthen the

14 [www.ilmastopaneeli.fi](http://www.ilmastopaneeli.fi)

interaction between research and policy making. The first two terms of the Panel were approximately two years each, during which the Panel published reports on several topics relevant to climate policy making, such as the Climate Change Act, Energy system and emission reduction measures, Carbon neutrality, Black carbon, Environmentally and socially sustainable climate policy in agriculture, Climate education; Adaptation to climate change; risks, responsibilities and costs, and Climate impacts of forestry. The mid-term evaluation of the Panel recommended that the Panel should make more efforts in communicating its messages, and relevant action was taken accordingly.

The legal base for the Finnish Climate Change Panel was established when the Climate Change Act came into force in summer 2015. The Panel is appointed as an independent body to support planning and decision making of climate policy. The Government nominated the current 15-member Panel in January 2016 for a term of four years. The policy advisory role of the Panel has become stronger. Panellists have been invited to comment the National Energy and Climate Strategy for 2030 (afterwards also referred to as National Energy and Climate Strategy) in relevant Committee hearings in the Finnish Parliament. The Panel's advice has also been sought during the preparation of the Government's first Medium-term Climate Change Policy Plan. The Panel has continued its work with LULUCF related issues by facilitating discussion on the climate impact of forestry and has also published reports on Cleantech and on transport.

### 4.2.3 Other stakeholders

The Climate Arena of the Ministry of the Environment is a network for other ministries and stakeholders (e.g. industrial and environmental non-governmental organisations (NGOs), research institutes and labour unions), where they can present their views concerning issues related to climate policy.

NGOs, including environmental, business, social and research organisations, participate in various governmental working groups, seminars and official delegations. Industrial enterprises and the general public also have a major role in providing information and views for the decision-making process. In addition, the Ministry of the Environment organises regular stakeholder meetings in advance of all major UNFCCC negotiations.

### 4.2.4 Public access to information

The right of access to information in official documents is a basic civil right protected by the Finnish constitution. Under the constitution, everyone has access to documents in the public domain. Documents in the possession of the authorities belong to the public domain unless access to them has been specifically restricted by an act.

The Act on the Openness of Government Activities<sup>15</sup> ensures everyone the right to information on the activities of public officials. Access to documents is the main principle and secrecy an exception.

### 4.2.5 Regions and municipalities

The 15 Centres for Economic Development, Transport and the Environment (ELY Centres) are currently responsible for the regional implementation and development tasks of the government. Regional environmental strategies guide environmental and land-use planning.

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15 621/1999

Regions and Regional Councils (RCs) are responsible for compiling a Regional Land-Use Plan, which defines the principles of urban structure and the use of areas needed for particular purposes. Climate change mitigation, the use of renewable energy, energy and resource efficiency as well as a coherent urban structure should be promoted in the plan. The national Forestry Centre under the Ministry of Agriculture and Forestry works in five regional offices and promotes sustainable forest management as well as enforces forestry legislation.

All Regional Councils have included climate and energy issues in their strategies – either as separate climate strategy documents or as a theme in comprehensive regional strategies. Finnish regions are different and the climate change strategies also differ. For example, forest-rich regions typically emphasise opportunities in bioenergy production, and regions with urban areas highlight issues related to transport.

Since April 2016 the reform of regional government according to the government policy outline has been under preparation. The reform will bring changes to the organisation of climate change related tasks in the regions.

The role of municipal authorities in both mitigation and adaptation is widely recognised in Finland. They have significant responsibilities in land-use and transport planning and in providing public transport and waste management services. Some Finnish municipalities are still major local energy suppliers or owners of energy supply companies, even though this role has changed in many municipalities during the last 15 years due to the privatisation and liberalisation processes of the electricity market. The municipalities also grant building permits, and can therefore promote energy efficiency and renewable energy. The municipalities can also influence the behaviour of people, for example, via information measures.

The trend of urbanisation is still ongoing in Finland. It is estimated that there are annually about 20,000 new inhabitants in urban areas, the Helsinki region growing most. According to a recent study by VTT on the mitigation potential in the non-ETS sector, the per capita emissions in these in big cities are lower than those in small municipalities. In bigger cities there are options for directing the growth in passenger traffic volumes to more environmentally friendly transport modes. Another factor that contributes to emissions reductions is that CHP can be more widely used and that emissions from CHP production in big installations are included in the EU ETS sector.

The Association of Finnish Local and Regional Authorities (AFLRA) coordinates the Cities for Climate Protection (CCP) campaign, the purpose of which is to encourage cities and municipalities to plan and initiate their own actions for reducing local greenhouse gas emissions. By 2013, more than 50 municipalities had joined the campaign. CCP Finland is part of a campaign organised by the International Council for Local Environmental Initiatives (ICLEI). AFLRA updated information on climate mitigation action in municipalities in 2015<sup>16</sup>. Nearly all municipalities with more than 30,000 inhabitants are active in the climate action.

Networking of municipalities is proceeding well in Finland. More municipalities are joining the networks and new ways of supporting local action are developed. Table 4.2 shows the key features of the main climate networks in Finland. Examples of activities in the networks are presented below.

The most common climate change mitigation measures carried out in the municipalities have been related to extending the district heating network, using renewable energy, improving energy efficiency and developing a biking infrastructure.

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16 The report analyses climate action taken in municipalities and regions and presents recommendations for future work. [http://shop.kunnat.net/product\\_details.php?p=3159](http://shop.kunnat.net/product_details.php?p=3159) (in Finnish)

Table 4.2

## Key features of the main municipal climate networks and campaigns in Finland

Campaign/ network/ partnership	Participants	Targets, goals	Activities
Cities for Climate Protection campaign (coordinated by ALFRA)	56 municipalities and 2 joint municipal authorities	Every municipality sets its own target	Estimation of emissions Target setting Plan for emissions reductions Implementation, monitoring The network's support to the municipalities ALFRA provides expert support and training
Carbon Neutral Municipalities project (HINKU)	HINKU has grown during 2008 to 2017 from a group of five small municipalities to a network of 39 municipalities of different sizes and covers a population of 680,000	HINKU municipalities are committed to cutting municipal emissions by 80% by 2030 and encouraging local actors towards carbon neutrality.	Green Economy solutions are sought to boost the economy and employment. Monitoring of both GHG and financial scores Promoting commitments by municipal leaders Activating people and enterprises Developing, testing and multiplying solutions. Good practices in the HINKU Folder (a net tool)
Covenant of Mayors	EU-wide initiative Helsinki*, Espoo*, Tampere*, Vantaa*, Turku*, Oulu*, Lahti, Jyväskylä, Vaasa, Joensuu, Kainuu Region	At least 40% GHG reductions by 2030; Commitment to improve energy efficiency and use of renewables	Energy efficiency in the built environment Adaptation to climate change
Mayors' Climate Network	The six largest Finnish cities have their own network in the context of the Covenant of Mayors' initiative		Responding to the climate challenge in growing cities
Smart Clean	Helsinki, Espoo, Vantaa; Kauniainen, Lahti, Uusimaa Region and other actors	Aiming at building the metropolitan Helsinki area into an internationally known reference area for ecological and smart solutions	Projects on transport and traffic, building, energy, waste, water as well as consumer-cleantech
Smart Retro	Lahti, Stockholm, Oslo; also other Nordic cities	Networking cities and local start-ups to work with intelligent solutions.	Themes: e.g. retrofitting buildings, digitalisation, sharing economy
Fisu (Finnish Sustainable Communities); network of forerunners	Forssa, Ii, Jyväskylä, Kuopio, Lahti, Lappeenranta, Turku, Vaasa	Aiming at carbon neutrality, zero waste and globally sustainable consumption by 2050. Aiming to strengthen the municipal and local economy, create jobs and build sustainable welfare	A joint vision and roadmap prepared by the municipality, enterprises and other local actors for fulfilling the targets a joint roadmap. The actors recognise new opportunities for cooperation and new ways for action.
Energy efficiency agreements	Energy efficiency agreements for municipalities between ALFRA, the Ministry of Economy and Employment and the Energy Authority. Individual municipalities make contracts with the Energy Authority.	Finland meets its commitments under the EU energy efficiency requirements with the agreements and thus reduces GHG emissions. Many municipalities also participate in respective energy efficiency agreements for enterprises.	The government gives grants to energy audits and investments for improving energy efficiency.

More than 130 municipalities (out of a total 320) have joined the voluntary energy efficiency agreements or programmes (see Section 4.5.1) and are thus committed to reducing municipal energy consumption rates.

ALFRA organises also every second year a climate change conference to disseminate information on the impacts of climate change and mitigations and adaptation solutions. The conferences are meant for municipal decision-makers, employees and stakeholders of the municipal networks. The next conference will be the 9th in order and held in May 2018.

Kuntarahoitus Oyj, owned largely by the Finnish municipalities, has as the first financial institution provided inexpensive investment loans (green bonds) to municipalities and companies with municipalities as the majority owners. These activities have taken place since 2016. Funding has been provided, for example, to energy efficient schools, day-care facilities, multipurpose buildings, rented apartment houses and for renewable energy production, wastewater treatment facilities, energy efficient street lights and public transport projects.<sup>17</sup>

The Carbon Neutral Municipalities project (HINKU) aims to create solutions that have economic and social benefits as well as environmental advantages. When the project was launched in 2008, five small municipalities were committed to an 80 per cent reduction in greenhouse gas emissions from the level of 2007 by 2030. Currently the HINKU project includes 39 municipalities, with total of 678,200 inhabitants, the four largest HINKU municipalities having population over 50,000. A large group of companies and experts are involved as partners.

During 2007 to 2017 the municipalities in the HINKU network reduced their emission by 29 per cent, on average, and it is estimated that they are on track to the 2030 goal. The most important measures have been to replace fossil fuels with renewable energy sources; improvements in energy efficiency of buildings and reduction in consumption of energy. The HINKU Forum<sup>18</sup> provides, e.g., sharing of information, support to the preparation of projects and initiatives.

A novel element of HINKU is joint procurement of solar power systems. This started as a successful pilot project in four small communities. SYKE has later launched a joint procurement of solar power systems, inviting all municipalities and municipal enterprises in Finland to increase their use of solar power. The solar power stations are to be leased, as a result municipalities do not need to invest in the plants themselves or accrue any additional operating costs. There is interest in municipalities for joint procurements of electric cars and efficient led lighting systems as well.

The mayors of the six largest cities in Finland (total population 1.7 million, representing approximately 30 per cent of the total Finnish population) established the Mayors' Climate Network in 2011. The network's purpose is to promote the achievement of the EU energy and climate policy targets and eco-efficient urban development. The network helps to highlight new initiatives, increase cooperation and disseminate best practices throughout the major cities (see Table 4.2).

The Finnish Sustainable Communities (FISU) are aiming at carbon neutrality, zero waste and globally sustainable consumption. Integrating climate and other relevant goals at the municipal level brings synergies to local actors and businesses. Developing new types of cooperation is central in FISU actions.

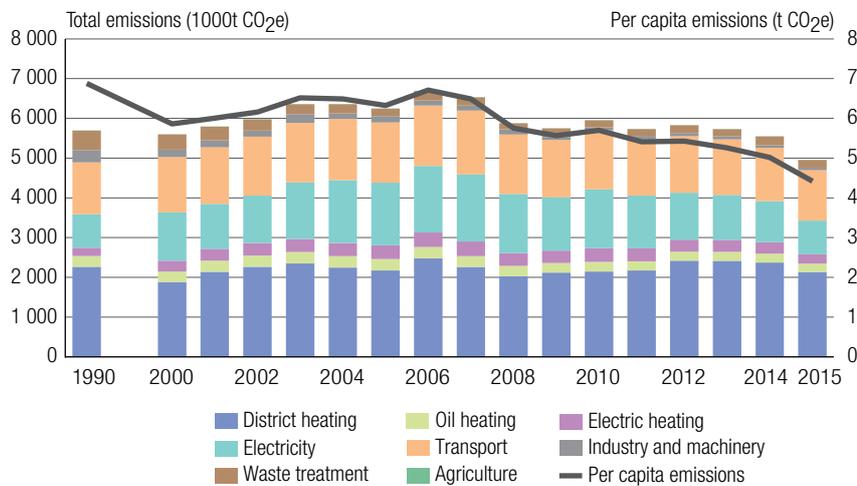
The Helsinki Metropolitan Area climate strategy of climate change mitigation to the year 2030 is a joint strategy of the four cities in the metropolitan region which aim to be carbon neutral in 2050. Individual cities in the area have their own targets as well. Figure 4.2 below shows the trend in greenhouse gas emissions in the metropolitan area in 1990 to 2015. The combined greenhouse gas emissions of Helsinki, Espoo, Vantaa and Kauniainen have been declining since the approval of the Helsinki Metropolitan Area Climate Strategy in 2007.

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17 <https://www.munifin.fi/green-bond>

18 <http://www.hinku-foorumi.fi/en-US>

Figure 4.2  
Trend in greenhouse gas emissions in the metropolitan area in 1990 to 2015



Both HINKU and ALFRA have compiled information on climate action in municipalities. Real-life cases from, e.g. installation of renewable energy systems, energy efficiency measures in municipal buildings are presented. Information on costs, pay-back times, etc., is also available in many cases. In several HINKU municipalities, the information on potential cost savings has been instrumental in switching away from oil-based heating systems.

## 4.3 Strategies and plans

### 4.3.1 National energy and climate strategies

Finland's long-term objective is to be a carbon-neutral society. Besides the long-term objective Finland has national and EU-level energy and climate targets and commitments for 2020 and 2030 under the UNFCCC, Kyoto Protocol and the EU. The Government regularly prepares strategies and plans for achieving these energy and climate targets.

In October 2009, the Government adopted the Foresight Report on Long-term Climate and Energy Policy and set a target to reduce Finland's greenhouse gas emissions by at least 80 per cent from the 1990 level by 2050 as part of a global effort. The report Energy and Climate Roadmap 2050 published by the Parliamentary Committee on Energy and Climate Issues in October 2014 serves as a strategic level guide on the journey towards the long-term target of carbon neutrality. The Energy and Climate Roadmap 2050 is discussed further in Section 4.3.2.

Finland has prepared five strategies on energy and climate policy, which were completed in 2001, 2005, 2008, 2013 and 2016. The focus of the 2008 and 2013 strategies is on policy measures for achieving the 2020 targets. The 2016 strategy - National Energy and Climate Strategy for 2030 - outlines the actions that will enable Finland to attain the targets specified in the Government Programme of Prime Minister Sipilä (27 May 2015) and adopted in the EU for 2030, and to set systematically the course for achieving an 80 to 95 per cent reduction in greenhouse gas emissions by 2050. The 2016 strategy was submitted to the Parliament as a Government Report on 24 November 2016. An extensive background report (in Finnish) adds further detail to the Government report.

The National Energy and Climate Strategy for 2030 discusses the key starting points and objectives of the Government Programme goals, the adequacy of current measures for meeting its targets (the basic scenario) and measures by which its targets can be attained (the policy scenario). The strategy also specifies the key measures for achieving the binding emission reduction targets in the effort sharing sector by 2030. These measures are complemented and specified in the national Medium-term Climate Policy Plan published in 2017. Additionally, the strategy examines the possibility of transitioning into an economy fully based on renewable energy by 2050.

The Government Programme of Prime Minister Sipilä sets ambitious targets in the energy sector. It aims for increasing the share of renewable energy to over 50 per cent of final consumption, increasing self-sufficiency to over 55 per cent, phasing out the use of coal in energy production, halving the domestic use of imported oil, and bringing the share of renewable transport fuels up to 40 per cent (23.5 per cent of the fuel energy content). An effort will be made to achieve all this by 2030.

With minor exceptions, Finland will phase out the use of coal for energy. The share of road transport biofuels will be increased to 30 per cent (of the fuel energy content), and an obligation to blend light fuel oil used in machinery and heating with 10 per cent of bioliquids will be introduced. The minimum aim is to have 250,000 electric and 50,000 gas-powered vehicles on the roads. The electricity market will be developed at the regional and the European level. The flexibility of electricity demand and supply and, in general, system-level energy efficiency will be improved. Technology neutral tendering processes will be organised in 2018 to 2020, based on which aid will be granted to cost-effective new electricity production from renewable energy.

With the additional measures outlined in the strategy the share of renewable energy in the final consumption is expected to increase to approximately 50 per cent and the self-sufficiency in energy to 55 per cent by 2030. The share of renewable energy use in transport will clearly exceed the Government Programme target. The domestic use of imported oil will be halved as planned. The greatest non-ETS sector reductions in emissions will be achieved in the transport sector, and this is also the foundation of the Medium-term Climate Change Policy Plan of 2017.

Based on the National Energy and Climate Strategy for 2030, Finland will take measures to achieve the energy and climate targets and objectives. The relevant ministries are responsible for implementing the measures and also for monitoring and evaluating them. In some cases this responsibility has been delegated to specialised government agencies, such as Motiva Oy, which is a state-owned expert company promoting the efficient and sustainable use of energy and materials.

Examples of sectoral climate policy progress reports include the yearly progress report on the climate policy programme of the Ministry of Transport and Communications and the reports on the impact of energy efficiency agreements published by Motiva Oy.

As a member of the European Union, Finland has reporting obligations concerning policies and measures and projections. The requirements are set by the EU Monitoring Mechanism Regulation<sup>19</sup>. The biennial report on policies and measures and projections has been compiled in cooperation with the Ministry of Economic Affairs and Employment (responsible for the overall coordination), the Ministry of the Environment, the Ministry of Transport and Communications, the Ministry of Agriculture and Forestry, the Ministry of Finance, Statistics Finland, the Finnish Environment Institute (SYKE), Motiva Oy and Natural Resources Institute Finland (LUKE).

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19 2013/525/EU

In the Government's yearly report to the Parliament, mitigation measures and the emission development are evaluated on a general level. Other energy and climate reporting activities include a yearly report to the Parliament on the implementation of the Medium-term Climate Policy Plan and reporting once per government term on the national adaptation plan constructed based on the Finnish Climate Change Act<sup>20</sup>.

### 4.3.2 Energy and Climate Roadmap 2050

A parliamentary committee on energy and climate issues issued in 2014 an energy and climate roadmap towards 2050. The roadmap analysed the means of constructing a low-carbon society and achieving an 80 to 95 per cent reduction in greenhouse gas emissions from the 1990 level in Finland by 2050.

An extensive research project titled 'Low Carbon Finland 2050 platform' completed in cooperation with a number of research institutes was used as a background material for preparing the Roadmap. This project created four scenarios for low-carbon development paths until 2050.

The roadmap discusses energy production and energy systems, use of energy, agriculture and forestry and carbon sinks, the waste sector and multidisciplinary measures that cut across several sectors. The Roadmap states that the measures Finland must take in any case in order to reduce greenhouse gases emissions by 80 to 95 per cent are related to renewable energy, energy efficiency and cleantech solutions.

According to the Roadmap, issues that are important for Finland when transitioning into a carbon-neutral society include safeguarding the security of supply of energy under all conditions, profitable forest biomass use, carbon sink calculation rules, replacing fossil transport fuels with bio-based fuels and securing the competitiveness of society. The building of a carbon-neutral society requires actions on all levels, and efforts must be made to reduce greenhouse gas emissions in all sectors, even if their possibilities of doing so vary.

Rather than selecting or proposing a delineated pathway towards 2050, the Roadmap examines different alternatives and their impacts on the cost effectiveness of reducing emissions and the competitiveness of Finnish society.

The Energy and Climate Roadmap 2050 also serves as a Low-Carbon Development Strategy for Finland in the reporting on policies and measures under the EU regulation on a mechanism for monitoring and reporting greenhouse gas emissions and for other information<sup>21</sup>.

### 4.3.3 Medium-term Climate Change Policy Plan

The Climate Change Act<sup>22</sup> that entered into force in June 2015 contains a provision on a climate change policy planning system that includes a Medium-term Climate Change Policy Plan adopted by the Government once every government term. The Medium-term Climate Change Policy Plan shall include an action plan that proposes the measures for the reduction of anthropogenic greenhouse gas emissions and mitigation of climate change in the effort sharing sector (sectors outside emissions trading), and projections of greenhouse gas emissions and the effects of policy measures on the emissions. The preparation of the Plan is coordinated by the Ministry of the Environment and all relevant ministries are involved in the work. The annual climate change report, which will

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20 609/2015

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be presented to the Parliament every year, will contain information on the implementation of the policy measures contained in the Medium-term Climate Change Policy Plan.

The first Medium-term Climate Change Policy Plan was finalised during 2017. Alongside the National Energy and Climate Strategy for 2030, adopted at the end of 2016, this plan implements the climate policy objectives of the Government Programme. The Medium-term Climate Change Policy Plan specifies and complements the emission reduction measures outlined in the National Energy and Climate Strategy. It also examines links between different sectors and cross-cutting themes, such as the role of consumption and local climate action. The plan takes into account the energy policy measures included in the strategy, because they will impact the development of emissions.

The Medium-term Climate Change Policy Plan sets a target for reducing greenhouse gas (GHG) emissions by 39 per cent in the effort sharing sector by 2030 compared to the 2005 level and determines the measures for achieving the target. The target is based on the European Union's (EU) 2030 target of reducing emissions by at least 40 per cent compared with 1990 levels and is in line with the Finland's long-term climate goal. As the existing measures are not sufficient to achieve the 2030 target, additional measures are identified in the plan. The greatest emission reduction potential is identified in the transport sector. In addition, the plan includes measures to reduce emissions in the agriculture, waste and machinery sectors as well as emissions from building-specific heating and F-gas emissions.

#### 4.4 National forest legislation and programmes

The sustainable management of forests in Finland is based on legislation and good practices. Maintaining the forest carbon sink is part of sustainable forest management, and it is also required as a means of conforming to the forest management reference level (-19.300 million tonnes CO<sub>2</sub><sup>23</sup>) set for Finland for the second commitment period of the Kyoto Protocol (2013 to 2020).

The means for steering the use of forests include legislation, Finland's National Forest Strategy 2025 (NFS), financing and public forestry extension organisations.

Forest legislation is the most important means of forest policy for ensuring sustainable forestry. The key acts include the Forest Act<sup>24</sup> and the Act on the Financing of Sustainable Forestry.<sup>25</sup> There is also legislation dealing with the prevention of forest damage and the trade in forest reproductive material, timber measurement, jointly owned forests and organisations in the forestry sector. Acts on timber measurement and jointly owned forests, as well as on some forest organisations have recently been updated.

The Forest Act sets requirements for the regeneration and conservation of certain key habitats. For instance, a new seedling stand has to be established within three years of the end of felling. The Forest Act is complemented with guidelines for good forest management and silviculture, which have been compiled and promoted by public forestry extension organisations. The Forest Act was amended in 2013. The updated law allows for more diversified management methods, such as uneven aged forest management, and to encourage the natural regeneration of forests. The guidelines for the sustainable management of forests were also renewed, parallel to the Forest Act process.

The Government Report on Forest Policy 2050 was adopted in 2014. The report, conducted in a participatory process, outlines a long-term vision and strategic objec-

23 Assuming instantaneous oxidation for harvest wood products (HWP)

24 1093/1996 (amendment 1085/2013)

25 34/2015

tives for the management of forests and the main measures to be taken. The vision of the Forest Policy Report, Sustainable forest management is a source of growing welfare, stresses the diverse welfare derived from forests and the fact that the utilisation of forests offers solutions to the needs of the people and society. Finland's National Forest Strategy (NFS), adopted by the Government in February 2015 and operationalising Government policy, specifies the main objectives for forest policy and forest-based business and activities until 2025. The vision was drawn from the Forest Policy Report 2050, including three strategic objectives to make the vision come true are: 1) Finland is a competitive operating environment for forest-based business, 2) Forest-based business and activities and their structures are renewed and diversified, and 3) Forests are in active, economically, ecologically and socially sustainable, and diverse use. The strategy is implemented by eleven key projects.

According to the NFS, climate change mitigation and adaptation in forests are supported by diversifying forest management. Forests' viability, i.e. growth and health will be maintained and enhanced through active forest management. Over the long term, forest management techniques must be adapted to new and changing climate conditions. Timely and careful forest management can improve the growth but also the resistance of growing stock to damage while safeguarding the ecosystem services of forests and producing wood biomass sustainably. Forests as a carbon sink have been a significant means of mitigating climate change in Finland.

The NFS is implemented and monitored in broad cooperation between the public and private sectors. The Ministry of Agriculture and Forestry, supported by the Forest Council, has the overall responsibility for the programme. The Forest Council includes representatives from different administrative sectors, industries, NGOs and specialist organisations. For more information on the national measures of the NFS, see Section 4.5.6.

In addition, regional forest programmes include development plans for the whole forest sector of the regions concerned. They define the needs and objectives for the management of forests, forest-based businesses and the multiple uses of and protection of forests, and they also suggest the measures and necessary funding for reaching the objectives.

With regard to contributing to the conservation of biodiversity and the sustainable use of natural resources, the most important instruments are Section 10 of the Forest Act (on preserving diversity and habitats of special importance) and the policies and measures outlined in the Forest Biodiversity Programme for Southern Finland 2014 to 2025 (the METSO programme), both of which are integral parts of the range of instruments in the NFS to protect biological diversity in the future.

The METSO programme is being implemented jointly by the Ministry of Agriculture and Forestry and the Ministry of the Environment. In southern Finland, 72 per cent of the forests are owned by private persons. METSO therefore targets both private and state-owned land. It covers the protection and commercial use of forests. The aim is to halt the decline in forest habitats and species and to establish stable and favourable conditions for forest biodiversity in southern Finland. The programme is being implemented through ecologically efficient, voluntary and cost-effective means. A Government decision-in-principle in 2014 sets goals for METSO up to 2025 that 96,000 ha of private and 13,000 ha state-owned forests will be conserved on permanent or temporary basis.

Forestry is a significant income source for forest owners and provides benefits to society at large. Private and public organisations provide guidance and consultation services for forest owners. The provision of these services was liberalised by a new act on forest management associations.<sup>26</sup> A private forest owner may also receive assistance from the State for forest management and improvement work. State support encourages measures with long-term impacts. Managing the natural environment in commercial forests

26 534/1998 (amendment 1090/2013)

is promoted through environmental support and forest nature management projects. Public funding for forestry is based on the Act on the Financing of Sustainable Forestry.

Environmental aid may be granted for additional costs and income losses due to preservation and management of habitats of special value. The State also finances forest nature management projects. The works to be designed and implemented in these projects are defined in further detail in the legislation. Most of the forest nature management projects have special regional importance. Apart from habitats of special value, the projects may concern landscape management, preventing damage to waters and the restoration of ditched areas.

## 4.5 Sectoral policies and measures

### 4.5.1 Energy

#### Policies and measures in the WM projection

The general objective of Finland's energy policy is to ensure energy security at competitive prices and with the lowest possible environmental impacts. Finland uses a diversity of energy sources, one third of which (including energy for transport) are domestic. The major trend is a steady increase both absolutely and in relative terms in the use of renewable energy.

The 'with measures' (WM) projection includes all energy policy measures implemented before autumn 2016. Direct governmental intervention to guide the choice of energy sources is rare in Finland. However, economic instruments, i.e. taxation and subsidies, have been used to improve energy efficiency and to promote the development of domestic energy sources, such as biomass, hydro, wind and peat.

Within the energy sector, the greenhouse gas emissions are in practice reduced in two ways: 1) the primary energy consumption is reduced by cutting the end use or by increasing the conversion efficiency in power plants; 2) fuels and energy use are shifted to alternatives with less emissions.

The main policies and measures in the energy sector include the EU ETS, an increase in renewable energy and energy conservation measures.

The EU ETS is an EU-wide domestic measure, while renewable energy sources are supported by various national measures: investment grants, taxation, support for research and feed-in tariffs.

Energy conservation measures concern all sectors of the economy. Energy efficiency agreements, a voluntary scheme for industry and municipalities, have proven to be efficient measures along with taxes and subsidies. For both new and existing buildings, building codes and regulations play an important role.

The policies and measures included in the WM projection for the energy sector are described in more detail in the following sections. A list summarising the policies and measures can be found in Table 4.3. Energy taxation and tax-related subsidies are described in Section 4.6.

#### EU Emissions Trading Scheme

The EU ETS has been operating since 2005 and is the most important economic steering method for reducing emissions at both the domestic and EU level. The EU ETS is included in the WM projection. It is considered here as a domestic measure, even though entities with emission ceilings participating in the scheme acquire emission units (AAUs, CERs and ERUs) through trading. The EU ETS covered only CO<sub>2</sub> emissions

Table 4.3  
Policies and measures according to the WM (marked with\*) and WAM projections in the energy sector (excluding transport)

Name of policy or measure/mitigation action	Objective and/or activity affected	GHG(s) affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact in kilotonnes CO <sub>2</sub> equivalent <sup>1)</sup>							
								1995	2000	2005	2010	2015	2020	2025	2030
* Implementation of the emission trade system in Finland	Increase in renewable energy (Energy supply), Efficiency improvement in industrial end-use sectors, reduction of GHG emissions (Industrial processes)	CO <sub>2</sub> , N <sub>2</sub> O	Economic, Regulatory	Implemented	This PaM is the implementation of the ETS in Finland and the object is reduction of greenhouse gas emissions. National implementation in Finland is carried out with national act of emission trade (311/2011) and degrees which are given under that act.	2005	Ministry of Economic Affairs and Employment	0	0	NA	NA	NA	NA	NA	NA
* Promoting wind power	Increase in renewable energy (Energy supply)	CO <sub>2</sub>	Economic, Fiscal, Regulatory, Planning	Implemented	Measures implemented since 1996 include investment subsidies for wind power plants, electricity tax subsidies, feed-in tariff (since 2011), information measures, support for land-use planning and adjustment of land use and building act.	1996	Ministry of Economic Affairs and Employment, Ministry of the Environment, Regional councils, Municipalities	0	NA	NA	177	1,385	3,000	3,180	3,600
* Promoting forest chips and other wood-based energy	Increase in renewable energy (Energy supply)	CO <sub>2</sub>	Economic, Fiscal, Information	Implemented	Measures implemented since 1992 include investment subsidies for heat and power production plants using forest chips, subsidies for harvesting of forest chips, electricity tax subsidies, feed-in tariff and information measures.	1992	Ministry of Economic Affairs and Employment, Ministry of Agriculture and Forestry	NA	NA	NA	5,199	5,304	7,629	8,609	9,934
* Promoting biogas in electricity and heat production	Increase in renewable energy (Energy supply), Enhanced CH <sub>4</sub> collection and use (Waste), Improved treatment technologies (Waste)	CO <sub>2</sub> , CH <sub>4</sub>	Economic, Fiscal, Regulatory	Implemented	Measures implemented since 1997 include investment subsidies, electricity tax subsidies and feed-in tariff.	1997	Ministry of Economic Affairs and Employment, Ministry of the Environment, Ministry of Agriculture and Forestry	0	NA	NA	169	202	388	367	352
* Promoting solar power	Increase in renewable energy (Energy supply)	CO <sub>2</sub>	Fiscal, Economic, Information	Implemented	Solar electricity self-consumers exempted from grid fees and electricity taxes up to 100 kVA system size or 800 MWh yearly production, investment subsidies for municipalities and companies, household tax deduction from solar system installation work and information measures.	2015	Ministry of Economic Affairs and Employment, Ministry of Finance	0	0	0	0	0	86	227	386

Table 4.3 Cont.

Name of policy or measure/mitigation action	Objective and/or activity affected	GHG(s) affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact in kilotonnes CO <sub>2</sub> equivalent <sup>1)</sup>							
								1995	2000	2005	2010	2015	2020	2025	2030
* Act on Ecodesign and Energy Labelling (1005/2008, amendment 1009/2010)	Efficiency improvement of appliances	CO <sub>2</sub>	Regulatory	Implemented	Improvement of energy efficiency of energy-using products by minimum efficiency requirements	2009	Ministry of Economic Affairs and Employment	0	0	0	NA	613	2,555	2,555	2,555
* Energy Audit Programme	Efficiency improvements of buildings, Efficiency improvement in services/ tertiary sector, Efficiency improvement in industrial end-use sectors	CO <sub>2</sub>	Economic, Information	Implemented	Subsidies for energy audits in industry and in public and private services. Harmonised audit models. Qualification system for auditors. Quality control and monitoring of audits.	1992	Ministry of Economic Affairs and Employment	61 (2)	437 (14)	734 (24)	683 (40)	561 (33)	326 (22)	277 (22)	322 (20)
* Energy Efficiency Agreements 1997-2007, 2008–2016 and 2017–2025 (Voluntary energy efficiency agreements)	Efficiency improvements of buildings, Efficiency improvement in services/ tertiary sector, Efficiency improvement in industrial end-use sectors, Reduction of losses (Energy supply), Efficiency improvement in the energy and transformation sector (Energy supply), Other energy consumption (processes)	CO <sub>2</sub>	Voluntary/ negotiated agreements	Implemented	The agreements cover industry, energy sector, municipalities, private services, property and building sector and oil heated buildings. Energy Efficiency Agreements are described in the National Energy Efficiency Actionplan for Energy Efficiency Directive.	1997	Ministry of Economic Affairs and Employment, Ministry of the Environment	0	841 (NA)	2,494 (NA)	4,179 (419)	6,321 (473)	7,912 (495)	7,841 (403)	8,415 (279)
* Consumer energy advice	Efficiency improvements of buildings, Efficiency improvement of appliances, Efficiency improvements in transport	CO <sub>2</sub>	Information	Implemented	An energy advice infrastructure for consumers has been under construction since 2010. Regional projects are financed to provide advice through local events, personal advice and a national website.	2010	Ministry of Economic Affairs and Employment	0	0	0	NA	NA	NA	NA	NA
* Act on energy certificates for buildings	Efficiency improvements of buildings, Information dissemination	CO <sub>2</sub>	Information	Implemented	Houseowners are obliged to provide information on energy efficiency	2008	Ministry of the Environment	0	0	0	NA	NA	NA	NA	NA
* Act on inspection of energy efficiency of cooling equipment for building, act (489/2007)	Efficiency improvements of buildings	CO <sub>2</sub>	Regulatory	Implemented	Obligation to inspect cooling equipments to keep them energy efficient	2007	Ministry of the Environment	0	0	0	NA	NA	NA	NA	NA
* Building regulations (2003, 2008, 2010)	Efficiency improvements of buildings	CO <sub>2</sub>	Regulatory	Implemented, expired (the policy is expected to continue to have an effect on greenhouse gas emissions)	Provides minimum standards for new buildings	2003	Ministry of the Environment	na	na	221 (17)	648 (26)	1,660 (35)	1,660 (35)	1,660 (35)	1,660 (35)

Table 4.3 Cont.

Name of policy or measure/mitigation action	Objective and/or activity affected	GHG(s) affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact in kilotonnes CO <sub>2</sub> equivalent <sup>1)</sup>							
								1995	2000	2005	2010	2015	2020	2025	2030
* Renewed Building regulations (2012)	Efficiency improvements of buildings	CO <sub>2</sub>	Regulatory	Implemented	Provides minimum standards for new buildings, switch to full energy based calculation	2012	Ministry of the Environment	0	0	0	0	724 (15)	2166 (45)	3608 (75)	5050 (105)
* Information dissemination and campaigns targeted to residents and other users of buildings	Efficiency improvements of buildings, Demand management/reduction	CO <sub>2</sub>	Information	Implemented	New energy regulations and other energy use related matters, retrofitting, renovating and maintaining buildings have been disseminated to both professionals and consumers through versatile means like seminars, building fair events, presentations, articles and webpages.	2001	Ministry of the Environment, The dedicated state owned company Motiva						NA	NA	NA
* Act (132/1999) and Decree (895/1999) on Land use and Building applied to reduce emissions due to land use and urban form	Demand management/reduction	CO <sub>2</sub>	Regulatory, Planning	Implemented	Regional and municipal planning are directed by national land-use guidelines. Land-use planning creates the preconditions for a sound and vital residential and living environment and supports the availability of services and transport. Finland's land-use planning system, defined by law, gives municipalities a high degree of autonomy in local land-use planning, which can also be used to reduce greenhouse gas emissions. The law specifies also the general conditions concerning building, further provisions are issued in the National Building Code.	1999	Ministry of the Environment	0	NA	NA	NA	NA	NA	NA	NA
* Ministry of the Environment Decree (4/13) on improving the energy performance of buildings undergoing renovation or alteration.	Efficiency improvements of buildings	CO <sub>2</sub>	Regulatory	Implemented	Provides minimum standards for improving energy performance of buildings in renovations and alterations	2013	Ministry of the Environment	0	0	0	0	108 (17)	396 (57)	711 (91)	1049 (120)
* Decree on water measurement instruments	Efficiency improvements of buildings, Demand management/reduction	CO <sub>2</sub>	Information, economic	Implemented	"Provides information on the use of water in each apartment and allows the billing based on the water consumption"	2011	Ministry of the Environment	0	0	0	0	16 (2)	33 (3)	51 (5)	68 (7)

Table 4.3 Cont.

Name of policy or measure/mitigation action	Objective and/or activity affected	GHG(s) affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact in kilotonnes CO <sub>2</sub> equivalent <sup>1)</sup>							
								1995	2000	2005	2010	2015	2020	2025	2030
* Long term planned real estate maintenance	Efficiency improvements of buildings	CO <sub>2</sub>	Information	Implemented	Provide information for appropriate use of the buildings and the proper adjustment and settings of heating, ventilation and air conditioning equipment, as well as maintenance and repair plans	Long term implementation, strengthening since 2000	Ministry of the Environment	0	0	0	NA	NA	NA	NA	NA
* Fresh grain silos (no energy used for drying)	Energy efficiency in agricultural sector	CO <sub>2</sub>	Economic	Implemented	Support to fresh grain silos (drying of grain avoided)	2008	Ministry of Agriculture and Forestry	0	0	0	NA	NA	6	9	12
* Energy efficiency of unheated cattle buildings and heat recovery in pig farms	Energy efficiency in agricultural sector	CO <sub>2</sub>	Economic	Implemented	Support to investments to unheated cattle buildings and heat recovery from pig slurry	2008	Ministry of Agriculture and Forestry	0	0	0	NA	NA	3	6	8
* Farm reparcelling to cut down energy use	Energy efficiency in agricultural sector	CO <sub>2</sub>	Economic	Implemented	Support to farm reparcelling leading to reduced farm traffic	1995	Ministry of Agriculture and Forestry	NA	NA	NA	NA	NA	82	95	108
* Farm Energy Programme and energy advice to the farms	Energy efficiency in agricultural sector	CO <sub>2</sub>	Economic, Information	Implemented	Subsidies for the preparation of Farm Energy Plans and for other energy advice.	2010	Ministry of Agriculture and Forestry	0	0	0	0	NA	6	9	10
Towards zero-energy buildings	Efficiency improvements of buildings	CO <sub>2</sub>	Regulatory, Information	Adopted	The preparation for the regulation and information programme for moving towards nearly zero energy buildings	2018	Ministry of the Environment, A number of companies/businesses/ industrial associations	0	0	0	0	0	NA	NA	NA
Promoting the use of bioliquids in machinery	Low carbon fuels	CO <sub>2</sub>	Fiscal, Regulatory	Planned	An obligation to blend light fuel oil used in machinery with 10 per cent of bioliquids	2019	Ministry of Economic Affairs and Employment	0	0	0	0	0	0	100	200
Phasing out coal in energy production	Switch to less carbon-intensive fuels (Energy supply)	CO <sub>2</sub>	Regulatory	Planned	A bill will be prepared for phasing out the use of coal for energy use. The bill shall take into account aspects related to the security of energy supply and emergencies.	2019	Ministry of Economic Affairs and Employment	0	0	0	0	0	0	0	600
Phasing out oil heating in public sector	Emission reductions in building-specific heating	CO <sub>2</sub>	Other	Planned	Commitment to phase out oil heating in central government premises by 2025 and encouraging all public-sector operators to do the same	2021	Relevant ministries	0	0	0	0	0	0	130 (130)	130 (130)

Table 4.3 Cont.

Name of policy or measure/mitigation action	Objective and/or activity affected	GHG(s) affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact in kilotonnes CO <sub>2</sub> equivalent <sup>1)</sup>							
								1995	2000	2005	2010	2015	2020	2025	2030
Promoting the use of bioliquids in heating of buildings	Low carbon fuel	CO <sub>2</sub>	Regulatory, Fiscal	Planned	An obligation to blend 10 % of bioliquids into light fuel oil used for heating of buildings. A decision of the types of policy instruments which are going to be applied to fulfill this PAM have not been made yet.	2019	Ministry of Economic Affairs and Employment	0	0	0	0	0	0	70	110
Promoting the production and use of biogas in agriculture <sup>2)</sup>	Increase in renewable energy	CO <sub>2</sub>	Economic	Planned	The target is to replace fossil fuels with biogas in agriculture	2021	Ministry of Agriculture and Forestry	0	0	0	0	0	0	155	310
Improving energy efficiency and promoting the use of alternative fuels in machinery	Reducing emissions from machinery by improving energy efficiency and promoting the use of alternative fuels or power sources	CO <sub>2</sub>	Information, fiscal, other	Planned	Promoting the use of biogas in machinery, increasing the share of energy-efficient and low emission machinery through public procurement, promoting the energy-efficient use of machinery through information and training.	2021	Ministry of Environment	0	0	0	0	0	0	130	250

NA = Not available

1) The values in brackets are estimated impacts in the non-ETS sector.

2) This measure affects emissions both in the agriculture sector and the energy sector. Reductions of CO<sub>2</sub> are presented in this table, reductions in CH<sub>4</sub> emissions from manure management in the agriculture sector are presented in Table 4.9.

until the year 2012, when N<sub>2</sub>O and PFC emissions from certain industries were also included. In addition to emissions from energy production and use, the EU ETS also includes emissions from industrial processes. Industrial processes currently count for more than one tenth of EU ETS emissions in Finland (Table 4.4).

Table 4.4

Greenhouse gas emissions in the emission trading (ETS) sector and non-emission trading sector in Finland in 2005, 2008 to 2010, 2013, 2014 and 2015, million tonnes CO<sub>2</sub> eq. The ETS figures do not include emissions from aviation in the EU ETS as their coverage under the trading scheme is not consistent with the national greenhouse gas inventory. Also, total national emissions (also for 1990) and emissions from domestic aviation are presented.

	1990	2005	2008	2009	2010	2013	2014	2015
ETS	NA	33.1	36.2	34.4	41.3	31.5	28.8	25.5
of which energy	NA	29.6	31.8	30.9	37.3	27.6	25.1	21.6
industrial processes	NA	3.5	4.3	3.4	4.1	3.9	3.7	3.9
Non-ETS	NA	36.2	34.7	32.8	34.1	31.5	30.2	29.9
Domestic aviation	NA	0.3	0.3	0.2	0.2	0.2	0.2	0.2
<b>Total</b>	<b>71.3</b>	<b>69.6</b>	<b>71.2</b>	<b>67.4</b>	<b>75.7</b>	<b>63.2</b>	<b>59.1</b>	<b>55.6</b>

The share of EU ETS emissions with respect to the total greenhouse gas emissions in Finland was 46 to 50 per cent between the years 2013 and 2015 (Table 4.4). This share is clearly higher than the EU-28 average, which is around 40 per cent.

The emissions in the EU ETS sector have decreased since 2010. The main reason for this has to do with a reduced use of fossil fuels and increased imports of electricity. A steady decrease is also foreseen in the future in the emissions from district heating and combined heat and power (CHP) production. Several condensing power plants have been decommissioned or moth-balled in recent years. The emissions from industry are not expected to change dramatically. Consequently, the EU ETS sector emissions are expected to decrease in the future. This is partly the result of the EU ETS making emission-free production of electricity and heat more competitive and partly the result of promotion of renewables and energy efficiency. However, some yearly variations to this trend can occur due to variations, for example, in the Nordic energy market and in weather conditions.

### Energy efficiency

The Finnish economy is relatively energy intensive, which has led to fairly high per capita greenhouse gas emissions. However, because energy use is efficient by international comparison, the high energy and emission intensities can be explained by structural factors. While the industrial structure has changed significantly towards less energy intensive industries, Finland still has a considerable number of energy intensive industries. Other factors explaining the quite high energy use per capita are the cold climate and long transport distances.

Energy efficiency agreements and energy audits (see below) and subsidies for developing and implementing energy efficient technology and innovative modes of operation are important for reaching the energy efficiency targets. The Government Decision also includes measures that aim to cause a behavioural change and, in the longer term, to effect a fundamental change in society through education, research and development.

## Voluntary energy efficiency agreements

Since the 1990s, Finland has employed a voluntary energy efficiency agreement scheme for companies and municipalities. Voluntary measures, such as energy efficiency agreements, energy audits and sector or measure-specific programmes, have already resulted in significant energy savings. Energy efficiency agreements covered approximately 65 per cent of the total energy consumption in Finland at the end of 2016.

The third generation of energy efficiency agreements for industries, municipalities, property and building sector and the oil sector have commenced for the period 2017 to 2025<sup>27</sup>. They are mainly the responsibility of the Ministry of Economic Affairs and Employment. Responsibility for the action plan for rental housing properties in the property and building sector agreement lies in the Ministry of the Environment. These agreements are the successors of the second agreement generation in 2008 to 2016 (rental housing properties 2010 to 2016, commercial properties 2011 to 2016) and the first generation of agreements in 1997 to 2007 (then called energy conservation agreements).

In 2010, an energy efficiency agreement was also launched in the agriculture sector under the Ministry of Agriculture and Forestry. The agreement was updated in 2016 for the period 2016 to 2020. Farms have received energy advice in the scope of the Farm Energy Programme in 2010 to 2015. In 2015 to 2020 energy advice is given in the sphere of the Rural Development Programme for Mainland Finland<sup>28</sup>. Energy efficiency measures in agriculture are farm reparcelling to cut down energy use in farm traffic, support to fresh grain silos where energy use for drying of grain is avoided as well as support to investments to unheated cattle buildings and heat recovery from pig slurry, see Table 4.3.

Total annual savings in force from measures implemented under the energy efficiency agreements since 1997 within the industry, energy, municipal, property and building sectors were approximately 16.6 TWh per year at the end of 2015. Almost 85 per cent of these savings came from end use sectors and one fourth of the savings were electricity. The savings were equal to about 4.5 per cent of Finland's total energy consumption (362 TWh in 2015). Additional energy savings have been achieved as a result of the energy efficiency agreement for the oil sector, covering oil heated buildings, amounted to 1.4 TWh energy savings in 2015.

CO<sub>2</sub> reductions under the industrial, municipal, property and building, and oil sectors energy efficiency agreements were in total approximately 6.3 million tonnes CO<sub>2</sub> per year at the end of 2015 (based on a marginal emissions rate of 600 kg CO<sub>2</sub>/MWh for electricity). It is estimated that by the end of 2020, the emissions reduction will be 7.9 million CO<sub>2</sub> tonnes per year, and 8.4 million tonnes per year by 2030 when taking into account the start of the new agreements period at the beginning of 2017 (see Table 4.3).

The energy efficiency agreements are especially important for implementing the Energy Efficiency Directive (EED)<sup>29</sup>. Monitoring and calculation methods for energy efficiency agreements are described in Annex 2 of the National Energy Efficiency Action Plans (NEEAPs) of the Energy Efficiency Directive<sup>30</sup>.

## Energy audits

The Energy Audit Programme is one of the oldest national energy efficiency grant schemes in place in Finland. The full-scale programme was launched in January 1994.

The purpose of energy auditing is to analyse the energy use of the facility being audited, to work out the potential for energy savings and to present a profitability calculation of saving proposals. In addition to working out possible ways to use different forms

27 <http://www.energiatohokkuussopimukset2017-2025.fi/en/>

28 The programme covers the territory of Finland excluding the Åland Islands

29 2012/27/EC

30 [https://ec.europa.eu/energy/sites/ener/files/documents/fin\\_eeap\\_2017\\_en.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/fin_eeap_2017_en.pdf)

of renewable energy and the energy saving potentials, the energy audit reports on the impact of the proposed measures on CO<sub>2</sub> emissions.

Since June 2014, energy audit activities are divided into two categories: mandatory energy audits for all large companies governed by the Energy Efficiency Act<sup>31</sup> based on the requirements in the EU Energy Efficiency Directive and voluntary subsidised energy audits for other operators (the Energy Audit Programme). Subsidies cannot anymore be granted for large companies under the mandatory energy audit requirement.

The Energy Audit Programme is a voluntary programme. The Ministry of Economic Affairs and Employment provides a 40 to 50 per cent subsidy for conducting energy audits on commercial and public buildings and in the industrial and energy sectors provided that the applicants do not fall into the scope of the mandatory audits. It also supports municipalities to carry out audits concerning the promotion of renewable energy use within the municipality's territory (Renewable Energy Municipal Audit). Apart from energy audits subsidised by the Ministry of Economic Affairs and Employment, there are energy audits intended for farms which are subsidised by the Ministry of Agriculture and Forestry.

By the end of 2015, the estimated savings in energy achieved by conducting voluntary energy audits in the service, municipal and industry sectors were approximately 1.8 TWh per year. About 90 per cent of the savings originated in the industry sector. The corresponding CO<sub>2</sub> reduction was 0.56 million tonnes CO<sub>2</sub> per year (based on a marginal emissions rate of 600 kg CO<sub>2</sub>/MWh for electricity). The emissions reduction of the energy efficiency measures conducted based on the proposals in the voluntary energy audits is estimated to be 0.33 million CO<sub>2</sub> tonnes per year by the end of 2020 and 0.28 million tonnes per year by the end of 2025. While a vast majority of the energy audits are implemented in connection with the energy efficiency agreements, overlap in energy savings and emission reductions has been removed in the estimates and the results are additive.

Monitoring and calculation methods for the voluntary energy audit programme are described for different sectors in Annex 2 of the National Energy Efficiency Action Plans (NEEAPs) of the Energy Efficiency Directive<sup>29</sup>.

## Renewable energy

Finland aims to increase the share of renewable energy in final energy consumption to 38 per cent by 2020 (this was reached in 2014 and the share was 39.3 per cent in 2015). This increase in the share has been achieved by reducing energy consumption and increasing the use of renewables. Forest-based fuels, liquid biofuels, wind power and heat pumps will contribute most to the target.

The sliding feed-in tariff system for the production of electricity from renewable energy sources came into force on 25 March 2011 under a Government Decree (Production Aid Act). The subsidy varies on the basis of a three-month electricity market price or the market price of emission allowances. The aid scheme concerns government support for electricity production based on wind power, biogas, forest chips and other forest-based fuels.<sup>32</sup>

The Production Aid Act was amended in 2015 in order to ensure a controlled closure of the feed-in tariff scheme. In August 2017, some 2,000 MVA of wind power had been approved for the feed-in tariff scheme. Due to the amendments made to the Production Aid Act, the total capacity of wind power plants approved to the feed-in tariff scheme will not reach the original target of 2,500 MVA, but is estimated to be approximately 2,300 MVA.

Finland's first offshore wind farm was granted a EUR 20 million investment subsidy in 2014 and was completed in 2017 having a total capacity of 40 MW. This project aims to

31 1429/2014

32 258/2011

demonstrate wind power technologies suitable for winter conditions in the Baltic Sea area where, for example, ice conditions can be very challenging due to pack ice.

The objective is to increase the production of wind power to five TWh by the year 2020. In 2015, the wind power production was approximately 2.3 TWh and in 2016 approximately 3.1 TWh.

The effect on emissions has been estimated based on the assumption that wind power reduces the need to produce electricity mainly in condensing power plants using fossil fuels and peat (for more information on the IMPAKTI calculation tool used to estimate the emission reduction impacts of renewables, see Section 5.8). Using a marginal emission coefficient of 600 t CO<sub>2</sub>/GWh, the promotion of wind power will reduce the emissions in 2020 by three million tonnes CO<sub>2</sub> (Table 4.3). The reduction will occur totally in the ETS sector. The estimate includes the impact of all policies and measures promoting wind power (including the impact of the feed-in tariff).

Increasing the use of forest chips in multi-fuel boilers is the most central and cost-efficient way of increasing the use of renewable energy in the generation of power and heat. The use of forest chips will replace the use of other fuels (mainly peat) in heat and power production and heating oil on farms. The estimated emission reduction achieved due to the use of forest chips is 7.6 million tonnes in 2020 and 9.9 million tonnes in 2030.

The impact of the feed-in tariff for biogas has not been numerically estimated for 2020. The promotion of biogas will replace power and heat production using other fuels. CH<sub>4</sub> and N<sub>2</sub>O emissions from material used for biogas production will also be

Figure 4.3  
Historic development and WM projection for renewable energy, TWh

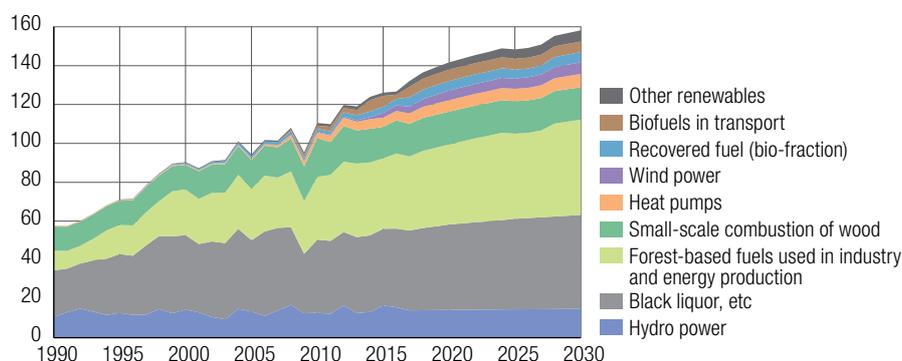


Table 4.5  
Historic development and WM projection for renewable energy, TWh

	2005	2010	2015	2020	2025	2030
Black liquor and other concentrated liquors	36.7	37.7	39.5	44	47	48
Industrial wood residues	21.2	19.8	21.7	21	22	24
Forest chips	6.0	13.8	15.8	22	24	29
Small-scale combustion of wood excl. forest chips	14.2	18.6	14.9	17	17	17
Hydro power	13.4	12.7	16.6	14	15	15
Heat pumps	0.6	2.9	4.8	6	6	7
Wind power	0.2	0.3	2.3	5	5	6
Biofuels for transport	0.0	1.7	5.7	6	6	5
Recovered fuel (bio-fraction)	1.3	1.7	3.2	5	5	5
Other renewables	0.7	1.3	1.6	2	2	2
<b>Total</b>	<b>94.3</b>	<b>110.5</b>	<b>126.1</b>	<b>142</b>	<b>148</b>	<b>158</b>

avoided, such as CH<sub>4</sub> emissions from landfilling of biogenic waste or CH<sub>4</sub> and N<sub>2</sub>O emissions from manure management.

Other measures to promote renewables include improving the logistics for harvesting and transporting forest chips and furthering the emergence of local heat entrepreneurs. Wind power will be advanced by reducing barriers for wind power investment and by enabling demonstration projects for off-shore wind power. The historic use of and WM projection for renewable energy in Finland is shown in Figure 4.3 and Table 4.5.

Renewable energy policies and measures for the transport sector are described in Section 4.5.2.

## Energy use in residential and other buildings

CO<sub>2</sub> emissions from the use of energy in buildings are mainly covered by the EU ETS. District heating is the source of about half of all space heating in Finland. The majority of district heating production falls within the sphere of the EU ETS. The total space heating energy used in residential, commercial and public buildings was 72 TWh in 2015 (25 per cent of the total end use of energy). Slightly less than 30 TWh of the space heating belongs to the non-ETS sector. Non-ETS CO<sub>2</sub> emissions from the energy used to heat buildings have been less than 3.5 million tonnes annually. These emissions mainly cover the use of light fuel oil (and to a very small extent, natural gas) in buildings, as well as the fuels used in small district heating plants. The non-CO<sub>2</sub> emissions from energy use in buildings are much smaller, approximately 0.2 million tonnes CO<sub>2</sub> eq. annually. Most of these emissions are CH<sub>4</sub> emissions from wood combustion.

Policies and measures for buildings and housing aim at improving energy efficiency, reducing ETS and non-ETS-emissions and increasing the use of renewable energy sources. Policy measures include standard setting, economic instruments, the dissemination of information and education and research. The measures target both new and existing buildings, including the use and maintenance of the building stock. In addition to policy measures in the building sector, energy use is affected by policy instruments for renewable energy via changes in the prices of heat and electricity.

The Directive on the Energy Performance of Buildings (EPBD)<sup>33</sup> aims to reduce CO<sub>2</sub> emissions by improving the energy efficiency of buildings. The directive was implemented in Finland by a regulation that came into force at the beginning of 2008. This legislation on the energy efficiency of buildings includes the following:

- Act on Energy Certification of Buildings<sup>34</sup>
- The Ministry of the Environment Decree on Energy Certification of Buildings<sup>35</sup>
- Act on Inspection of Air-conditioning Systems<sup>36</sup>
- Amendments to the Land Use and Building Act,<sup>37</sup> which was expanded to cover energy efficiency requirements and details on how energy efficiency should be calculated<sup>38</sup>.

The minimum requirements for thermal insulation and ventilation in new buildings have been set by the National Building Code since 1976. The energy efficiency requirements were tightened by 30 per cent compared to earlier requirements (2003) in December 2008 due to the implementation of the EPBD. The requirements were further tightened (by 20 per cent) in March 2011 due to the implementation of the Directive on the En-

33 2002/91/EC

34 487/2007

35 765/2007

36 489/2007

37 1129/2008

38 488/2007

ergy Performance of Buildings (Recast).<sup>39</sup> The building regulation came into force in July 2012, and it is based on the overall energy consumption, which takes into account, among other things, air conditioning, cooling, lighting and heating, the washing water and heating energy. The regulation favours the utilisation of district heating and renewable energy when defining the energy performance of a building as a whole. Also, due to the implementation of the Directive on the Energy Performance of Buildings, EPBD, the regulation for the energy efficiency of the existing building stock was given in February 2013 and this Ministry of the Environment Decree<sup>40</sup> on improving the energy performance of buildings undergoing renovation or alteration came into force in June 2013.

The Government has supported energy efficiency improvements in renovation and investment in low-carbon heating systems through various subsidies. Low-carbon heating systems utilise renewable energy sources, especially ground heat and forest-based energy (pellets, small-scale firewood). Due to the overall reductions in the Government's budget, these subsidies have now been ceased.

The State also supports the low-income households with an optional subsidy of 25 per cent covering costs for improving energy economics and using renewable energy sources in heating. A tax incentive scheme for domestic employment of various service providers has been in effect since 2001. A household may deduct 15 per cent of personnel salary costs or 45 per cent of company-provided services from personal taxation. Although the deduction can be applied to various type of work carried within a household, the emphasis has been on encouraging households to make improvements and alterations in heating system and installing systems using renewable energy sources. At the moment, the annual maximum for tax deduction is EUR 2,400/person.

Based on the modification in the decree of the national building code for sewage and fresh water systems, water measurement instruments became compulsory in new apartment buildings at the beginning of 2011. The aim was to reduce the consumption of water and the need for heating it. The water measurement instruments provide information on the use of water in each apartment and make it so that the billing is done according to the actual water use, which provides a direct price signal for inhabitants. The requirement was expanded into the existing building stock in 2013 in the case of pipe and plumbing system repairs subject to a building permit.

Information provision and the campaigns supported by the Government seek to influence the behaviour of building users and owners. At the moment, activities exist for giving internet-based informational guidance, e.g. in repair, energy efficiency and building maintenance issues.

Systematic and well-timed building maintenance activities for buildings include repairs and replacement as well as the proper adjustment and settings for heating, ventilation and air conditioning equipment. The aim is to reach the full extent of the technical and economic lifecycle. The maintenance and repair plan is based on condition assessment surveys in which the conditions as well as any need for repairing a building or equipment are determined, mainly by sensory and empirical evaluations and non-destructive methods. Systematic and well-timed renovations can reduce costs while meeting the needs of users and sustainable development, e.g. energy and material efficiency.

Renovation and the retrofitting of buildings increases rapidly in Finland and will continue to do so in the next two decades. The reason is that, among other things, a large amount of the building stock needs improvements in their physical condition or in their energy efficiency. Such an increase in repair and renovation work will require considerable development and changes in the property and building sectors. In order to

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39 2010/31/EU

40 4/2013

address the expected challenges, the Ministry of the Environment has launched a programme in co-operation with the Finnish real estate and construction branch, various research institutions and the public administration. As a result of the programme, the Strategy for Repair and Renovation 2007 to 2017, an implementation plan (2009) and the Government Resolution on Renovation (2008) were compiled.

The implementation plan consists of thirteen measures for action that define the aims and concrete measures to be taken. The actions include, e.g. developing a maintenance culture, making improvements in energy efficiency, improving know-how and disseminating knowledge, developing the materials and resource efficiency, and developing renovation services. Research and communication play an important role in the implementation of the strategy. The responsibility for implementing the strategy is broadly spread among the actors in the property and building sectors. The implementation is ongoing. In 2015 a follow-up was made. As a result, many effective actions were recognised and the programme was estimated to have reached its aims in a good manner. For the following years, focus areas were defined: promoting planned real estate management, improving the cost efficiency and customer-orientation of renovation services and developing skills for repair work and its education.

Improving the built environment, including the transport systems, thus plays a key role in reducing greenhouse gas emissions and mitigating climate change. The Energy-Smart Built Environment 2017 (ERA17) action plan originally proposed 31 necessary actions for reducing emissions in the built environment, for improving energy efficiency and for promoting the use of renewable energy. The overall target of the programme is to create an 'energy-smart built environment' that is energy-efficient and low in emissions and that provides a high-quality living and working environment. The action plan combined simultaneous and former programmes and was drawn up as a joint effort by the Ministry of the Environment, the Finnish Innovation Fund (Sitra) and the Finnish Funding Agency for Technology (Tekes) and in collaboration with the business sector, research institutions and the public administration. The programme has focused on land use, decentralised energy production, building policies, use and ownership of real estate and know-how for the years 2013 to 2014. The actions within the programme were continued for 2015 to 2017. The programme is ongoing and it ends in 2017. For the last year of action, weight is put on spreading good practices and assessing the procedure.

The emission impacts of building-related policy measures have been evaluated using EKOREM and POLIREM calculation models (see Section 5.8) and information on the emission coefficients for district heating and electricity. These models calculate the heat and energy consumption and the resulting greenhouse gas emissions of the building stock. The impacts of policy measures are evaluated by modifying the energy efficiency of the building elements (EKOREM) or specific consumptions of energy (POLIREM), or the distribution of heating systems. The energy savings are converted into emission reductions with an average emission coefficient in the case of district heating (235 kg CO<sub>2</sub>/MWh) and with a mean marginal emission coefficient in the case of electricity (600 kg CO<sub>2</sub>/MWh).

The emission reduction impacts of the policy measures are presented in Table 4.3. The regulation for the energy performance of new buildings entails the largest emission reductions, namely 3.8 million tonnes CO<sub>2</sub> by 2020 and 6.7 million tonnes CO<sub>2</sub> by 2030. Most of the emission reduction will take place in the EU ETS sector through the reduced use of electricity and district heat.

Subsidies for energy efficiency improvements will supposedly reduce the annual emissions by 0.3 million tonnes CO<sub>2</sub> in 2010, 2020 and 2030. The impact will be larger in the non-ETS sector because of the fact that subsidies were provided to replace the oil boilers with ground heat or wood bioenergy (pellets, small-scale firewood) in 2011 to 2012.

Due to the implementation of the Directive on the Energy Performance of Buildings (Recast), the regulation for the energy efficiency of the existing building stock was put into effect on 27 February 2013. It is estimated that the emission reductions due to improvements in energy performance in renovations and alterations will be 0.4 million tonnes CO<sub>2</sub> in 2020 and 1.0 million tonnes CO<sub>2</sub> in 2030. Energy efficiency improvements are related to the normal lifecycle of buildings and are thus realised during long periods of time in connection with other renovations and alterations. Most of the emission impact is due to the reduced use of district heating and electricity produced in the ETS sector. It is estimated that the emission reductions in the non-ETS sector will be quite modest, namely 0.06 million tonnes CO<sub>2</sub> in 2020 and 0.1 million tonnes CO<sub>2</sub> in 2030. Part of the emission reductions will be obtained when oil fuelled boilers are replaced with ground heat and other heating systems that need electricity. This will increase emissions somewhat in energy production within the ETS sector.

Building maintenance activities, like adjusting the heat and ventilation systems, are able to provide immediate energy savings and emission reductions. In addition, no investments in equipment or materials are needed. Therefore, the net emission and cost reductions will take place immediately. The possibilities to reduce emissions are, however, limited. The short-term impacts of minimum standards for energy performance in new and existing buildings are small. The impact will gradually increase over time when the building stock is renewed and renovated.

Existing regulations for both new and existing buildings state that the energy performance target can be obtained by improving the energy efficiency and/or changing the heating system. This substantially complicates the evaluation of energy saving and emission impacts.

## Policies and measures in the WAM projection

### *Renewable energy supply*

Operating aid for renewable energy based on a tendering process will be introduced as a transition period solution. In 2018 to 2020, a tendering process that concerns electricity production of two TWh will be organised. The details of the tendering process will be published later.

### *Energy use in residential and other buildings*

In the building sector, additional measures are under preparation. Nearly zero-energy (NZEB) regulations for new buildings will enter into force in 2018. According to the Government report on the National Energy and Climate Strategy for 2030 there is an obligation to blend 10 per cent of bioliquids into light fuel oil used for heating of buildings. A decision of the types of policy instruments which are going to be applied to fulfil this PAM have not been made yet. A commitment to phase out oil heating in the central government premises by 2025 is included in the Medium-term Climate Change Policy Plan.

### *Machinery*

The Government report on the National Energy and Climate Strategy for 2030 includes an obligation to blend 10 per cent of bioliquids into light fuel oil used for machinery. A decision of the types of policy instruments which are going to be applied to fulfil this PAM has not been made yet.

Additional measures are included in the Medium-term Climate Change Policy Plan, mainly to improve energy efficiency. The measures include, for example, the following:

- Promotion of biogas in machinery
- Changes in the taxation of light fuel oil

- Promotion of energy efficient and low emission machinery through public procurements
- Promotion of energy efficient use of machinery through information and advisory action
- Strengthening of the information base related to machinery.

#### *Phase-out of coal*

The National Energy and Climate Strategy for 2030 outlines that Finland will phase out the use of coal for energy by 2030. No new power plants burning hard or brown coal will be built, nor will any replacement investments based on coal be made. Once the existing plants based on pulverised fuel combustion have been decommissioned, coal will only be used as a backup fuel in exceptional situations.

During the current government term, a bill will be prepared for the transition period during which the use of coal for energy use is phased out. The bill will take into account aspects related to the security of energy supply and emergencies.

There has been a declining trend in the use of coal for energy for over 10 years, and the calculations of the basic scenario indicate that this trend continues. Without additional measures, the share of coal is estimated to be some one to two per cent of the total energy consumption, i.e. 3 to 7 TWh, in 2030.

### Summary of policies and measures

A summary of the policies and measures in the energy sector is presented in Table 4.3.

## 4.5.2 Transport

### Policies and measures in the WM projection

Policies and measures within the transport sector under the WM projection are outlined in Table 4.6 at the end of this section. The WM projection includes all measures that were in use in the transport sector to cut down the emissions in June 2016. The measures are designed to achieve the target of the Climate Policy Programme for the Transport Sector and Finland's Long-term Climate and Energy Strategy from 2008, –15 per cent in 2020 compared to 2005. The measures also contribute to achieving the EU's Effort Sharing Decision target.

The WM projection contains the following measures: 1) promoting the use of bio-fuels within the transport sector, 2) improving the energy-efficiency of vehicles, and 3) improving the energy-efficiency of transport system by promoting the choices of more environmentally friendly modes of transport and curbing the growth of vehicle kilometres. It is assumed that the growth in transport performances needs to stay at a moderate level (0.5–1.5 per cent per year) so that it will be possible to achieve the climate policy aims within the transport sector.

The greenhouse reduction impact of the policies and measures (both ex post and ex ante) has been estimated by the Technical Research Centre of Finland VTT Ltd based on, for example, the results of the LIPASTO calculation model, which is the model used to estimate emissions from the transport sector for the greenhouse gas inventory. The methods used for impact assessment are documented in Finland's second National Energy Efficiency Action Plan (NEEAP 4).

### *Promoting the use of biofuels*

The amendment to the national act on promoting the use of biofuels within the transport sector<sup>41</sup> came into force on 1 January 2011. The biofuel distribution obligation was six per cent for 2011 to 2014, followed by a phased increase to 20 per cent by 2020. The energy content of second-generation biofuels (biofuels produced, for example, from waste material) is taken into account as double its actual energy content when calculating the share of biofuels for the purposes of the distribution obligation.

In 2015, approximately 12 per cent of all transport fuels used were biofuels in actual terms. The measure achieved an estimated 1.5 million tonnes CO<sub>2</sub> reduction in transport-related greenhouse gas emissions in 2015. It is expected that biofuels will account for 20 per cent (double counting included) of all fuels consumed in transport in 2020. This would consist of first-generation biofuels (seven per cent of all road transport fuels sold) and second-generation biofuels (6.5 per cent of all road transport fuels sold). Biofuels would, in other words, replace 13.5 per cent of fossil fuels in transport in 2020, but as the contribution of second-generation biofuels is considered to be twice that made by other biofuels, the calculated share of all road transport biofuels would be 20 per cent. This means that the related emission reduction in the transport sector would be an estimated 1.6 to 1.7 million tonnes of CO<sub>2</sub> in 2020 depending on the eventual biofuels consumption.

### *Improving the energy-efficiency of vehicles*

In the Climate Policy Programme for the Transport Sector, the aim for improving the energy-efficiency of vehicles is that by 2020 specific emissions of new cars sold in Finland would be near the EU target (95 g/km; the current level in 2015 was at around 124 g/km and in 2016 around 121 g/km), and that the rate of vehicle fleet renewal would be around six to seven per cent a year. The working group's proposal for a plan for a distribution network for alternative transport fuels was published in November 2016. According to the proposal, the objective is that 20 per cent of new cars sold will be able to use alternative fuels in 2020.

The regulation of the European Parliament and of the Council<sup>42</sup> setting emission performance standards for new passenger cars (a binding CO<sub>2</sub> standard for passenger cars) entered into force in June 2009. The objective of the regulation is to establish manufacturer-specific emission performance standards for new passenger cars registered in the Community. It sets the target for the average CO<sub>2</sub> emissions for new passenger cars at 95 g/km by 2020. A corresponding regulation<sup>43</sup> for light commercial vehicles entered into force in 2011. This regulation sets a target of 175 g CO<sub>2</sub>/km by 2017 and 147 g/km by 2020 for the average emissions of new light commercial vehicles registered in the Union. Furthermore, the European Commission has initiated the work for proposals for CO<sub>2</sub> emission targets for new cars for the period beyond 2020 until 2030. The Commission is also making preparations for legislation on monitoring and reporting of heavy-duty vehicle fuel consumption and CO<sub>2</sub> emissions.

In Finland, the tax on passenger vehicles consists of several elements that are differentiated according to vehicle-specific emissions (CO<sub>2</sub> g/km). Initially, at the event of the first registration, a one-time tax ("Car Tax") is paid. For that registration tax, the lowest tax rate (3.8 per cent) applies to cars with zero CO<sub>2</sub> emissions, while the highest tax rate (50 per cent) applies to cars with CO<sub>2</sub> emissions exceeding 360 g/km. Furthermore, the basic part of the vehicle tax, which is paid annually, is also differentiated according to CO<sub>2</sub> emissions of each vehicle similarly to the registration tax. This basic part of the emission-based annual vehicle tax is EUR 106 to 654 per year, depending on the car's

41 446/2007

42 2009/443/EU

43 2011/510/EU

specific CO<sub>2</sub> emissions. The second part of the annual tax is based on the type of fuel the cars uses. Petrol-fuelled cars have no additional tax. Cars fuelled with diesel, methane or electricity have an additional annual tax (fuel fee) that is relative to the mass of the car (“mass in running order”), but not to the specific CO<sub>2</sub> rate itself. However, the CO<sub>2</sub> rate and vehicle mass have a certain correlation.

Finland has also been active to provide people with more information about the CO<sub>2</sub> emissions of passenger cars. Examples of this include the energy label for cars, the online car comparison engine produced by the Finnish Transport Safety Agency Trafi, which enables potential car buyers or used-car owners to compare different car models based on fuel consumption and CO<sub>2</sub> emissions<sup>44</sup> and the Choosing a Car website<sup>45</sup>.

If the renewal rate of the vehicle fleet speeds up to reach the level set for the sector, it is estimated that the emission reduction effects of new vehicle technologies can be as much as 2.1 million tonnes in 2020.

During the period 2007 to 2015, the average CO<sub>2</sub> emissions of new cars decreased by some 30 per cent. The average CO<sub>2</sub> emissions in 2015 were 123 g/km for new petrol-driven passenger cars and 127 g/km for diesel-driven passenger cars (see Chapter 3, Figure 3.11). A total of some 109,000 new cars were sold in 2015 (the goal was 150,000). The emission reduction effects of new low-emission cars were estimated at approximately 0.2 million tonnes CO<sub>2</sub> in 2015 and 0.3 million tonnes CO<sub>2</sub> in 2016.

#### *Improving the energy-efficiency of the transport system*

According to the Climate Policy Programme for the Transport Sector, the energy efficiency in transport should be improved. This can be achieved through means such as energy efficiency agreements (2008–2016), eco-driving, and public sector vehicle and transport service procurement. Energy efficiency in the transport sector can also be improved by developing new services. Intelligent transport and the use of information technology (IT) will help to improve both the traffic safety and fluency as well as achieving the environmental targets in the transport sector. It also creates significant business opportunities for companies.

At the beginning of 2017, the energy efficiency agreements in the transport sector were substituted with the Responsibility Model<sup>46</sup>, the target of which is to promote responsible and sustainable transportation. The Responsibility Model is a voluntary based management system taking into account finance, safety, quality and environmental aspects, including energy efficiency. The Responsibility Model has been developed by the transport administration in cooperation with the transport sector.

In 2013, the Ministry of Transport and Communication prepared a decree<sup>47</sup> on new maximum masses and dimensions of heavy goods vehicles and vehicle combinations. The decree raises the maximum allowed height of a vehicle from 4.2 to 4.4 meters and the maximum allowed mass from 60 to 76 tonnes. The decree entered into force on 1 October 2013. The goal of this update was to improve the energy efficiency in road freight transport and consequently to improve Finland’s economic competitiveness as well. The update is also estimated to reduce the total CO<sub>2</sub> emissions in the transport sector by around 1.5 per cent annually.

According to the National Energy and Climate Strategy, the aim is to reduce the number of car journeys with no passengers but only the driver, and to halt the increase in the use of passenger cars in urban areas regardless of growth in population. For that

44 <http://autovertaamo.trafi.fi/?lang=en>

45 [https://www.motiva.fi/ratkaisut/kestava\\_liikenne\\_ja\\_liikkuminen/nain\\_liikut\\_viisaasti/valitse\\_auto\\_viisaasti](https://www.motiva.fi/ratkaisut/kestava_liikenne_ja_liikkuminen/nain_liikut_viisaasti/valitse_auto_viisaasti) (only in Finnish)

46 [https://www.trafi.fi/en/road/commercial\\_transport/responsibility\\_model\\_for\\_road\\_transport\\_enterprises](https://www.trafi.fi/en/road/commercial_transport/responsibility_model_for_road_transport_enterprises)

47 407/2013

aim, the current self-service market, where people own a vehicle and self-cater for their transport and mobility needs, has to be replaced by a service market, where people do not own vehicles anymore, but buy transport and mobility services.

In practice, the development of new service models and the revolution of the transport market will be promoted by reforming and relaxing the current legislation on the transport market through the introduction of a unified regulatory act (Transport Code). The Transport Code will provide a better response to user needs, facilitate companies' access to the market and promote the interoperability of different parts of the system. At the same time, the deployment of new technologies, digitalisation and new business concepts will be encouraged. The reform will be implemented in three stages. The first stage includes provisions on road transport and better interaction between all modes of transport. Later stages include provisions on air, sea and rail transport markets, as well as on transportation services. The first phase of the reform is intended to enter into force on 1 July 2018, to enable the transport sector to prepare for the new rules. The Transport Code envisages that essential data on transport services are made open, laying down provisions for the interoperability of different ticket and payment systems. This is expected to facilitate combinations of different transport services.

Another measure to improve the energy efficiency of the transport system is to coordinate transport and land use as well as promote the conditions for walking, cycling and public transport, especially in urban areas. The target is a 30 per cent increase in the number of journeys taken by walking and cycling by 2030, and a notable reduction in the short-range car use.

Finland's Public Transport Act<sup>48</sup> was reformed in 2009 to comply with the requirements of the EU's PSO Regulation. The current bus transport system is to be reorganised after the service contracts for the transition period, concluded pursuant to the Public Transport Act, expire between 2014 and 2019. After the transition period, competent authorities must organise public transport in their area. In the implementation of the Public Transport Act, particular attention is paid to introducing a nation-wide ticketing system and implementing a schedule and journey planner service. The goal is to create a uniform, user-friendly service package and to increase the passenger rate of public transport. The year 2016 was record breaking for public transport in large and mid-sized cities: the number of public transport journeys increased by as much as 14 per cent. A national strategy and implementation plan for the promotion of walking and cycling, covering the period 2011 to 2020, was released in 2011. This strategy is aimed at increasing the share of trips made walking or cycling. The target is that by 2020, the share of walking and cycling rises from the current 32 per cent to 35 to 38 per cent in the modal split, and the proportion of short trips made by passenger cars decreases correspondingly.

The popularity of public transport, walking and cycling is also promoted through Mobility Management, which was made a national-level project in 2010. Mobility Management is a broad concept, the objective of which is to reduce dependence on the private car for personal transport. The basic means of achieving this are offering better information about alternative transport modes and more attractive services. The central aim is to encourage actors that generate traffic to develop various ways to promote public transport, cycling, walking, car pooling and car sharing. The Mobility Management work at the regional level has been supported through R&D calls for projects, and through a EUR 0.9 million appropriation included in the 2015 and 2016 Budgets.

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48 869/2009

## Policies and measures in the WAM projection

Table 4.6 sets out the main policies and measures included in the WAM projection for the transport sector. The WAM projection is based on the National Energy and Climate Strategy for 2030 and contains the following measures: 1) promoting the use of biofuels in the transport sector (additional measure), 2) improving the energy-efficiency of vehicles (additional measures), and 3) improving the energy-efficiency of the transport system (additional measure).

Promoting the use of biofuels (additional measure) includes increasing the physical share of biofuel energy content in all fuels sold for road transport (30 per cent by 2030). It has been estimated that the additional potential emission reduction effects of the use of biofuels in the transport sector will be as much as 1.5 million tonnes CO<sub>2</sub> by 2030.

Improving the energy-efficiency of vehicles (additional measures) includes very stringent CO<sub>2</sub> standards for new cars and light commercial vehicles (i.e. reaching 64 g CO<sub>2</sub>/km for cars and 106 g CO<sub>2</sub>/km for light commercial vehicles in 2030). It has been estimated that the emission reduction effects of improving the energy-efficiency of vehicles will total around one million tonnes CO<sub>2</sub> by 2030.

Improving the energy-efficiency of the transport system (additional measure) includes reducing the number of car journeys with only the driver, and to halt the increase in the use of passenger cars in urban areas regardless of a growth in population. It has been estimated that the emission reduction effects of improving the energy-efficiency of the transport system will be as much as 0.3 million tonnes CO<sub>2</sub> by 2030.

## Summary of policies and measures

A summary of the policies and measures in the transport sector is presented in Table 4.6.

### 4.5.3 International bunkers

#### Policies and measures in the WM projection

Finland has participated actively in IMO's and ICAO's work to limit emissions from international traffic. At the ICAO Assembly in October 2016, a global carbon offsetting scheme for international aviation was adopted. By this decision, aviation became the first industrial sector to have a global market-based measure scheme in place. Under the Carbon Offsetting Scheme for International Aviation (CORSIA), aircraft operators will be required to purchase offsets for the growth in CO<sub>2</sub> emissions covered by the scheme. CORSIA aims to address any annual increase in total CO<sub>2</sub> emissions from international civil aviation above 2020 levels.

In July 2011, IMO approved binding energy efficiency targets for new ships. An Energy Efficiency Design Index (EEDI) will be calculated for each ship during the planning phase. The new regulation has been in force since the beginning of 2013. In addition, all ships, the gross tonnage of which is 400 tonnes or more, are required to compile a Ship Energy Efficiency Management Plan (SEEMP) following a guidance format prepared by IMO. These measures were implemented in the national legislation<sup>49</sup> of Finland at the end of 2014. The impacts of these measures on the emissions of ships have not yet been evaluated.

At EU level, the Regulation on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport (MRV Regulation)<sup>50</sup> entered into force in 2015. In August 2017, companies shall submit ship-specific monitoring plans to veri-

49 1113/2014

50 2015/757/EU

Table 4.6  
Policies and measures according to the WM (marked with \*) and WAM projections in the transport sector

Name of policy or measure/mitigation action	Objective and/or activity affected	GHG(s) affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact in kilotonnes CO <sub>2</sub> equivalent							
								1995	2000	2005	2010	2015	2020	2025	2030
* Promoting biogas in road transportation	Low carbon fuels/electric cars	CO <sub>2</sub> , CH <sub>4</sub>	Fiscal	Implemented	Biogas in road transportation is excise duty free.	2011	Ministry of Finance	0	0	0	0	NA	8	14	25
* Promoting the use of biofuels in the transport sector	Low carbon fuels	CO <sub>2</sub>	Regulatory, Fiscal	Implemented	The annual minimum share of biofuels, measured from the total energy content of petrol, diesel and biofuels delivered for consumption shall be 6 per cent in 2011–2014 and then be gradually raised to 20 per cent in 2020. This includes so-called double-counted biofuels, the actual share of biofuels is estimated to be 13.5 per cent in 2020. Biofuels are also promoted through tax subsidies.	2008	Ministry of Economic Affairs and Employment, Ministry of Finance	0	0	0	700	1,554	1,520	1,467	1,436
* Improving the energy-efficiency of vehicles	Efficiency improvements of vehicles	CO <sub>2</sub>	Regulatory, Fiscal, Information	Implemented	The target is, that specific emissions of new cars sold in Finland would be near the EU objective (95 g/km) in 2020; the rate of vehicle fleet renewal would be around 7 per cent (150,000 new cars) a year, 50 per cent of new cars sold would be able to use alternative fuels. There are three main measures to get to these targets: 1) EU-legislation, 2) the Finnish taxation (car tax, annual vehicle tax and fuel tax) and 3) information steering. The target group is the buyers of a new car.	2008	Ministry of Transport and Communications, Ministry of Finance	0	0	0	NA	232	545	837	907
* Improving the energy-efficiency of transport system	Modal shift to public transport or non-motorized transport, Demand management/reduction	CO <sub>2</sub>	Regulatory, Information, Planning, Economic	Implemented	The objective is that in 2020 100 million more journeys are made by public transport and 300 million more on foot or by bicycle than at present, which means an increase of about 20 per cent in the numbers of these journeys.	2009	Ministry of Transport and Communications, Municipalities	0	0	0	NA	NA	300	NA	NA

Table 4.6 Cont.

Name of policy or measure/mitigation action	Objective and/or activity affected	GHG(s) affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact in kilotonnes CO <sub>2</sub> equivalent							
								1995	2000	2005	2010	2015	2020	2025	2030
* Improved regulation of the development of major retail centres	Demand management/reduction	CO <sub>2</sub>	Regulatory, Planning	Implemented	Strengthening of available policy instruments in the land use and building act to avoid disruptive land-use development and increased transportation needs due to construction of retail centres based on private car transportation	2000	Ministry of the Environment, Regional councils, Municipalities	0	0	NA	NA	NA	NA	NA	NA
Promoting the use of biofuels in the transport sector	Low carbon fuels	CO <sub>2</sub>	Regulatory	Planned	The target is to increase the physical share of biofuel energy content in all fuels sold for road transport to 30 per cent by 2030	2019	Ministry of Economic Affairs and Employment	0	0	0	0	0	NA	637	1,476
Improving the energy-efficiency of vehicles	Efficiency improvements of vehicles	CO <sub>2</sub>	Regulatory	Planned	The target is to influence the drafting of EU legislation applicable to car manufactures in order to achieve very stringent CO <sub>2</sub> standards for cars and light commercial vehicles, so that the specific consumption and emissions of new cars and vans will be reduced by approximately 30% from their 2020 levels by 2030. Estimated mitigation impact also includes the National Energy and Climate Strategy for 2030 goal to have a minimum of 250,000 electric and 50,000 gas-powered vehicles on the roads in 2030.	2019	Ministry of Transport and Communications	0	0	0	0	0	NA	403	978
Improving the energy-efficiency of transport system	Modal shift to public transport or non-motorized transport, Demand management/reduction	CO <sub>2</sub>	Regulatory	Planned	The aim is to reduce the number of solo car journeys and to halt the increase in the transport performance of cars in urban areas regardless of a growing population by promoting the conditions for walking, cycling, public transport and new travel services, especially in urban areas. The target is at a 30 per cent increase in the number of journeys taken by walking and cycling by 2030.	2019	Ministry of Transport and Communications	0	0	0	0	0	NA	214	301

NA = not available

fiers for approval. The first monitoring year will be 2018. From 2019, by 30 April each year, companies shall submit to the Commission verified annual emission reports. Aviation has been included in the EU emissions trading scheme (EU ETS) since 2012. Between 2013 and 2016, the EU ETS covered flights between aerodromes located in the member states of the European Economic Area. In February 2017, the European Commission proposed to continue the intra-EEA scope beyond 2016.

The environmental outcome of an emissions trading system is pre-determined through the setting of an emissions cap. In the case of the EU ETS, a cap is established for aviation emissions in addition to the overall emissions cap. However, aircraft operators are also able to use allowances allocated to other sectors to cover their emissions. It is therefore possible (indeed highly likely given traffic growth forecasts) that the absolute level of CO<sub>2</sub> emissions from aviation will exceed the number of allowances allocated to aviation. Anyway, aviation emissions will necessarily be offset by CO<sub>2</sub> emission reductions elsewhere, either in other sectors within the EU that are subject to the EU ETS or through emission reduction projects in third countries. The 'net' aviation emissions will, however, be the same as the number of allowances allocated to aviation under the EU ETS.

In terms of contributing to the ICAO global goals, the states implementing the EU ETS together delivered, in 'net' terms, a three per cent reduction below the 2005 level of aviation CO<sub>2</sub> emissions in 2012, and will deliver a five per cent reduction below the 2005 level of aviation CO<sub>2</sub> emissions for the period 2013 to 2020.

As a member of the European Union, Finland is implementing the EU ETS for aviation. In 2016 Finland issued 493,036 aviation emission allowances free of charge to aircraft operators administered by the Finnish Transport Safety Agency and sold 110,500 aviation emission allowances at the common auction platform. Intra-EEA emissions of aircraft operators administered by Finland amounted to 988,675 tonnes of CO<sub>2</sub> in 2016. The Ministry of Transport and Communications is actively involved in EU policymaking to enhance the effectiveness of the EU ETS for aviation.

As a Member of the EU and European Civil Aviation Conference ECAC, Finland has submitted its State Action Plan for International Aviation CO<sub>2</sub> Emissions in order to communicate to ICAO information on Finland's activities to address CO<sub>2</sub> emissions from international civil aviation.

## Policies and measures in the WAM projection

The Directive of the European Parliament and of the Council on the deployment of alternative fuels infrastructure entered into force in October 2014<sup>51</sup>. According to the Directive, all Member States must draft a national policy framework for the development of an alternative transport fuel market and deployment of a related infrastructure by November 2016. The national policy framework must specify the alternative transport fuels and their distribution infrastructure targets for 2020 and 2030 as well as the measures by means of which the targets will be achieved.

In 2012, the Ministry of Transport and Communications set up a working group to consider the possible future energy sources for transportation. The task of the working group was to consider the extent to which and the time frame within which alternative energy sources could be used in different transport modes and to propose objectives and measures.

The working group's proposal for a plan for a distribution network for alternative transport fuels was published in November 2016. According to the proposal, in maritime transport the objective is to decrease greenhouse gas emissions by 40 per cent by 2050 (compared to 1990) with measures including the use of LNG (liquefied natural

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51 2014/94/EU

gas) and biofuels. In aviation the objective is to increase the use of biofuels so that the share would be 40 per cent in 2050, which is in line with the common EU target.

At IMO member states have come to an agreement on a three-step approach to decreasing greenhouse gas emissions from international shipping. The first step is to compile data on fuel consumption, following the mandatory data collection system (DCS). The second step is to analyse the data and the third step is to consider how to reduce GHG emissions from international shipping. During the Marine Environment Protection Committee session (MEPC70) in 2016 IMO member states also approved a Roadmap for Developing a Comprehensive IMO Strategy on Reduction of GHG emissions from Ships. The Strategy should be finalised by MEPC72 in 2018. According to the Roadmap, by 2023 IMO member states should come to an agreement on a final strategy on short, medium, and long-term measures, taking into account the results from the IMO Data Collection System.

The Black Carbon (BC) emissions also have a huge impact on climate change, especially in the polar areas. Finland is committed to decreasing BC emissions in the polar regions and supports legally binding regulations on black carbon that are currently lacking in the Polar Code. The Finnish Transport Safety Agency Trafi together with the Finnish Meteorological Institute (FMI) and VTT Technical Research Centre of Finland Ltd are conducting studies to test the candidate measuring methods and collect data on BC emissions from shipping. Preliminary results are introduced in IMO, but more research work is needed before any regulations to limit BC emissions can be considered.

## Summary of policies and measures

A summary of the policies and measures for international bunkers is presented in Table 4.7.

### 4.5.4 Industrial processes and product use

The most significant CO<sub>2</sub> emissions from industrial processes and product use are included in the EU ETS and are covered in Section 4.5.1. The remaining CO<sub>2</sub> sources in this sector are small and no specific policies in the WM projection target either these emissions or the CH<sub>4</sub> emissions from industrial processes and product use. Since 2013, nitric acid production is included in the EU ETS, and therefore, the mitigation impact of measures relating N<sub>2</sub>O emissions has not been estimated for future years. Therefore, the policies and measures described in this section are those mitigating F-gases.

### Policies and measures in the WM projection

The amount of emissions from F-gases (HFC, PFC, SF<sub>6</sub>) was about three per cent of total emissions in 2015. Emissions from the use of HFC have increased since the 1990s, while PFC emissions have declined since their peak level in the late 1990s and SF<sub>6</sub> emissions have decreased compared to 1990, the peak level of SF<sub>6</sub> emissions. The most important regulations affecting the amount of these gases are the F-gas regulation<sup>52</sup> and the directive relating to HFC emissions from air-conditioning systems in motor vehicles.<sup>53</sup> Also, technical development has affected the development of emissions. F-gases are not produced in Finland.

The WM projection for F-gases includes the impacts of the EC regulation and the EC directive referred to above. Emissions from refrigeration and air conditioning equipment are expected to decline due to measures and technical changes leading to smaller

52 2014/517/EC

53 2006/40/EC

Table 4.7  
Policies and measures according to the WM (marked with \*) and WAM projections for international bunkers

Name of policy or measure/mitigation action	Objective and/or activity affected	GHG(s) affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact in kilotonnes CO <sub>2</sub> equivalent							
								1995	2000	2005	2010	2015	2020	2025	2030
*Energy Efficiency Design Index (EEDI) for new ships; Ship Energy Efficiency Management Plans (SEEMP)	To save energy and reduce emissions	CO <sub>2</sub>	Regulatory	Implemented	The new IMO regulations set binding energy efficiency targets based on EEDI for new ships and require compilation of SEEMP by ships, the gross tonnage of which over 400 tonnes.	2013	Ministry of Transport and Communications	0	0	0	0	NA	NA	NA	NA
*Aviation Emissions Trading	To reduce emissions	CO <sub>2</sub>	Regulatory	Implemented	Aviation is included in EU emissions trading	2012	Ministry of transport and communications	0	0	0	0	NA	NA	NA	NA
*Maritime Transport MRV Regulation	To reduce emissions from international shipping	CO <sub>2</sub>	Regulatory	Implemented	In order to reduce CO <sub>2</sub> emissions from shipping at EU level, a system for monitoring, reporting and verification (MRV) of CO <sub>2</sub> emissions based on the fuel consumption of ships has been set up as a first step of a staged approach for the inclusion of maritime transport emissions in the EU's greenhouse gas reduction commitment.	2015	Ministry Transport and Communications	0	0	0	0	NA	NA	NA	NA
Liquefied natural gas and other alternative fuels in the sea traffic	To increase the use of alternative fuels, including renewables	CO <sub>2</sub>	Regulatory, economic, information	Planned	The use of alternative fuels in marine transport is promoted.		Ministry of Economic Affairs and Employment, Ministry of Transport and Communications, Finnish Transport Safety Agency Trafi	0	0	0	0	NA	NA	NA	NA
Biofuels in air traffic	To increase the use of renewables	CO <sub>2</sub>	Regulatory and/or economic	Planned	The use of biofuels in aviation are promoted.		Ministry of Economic Affairs and Employment, Ministry of Transport and Communications, Finnish Transport Safety Agency Trafi	0	0	0	0	NA	NA	NA	NA
Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)	To offset and reduce emissions	CO <sub>2</sub>	Regulatory	Adopted	Global market-based measure scheme for international aviation was adopted in ICAO	2021	Ministry of Transport and Communications	0	0	0	0	0	0	NA	NA
Regulations on Black Carbon (BC)	Mitigate GHG-emissions and decrease BC emissions in the polar regions	BC	Regulatory	Planned	To introduce legally binding regulations on black carbon in the Polar Code.		Ministry of Transport and Communications	0	0	0	0	0	NA	NA	NA
IMO data collection system (DCS) and Roadmap for Developing a Comprehensive IMO Strategy on Reduction of GHG-emissions from Ships	To reduce emissions from international shipping	CO <sub>2</sub>	Regulatory	Planned	To collect data on fuel consumption and consider measures to reduce GHG-emissions from international shipping.	2023	Ministry Transport and Communications	0	0	0	0	0	0	NA	NA

NA = not available

charges and decreased leakage implemented under these regulations. Key drivers of the F-gas regulation in cutting the emissions are the phase down of HFCs that can be placed on the EU market and the bans on the use of HFCs in different applications. They will lead to a replacement of HFCs with low GWP alternatives in most applications.

Emissions from electricity distribution equipment have declined heavily as a result of voluntary actions by the industries. Only a slight increase in emissions is assumed in the future but the peak level of emissions in the 1990s will not be reached. Restrictions forced by the EC regulation have a decreasing effect on emissions from foam blowing, aerosols and other sources. The emissions from foam blowing and aerosols are expected to decrease in the future. The emissions from other sources are expected to stay quite steady. Emissions from refrigeration and air-conditioning equipment account for more than 90 per cent of Finnish F-gas emissions, and therefore the projected overall emission trend is declining.

The mitigation measures have been able to cut the almost exponential increase in emissions from refrigeration and air-conditioning equipment that started in the mid-1990s.

### Policies and measures in the WAM projection

The WAM projection of F-gases is based on additional measures that are expected to promote the alternative low GWP non-HFC technologies in the refrigeration and air conditioning equipment sector in addition to the F-gas regulation. These additional measures include criteria for public procurement that are related to F-gases and information and education campaigns.

It is estimated that the emission reduction achieved by these additional measures will be 0.3 million tonnes CO<sub>2</sub> eq. in 2030.

### Summary of policies and measures

A summary of the policies and measures in the industrial processes and product use sector is presented in Table 4.8.

## 4.5.5 Agriculture

### Policies and measures in the WM projection

Finnish agricultural policy is based on the view that the competitive disadvantage due to natural conditions (such as the short growing period, low temperatures, frosts and problematic drainage conditions) must be compensated for in order to have profitable domestic production and to make agriculture sustainable and multifunctional. The objectives of sustainable and multifunctional agriculture include taking into account greenhouse gas emissions, the possible need for adaptation measures and other environmental and socio-economic aspects. These objectives can be reached through the Common Agricultural Policy (CAP) of the EU as well as through national measures. According to conclusions made by the European Council, agricultural production should continue in all areas of the Community.

Some of the effective climate policy measures may conflict with agricultural policy objectives and measures, such as securing the availability of food and animal welfare and reducing the strain on water systems. If Finnish consumption patterns remain unchanged, a reduction in domestic agricultural production would probably not reduce global greenhouse gas emissions because domestic production would be replaced by production elsewhere.

Annual CH<sub>4</sub> and N<sub>2</sub>O emissions from agriculture have fallen by 14 per cent over the period 1990 to 2015 mainly due to a decrease in the number of livestock and in nitrogen

Table 4.8

## Policies and measures according to the WM (marked with \*) and WAM projections in the industrial processes and product use sector

Name of policy or measure/mitigation action	Objective and/or activity affected	GHG(s) affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact in kilotonnes CO <sub>2</sub> equivalent							
								1995	2000	2005	2010	2015	2020	2025	2030
*Revised Environmental Protection Act (423/2015) and the related Government Decree (766/2016)	Reduction of emissions of fluorinated gases, Replacement of fluorinated gases by other substances	HFC, PFC, SF <sub>6</sub>	Regulatory	Implemented	National implementation of of the EU F-gas regulation 517/2014	2015	Ministry of the Environment	0	0	IE	IE	IE	IE	IE	IE
*Improved enforcement of F-gas regulations	Reduction of emissions of fluorinated gases, Replacement of fluorinated gases by other substances	HFC, PFC, SF <sub>6</sub>	Regulatory, Information	Implemented	Enhance cost-effective compliance monitoring: further support and information for inspectors, targeted information dissemination on new regulations to different groups of stakeholders	2015	Ministry of the Environment, Finnish Environment Institute, Finnish Safety and Chemicals Agency	0	0	IE	IE	IE	IE	IE	IE
*The EU-wide measures of Regulation 517/2014/EU	Reduction of emissions of fluorinated gases, Replacement of fluorinated gases by other substances	HFC, PFC, SF <sub>6</sub>	Regulatory	Implemented	The EU-wide measures of regulation 517/2014 where no national implementation takes place (e.g. phase-down schedule on placing on the market of HFCs, enhanced leakage prevention and bans on certain equipment)	2015	Ministry of the Environment	0	0	IE	IE	IE	IE	IE	IE
*Aggregated impact of the policies and measures in the WM scenario		HFC, PFC, SF <sub>6</sub>			Regulation 517/2014/EU replaced the first F-gas regulation 842/2006/EU that was adopted in 2006. The estimated aggregated impact includes also the effect of the regulation from 2006.	2006		0	0	745	1,008	1,423	1,821	2,259	2,763
Criteria for public procurement containing F-gases	Reduction of emissions of fluorinated gases, Replacement of fluorinated gases by other substances	HFC, PFC, SF <sub>6</sub>	Information, Other	Planned	Criteria for public procurement containing F-gases to promote the transition from HFC technologies to alternative low GWP technologies	2018	Ministry of Environment, Finnish Environment Institute	0	0	0	0	0	IE	IE	IE
Information and education campaign to promote alternative non-HFC technologies and recovery of F-gases	Reduction of emissions of fluorinated gases, Replacement of fluorinated gases by other substances	HFC, PFC	Information	Planned	Information and education campaign to promote alternative non-HFC technologies and recovery of F-gases	2018	Ministry of the Environment, Finnish Environment Institute	0	0	0	0	0	IE	IE	IE
Aggregated impact of the policies and measures in the WAM scenario		HFC, PFC, SF <sub>6</sub>						0	0	0	0	0	2	241	324

NA = not available

IE = included elsewhere (It has been possible to estimate only the impact of aggregated the policies and measures. The aggregated impacts have been presented separately for the WM and WAM scenario).

fertilisation. Changes in agricultural policy and farming subsidies have had a significant influence on agricultural activities, and hence, on the emissions from this sector.

There are measures in the CAP aiming to reduce greenhouse gas emissions. The agri-environmental payment programme has been part of the Rural Development Programme for Mainland Finland<sup>54</sup> 2007 to 2013. In the new Rural Development Programme for Mainland Finland 2014 to 2020 the agri-environmental payment programme is replaced by environmental compensation payments. They are essential tools for promoting sustainable development in agriculture, and 86 to 90 per cent of Finnish farmers have participated in them.<sup>55</sup> Their objectives are to decrease the nutrient load on the environment, especially on surface and ground waters, and to preserve plant and animal biodiversity and the rural landscape. The measures also aim to maintain or improve the productive capacity of agricultural land and reduce greenhouse gas and other air emissions as well as to adapt to climate change. One measure to reduce emissions from organic soils is support to long-term cultivation of grass on organic soils.

In the Rural Development Programme 2014 to 2020 there are several measures for climate change mitigation and adaptation: environment compensation payments for incorporation of slurry, recycling of nutrients and organic matter, environment management of grassland, cultivation of catch crops, plant cover on arable land in winter and use of organic mulch for horticulture crops and seed potato to increase the amount of carbon in arable soil. Agricultural investment aid can be targeted to controlled subsurface drainage and more efficient handling, storage and use of manure. There is also a support system for investments in renewable energy, for example, in biogas plants. As a part of the programme advisory services will be provided regarding the cross-compliance conditions, greening payments, climate change mitigation and adaptation, biodiversity, protection of water and soil, environment payments, maintaining agricultural land, organic production and issues related to environmental efficiency, including more efficient energy use and renewable energies. Implementation of the Rural Development Programme 2014 to 2020 started in 2015.

The Climate Programme for Agriculture (“Steps towards environmentally-friendly food”)<sup>56</sup> was finalised in November 2014 and it is under implementation. The Climate Programme for Finnish Agriculture prepared by the Ministry of Agriculture and Forestry aims to further enhance the sustainability of the Finnish food system, which is founded on profitable food production and responsible consumption. By improving sustainability in a comprehensive way, it is also possible to increase the profitability of production. The objective is to improve the energy and material efficiency and reduce emissions per litre or kilogram of production. The Climate Programme for Finnish Agriculture presents a total of 76 measures to facilitate the adaptation of food production and consumption to climate change and/or to mitigate the climate change. Key measures identified in the Climate Programme for mitigation are carbon sequestration into soil, measures relating to the use of peatlands, handling and treatment of manure, more accurate nitrogen fertilization, improvements in energy efficiency, and production and consumption of renewable energy.

Making use of the agricultural nutrients project<sup>57</sup> is a three-year pilot programme (2016 to 2018). This programme is part of the government key project for the circular economy, introduced in the government programme. It conveys information on the funding possibilities related to the recycling of nutrients and essential research knowledge to

54 The programme covers the territory of Finland excluding the Åland Islands.

55 Rural Development Programme for Mainland Finland 2014–2020 is based on a European Parliament and Council Regulation (EU) no 1303/2013 and 1305/2013)

56 [http://mmm.fi/documents/1410837/1867349/Climate\\_programme\\_agriculture\\_WEB\\_03072015.pdf/1a6f135c-068c-48aa-ad00-787562628314](http://mmm.fi/documents/1410837/1867349/Climate_programme_agriculture_WEB_03072015.pdf/1a6f135c-068c-48aa-ad00-787562628314)

57 <http://mmm.fi/en/recyclenutrients>

practical operators. It identifies the bottlenecks in nutrient recycling and facilitates their elimination as well as promotes the networking and new experiments of nutrient recycling operators. It is also possible to fund advanced nutrient recycling investments.

The Rural Development Programmes for Mainland Finland have been the main instruments to implement climate change mitigation and adaptation measures in the agriculture sector. Rural Development programmes are evaluated as defined in the Parliament and Council regulation<sup>58</sup>. At programme level Finland has defined an evaluation plan and an implementation plan for evaluating climate change issues.

### Policies and measures in the WAM projection

New measures are identified in the Medium-term Climate Change Policy Plan. The Sector Plan for agriculture includes activities relating to reducing emissions from organic soils, for example, intensification of long-term grass cultivation and afforestation on organic soils. There are also new measures to replace fossil fuels with biogas in agriculture.

### Summary of policies and measures

A summary of the policies and measures in the agriculture sector is presented in Table 4.9.

## 4.5.6 Land use, land-use change and forestry

### Policies and measures in the WM projection

The land use, land-use change and forestry (LULUCF) sector affects the mitigation of climate change in three different ways, by:

- Conserving and enhancing carbon storages and sinks
- Creating new carbon storages and sinks
- Substitution, i.e. replacing fossil-based energy, raw materials and products with renewable biomass.

The LULUCF sector as a whole acts as a net sink in Finland because the emissions under this sector are smaller than the removals. This net sink from the LULUCF sector can vary greatly from one year to the next: in the period 1990 to 2015, it was between 12.4 and 38.0 million tonnes CO<sub>2</sub> eq. In 2015, the net sink was 26.0 million tonnes CO<sub>2</sub> eq.

The largest sink in the LULUCF sector is forest land. The tree growth removes more CO<sub>2</sub> from the atmosphere than is released as the result of harvesting and natural mortality. In 2015, the net removals were 30.3 million tonnes CO<sub>2</sub> eq. These net removals have varied much annually, from 19.3 to 51.3 million tonnes CO<sub>2</sub> eq. during the period 1990 to 2015. The interannual variation is mainly due to changes in forest harvesting levels.

According to the National Forest Inventory, the annual increment of growing stock has been increasing since the 1970s, reaching its current level of 105 million cubic metres, of which 99 million cubic metres is in commercially managed forests.

Finland's forest policy aims at sustainable forest management, and the policy measures include legislation, the National Forest Strategy 2025 (NFS), financial support and extensive public forestry organisations. For more information on these, see Section 4.4.

The studies by the Finnish Natural Resources Institute (Luke) indicate that Finnish forests will act as a net sink in the future, too. The objective for the forests' carbon sink (incl. trees and soil) set out in the NFS is to maintain the sink at a level of at least 13.5 to 20 million tonnes CO<sub>2</sub> eq. per year up to 2025. The harvesting of wood is targeted to increase by 10 to 15 million cubic metres a year. The objectives and measures in the National Energy and Climate Strategy for 2030 are consistent with the policy defined

<sup>58</sup> 1305/2013/EU (rural development regulation)

Table 4.9

## Policies and measures according to the WM (marked with \*) and WAM projections in the agriculture sector

Name of policy or measure/mitigation action	Objective and/or activity affected	GHG(s) affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact in kilotonnes CO <sub>2</sub> equivalent							
								1995	2000	2005	2010	2015	2020	2025	2030
*Implementation of the Nitrates Directive (1991/676/EEC)	Reduction of fertilizer/manure use on cropland, Improved animal waste management systems	N <sub>2</sub> O	Regulatory	Implemented	Decreases greenhouse gas emissions and the use of mineral fertilisers.	2014	Ministry of Agriculture and Forestry	0	0	0	0	NA	NA	NA	NA
*Implementation of Common Agricultural Policy: EU direct payments	Activities improving grazing land or grassland management, Improved management of organic soils	CH <sub>4</sub> , N <sub>2</sub> O	Economic, Regulatory	Implemented	As from 2015 new environmental requirements have been incorporated into the single payments under the Common Agricultural Policy of the EU. 30 per cent of the direct payments are tied to the so-called greening. There are three greening measures that the farmers must implement in their eligible area: crop diversification, preserving permanent grassland and requirement concerning ecological focus area.	2014	Ministry of Agriculture and Forestry	0	0	0		NA	NA	NA	NA
*Implementation of Common Agricultural Policy: The Rural Development Programmes for Mainland 2014–2020 (Regulation (EU) no 1303/2013 and 1305/2013)	Reduction of fertilizer/manure use on cropland, Improved livestock management, Improved animal waste management systems, Activities improving grazing land or grassland management, Improved management of organic soils	CH <sub>4</sub> , N <sub>2</sub> O	Economic, Regulatory	Implemented	"The Rural Development Programme for Mainland Finland 2014–2020 is an essential tool for promoting sustainable development in agriculture. Environmental compensation payments are part of the programme. Agri-environmental payment programme covers about 86 per cent of farms in Finland. It promotes decreasing nutrient load, preserving plant and animal biodiversity and the rural landscape, improving the productive capacity of agricultural land, and reducing GHG emissions. Measures: environment management of grasslands: riparian zones, perennial environment grasslands, nature management field grasslands, controlled subsurface drainage investments and management measures for them."	2014	Ministry of Agriculture and Forestry	0	0	0	0	NA	NA	NA	NA
*Climate Programme for Finnish Agriculture – Steps Towards Climate Friendly Food	Reduction of fertilizer/manure use on cropland, Improved livestock management, Improved animal waste management systems, Activities improving grazing land or grassland management, Improved management of organic soils, Increase in renewable energy (Energy supply), Efficiency improvement in the energy and transformation sector (Energy supply), Prevention of deforestation (LULUCF), Multi-sectoral policy	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O	Information, Research, Economic, Regulatory	Implemented	The Climate Programme for Finnish Agriculture presents a total of 76 measures to facilitate the adaptation of food production and consumption to climate change and/ or to mitigate the change. The selection of the measures was based on the most recent scientific research results and views of various experts involved in the food system. By implementing the measures put forward in the programme we will achieve more climate friendly food production and consumption.	2014	Ministry of Agriculture and Forestry	0	0	0	0	NA	NA	NA	NA
Activities of organic soils <sup>1)</sup>	Additional activities improving grassland management, improved management of organic soils, afforestation	N <sub>2</sub> O	Economic	Planned	The target is to reduce emissions from organic soils (long term grass cultivation and afforestation)	2021	Ministry of Agriculture and Forestry						0	225	450
Promoting the production and use of biogas	Reduction of emissions from manure management and increase in renewable energy (impacts on emission from energy use are included under Energy, promoting biogas in electricity and heat production)	CH <sub>4</sub>	Economic	Planned	The target is to replace fossil fuels with biogas in agriculture	2021	Ministry of Agriculture and Forestry	0	0	0	0	0	0	25	50

NA = not available

1) This measure affects emissions both in the agriculture sector and the LULUCF sector. Reduction in N<sub>2</sub>O emissions are presented in this table. Reductions in CO<sub>2</sub> emissions are presented in Table 4.10.

in the NFS regarding the increase in industrial roundwood and energy wood, and they will help achieve the target set by the directives on promoting the use of energy from renewable sources.<sup>59</sup> The global economic development will greatly influence the achievements of the NFS goals.

The national measures are set out in the NFS<sup>60</sup>. The measures, consistent with the National Energy and Climate Strategy for 2030, include implementing the following strategic projects in order to secure the climatic advantages provided by forests and to ensure the availability of renewable raw materials:

- Forest-related information and e-services of the future. The project will develop a next-generation forest related information system and a process for keeping the information resources up to date.
- Statistics on the renewing forest-based business and activities. Collection of statistics on the interfaces between the forest, energy and chemical industries, nature tourism, forestry-related services and other forest-based business and ecosystem services will be improved.
- Development of active forest management, entry of timber to the market and forest ownership structure. Underpinned by studies, forestry taxation and legislation will be developed to support active forest management, entry of timber to the market and a change in the forest ownership structure.
- New incentive schemes and resource-efficient forest management. The project will prepare a future incentive scheme for forest management that promotes active and resource efficient forest use and welfare derived from non-market benefits.

With regard to agricultural soils, CO<sub>2</sub> emissions and removals from croplands and grasslands are not expected to be subject to large changes in the WM projection by 2030. The CO<sub>2</sub> emission reductions due to increasing the area of perennial crops on organic soils and due to other measures in the Rural Development Programme (see Section 4.5.5) are presented in Table 4.10 below.

### Policies and measures in the WAM projection

For cropland and grassland the measures in the National Energy and Climate Strategy for 2030 include developing farming to increase sinks and launching a relating pilot project, developing measures to monitor soil carbon sequestration in agricultural soils and studying the influence of CAP to soil carbon and prepare proposals how in the renewal of CAP, farmers could be encouraged to increase sinks.

Measures which are identified in the Medium-term Climate Change Policy Plan relating to reducing emissions from organic soils from the agriculture sector also have effects on emissions from the LULUCF sector.

### Implementation of Articles 3.3 and 3.4 of the Kyoto Protocol

Articles 3.3 and 3.4 of the Kyoto Protocol concern emissions and removals from land use, land-use change and forestry (LULUCF) activities. Article 3.3 activities (afforestation, reforestation and deforestation) are based on land-use changes, and reporting these activities is mandatory for the Annex I Parties. Under Article 3.4, the election of activities (forest management, cropland management, grazing land management and revegetation) was voluntary for Parties during the first commitment period. During the second commitment period, forest management (FM) has become a mandatory activity. Finland had elected to apply FM already in the first commitment period but has not elect-

59 2001/77/EC and 2009/28/EC

60 <http://mmm.fi/en/nfs>

ed other voluntary activities for neither commitment period. The accounting for the emissions and removals under Article 3, Paragraphs 3 and 4 was done at the end of the first commitment period, and will be done so also for the second commitment period.

Based on a study by the Natural Resources Institute (Luke), Article 3.3 activities are estimated to cause net emissions for the period 2013 to 2020. This is due to land-use changes as a result of converting forest land to other land uses as well as low carbon sequestration rates in areas afforested or reforested since 1990. During the period 2012–to 2015, the emissions were, on average, 3.2 million tonnes CO<sub>2</sub> eq. per year. Land-use change from forest land to other land uses is difficult to avoid in a country where forests cover 72 per cent of the land area. Most of the change is driven by settlements, agriculture and infrastructure (e.g. roads and transmission lines). The emissions under Article 3.3, estimated to be around 24 million tonnes for the whole commitment period, will be subtracted from Finland's assigned amount at the end of the commitment period.

The FM net sink between 2013 and 2015 has been approximately 53.3 million tonnes CO<sub>2</sub> eq. per year. These net removals for FM include the net removals from harvested wood products, which have been, on average, 18.1 million tonnes during 2013 to 2015. Net removals from forest management vary significantly based on the overall economic situation. The NFS estimates that the annual carbon sink of forests (incl. trees and soil but excl. HWP) will remain at a level of at least 13.5 to 20 million tonnes CO<sub>2</sub> eq. by 2025 if logging increases by 10 to 15 million cubic metres a year, as is currently projected. The policy defined in the NFS regarding the increase in industrial roundwood and energy wood is consistent with the National Climate and Energy strategy and it will help to achieve the target set by the directive on promoting the use of energy from renewable sources.

The net emissions from FM will be compared to the reference level established for Finland (–20.466 million tonnes CO<sub>2</sub> eq.) in decision 2/CMP.2 adjusted with the technical correction (–13.583 million tonnes CO<sub>2</sub> eq. in Finland's latest inventory submission). A higher sink will result in RMU units which can be used to meet the reductions target, a lower sink will mean subtraction of assigned amount units equal to the difference between FM and reference level removals. Additional RMU units can be received only up to a value of 3.5 per cent of the 1990 national total emissions without the LULUCF sector. Finland's cap value for the FM sink is –19.978 million tonnes CO<sub>2</sub> eq. Based on the recent inventory data, it is likely that Finland can issue RMU units equal to this value at the end of the commitment period. However, due to pending technical corrections to the reference level and uncertainties in the harvesting amounts, this estimate is still uncertain.

The information provided in Section 4.4 regarding how the Forest Act and METSO programme contribute to the conservation of biodiversity and the sustainable use of natural resources is also applicable to lands under Articles 3.3 and 3.4 of the Kyoto Protocol. Detailed information on Kyoto Protocol activities under Articles 3.3 and 3.4 is presented in Finland's latest National Inventory Report under the UNFCCC and the Kyoto Protocol.

### Summary of policies and measures

A summary of the policies and measures in the LULUCF sector is presented in Table 4.10.

Table 4.10  
Policies and measures according to the WM (marked with \*) and WAM projections in the LULUCF sector

Name of policy or measure/mitigation action	Objective and/or activity affected	GHG(s) affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact in kilotonnes CO <sub>2</sub> equivalent							
								1995	2000	2005	2010	2015	2020	2025	2030
*National Forest Strategy 2025	Conservation of carbon in existing forests, Enhancing production in existing forests, Increasing the harvested wood products pool, Enhanced forest management, Strengthening protection against natural disturbances, Substitution of GHG-intensive feedstocks and materials with harvested wood products. Contribute to increase in renewable energy supply (Energy)	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O	Economic, Regulatory, Fiscal	Implemented	The National Forest Strategy's (NFS) vision is to create welfare through sustainable forest management. It has the strategic objectives to improve competitive operating environment for forest-based business, to renew and diversify forest-based business and activities, and to enhance active, economically, ecologically and socially sustainable and diverse use of forests. Implementation of the Bioeconomy Strategy and the Energy and Climate Strategy has substantial links with achieving the objectives of the NFS.	2015	Ministry of Agriculture and Forestry	0	0	0	0	0	NA	NA	NA
Activities of organic soils <sup>1)</sup>	Additional activities improving grassland management, improved management of organic soils, afforestation	CO <sub>2</sub>	Economic	Planned	The target is to reduce emissions from organic soils (long term grass cultivation and afforestation)	2021	Ministry of Agriculture and Forestry	0	0	0	0	0	0	570	1,140

NA = not available

1) This measure affects emissions both in the agriculture sector and the LULUCF sector. Reductions in CO<sub>2</sub> emissions are presented in this table. Reductions in N<sub>2</sub>O emissions are presented in Table 4.9.

## 4.5.7 Waste management

### Policies and measures in the WM projection

Greenhouse gas emission projections from the waste sector include CH<sub>4</sub> from landfills, CH<sub>4</sub> and N<sub>2</sub>O emissions from composting and CH<sub>4</sub> and N<sub>2</sub>O emissions from wastewater treatment. Finnish waste legislation is largely based on the EU's Landfill Directive,<sup>61</sup> Waste Directive<sup>62</sup> and Waste Framework Directive.<sup>63</sup> The first Waste Tax Act<sup>64</sup> entered into force in 1996 for municipal landfills. The tax level per tonne of waste has increased from EUR 15.15/t in 1996 to EUR 23/t in 2003, EUR 30/t in 2005 and EUR 40/t in 2011. A new Waste Tax Act<sup>65</sup> entered into force at the beginning of 2011 and replaced the former Waste Tax Act. The purpose of the new Waste Tax Act is to collect tax from those waste fractions that could be technically and environmentally recovered but are currently being disposed in landfill sites. The tax list for waste is based on a Commission decision<sup>66</sup> regarding what to include in the waste list. The industrial landfills are under taxation as well. The waste tax was EUR 40 per tonne in 2011 and EUR 50 per tonne in 2013. In 2015 it was raised to EUR 55 per tonne<sup>67</sup>, and in 2016 to EUR 70 per tonne.

Enforcement of the Waste Act<sup>68</sup> and the Decree on Waste<sup>69</sup> will continue to increase recycling and recovery, thus further replacing landfilling, and will contribute to reducing greenhouse gas emissions as well. The Decree on Packaging and Packaging Waste<sup>70</sup> is also intended to increase recycling. The restrictions on landfilling of biodegradable municipal waste have been made stricter over a number of years. The Decree on Landfills<sup>71</sup> generally restricts the amount of biodegradable and other organic waste to less than 10 per cent total organic carbon (TOC) after 2016 except for building waste where the 10 per cent rule enters into force in 2020. From 2016 until the end of 2019, the limit value for organic carbon content in building waste is set to 15 per cent. These restrictions are expected to increase incineration of waste from current levels. According to the National Energy and Climate Strategy for 2030, additional efforts will be taken to enforce the restrictions on the landfilling of biodegradable waste.

The monitoring of the effectiveness of the policies and measures affecting waste are based on statistics and modelling that follows the IPCC methodology for estimating emissions. It is not possible to identify in detail the effects of individual policy measures in terms of emission reductions. The overall reduction that has been achieved has been estimated by using 1990 as a base year, when none of the climate-oriented waste policies were yet in place. When estimating the mitigation impact, the assumption has been made that 1990 would represent the average emission level without measures. This assumption is conservative as the amount of waste would probably have changed and the gradual accumulation of waste would have increased CH<sub>4</sub> emissions. The average emissions from the waste sector in 1990 to 1995 were approximately 4.7 million tonnes CO<sub>2</sub> eq but by 2010 significant reductions of more than 2 million tonnes CO<sub>2</sub> eq had been achieved.

The same IPCC-based modelling methodology is also used for projections based on assumed developments in the amount of waste. The projections for the waste sector

61 1999/31/EC

62 2006/12/EC

63 2008/98/EC

64 495/1996

65 1126/2010

66 2000/532/EC

67 1072/2014

68 646/2011

69 179/2012

70 518/2014

71 331/2013

do not, however, include emissions from waste incineration, which belong to the energy sector emissions.

Greenhouse gas emissions from the waste sector were 54 per cent lower in 2015 than in 1990 and will decrease further in the WM projection (See Chapter 5, Table 5.9). The main reason for this is the implementation of the Landfill Directive and national legislation and strategies that aim at reducing the amount of waste and minimising the amount of waste delivered to the landfills. The reform of the waste legislation, previously reported in the WAM projection, has now been included in the WM projection, leading to an additional reduction in emissions relative to those reported earlier. Currently no additional measures are scheduled for the waste sector. Hence, there is no separate WAM projection.

### Summary of policies and measures

A summary of the policies and measures in the waste sector is presented in Table 4.11.

#### 4.5.8 Land-use planning and spatial structure

The development of the urban structure has long-term effects on greenhouse gas emissions from transport and buildings. The most significant solutions that concern cutting emissions in the urban structure are associated with sustainable urban development: the urban structure and effective functioning of urban subregions, coordination of land use and transport, creating preconditions for renewable energy production and enabling a low-emission lifestyle. In urban subregions, the preconditions for this include good public transport services and a network of pedestrian and cycling routes, a living and well-functioning city centre and good accessibility of recreational and green areas. Effective urban subregions are a prerequisite for a thriving business life and Finland's competitiveness. There may be significant differences between the practical solutions used to reduce emissions in different parts of the country.

Preconditions for increasing wind power production include coordinating wind power construction with land use in the surrounding areas, giving sufficient consideration for negative impacts and ensuring local acceptability. In order to promote planning, the Land-Use and Building Act contains specific provisions on local master plans that apply to wind power construction directly. Rapid progress has been made in recent years in land-use planning for wind power construction. An amendment to the Land-Use and Building Act (1.4.2017) for the installation and construction of solar panels and solar collectors harmonises and streamlines the permit procedure so that permit consideration would only be required for solar panels or collectors that have significant impacts on the townscape or the environment.

The most recent National Energy and Climate Strategy for 2030 includes policy objectives that aim to minimise greenhouse gas emissions related to land use and the urban structure.

The National Energy and Climate Strategy for 2030 specifies the following policy objectives in relation to the spatial structure and related land-use planning:

- The effectiveness of land use and mobility in urban subregions will be promoted by developing legislation and the land-use planning system, by updating the national land use objectives, and through agreements between the central government and municipalities. Transport infrastructure implementation will be linked to land-use planning and construction with the aim of reducing emissions.
- In growing urban subregions, new construction will primarily be directed to areas with existing services and public transport. Outside growing urban centres, land use steering will be developed taking into account the need to develop areas, new trends

Table 4.11

## Policies and measures according to the WM (marked with \*) and WAM projections in the waste sector

Name of policy or measure/mitigation action	Objective and/or activity affected	GHG(s) affected	Type of instrument	Status of implementation	Brief description	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact in kilotonnes CO <sub>2</sub> equivalent							
								1995	2000	2005	2010	2015	2020	2025	2030
Government decision on packaging and packaging waste 962/1997, 1025/2000, 987/2004, 817/2005, 2014/518*	Demand management / reduction, Enhanced recycling, Waste incineration with energy use, Reduced landfilling	CO <sub>2</sub> , CH <sub>4</sub>	Regulatory	Implemented	The Decision is specifying the criteria and markings on packaging waste. It is basically regulatory, but also economic by specifying the system for handling packaging waste. The key actor is the Environmental Register of Packaging PYR Ltd, which is a non-profit firm, operating in conjunction with producer organisations in the packaging sector. It helps firms registered with PYR and the authorities to fulfil packaging recovery obligations economically and easily.	1997	Ministry of the Environment	0	IE	IE	IE	IE	IE	IE	IE
Government decree on landfills (861/1997, revised 2006), Biowaste strategy (2004)*	Demand management /reduction, Enhanced recycling, Reduced landfilling, Enhanced CH <sub>4</sub> collection and use, Improved treatment technologies	CH <sub>4</sub>	Regulatory	Implemented	Regulation on biodegradable waste	1997	Ministry of the Environment, Regional and local environmental authorities	0	IE	IE	IE	IE	IE	IE	IE
General reform of waste legislation; Act on Waste (646/2011); Decree on Waste (179/2012); Waste Tax Act (1126/2010)*	Demand management / reduction, Enhanced recycling, Enhanced CH <sub>4</sub> collection and use, Improved treatment technologies, Improved landfill management, Waste incineration with energy, Reduced landfilling	CO <sub>2</sub> , CH <sub>4</sub>	Regulatory, Economic, Information, Planning	Implemented	The reform provides the basis for more effective waste management with respect to recycling, reduced landfilling of organic waste, enhanced collection of CH <sub>4</sub> and regulated incineration, all contributing to reduced greenhouse gas emissions. The reform combines all different types of policy instruments from planning (mandatory waste plans) to regulation (basis for restrictions on landfills) and economic instruments (waste tax).	2012	Ministry of the Environment, Regional and local environmental authorities	0	0	0	0	IE	IE	IE	IE
New Decree on Landfills (331/2013)*	Improved landfill management, Reduced landfilling	CH <sub>4</sub>	Regulatory	Adopted	Regulation on landfills setting quantitative limits on amount and proportion of organic waste in land fill waste. Implementing and going beyond landfill directive.	2016	Ministry of the Environment, Regional and local environmental authorities	0	0	0	0	0	IE	IE	IE
Agregated impact of the above policies and measures*		CO <sub>2</sub> , CH <sub>4</sub>						75	821	1,848	2,088	2,538	2,870	3,166	3,361

IE = included elsewhere (It has been possible to estimate only the impact of aggregated policies and measures for the WM scenario).

of the natural resources economy and the strive for local energy production. Rural centres and villages will be strengthened to safeguard the local availability of services.

- In land-use planning and construction, and when making efforts to develop the steering of these sectors, preparation is made for utilising solar power.

In land-use planning, Finland will prepare to utilise extensively the country's wind power potential. In order to minimise the negative impacts of wind power plants, an effort will primarily be made to centralised wind power construction in large units at a sufficient distance from permanent housing.

Nearly all regions in Finland and many individual municipalities have prepared their own climate strategies. It is, however, difficult to provide quantitative emission reduction potentials for the policies and measures concerning land-use planning and the urban structure. The urban form influences emissions mainly in the energy sector, for example, through its effects on transport and the heating of buildings. In particular, emissions from daily mobility may be many times higher in car-oriented zones compared to urban centre areas. Emissions from the heating of buildings depend greatly on energy solutions for the dwelling and possible district heating. The location of a dwelling is also connected to emissions via the consumption of goods and services as well as long leisure trips, mainly due to spatial differences in income levels. The overall reductions in emissions in different regions are thus dependent not only on the urban structure, but also on complex processes that include lifestyle changes as well as economic conditions and developments.

## 4.6 Energy taxation and related measures

### 4.6.1 Energy taxation

Energy taxes are a substantial revenue source for the Government. They generate around EUR 4,600 million annually, or more than 10 per cent of the Government tax revenue. Over the past ten years, energy taxes have been increasing steadily in terms of the amount generated and as a share of the total tax revenue. Energy taxation is a key instrument of the Government's energy and climate policy.

Energy taxes are levied on electricity, coal, natural gas, peat, tall oil and liquid fuels. Major changes to the structure of energy taxation were introduced in January 2011. Energy taxation now takes account of the energy content, carbon dioxide emissions, local emissions and sulphur content of fuels (see Table 4.12 for details). The overall tax rates are driven primarily by the energy content component and the CO<sub>2</sub> component. An additional surcharge, called the strategic stockpile fee, is also added to the total (to cover expenses incurred by the state when securing the supply of energy).

The energy content component is levied on both fossil fuels and biofuels based on their volumetric energy content. Higher rates apply to fuels used in the transport sector. Lower rates apply in the case of gas oil, biofuel and heavy fuel oils and electricity used for agricultural purposes. The CO<sub>2</sub> component is based on the lifetime CO<sub>2</sub> emissions of the fuel in question, and for this reason biofuels are subject to a CO<sub>2</sub> tax rate that is reduced from 50 to 100 per cent if they meet the European Union's sustainability criteria. Carbon dioxide taxes for the fossil fuels used in combined electricity and heat production are also lowered by 50 per cent.

Furthermore, a reduced energy content tax is applied to fuel grades that are better in terms of local emissions than traditional fossil fuels. Local emissions are emissions causing health effects in nearby areas like NO<sub>x</sub> and particle emissions. The reduction

Table 4.12  
Energy taxes in Finland

Date	Energy taxes, strategic stockpile fees and oil pollution fees *											
	Fuels <sup>1</sup>							Electricity				
	Motor-gasoline, unleaded <sup>2)</sup>	Diesel fuel <sup>3)</sup>	Light fuel oil <sup>12)</sup>	Heavy fuel oil	Hard coal <sup>11)</sup>	Natural gas	Peat	Consumption		Production		
								Electricity, I <sup>4)</sup>	Electricity, II <sup>5)</sup>	Nuclear power	Hydro power	Imports
c/l			c/kg	€/t	c/nm <sup>3</sup>	€/MWh	c/kWh					
<b>Excise taxes <sup>10)</sup></b>												
1.1.1990	21.53	16.82	0.34	0.34	2.69	0.17	0.34	–	–	–	–	–
1.1.1995	45.12	27.5	3.02	3.12	19.53	0.94	0.59	–	–	0.4	0.07	0.37
1.7.2005	58.08	31.59	6.71	5.68	43.52	1.82	–	0.73	0.44	–	–	–
1.1.2007	58.08	31.59	6.71	5.68	43.52	1.82	–	0.73	0.22	–	–	–
1.1.2008	62.02	36.05	8.35	6.42	49.32	2.016	–	0.87	0.25	–	–	–
1.1.2011	62.02	36.05	15.7	18.51	126.91	8.94	1.9	1.69	0.69	–	–	–
1.1.2012	64.36	46.6	15.7	18.51	126.91	8.94	1.9	1.69	0.69	–	–	–
1.1.2013	64.36	46.6	15.99	18.93	131.53	11.38	4.9	1.69	0.69	–	–	–
1.1.2014	66.61	49.31	15.99	18.93	131.53	11.38	4.9	1.89	0.69	–	–	–
1.1.2015	67.45	50.26	18.39	21.84	153.24	15.36	3.4	2.24	0.69	–	–	–
1.1.2016	67.45	50.26	21.05	25.08	177.36	17.34	3.4	2.24	0.69	–	–	–
1.4.2016	67.45	50.26	21.05	25.08	177.36	17.34	1.9	2.24	0.69	–	–	–
1.1.2017	69.57	52.67	22.52	26.83	189.84	18.53	1.9	2.24	0.69	–	–	–
<b>Energy content tax <sup>8)</sup></b>												
1.1.2011	50.36	–	7.7	8.79	54.54	3	–	–	–	–	–	–
1.1.2012	50.36	30.7	7.7	8.79	54.54	3	–	–	–	–	–	–
1.1.2013	50.36	30.7	6.65	7.59	47.1	4.45	–	–	–	–	–	–
1.1.2014	50.36	30.7	6.65	7.59	47.1	4.45	–	–	–	–	–	–
1.1.2015	51.2	31.65	6.65	7.59	47.1	6.65	–	–	–	–	–	–
1.1.2016	51.2	31.65	6.65	7.59	47.1	6.65	–	–	–	–	–	–
1.1.2017	52.19	32.77	7.05	8.05	49.93	7.05	–	–	–	–	–	–
<b>Carbon dioxide tax <sup>9)</sup></b>												
1.1.2011	11.66	–	8	9.72	72.37	5.94	–	–	–	–	–	–
1.1.2012	14	15.9	8	9.72	72.37	5.94	–	–	–	–	–	–
1.1.2013	14	15.9	9.34	11.34	84.43	6.93	–	–	–	–	–	–
1.1.2014	16.25	18.61	9.34	11.34	84.43	6.93	–	–	–	–	–	–
1.1.2015	16.25	18.61	11.74	14.25	106.14	8.71	–	–	–	–	–	–
1.1.2016	16.25	18.61	14.4	17.49	130.26	10.69	–	–	–	–	–	–
1.1.2017	17.38	19.9	15.47	18.78	139.91	11.48	–	–	–	–	–	–
<b>Energy tax <sup>7)</sup></b>												
1.1.2011	–	–	–	–	–	–	1.9	1.69	0.69	–	–	–
1.1.2013	–	–	–	–	–	–	4.9	1.69	0.69	–	–	–
1.1.2014	–	–	–	–	–	–	4.9	1.89	0.69	–	–	–
1.1.2015	–	–	–	–	–	–	3.4	2.24	0.69	–	–	–
1.1.2016	–	–	–	–	–	–	3.4	2.24	0.69	–	–	–
1.4.2016	–	–	–	–	–	–	1.9	2.24	0.69	–	–	–
1.1.2017	–	–	–	–	–	–	1.9	2.24	0.69	–	–	–
<b>Strategic stockpile fees</b>												
1.7.1984	0.72	0.39	0.39	0.32	1.48	–	–	–	–	–	–	–
1.1.1997	0.68	0.35	0.35	0.28	1.18	0.084	–	0.013	0.013	–	–	–
<b>Oil pollution fees <sup>6)</sup></b>												
1.1.1990	0.28	0.031	0.031	0.037	–	–	–	–	–	–	–	–
1.1.2005	0.038	0.042	0.042	0.05	–	–	–	–	–	–	–	–
1.1.2010	0.113	0.126	0.126	0.15	–	–	–	–	–	–	–	–

1) Fuels in electricity production tax-exempt since 1 January 1997

2) Reformulated, since 1 January 1993, also sulphur-free since 1 September 2004. Fossil fuel

3) Sulphur-free, sulphur content < 50 ppm since 1 July 1993, sulphur content < 10 ppm since 1 September 2004. Fossil fuel.

4) Tax class I: others

5) Tax class II: industry, data centers, mining, professional greenhouses (also agriculture through tax rebates)

6) Fee for imported oil and oil products: EUR 1.50/t

7) Energy tax included in excise taxes

8) Energy content tax included in excise taxes

9) Carbon dioxide tax included in excise taxes

10) Excise taxes contain energy content tax, carbon dioxide tax, and energy tax

11) Excise taxes for hard coal is in the heat production. In CHP use excise tax is lower.

12) Fossil fuel. Sulphur free

\* see the full tax table: [http://ec.europa.eu/taxation\\_customs/tedb/taxDetails.html?id=4077/1496136747](http://ec.europa.eu/taxation_customs/tedb/taxDetails.html?id=4077/1496136747)

All rates based on energy content, local emissions and CO<sub>2</sub>-emissions. For example liquid biofuels have lower tax rate per litre thanks lower energy content and emissions.

corresponds to the imputed value of the emission benefit in accordance with the principles set out in the EU Directive<sup>72</sup> on the promotion of clean and energy-efficient road transport vehicles.

Energy taxation rules include exemptions and reduced tax rates resulting in tax expenditure. Fuel for commercial aviation and shipping are not taxed. Peat is taxed at a lower rate.

In transport, diesel fuel accounts for more than 50 per cent of CO<sub>2</sub> emissions and energy content. Diesel and corresponding biofuels are taxed at lower rates than gasoline and corresponding biofuels, leading to a tax expenditure compared to the taxes levied on gasoline. To compensate the difference, an annual propelling force tax is levied on diesel passenger cars and vans. In heating and process use, waste and biomass are not taxed and account for more than 40 per cent of the energy content and emissions from the heating and process use of fuels. All heating fuels are taxed at a lower rate than transport fuels.

Electricity used by industry is taxed at a much lower rate than electricity used for commercial and residential purposes. Energy taxes are not levied on energy used for the transformation of other fuels and for electricity in rail.

A further tax applied to diesel-driven vehicles is the annual propelling-force tax, which is, on average, EUR 420 per diesel vehicle. The annual propelling-force tax is levied to achieve the tax burden required by the environmental tax model, that is, to compensate the difference between the taxation of diesel and gasoline.

#### 4.6.2 Government expenditure on energy and climate policy

Government appropriations for the energy and climate policy are discussed and the relevant decisions are made within the central government spending limits in the General Government Fiscal Plan, coordinated with other expenditure needs of the public economy.

Table 4.13 shows a compilation of funding related to the energy and climate policy for 2017 to 2030 in the budget for 2017 and the General Government Fiscal Plan for 2017 to 2020. Table 4.14 provides initial estimates of the completely new funding needs arising from the new measures proposed in the National Energy and Climate Strategy for 2030 in 2017 to 2020 and 2021 to 2030. A significant part of strategy implementation costs would be realised after 2020.

The most important new funding needs arise from subsidising renewable energy. It is proposed that the current energy aid scheme be continued after 2020, and a general increase of EUR five million is proposed in the relevant budget authority.

### 4.7 Use of Kyoto mechanisms

The use of Kyoto mechanisms is one option to meet Finland's national emission reduction commitments of the Kyoto Protocol. It includes the use of project mechanisms (the Clean Development Mechanism (CDM) and Joint Implementation (JI)) or acquiring assigned amount units (AAU) through international emissions trading.

Finland's Government activities to provide Kyoto mechanisms started in the form of the CDM/JI pilot programme from 1999 until early 2006, followed by the Kyoto mechanism purchase programme that covers the period 2006 to 2020. The total budget for the acquisition of emission reductions from the Kyoto Protocol flexible mechanisms has been approximately EUR 70 million. The programme includes 10 bilateral projects and investments in several multilateral carbon funds.

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72 2009/33/EC

Table 4.13

Funding under the current General Government Fiscal Plan in accordance with the Government report on the National Energy and Climate Strategy for 2030

Appropriation	EUR million				
	2017	2018	2019	2020	2021–2030 Total
<b>MINISTRY OF ECONOMIC AFFAIRS AND EMPLOYMENT</b>					
Investment subsidies for renewable energy and new energy technologies	40	40			
Operating aid for electricity from renewable energy sources	245	305	305	245	1,340
<b>MINISTRY OF AGRICULTURE AND FORESTRY</b>					
Rural Development Programme:					
Certain agri-environment payment measures					
Balanced use of nutrients <sup>1)</sup>	103.2	103.2	103.2	103.2	
Incorporation of slurry into fields <sup>1)</sup>	7.4	7.4	7.4	7.4	
Control of runoff waters <sup>1)</sup>	6.0	6.0	6.0	6.0	
Environment management grasslands <sup>1)</sup>	35.4	35.4	35.4	35.4	
Wetland management <sup>1)</sup>	0.5	0.5	0.5	0.5	
Advice <sup>1)</sup>	4.0	4.0	4.0	4.0	
Renewable energy investments	9.0	9.0	9.0	9.0	
<b>TOTAL appropriations (national funding)</b>	<b>385</b>	<b>445</b>	<b>405</b>	<b>345</b>	<b>1,340</b>
<b>Budget authority</b>					
EUR million					
	2017	2018	2019	2020	2021–2030
<b>MINISTRY OF ECONOMIC AFFAIRS AND EMPLOYMENT</b>					
Energy aid (32.60.40.)	35	35	35	35	
<b>TOTAL budget authority</b>	<b>35</b>	<b>35</b>	<b>35</b>	<b>35</b>	<b>0</b>

1) Contains 42% of EU co-funding

Table 4.14

Estimate of new funding needs arising from the proposed measures

Appropriation	EUR million				
	2017	2018	2019	2020	2021–2030 Total
<b>MINISTRY OF THE ENVIRONMENT</b>					
Piloting of digital mobility services. Ministry of the Environment + Ministry of Transport and Communications	0.5	0.5	0.5	0.5	
Market experiments related to low-carbon business and service platforms (e.g. former railway stations as hubs)	2.5	2.5	2.5	2.5	
Guidance by information to promote wood construction		2	2	2	
<b>MINISTRY OF AGRICULTURE AND FORESTRY</b>					
Additional needs of R&D related to sink policy measures	0.75				
<b>MINISTRY OF ECONOMIC AFFAIRS AND EMPLOYMENT</b>					
Production aid for renewable electricity (new aid scheme based on a tendering process)				13	265
<b>MINISTRY OF TRANSPORT AND COMMUNICATIONS</b>					
Promoting energy-efficient vehicles (electricity and gas)		25	25	25	25
<b>TOTAL appropriations</b>	<b>4</b>	<b>30</b>	<b>30</b>	<b>43</b>	<b>290</b>
<b>Budget authority</b>					
EUR million					
	2017	2018	2019	2020	2021–2030
<b>MINISTRY OF ECONOMIC AFFAIRS AND EMPLOYMENT</b>					
Energy aid		5	5	5	400
Major new energy technology projects (incl. biorefineries)			60	60	240
<b>TOTAL appropriations</b>	<b>0</b>	<b>5</b>	<b>65</b>	<b>65</b>	<b>640</b>

In total, in the first Kyoto commitment period Finland procured approximately 6.2 million tonnes of project units. These units have been carried over to the second commitment period. The Kyoto mechanisms purchase programme will continue to deliver project units until 2020 through existing investments in carbon funds and one ongoing bilateral CDM project. A total of four million tonnes of project units are expected to be generated by the end of 2020. No decision on the use of Kyoto mechanisms for compliance purposes in the second commitment period of the Kyoto Protocol has been made.

In the EU emissions trading scheme, companies may partly meet their emission reduction obligations by using international credits from the Clean Development Mechanism (CDM) and Joint Implementation (JI). In the first Kyoto commitment period the operators used 12.3 million tonnes CERs and 4.1 million tonnes ERUs.

In the period 2008 to 2020, stationary installations and aircraft operators have an International Credit Entitlement (ICE) limit in use, i.e. the installations/aircraft operators can exchange eligible credits (CER/ERU) up to the maximum amount allowed by EU legislation. The allowances (EUAs) obtained in exchange can be used freely for compliance and trading. For the Finnish operators the Credit Entitlement limit is totally about six million tonnes.

## 4.8 Effect of policies and measures on longer term trends

The Government's Foresight Report on Long-term Climate and Energy Policy (published in 2009) highlighted possible paths towards a low-carbon Finland. Also, the report of the parliamentary committee from 2014, the Energy and Climate Roadmap 2050, analysed the means of constructing a low-carbon society and achieving an 80 to 95 per cent reduction in greenhouse gas emissions from the 1990 level in Finland by 2050. The background material for the 2014 roadmap included four scenarios on alternative development paths for a low-carbon society up to 2050 made by the Low Carbon Finland 2050 platform research project.

A large proportion of current Finnish climate and energy policies also contributes to reducing greenhouse gas emissions in the longer term, in particular when they are based on creating structural changes in the respective systems. For example, buildings have long lifetimes, and therefore the regulations for improving the energy efficiency of new and existing buildings will have long-lasting impacts.

Land-use planning also yields permanent emission reductions in buildings and transport, for example, by allowing the use of low-emission heating modes or by improving the possibilities for walking, biking and using public transportation. However, the actual emission reductions will depend on a large array of factors, including general economic development.

Investments in the energy infrastructure have long lifetimes. Therefore, measures that promote investments in renewable energy and improve the competitiveness of renewable energy sources will reduce greenhouse gas emissions in the longer term. Measures that would in principal contribute to emission reductions only as long as the measure is ongoing, such as feed-in tariffs for renewable energy, also have long-term emission reduction effects provided that the measure has triggered investments.

Prohibiting certain F-gases or halting the disposal of biodegradable waste on landfills can be expected to lead to permanent changes in current practices, and therefore to yield permanent emission reductions.

The impact of policies and measures on the longer-term trend (up to 2050) in greenhouse gas emissions from transport have been studied in the ILARI project (2010 to

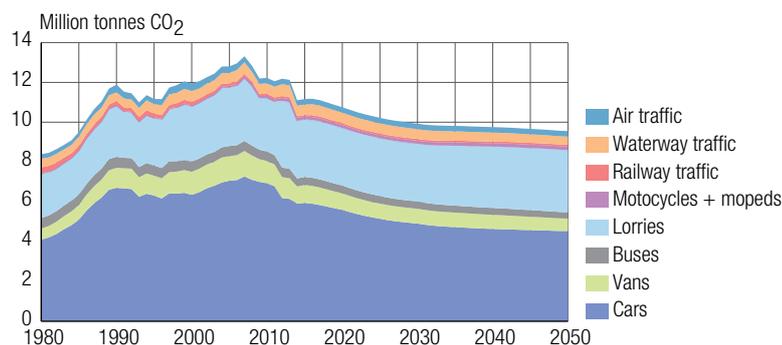
2012) and its updates (2015 and 2016). The impacts of different policy packages have been compared to a baseline scenario based on statistics and forecasts on transport volumes and vehicle fleets provided by the Finnish Transport Agency and the Finnish Transport Safety Agency, energy efficiency forecasts for vehicles provided by Technical Research Centre of Finland Ltd (VTT) and the national calculation system for measuring traffic exhaust emissions and energy consumption in Finland, LIPASTO.

In the 2015 update the difference between the projected transport volumes and actual reporting by the Finnish Transport Agency were taken into account. This resulted in a decrease in the previously estimated passenger car vehicle kilometres. Furthermore, the transport volumes for heavy goods vehicles were adjusted to be higher and the development of the energy efficiency was re-evaluated to be more modest than previously estimated.

According to the projections, transport volumes continue to grow over the forecast period, whereas the GHG emissions start to decline at the end of the current decade (see Figure 4.4). The main reasons for emission reductions are the use of biofuels, development in vehicle technology and CO<sub>2</sub>-based taxation. The effect is greatest on passenger cars. Emissions from heavy goods vehicles are expected to grow slightly due to economic growth and more modest energy efficiency expectations.

Uncertainties in the projections include reaching the vehicle energy efficiency targets, the renewal rate of the vehicle fleet and the use of alternative fuels.

Figure 4.4  
Projection on longer-term trend in the greenhouse gas emissions in transport



## 4.9 Mitigation benefits other than greenhouse gas reduction

Environmental impact assessments (EIAs) have been made for all of Finland's national energy and climate strategies and for the Medium-term Climate Change Policy Plan. The EIAs include a general examination of the benefits and adverse impacts of the strategies and the Medium-term Climate Change Policy Plan, specifically evaluating the relationship between measures for climate change mitigation and air pollution. In addition to climate change and air pollution, the National Energy and Climate Strategy for 2030 and the Medium-term Climate Change Policy Plan affect biodiversity and waters, and people's health and living conditions. The details of the practical implementation of the alignments are essential. They instruct, among other things, how increased use of wood affects on biodiversity and what the impacts on the welfare of different population groups are.

The amount of air pollution is expected to decrease due to the alignments proposed in the National Energy and Climate Strategy for 2030 and the Medium-term Climate

Change Policy Plan. However, the risks for health caused by air pollution still remain significant. At present, the emissions from power plants have only a small effect on air quality. The alignments, which decrease vehicle mileage or increase the use of gas-powered or electric cars, are significant in decreasing small particle emissions. The effect on the air quality of densely populated areas is dependent on the development of passenger mileages and how they are distributed.

In general, measures that reduce greenhouse gas emissions will also reduce air pollution. Small-scale wood burning is an exception, however. In Finland, most of solid forest-based fuels are used in CHP plants and in regional heating plants, but also the use of firewood in households and in the heating of farm and service buildings is considerable. In addition to methane and black carbon, which contribute to global warming, small particles having negative health impacts are also released from small-scale wood burning. The alignments of the National Energy and Climate Strategy for 2030 and the Medium-term Climate Change Policy Plan concerning small-scale wood burning do not cause notable changes to the present state. It is, nevertheless, possible to affect the emissions by technical standards, innovations and information guidance.

According to the National Energy and Climate Strategy for 2030 and the Medium-term Climate Change Policy Plan, the use of biofuels will be increased in transport, buildings and machinery through distribution obligations. The scale of the impacts of biofuel production will be highly dependent on the raw materials used and the total resources needed for production of biofuels, such as energy, materials and productive land area. The main domestic feedstocks in the future biofuel production in Finland are expected to be e.g. biodegradable wastes, forest industry residues (e.g. sawdust), other industrial residues and logging residues. By using biofuels made from domestic raw materials, Finland can reduce its dependence on crude oil. If the future biofuel production in Finland would be based on a larger scale on forest biomass, the potential impacts of the production and use of biofuels are going to be assessed together with the general goal of increasing harvesting volumes in Finland, and other potential impacts on forest sinks, forest biodiversity and water bodies.

## 4.10 Minimising the adverse effects of policies and measures in other countries

Finland strives to implement its climate policies in such a way that the social, environmental and economic impacts on other countries, and on developing countries in particular, are minimised. Applicable notification requirements under international trade conventions are also followed. Finland takes into account knowledge on and understanding of the possible adverse impacts of its measures based on available information received from other Parties. The main principles of minimising adverse impacts have not changed since reporting on this matter in the Sixth National Communication and latest National Inventory Report (NIR).

All major policies and activities undergo environmental impact assessments, including impacts in other countries. Environmental impact assessments have been carried out for all national energy and climate strategies, including the latest one published in 2016. The assessments have identified on a qualitative level the kind of impacts that the measures may have. A lifecycle analysis of fuel imports takes into account impacts arising outside Finland. Finland has also participated in the work on developing sustainability criteria for biofuels through scientific studies. In line with the most recent energy and

climate strategy, the identified potential adverse environmental impacts due to the increased use of bioenergy are addressed as early as possible.

Finland strives to minimise the adverse effects of climate change on developing countries by including in its development policy both climate change mitigation and adaptation in developing countries (see Chapter 7 for more details). Finland promotes low carbon development and the capacity of its partner countries to adapt to climate change, and it furthers the integration of these goals into partner countries' own development planning. Particular attention is paid to the roles of women, children and indigenous peoples in adapting to and combating climate change. Finland has adopted a climate sustainability tool for assessing the climate change impacts of its development policy and preventing the adverse impacts of climate change, including disaster risk reduction. The Manual for Bilateral Programmes (2016) includes the Guidance and Checklist for Climate Sustainability<sup>73</sup>. Thus, climate change has been mainstreamed in Finland's development programming. Finland aims to support programmes and projects that focus on saving energy, increasing energy efficiency and promoting renewable energy production, focusing on poor countries and regions in particular. According to its development policy, Finland supports access to sustainable renewable energy and also promotes energy and overall resource efficiency and research on those issues. In its own development cooperation, Finland aims to achieve carbon neutrality as soon as possible. In the implementation of its development policy (2016), Finland will take urgent action to combat climate change and its impacts<sup>74</sup>. Finnish development cooperation activities take into account climate change mitigation and giving support to climate change adaptation and disaster preparedness. Today, climate financing is part of Finland's development cooperation funding and disaster risk management is also covered by our development cooperation.

The overarching goal of Finland's development policy is the eradication of extreme poverty. Regarding the minimisation of adverse social impacts, the Ministry for Foreign Affairs commissioned a study some years ago on integrating poverty reduction and climate change response measures in Finland's development cooperation and CDM activities. The results showed that the level of coherence between climate funding and development co-operation objectives has progressed, although there is still room for learning how to focus in particular on CDM activities in such a way that they also contribute to poverty reduction.

Finland supports developing countries by helping them to build their capacities and develop their economic infrastructure, thus helping them diversify their economies and improve energy production. Economic diversification and private sector development are particularly important targets in various Finnish bilateral programmes and Finnish-supported multilateral programmes in Zambia, southern Africa and the Mekong region. Regional programmes that promote the role of the private sector in providing energy services are being promoted in Latin America, Sub-Saharan Africa and parts of Asia (see Chapter 7).

Among the actions listed in the Annex to Decision 15/CMP.1, Part I.H, 'Minimization of adverse impacts in accordance with Article 3, paragraph 14', Finland gives particular priority to the following actions:

- Action (a): Finland has addressed the progressive reduction or phasing out of market imperfections, fiscal incentives, tax and duty exemptions and subsidies in all greenhouse-gas-emitting sectors domestically, with a major revision in energy taxation in 2011, according to which all fuels are taxed based on their energy and fossil carbon

73 <http://formin.finland.fi/public/default.aspx?contentid=259204&nodeid=15445&contentlan=2&culture=en-US>

74 <http://formin.finland.fi/public/default.aspx?contentid=341918&nodeid=49540&contentlan=2&culture=en-US>

content, in its development policy by including in the support provided to developing countries through multinational development banks' criteria that are targeted at removing subsidies for fossil fuels and phasing out support for investments based on fossil fuels by the year 2050.

- Action (d): Finland has cooperated in the development, diffusion, transfer and wider use of less-greenhouse-gas-emitting, advanced fossil-fuel technologies and technologies that capture and store greenhouse gases from fossil fuel use by supporting, at a policy level, methane capture for electricity generation instead of gas flaring, clean coal technologies and carbon capture and storage.
- Action (f): Finland has assisted developing country Parties that are highly dependent on the export and consumption of fossil fuels in diversifying their economies in several projects: In Lao PDR, Finland has implemented a policy level programme that aims to diversify the economy and energy mix towards renewable sources that will provide local employment and increase energy and income security. Through the Energy and Environment Partnership Programme (EEP), Finland supports the participating developing countries in developing, adopting and scaling-up appropriate and affordable renewable energy and energy efficiency technologies for improved energy access and local employment. Finnish-supported EEP programmes are executed in Central America, the Mekong Region, southern and eastern Africa, the Andean Region and Indonesia.

Finland promotes policy coherence for development at the national and EU levels and especially in relation to the implementation of the Agenda 2030. Finland implements the recommendations of the OECD, and piloted the OECD's tool for policy coherence in the theme of food security and the right to food in 2012 to 2013. Policy coherence on other themes, such as trade and development, tax and development, migration and development, and security and development, have been strengthened both nationally and internationally. The Government submitted a communication to the Parliament on aid effectiveness and policy coherence for development in 2014.

Finland has consistently and for a long time worked to reform harmful fossil fuel subsidies for both climate and wider environmental, social and economic reasons. We are part of the Friends of Fossil Fuel Subsidy Reform (FFFSR), playing an active role in all relevant policy areas on behalf of the reform. Furthermore, in Tax and Development Finland's Action Programme 2016 to 2019 we recognise the fossil fuel subsidy reform as part of the wise management of public resources<sup>75</sup>.

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- Car comparison Service produced by Finnish Transport Safety Agency Trafi  
<http://autovertaamo.trafi.fi/?lang=en>
- Cities for Climate Protection,  
<http://www.iclei-europe.org/ccp>
- Energy advice for consumers,  
[https://www.motiva.fi/en/home\\_and\\_household](https://www.motiva.fi/en/home_and_household)
- Energy Efficiency Agreements – Results,  
[http://www.energiatehokkuussopimukset.fi/en/activities\\_and\\_results/](http://www.energiatehokkuussopimukset.fi/en/activities_and_results/)

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