

# **ESTONIA'S FIRST BIENNIAL REPORT**

under the United Nations Framework Convention on Climate Change

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The Ministry of the Environment (MoE) has responsibility of the preparation and finalization of Estonia's Biennial Report and its submission to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat.

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## **1. INTRODUCTION**

Estonia is pleased to submit its First Biennial Report (BR1) under decision 2/CP.17 of the Conference of the Parties under the United Nations Framework Convention on Climate Change (UNFCCC).

As defined in the UNFCCC biennial reporting guidelines for developed country Parties<sup>1</sup>, the information is structured into:

- information on greenhouse gases (GHG) emissions and trends and the GHG inventory including information on national inventory system (chapter 2),
- quantified economy-wide emission reduction target (chapter 3),
- progress in achievement of the quantified economy-wide emission reduction targets (chapter 4),
- projections (chapter 5) and
- provision of financial, technological and capacity building support to developing countries (chapter 6).

Tabular information as defined in the common tabular format (CTF) for the UNFCCC biennial reporting guidelines for developed country Parties (UNFCCC decision 19/CP.18) are enclosed to the BR1 submission (BR1 CTF). For the CTF submission to the UNFCCC, the electronic reporting facility provided by the UNFCCC Secretariat has been used as required by UNFCCC decision 19/CP.18.

## **2. INFORMATION ON GHG EMISSIONS AND TRENDS, GHG INVENTORY INCLUDING INFORMATION ON NATIONAL INVENTORY SYSTEM**

### **2.1. Introduction and summary information from the national GHG inventory**

This chapter sets out Estonia's GHG emissions and their trends for the period 1990-2011. It also provides information on Estonia's national inventory arrangements. The greenhouse gas data presented in the chapter is consistent with Estonia's 2013 submission to the UNFCCC Secretariat. Summary tables of GHG emissions are presented in CTF Table 1.

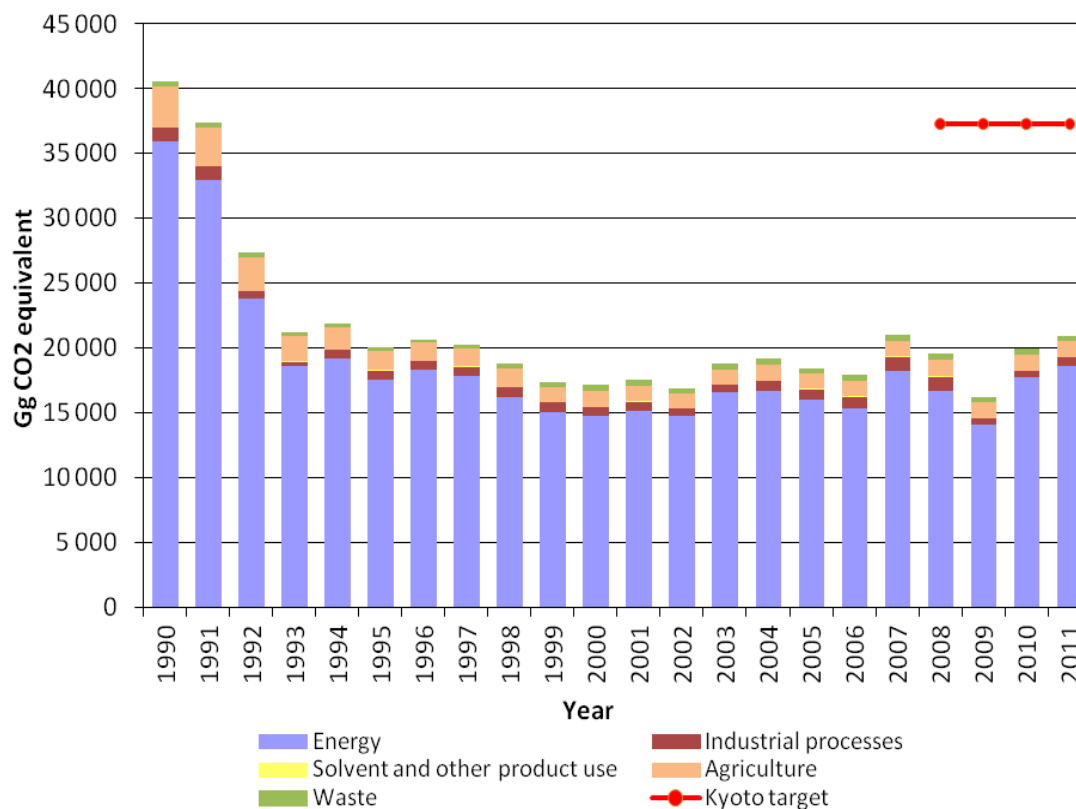
The chapter presents data on direct greenhouse gases: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>).

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<sup>1</sup> Annex I to UNFCCC decision 2/CP.17.

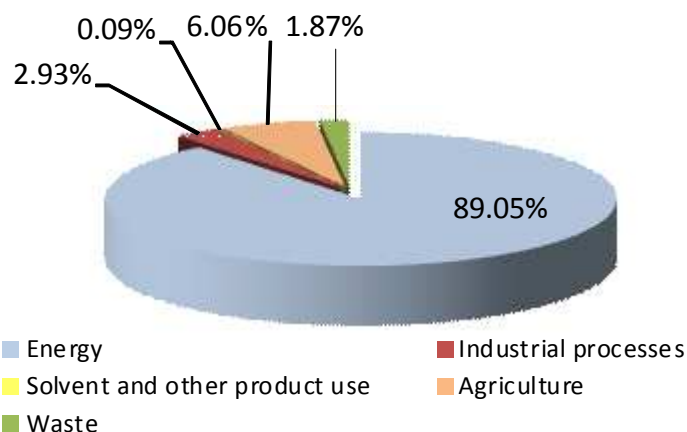
### 2.1.1. Overall greenhouse gas emission trends

Estonia's total greenhouse gas emissions in 2011 were 20,955.58 Gg CO<sub>2</sub> equivalent, excluding net emissions from LULUCF (land use, land-use change and forestry). Emissions decreased by 48.31 per cent from 1990-2011 (see Table 2.1) but increased by around 5 per cent between 2010 and 2011. Estonia's Kyoto Protocol target was to reduce GHG emissions by 8 per cent during the period from 2008-2012 compared to the 1990 level. Emission trends by sector and the Kyoto Protocol target are given in Figure 2.1.



**Figure 2.1.** Estonia's greenhouse gas emissions by sector, 1990-2011, excluding LULUCF and Kyoto target, Gg CO<sub>2</sub> equivalent

The energy sector is by far the largest producer of GHG emissions in Estonia. In 2011 the sector accounted for 89.05 per cent of Estonia's total greenhouse gas emissions (Figure 2.2). The second largest sector is agriculture, which accounted for 6.06 per cent of total emissions in 2011. Emissions from the industrial processes, waste and solvent and other product use sectors accounted for 2.93 per cent, 1.87 per cent and 0.09 per cent of total emissions respectively.



**Figure 2.2.** Greenhouse gas emissions by sector in 2011, per cent

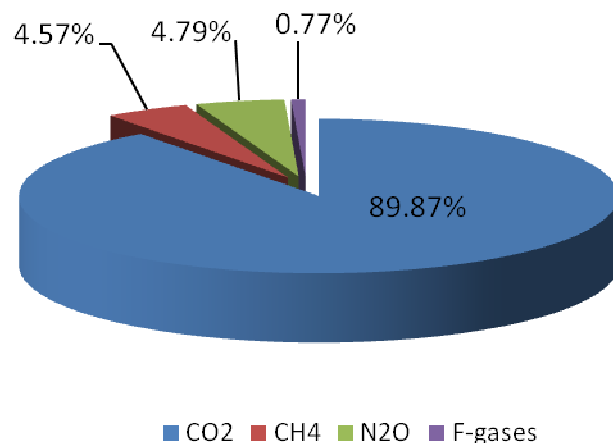
The LULUCF sector, acting as the only possible sink of greenhouse gas emissions in Estonia, plays an important role in the national carbon cycle. In 2011 the LULUCF sector acted as a CO<sub>2</sub> sink, with total uptake of 4,262.81 Gg CO<sub>2</sub> equivalent (see Table 2.1). Uptake of CO<sub>2</sub> decreased by 51.83 per cent compared to the base year (1990) and by 28.26 per cent compared to the previous year (2010).

**Table 2.1.** Greenhouse gas emissions and removals by sector in 1990, 1995, 2000 and 2005-2011, Gg CO<sub>2</sub> equivalent

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	Change, per cent <sup>2</sup>
<b>Energy</b>	35,956.90	17,596.48	14,770.96	16,020.66	15,385.39	18,270.54	16,745.77	14,129.73	17,767.99	18,661.63	-48.10
<b>Industrial processes</b>	1,048.23	675.54	705.92	807.11	871.47	1,059.00	1,051.13	451.04	493.86	613.82	-41.44
<b>Solvent and other product use</b>	26.44	26.02	26.76	26.16	26.35	24.43	21.96	18.49	17.39	18.86	-28.69
<b>Agriculture</b>	3,166.84	1,483.71	1,203.70	1,170.78	1,166.40	1,209.27	1,329.85	1,230.60	1,256.59	1,270.52	-59.88
<b>Waste</b>	343.72	256.49	434.83	452.93	479.04	483.74	468.96	431.72	452.94	390.76	13.69
<b>Total (excl. LULUCF)</b>	<b>40,542.14</b>	<b>20,038.23</b>	<b>17,142.17</b>	<b>18,477.64</b>	<b>17,928.66</b>	<b>21,046.97</b>	<b>19,617.67</b>	<b>16,261.58</b>	<b>19,988.77</b>	<b>20,955.58</b>	<b>-48.31</b>
<b>Land use, land-use change and forestry</b>	-8,848.70	-10,596.46	1,099.71	-5,037.42	-6,989.58	-8,112.22	-8,125.30	-7,342.13	-5,941.64	-4,262.81	-51.83
<b>Total (incl. LULUCF)</b>	<b>31,693.44</b>	<b>9,441.77</b>	<b>18,241.88</b>	<b>13,440.22</b>	<b>10,939.07</b>	<b>12,934.75</b>	<b>11,492.37</b>	<b>8,919.45</b>	<b>14,047.13</b>	<b>16,692.77</b>	<b>-47.33</b>

In 2011, the main greenhouse gas in Estonia was carbon dioxide (CO<sub>2</sub>), accounting for 89.87 per cent of all GHG emissions (excluding LULUCF), followed by nitrous oxide (N<sub>2</sub>O) on 4.79 per cent and methane (CH<sub>4</sub>) on 4.57 per cent. F-gases (HFCs, PFCs and SF<sub>6</sub>) collectively accounted for 0.77 per cent of overall GHG emissions (see Figure 2.3).

<sup>2</sup> Change from base year (1990) to latest reported year (2011).



**Figure 2.3.** Greenhouse gas emissions by gas in 2011, per cent

Emissions of CO<sub>2</sub> decreased by 48.59 per cent from 1990-2011 (see Table 2.2), caused largely by CO<sub>2</sub> emissions from the energy sub-sector of public electricity and heat production, which is the major source of CO<sub>2</sub> in Estonia. N<sub>2</sub>O emissions decreased by 55.06 per cent, especially N<sub>2</sub>O emissions from the agriculture sub-sector of agricultural soils, which is the major source of N<sub>2</sub>O in Estonia. Emissions of CH<sub>4</sub> decreased by 42.78 per cent, largely from the agriculture sub-sector of enteric fermentation, which is the major source of CH<sub>4</sub> in Estonia.

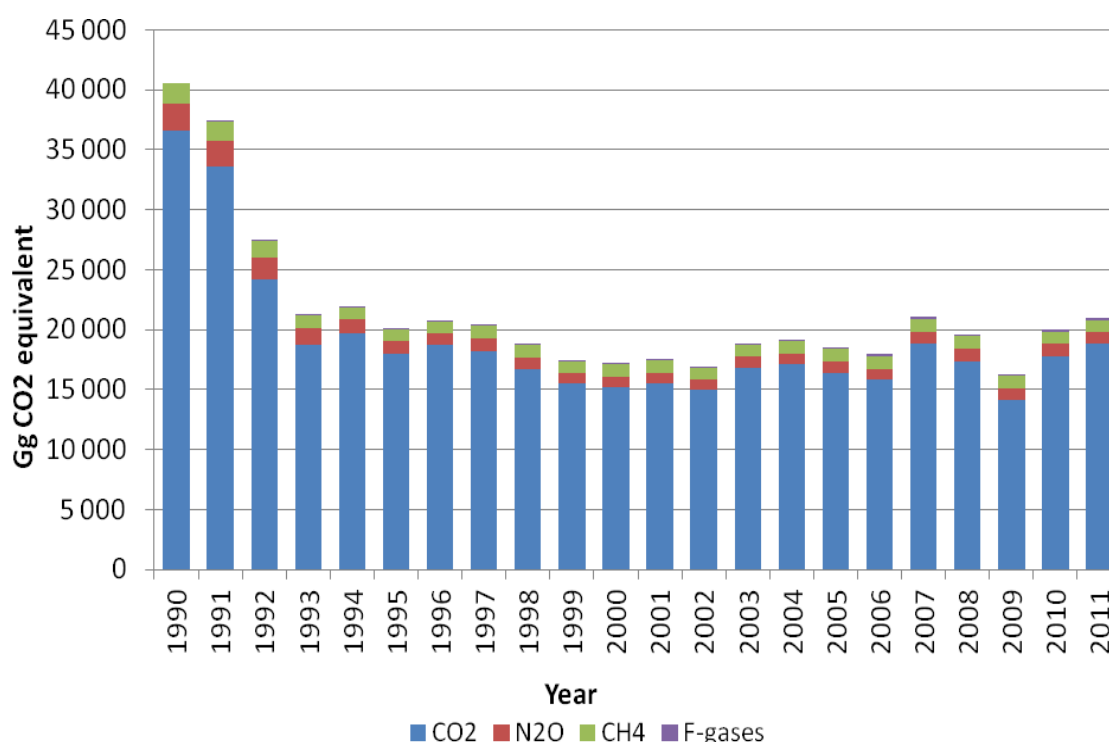
Emissions of F-gases increased from 0 Gg CO<sub>2</sub> equivalent in 1990 to 161.19 Gg CO<sub>2</sub> equivalent in 2011, especially HFC emissions from refrigeration and air-conditioning equipment, which is the major source of halocarbons in Estonia. GHG emission trends from 1990-2011 by gas are shown in Figure 2.4.

**Table 2.2.** Greenhouse gas emissions by gas in 1990, 1995, 2000 and 2005-2011, excluding LULUCF, Gg CO<sub>2</sub> equivalent

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	Change, per cent <sup>3</sup>
CO <sub>2</sub> emissions (excl. net CO <sub>2</sub> from LULUCF)	36,635.00	17,981.46	15,143.30	16,419.49	15,842.60	18,873.36	17,357.71	14,157.89	17,801.49	18,832.99	-48.59
CH <sub>4</sub> emissions (excl. CH <sub>4</sub> from LULUCF)	1,673.18	981.63	1,024.95	1,043.93	1,054.57	1,062.77	1,053.77	984.50	1,016.84	957.42	-42.78
N <sub>2</sub> O emissions (excl. N <sub>2</sub> O from LULUCF)	2,233.95	1,046.55	901.65	894.98	894.95	960.83	1,073.49	979.61	1,016.05	1,003.97	-55.06
HFCs	NA,NE,NO	25.37	69.54	118.16	135.31	148.98	131.31	138.15	152.56	159.38	100.00
PFCs	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	0.07	0.06	0.04	NA,NE,NO	NA,NE,NO	NA,NE,NO	0.00
SF <sub>6</sub>	NA,NE,NO	3.22	2.73	1.08	1.15	0.97	1.35	1.44	1.81	1.82	100.00
Total (excl. LULUCF)	40,542.14	20,038.23	17,142.17	18,477.64	17,928.66	21,046.97	19,617.67	16,261.58	19,988.77	20,955.58	-48.31

<sup>3</sup> Change from base year (1990) to latest reported year (2011).





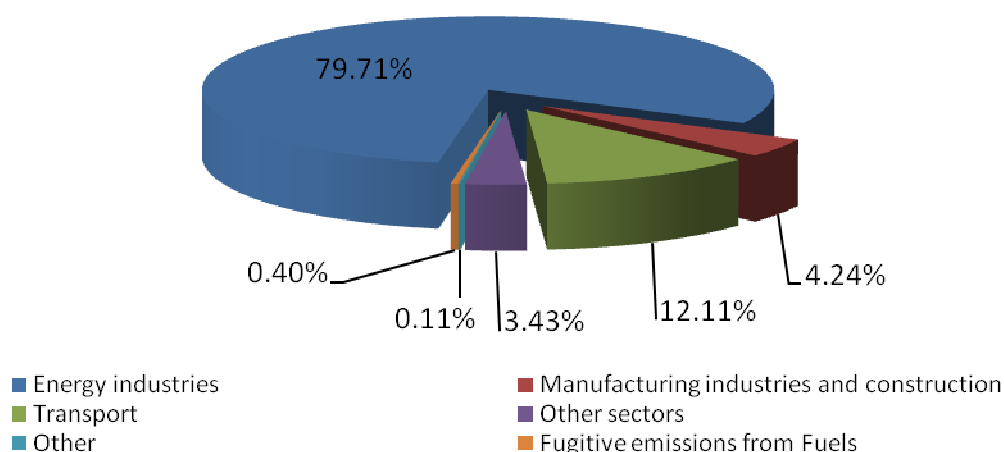
**Figure 2.4.** Estonia's greenhouse gas emissions by gas, 1990-2011, excluding LULUCF, Gg CO<sub>2</sub> equivalent

## 2.1.2. Greenhouse gas emissions by sector

### 2.1.2.1. Energy

Estonia's emissions from the energy sector are divided into the following categories: fuel combustion, including energy industries; manufacturing industries and construction; transport; other sectors (incl. commercial/institutional, residential and agriculture/forestry/fisheries); other; and fugitive emissions from fuels.

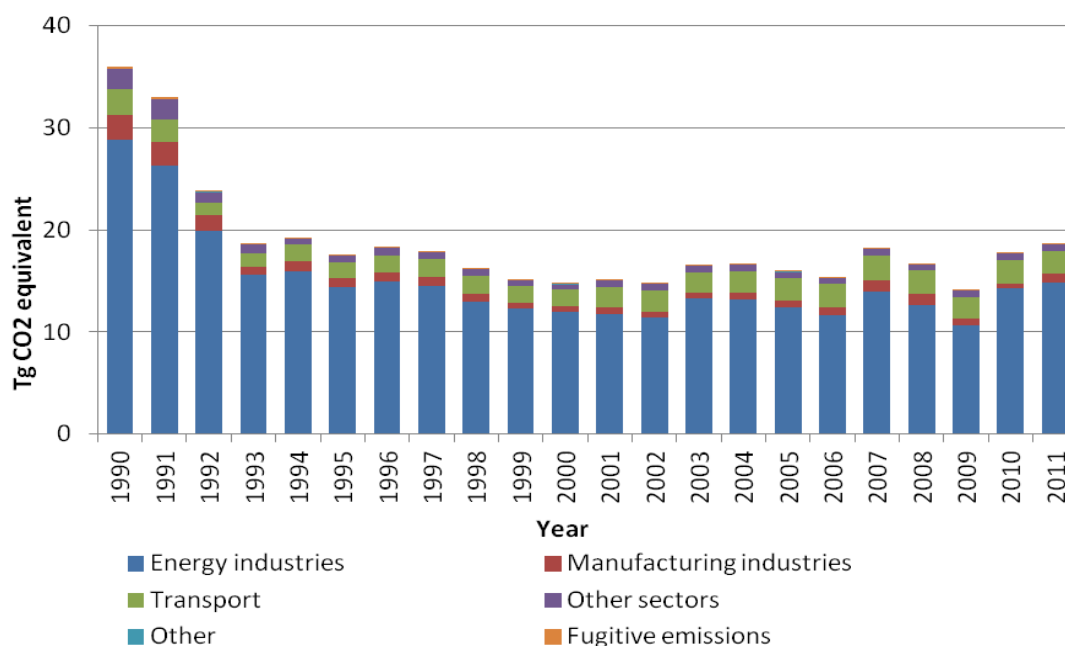
The energy sector is the main source of greenhouse gas emissions in Estonia. In 2011 the sector contributed 89.05 per cent of all emissions, totalling 18.66 Tg CO<sub>2</sub> equivalent. 99.6 per cent of emissions in the sector originated from fuel combustion – just 0.4 per cent were from fugitive emissions. The share of emissions by category in 2011 is presented in Figure 2.5.



**Figure 2.5.** Share of emissions from energy sector by category, 2011

A substantial amount of energy-related emissions in Estonia are caused by extensive consumption of fossil fuels in power and heat production. 70.59 per cent of energy sector emissions resulted from consumption of solid fuels in public electricity and heat production.

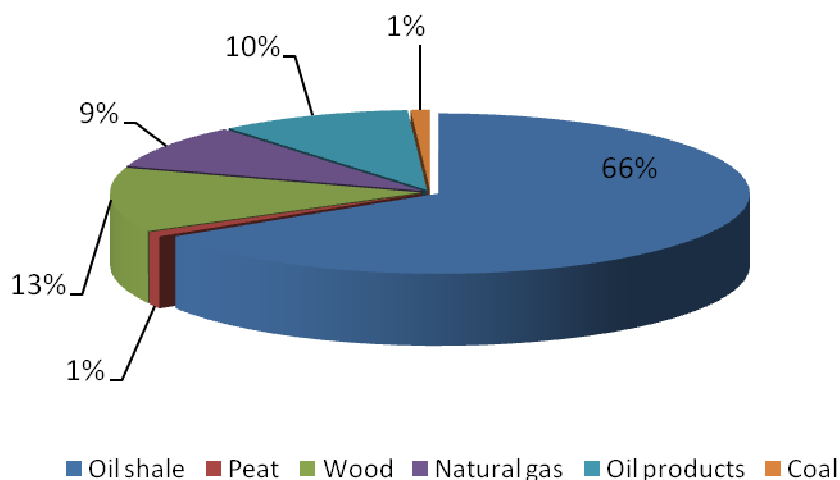
Emissions from the energy sector decreased by 48.10 per cent compared to 1990 (incl. energy industries – 48.30 per cent; manufacturing industries and construction – 68.22 per cent; transport – 8.15 per cent; other sectors – 68.10 per cent; other – 54.51 per cent; and fugitive emissions from fuels – 58.51 per cent). This major decrease was caused by structural changes in the economy after 1991 when Estonia regained its independence. There has been a drastic decrease in the consumption of fuels and energy in energy industries (closure of factories), agriculture (reorganisation and dissolution of collective farms), transport (the proportion of new and environmentally friendly cars has increased and the number of agricultural machines has decreased), households (energy saving) etc. The overall progression of GHG emissions in the energy sector is presented in Figure 2.6.



**Figure 2.6.** Greenhouse gas emissions from energy sector, 1990-2011, Tg CO<sub>2</sub> equivalent

Domestic fuels form a large share of Estonia's total energy resources and of the balance of primary energy, which is mainly based on oil shale. This gives Estonia strategic independence for the supply of electricity. The share of imported fuels amounts to approximately one-third, while the average share within European Union (EU) Member States is around two-thirds. The volume of exported electricity essentially influences the share of oil shale in the balance of primary energy i.e. the higher the exports of electricity, the higher the share of oil shale in the balance of primary energy.

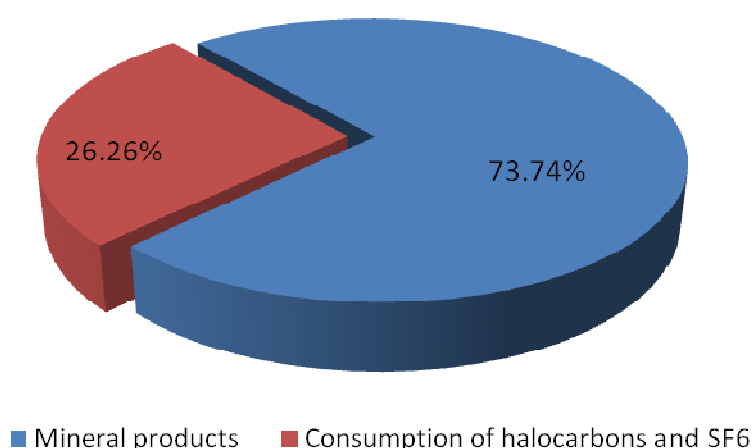
In 2011, the supply of primary energy was 232.3 PJ, of which oil shale formed 66 per cent, and peat and wood together 14 per cent. The share of renewable energy sources amounted to approximately 13 per cent (see Figure 2.7), of which wood fuels comprised the main portion and other sources just 0.1 per cent. Around 50 per cent of primary fuel energy was used for electricity and 16 per cent for heat generation. The total primary energy supply remained at the same level in 2011 as during the previous year.



**Figure 2.7.** Structure of primary energy supply in Estonia, 2011

#### 2.1.2.2. Industrial processes

Estonia's GHG emissions from the industrial processes sector are divided into the following emission categories: mineral products; chemical industry; and consumption of halocarbons and SF<sub>6</sub>. Under mineral products, emissions from cement, lime, glass, bricks and tile production as well as those from lightweight gravel production and soda ash use are reported. Emissions from ammonia production are reported under chemical industry. Consumption of halocarbons and SF<sub>6</sub> covers emissions of F-gases from refrigeration and air-conditioning, foam blowing, aerosols and electrical equipment, as well as some smaller sources, such as fire extinguishers and other. The share of emissions by category in 2011 is presented in Figure 2.8.



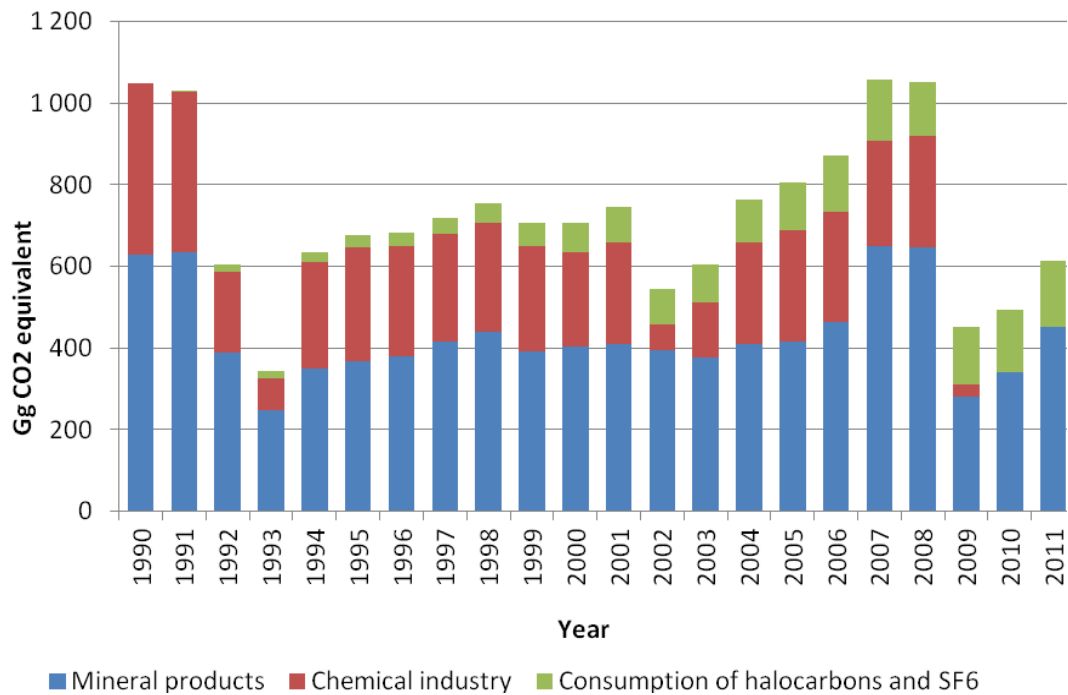
**Figure 2.8.** Share of emissions from industrial processes sector by category<sup>4</sup>, 2011

<sup>4</sup> There was no ammonia production in 2011.

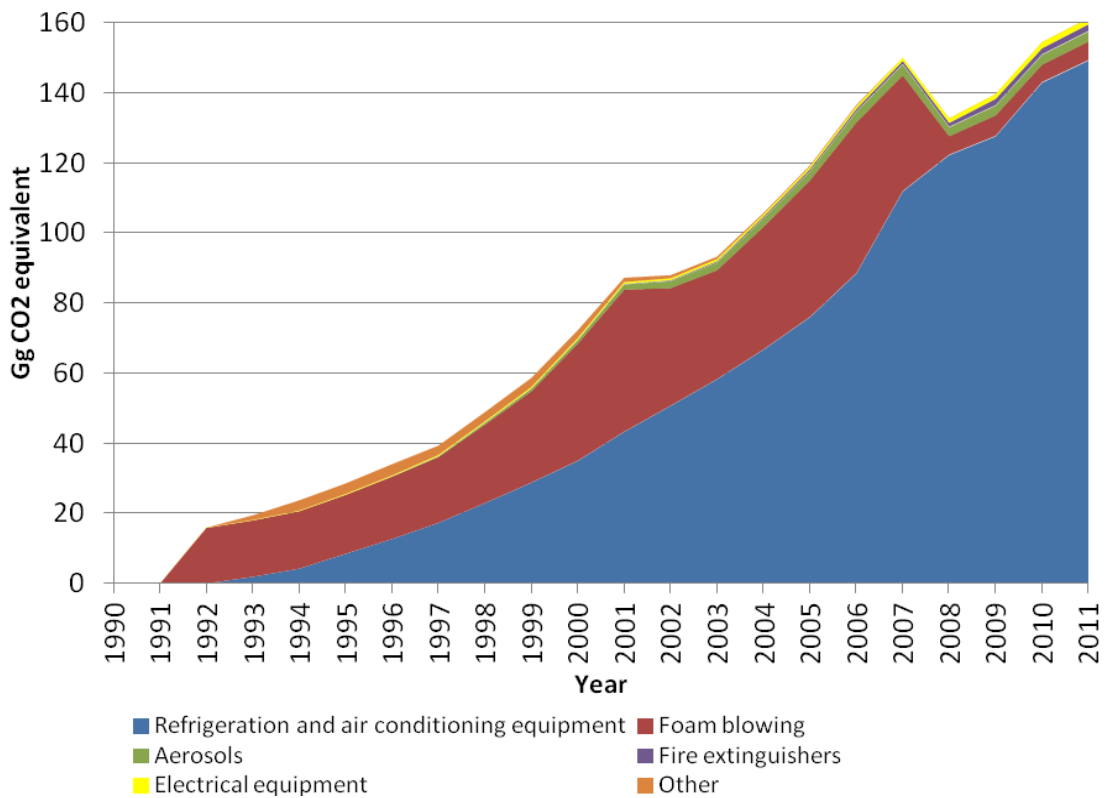
In 2011 the industrial processes sector contributed 2.93 per cent of all GHG emissions in Estonia, totalling 613.82 Gg CO<sub>2</sub> equivalent. The most significant emission sources were CO<sub>2</sub> from cement and lime production at 1.99 per cent and 0.11 per cent respectively, and HFC emissions from refrigeration and air conditioning equipment at 0.71 per cent of total GHG emissions. F-gas emissions as a whole comprised 0.77 per cent of total GHG emissions.

Industrial CO<sub>2</sub> emissions have fluctuated strongly since 1990, reaching their lowest level in 1993. The decrease in emissions during the early 1990s was caused by the transition from a planned economy to a market economy after 1991 when Estonia regained its independence. This led to lower industrial production and to an overall decrease in emissions from industrial processes between 1991 and 1993. The decrease in emissions in 2002 and 2003 was caused by the reduction in ammonia production, as the only ammonia factory in the country was being reconstructed. The sudden increase in emissions in 2007 was mainly caused by an increase in cement production, as the only cement factory renovated its third kiln. In 2009 the industrial processes sector was affected by the recession. Decline in production was mainly due to insufficient demand on both the domestic and external markets. The overall progression of GHG emissions in the industrial processes sector is presented in Figure 2.9.

F-gas emissions have increased significantly from 0 Gg CO<sub>2</sub> equivalent in 1990 to 161.19 Gg CO<sub>2</sub> equivalent in 2011. A key driver behind the growing emissions trend in refrigeration and air conditioning, which is the major source of halocarbons in Estonia (see Figure 2.10), has been the substitution of ozone-depleting substances with HFCs. The second largest source is foam blowing, which shows a relatively steady increase of emissions over the years, except for two major decreases – in 2001 one of two big Estonian producers of one component foam replaced HFC-134a with HFC-152a, followed by the other producer, starting from 2007. Due to the much lower GWP of HFC-152a the emissions decreased suddenly in the corresponding years. All remaining sources are comparatively small emitters of F-gases in Estonia.



**Figure 2.9.** Greenhouse gas emissions from industrial processes sector, 1990-2011, Gg CO<sub>2</sub> equivalent

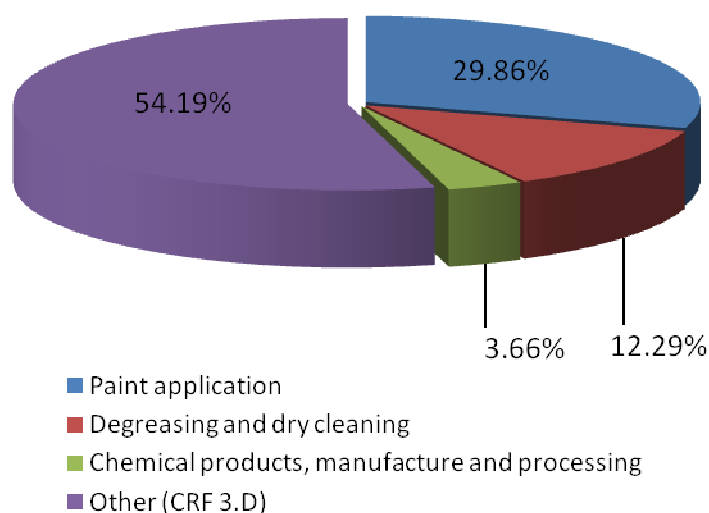


**Figure 2.10.** Actual emissions of F-gases by category, 1990-2011, Gg CO<sub>2</sub> equivalent

### 2.1.2.3. Solvent and other product use

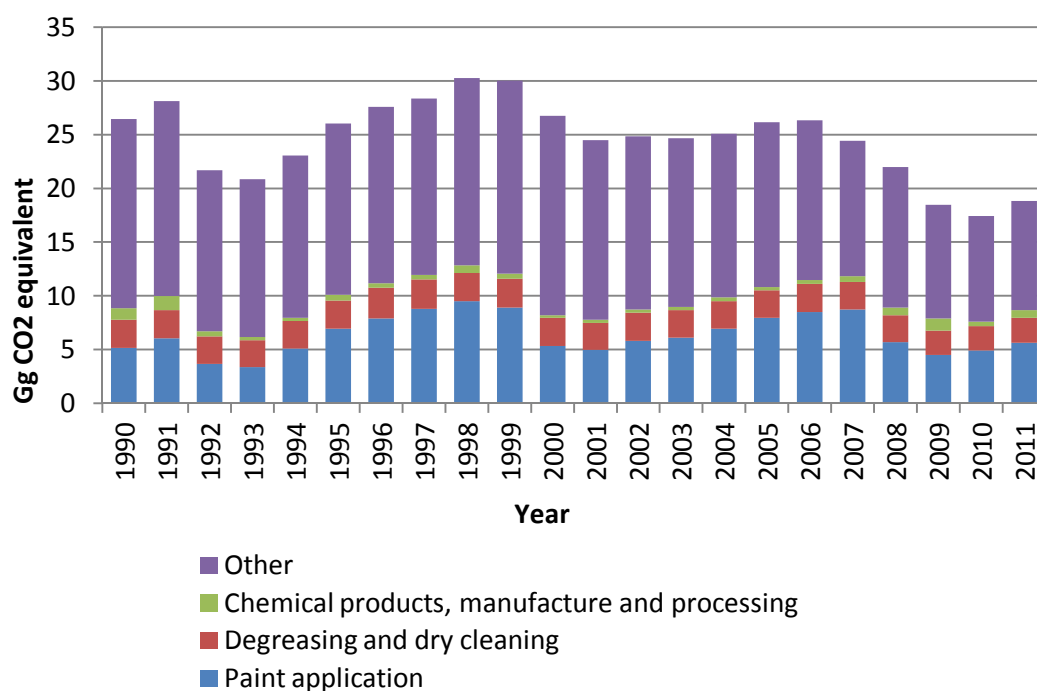
Estonia's emissions from the solvent and other product use sector are divided into the following categories: paint application; degreasing and dry cleaning; chemical products, manufacture and processing; and other (CRF 3.D). Under these categories Estonia reports indirect greenhouse gas emissions (NMVOCs) and indirect CO<sub>2</sub> emissions from NMVOC emissions. Under CRF 3.D (other), Estonia also reports N<sub>2</sub>O emissions from the sources N<sub>2</sub>O use for anaesthesia and N<sub>2</sub>O from aerosol cans.

In 2011, the solvent and other product use sector contributed 0.09 per cent of all greenhouse gas emissions in Estonia, totalling 18.86 Gg CO<sub>2</sub> eq. Indirect CO<sub>2</sub> emissions from paint application and other (CRF 3.D.5) contributed the main share of total emissions from the sector – 29.86 per cent and 28.19 per cent respectively. The share of emissions by category is presented in Figure 2.11.



**Figure 2.11.** Share of emissions from solvent and other product use sector by category, 2011

Emissions from the solvent and other product use sector have decreased by 28.69 per cent compared to 1990. Two major categories where a decrease in NMVOC emissions and, consequently, a decrease in indirect CO<sub>2</sub> emissions have occurred in more recent years are paint application and other product use. The fluctuation of NMVOC emissions in the period 1990-2011 has mostly occurred due to the welfare of the economic state of the country. The overall progression of GHG emissions in the solvent and other product use sector is presented in Figure 2.12.



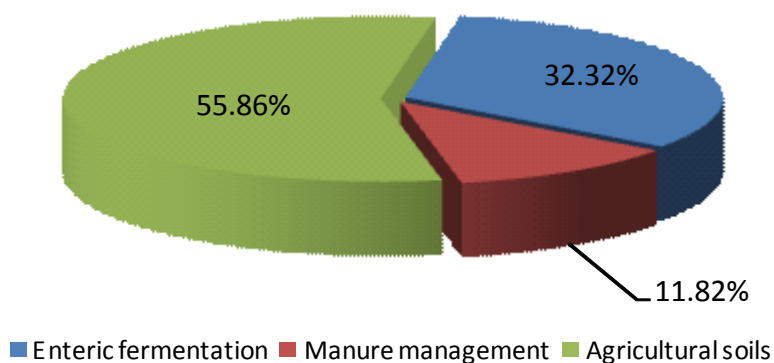
**Figure 2.12.** Greenhouse gas emissions from the solvent and other product use sector, 1990-2011, Gg CO<sub>2</sub> equivalent

#### 2.1.2.4. Agriculture

Agricultural GHG emissions in Estonia consist of CH<sub>4</sub> emissions from enteric fermentation of domestic livestock, N<sub>2</sub>O emissions from manure management systems and direct and indirect N<sub>2</sub>O emissions from agricultural soils. Direct N<sub>2</sub>O emissions include emissions from synthetic fertilizers, animal manure and sewage sludge applied to agricultural soils, emissions occurring from crop-growing (i.e. N-fixing crops and crop residue) and due to the cultivation of histosols. Indirect N<sub>2</sub>O emissions include emissions due to atmospheric deposition and nitrogen leaching and run-off.

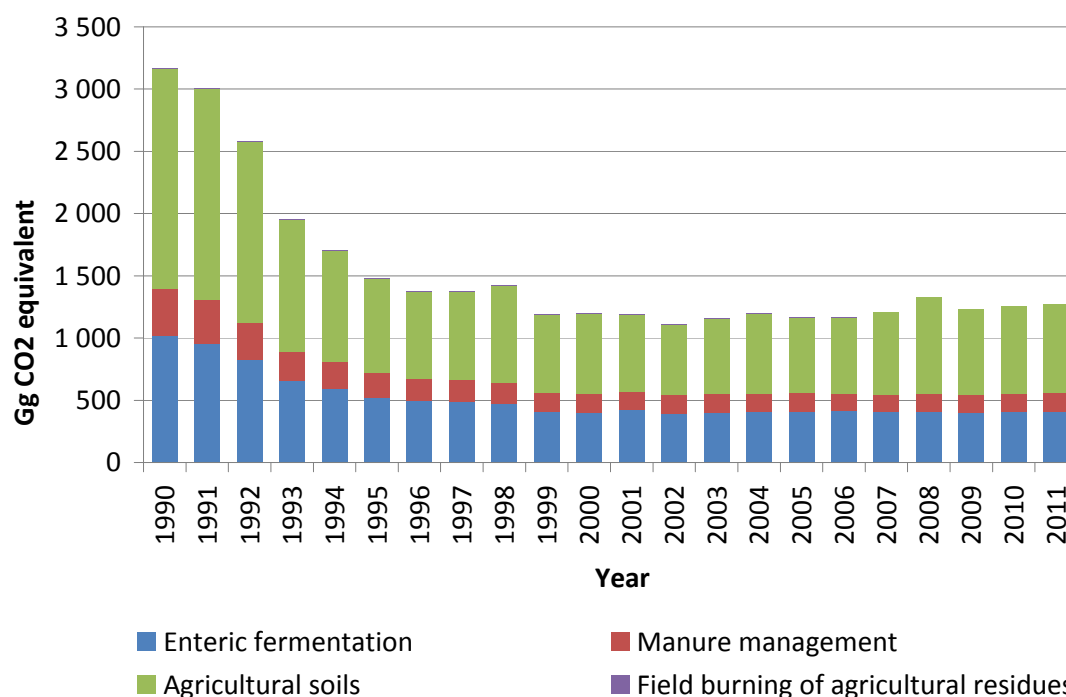
The total greenhouse gas emissions reported in the agriculture sector of Estonia were 1,270.52 Gg CO<sub>2</sub> equivalent in 2011. The sector contributed around 6.06 per cent to total CO<sub>2</sub> equivalent emissions. Emissions from enteric fermentation of livestock and direct emissions from agricultural soils were the major contributors to the total emissions recorded in the sector – 32.3 per cent and 31.5 per cent respectively. The share of emissions by category is presented in Figure 2.13.





**Figure 2.13.** Share of emissions from agriculture sector by category, 2011

Emissions from the agricultural sector declined by 59.88 per cent by 2011 compared with the base year (1990), mostly due to the decrease in the livestock population and quantities of synthetic fertilizers and manure applied to agricultural fields. The overall progression of GHG emissions in the agriculture sector is presented in Figure 2.14.



**Figure 2.14.** Greenhouse gas emissions from agriculture sector, 1990-2011, Gg CO<sub>2</sub> equivalent

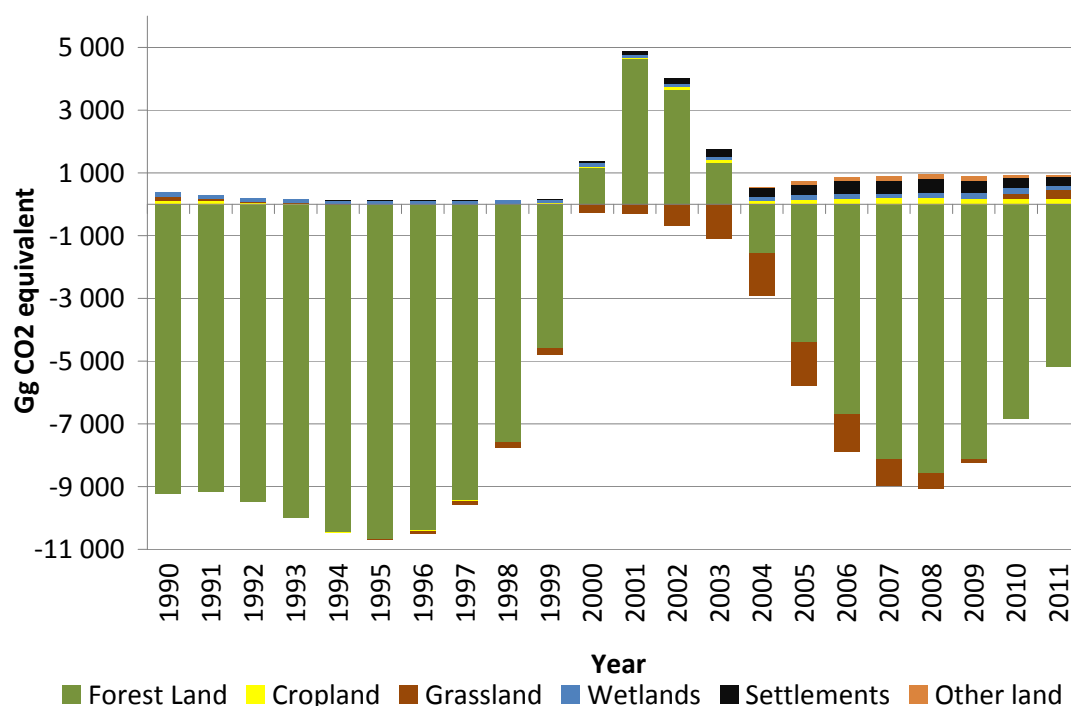
### 2.1.2.5. Land use, land-use change and forestry

The LULUCF sector, acting as the only possible sink of greenhouse gas emissions in Estonia, plays an important role in the national carbon cycle. Emissions and removals from the LULUCF sector are divided into the following categories: forest land; cropland; grassland; wetlands (peatland); settlements; and other land. Each category is further divided between 'land remaining' and 'land converted to' sub-categories.

In 2011 the LULUCF sector acted as a CO<sub>2</sub> sink, totalling uptake of 4,262.81 Gg CO<sub>2</sub> equivalent. Compared to 1990, uptake of CO<sub>2</sub> has decreased by 51.83 per cent; compared to 2010, it has decreased by 28.26 per cent. In the last decade, CO<sub>2</sub> emissions have varied widely due to highly unstable rates of felling and deforestation. As can be seen in Figure 2.15, the LULUCF sector also acted as a net source from 2000-2003, when harvesting exceeded biomass increment in forests. A key driver behind these trends has been the socio-economic situation in Estonia.

The majority of CO<sub>2</sub> removals in the LULUCF sector come from the biomass increment in 'forest land remaining forest land' and 'land converted to forest land' sub-categories. In 2011, forest land was the only net sink category. From 2003-2007, grasslands constituted a significant CO<sub>2</sub> sink in addition to forest land. Grasslands are reallocated to the forest land category when the tree growth cover exceeds 30 per cent due to natural succession and a reduction in management activities.

Most of the emissions in the LULUCF sector are the result of biomass loss due to land conversion to settlements and drainage of organic soils. Minor sources of CO<sub>2</sub> are biomass burning (wildfires), cropland liming and peat extraction.

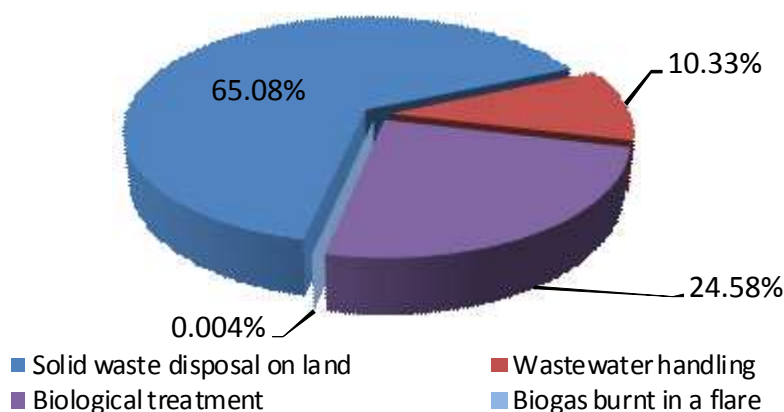


**Figure 2.15.** Greenhouse gas emissions and removals from land use, land-use change and forestry sector, 1990-2011, Gg CO<sub>2</sub> equivalent

### 2.1.2.6. Waste

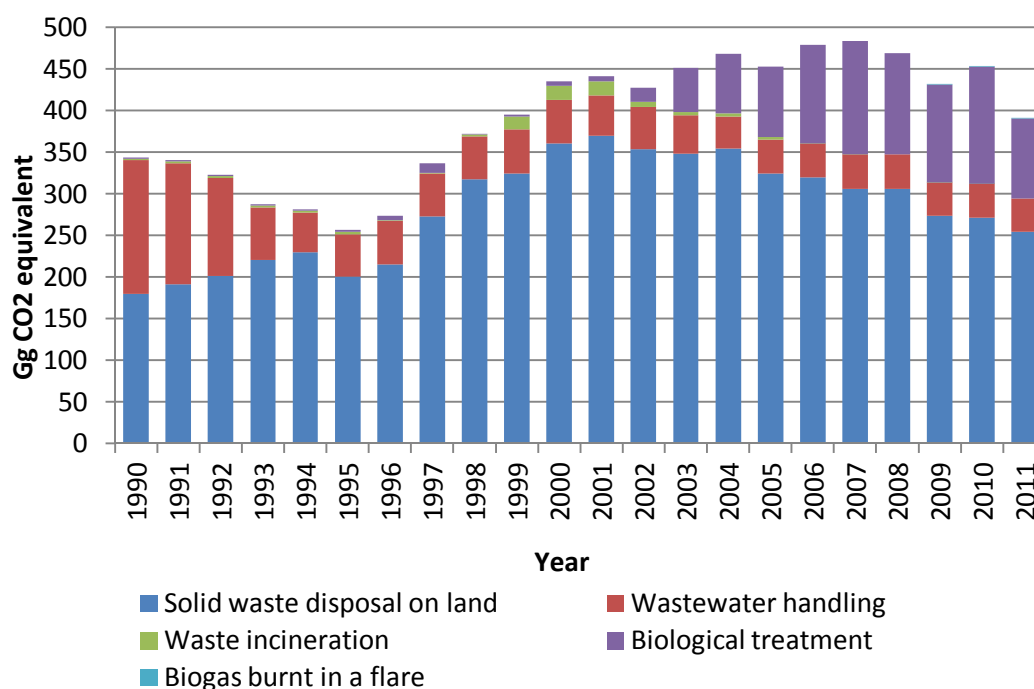
In the waste sector, Estonia's GHG inventory covers CH<sub>4</sub> emissions from solid waste disposal sites including solid municipal and industrial waste and domestic and industrial sludge. The waste sector also covers GHG emissions from waste incineration (incl. biogas burnt in a flare), biological treatment and wastewater handling including domestic, commercial and industrial wastewater.

In 2011, the waste sector contributed 1.87 per cent of all greenhouse gas emissions, totalling 390.76 Gg CO<sub>2</sub> eq. Solid waste disposal on land contributed the most to total emissions in the waste sector in Estonia. The share of emissions by category in 2011 is presented in Figure 2.16.



**Figure 2.16.** Share of emissions from waste sector by category, 2011

The total CO<sub>2</sub> equivalent emissions from the waste sector in 2011 increased by 13.69 per cent compared to the base year: emissions from solid waste landfilled increased by 41.5 per cent and emissions from waste composting processes increased almost a hundred-fold – from 1.26 Gg to 96.1 Gg – in 2011. In 1995 the GHG emissions from the waste sector decreased, which was due to CH<sub>4</sub> emissions from paper and sludge waste disposal on land decreasing. Total CO<sub>2</sub> equivalent emissions were highest in 2007, mostly due to a steady increase in emissions from biological treatment, which is related to obligations stated in the Waste Act. The total CO<sub>2</sub> equivalent in 2011 decreased significantly compared to previous years (see Figure 2.17), mainly because of the change in the national currency, which raised prices in the country and therefore reduced consumption habits and waste generation.



**Figure 2.17.** Greenhouse gas emissions from waste sector, 1990-2011, Gg CO<sub>2</sub> equivalent

#### 2.1.2.7. Reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Estonia reports activities under Article 3, paragraph 3, of the Kyoto Protocol and has not elected any activities under Article 3, paragraph 4, of the Kyoto Protocol. Estonia has chosen to account for KP-LULUCF activities at the end of the commitment period.

Under Article 3, paragraph 3, of the Kyoto Protocol (KP), Estonia reports emissions and removals from afforestation (A), reforestation (R) and deforestation (D). In 2011, net emissions from Article 3.3 activities were 232.11 Gg CO<sub>2</sub> equivalent. Uptake from afforestation and reforestation activities, including emissions from biomass burning, was estimated at -145.01 Gg CO<sub>2</sub> equivalent, whereas deforestation resulted in a net emission of 377.12 Gg CO<sub>2</sub> equivalent. Areas subject to AR and D were 27,295 and 19,135 ha respectively by the end of 2011. Annual rates of afforestation and deforestation declined continuously from 0.6 kha to 0.4 kha per year for AR and from 2.2 kha to 0.8 kha per year for D during the period 2008-2011.

## 2.2. National inventory arrangements

### 2.2.1. Institutional arrangements

The Ministry of the Environment (MoE) is the national entity with overall responsibility for organizing and coordinating the compilation of GHG inventory reports and submitting them to the UNFCCC Secretariat and the European Commission.

The contact in the MoE is:

Ms Anne Mändmets  
Adviser, Climate and Radiation Department  
Tel. +372 626 2817  
Fax +372 626 2801  
Anne.Mandmets@envir.ee

The MoE is responsible for:

- coordinating the inventory preparation process as a whole;
- approving the inventory before official submission to the UNFCCC;
- reporting the greenhouse gas inventory to the UNFCCC, including the National Inventory Report and CRF tables;
- entering into formal agreements with inventory compilers;
- coordinating cooperation between the inventory compilers and the UNFCCC Secretariat;
- informing the inventory compilers of the requirements of the national system and ensuring that existing information in national institutions is considered and used in the inventory where appropriate;
- informing the inventory compilers of new or revised guidelines; and
- coordinating the UNFCCC inventory reviews.

Estonia's 2013 GHG inventory submission was compiled in collaboration between the MoE, the Estonian Environmental Research Centre (EERC), the Estonian Environment Information Centre (EEIC) and Tallinn University of Technology (TUT).

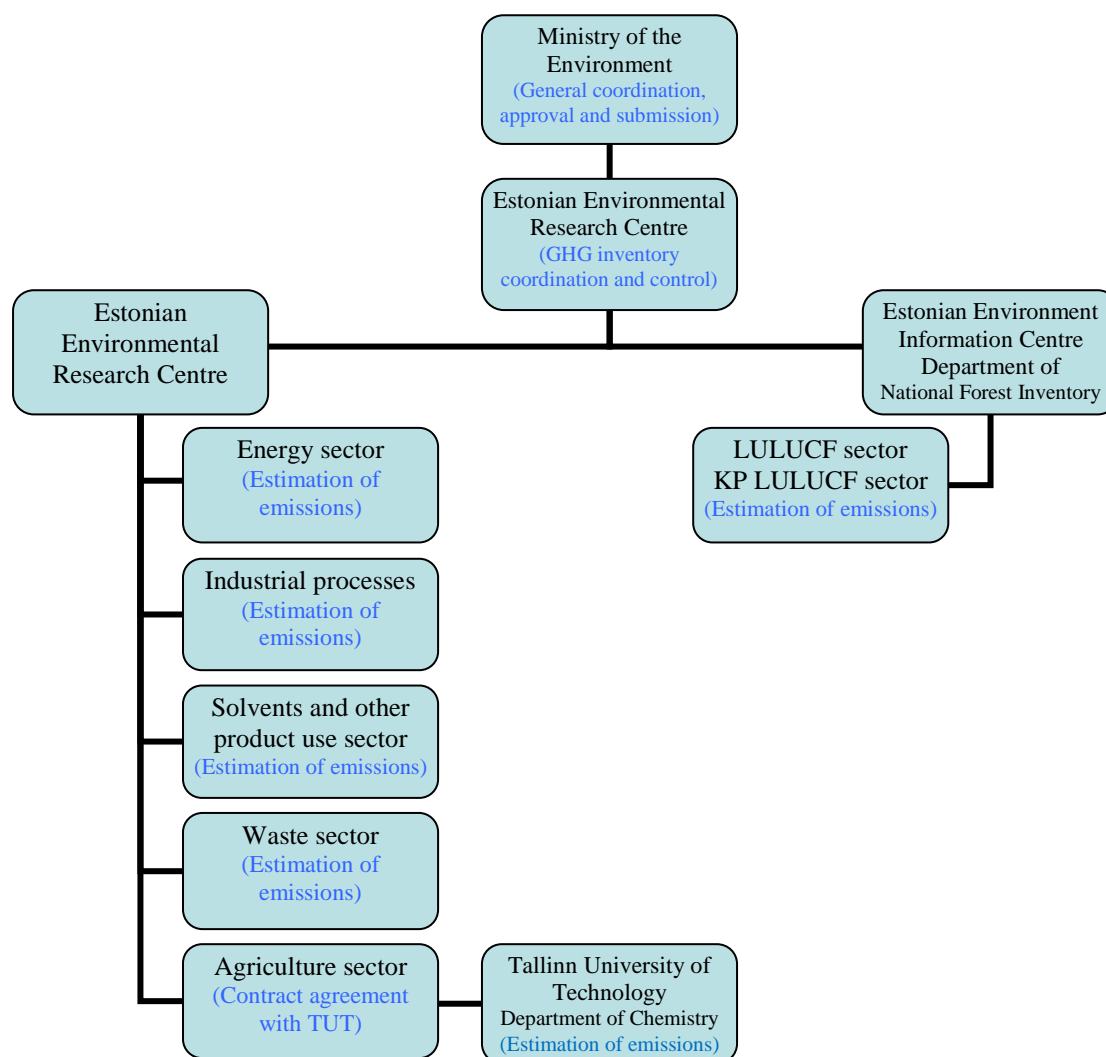
The MoE contracted EERC to prepare the estimates for the energy, industrial processes, solvent and other product use, agriculture and waste sectors and to coordinate inventory. The EERC signed a contract agreement with the Department of Chemistry at TUT to prepare the estimates for the agriculture sector.

The EERC, as the inventory coordinator, was responsible for:

- compiling the National Inventory Report according to the parts submitted by the inventory compilers;
- coordinating the implementation of the QA/QC plan;
- coordinating the inventory process;
- preparing the UNFCCC inventory reviews and coordinating communication with the expert review team, including responses to the review findings; and
- the overall archiving system.

The Department of National Forest Inventory at the EEIC was responsible for the LULUCF and KP LULUCF sectors.

An overview of the division of responsibilities in 2013 inventory submission is shown in Figure 2.18.



**Figure 2.18.** Overview of institutional arrangements for compilation of Estonia's 2013 GHG inventory

### Legal arrangements

In accordance with §117 of the Ambient Air Protection Act (RT I 2004, 43,298), activities for the reduction of climate change are organised by the Ministry of the Environment on the basis of the requirements for the restriction of the limit values of emissions of greenhouse gases provided by the UNFCCC and the Kyoto Protocol to the UNFCCC. In accordance with the Statutes of the Climate and Radiation Department of the MoE, the department is responsible for organizing and coordinating GHG emission reporting activities under the UNFCCC, the Kyoto Protocol and European Union legislation.

In accordance with §6 section 3 and 4 of the Statutes of the Estonian Environment Information Centre, the EEIC performed<sup>5</sup> the following tasks: forest and forest sector data collection, analysis and assessments; and National Forest Inventory compilation.

The EERC is a joint stock company, all of the shares in which are held by the Republic of Estonia. The EERC belongs to the government area of the MoE. It compiles the GHG inventory on the basis of contract agreements with the MoE.

A three-year contract agreement (for the 2011, 2012 and 2013 submissions) was entered into with the EERC for inventory compilation in the industrial processes, solvent and other product use and waste sectors. A one-year contract agreement (for the 2013 submission) was entered into with the EERC for inventory preparation in the energy and agriculture sectors and for inventory coordination.

A new contract agreement with the EERC for inventory compilation in the energy, industrial processes, solvent and other product use, agriculture and waste sectors and for inventory coordination was entered into in 2013 for three years (for the 2014, 2015 and 2016 submissions). The MoE plans to use the three-year contract approach in the coming years to ensure the continuity of inventory preparation.

The Forest Monitoring Department of the Estonian Environment Agency is responsible for LULUCF and KP LULUCF estimates in the 2014 inventory submission.

### **2.2.2. Inventory process**

The UNFCCC, the Kyoto Protocol and the European Union (EU) greenhouse gas monitoring mechanism require Estonia to submit annually a National Inventory Report (NIR) and Common Reporting Format (CRF) tables. The annual submission contains emission estimates for the years between 1990 and the year before last year.

Estonia's national GHG inventory system is designed and operated according to the guidelines for national systems under article 5, paragraph 1, of the Kyoto Protocol to ensure the transparency, consistency, comparability, completeness and accuracy of inventories. Inventory activities include planning, preparation and management of the inventories.

The EERC and the MoE have developed an inventory production plan that sets out the schedule for inventory preparation. The schedule, which is annually reviewed, forms part of Estonia's QA/QC plan and must be followed by all core institutions.

Under the EU monitoring mechanism the annual inventory must be submitted to the Commission by 15 January. Member States may then complement and update their submissions by 15 March. The official greenhouse gas inventory is submitted to the UNFCCC Secretariat by 15 April.

The methodologies, activity data collection and emission factors are consistent with the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 1996) and IPCC Good Practice Guidance (IPCC 2000), IPCC Good Practice

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<sup>5</sup> The Estonian Environment Agency was formed in 2013 as a result of the merger of the Estonian Meteorological and Hydrological Institute and the Estonian Environment Information Centre and is the legal successor to both.

Guidance for Land Use, Land Use Change and Forestry (IPCC 2003) and 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2006).

The inventory process for the next inventory cycle starts with an examination of previous years and an analysis of the available datasets in order to improve the inventory through new knowledge and the activity data developed. Activity data is mainly based on official statistics and data from companies and the National Forest Inventory. The emission factors are national values, values recommended in the IPCC guidelines or values taken from other countries' GHG inventories.

Sectoral experts collect activity data, estimate emissions and/or removals, implement QC procedures and record the results, fill in sectoral data to the CRF Reporter and prepare the sectoral parts of the NIR. These experts are also responsible for archiving activity data, estimates and all other relevant information according to the archiving system. The EERC compiles the NIR according to the parts submitted by the inventory experts, evaluates the overall uncertainty of the inventory totals and performs key category analysis.

The uncertainty estimate is conducted according to the Tier 1 method presented by IPCC 2000. This method combines the uncertainty in activity rates and emission factors, for each source category and greenhouse gas, and then aggregates these uncertainties, for all source categories and greenhouse gases, to obtain the total uncertainty for the inventory. The uncertainty values for each source category are provided by sectoral experts, which in many cases are assigned based on default uncertainty estimates according to IPCC guidelines or expert judgements, as there is a lack of information.

Key categories are those of emissions/removals, which have a significant influence on the total inventory in terms of the absolute level of emissions or trends in emissions (or both). Estonia uses the Tier 2 method to identify key categories, and emission categories are sorted according to their contribution to emission levels or trends. The key categories are those that together represent 90 per cent of the inventory level or trend.

The results of key category analysis are important because they guide decisions on methodological choice. The goal is to screen the long list of category-gas contributions and find those that are most important in terms of the emissions level or trend. The list of key categories forms the basis of discussions with the sectoral experts on the quality of the estimates and possible need for improvement.

Recalculations are made if errors, overlaps or inconsistencies in the time series are identified, when a new source or sink is considered or if more accurate knowledge becomes available. The driving forces in applying recalculations to Estonia's GHG inventory are the implementation of the guidance given in IPCC 2000 and IPCC 2003 and the recommendations from the UNFCCC inventory reviews. In order to ensure the consistency of the emission inventory, recalculations are carried out on the whole time series, as far as possible.

All institutions involved in compiling the GHG inventory keep in close contact with one another. Several cooperation meetings are held annually to discuss and agree on methodological issues, problems that have arisen and improvements that need to be implemented.



### 2.2.3. Quality management

The starting point in accomplishing a high-quality GHG inventory is consideration of expectations and inventory requirements. The quality requirements set for annual inventories are continuous improvement, transparency, consistency, comparability, completeness, accuracy and timeliness. The setting of concrete annual quality objectives is based on these requirements. The next step is development of the QA/QC plan and implementing the appropriate quality control measures (e.g. routine checks and documentation) focused on meeting the quality objectives set and fulfilling the requirements. In addition, QA procedures are planned and implemented.

The MoE as the national entity has overall responsibility for the greenhouse gas inventory in Estonia, including responsibility for assuring that the appropriate QA/QC procedures are implemented annually. The EERC as the inventory coordinator is responsible for coordinating the implementation of the QA/QC plan.

Estonia's QA/QC plan consists of seven parts: (1) production plan; (2) annual meetings; (3) QA/QC checks; (4) QA results documentation form; (5) archiving structure; (6) response table to review process; and (7) list of planned activities and improvements.

Annual inventory meetings with experts from all institutes participating in inventory preparation are held four times a year. Bilateral quality meetings between the quality coordinator (the EERC) and the inventory experts are held whenever necessary.

#### QC procedures

The QC procedures used in Estonia's greenhouse gas inventory comply with IPCC Good Practice Guidance. General inventory QC checks (IPCC GPG 2000, Table 8.1 and IPCC GPG LULUCF 2003, Table 5.5.1) include routine checks on the integrity, correctness and completeness of data, identification of errors and deficiencies, documentation and archiving of inventory data and quality control actions. Once the experts have implemented the QC procedures, they complete the QC checklist for each source/sink category, which provides a record of the procedures performed. The QC checklist forms part of Estonia's QA/QC plan.

The EERC checks the QC reports of sectoral experts. If it disagrees with a report, the errors are discussed and changes are made, where necessary. The EERC also carries out general QC of the NIR and CRF tables.

In addition, the QA/QC of Member States' submissions conducted under the European Union GHG Monitoring Mechanism (e.g. completeness checks, consistency checks and comparison across Member States) produces valuable information on errors and deficiencies, and the information is taken into account before Estonia submits its final inventory to the UNFCCC.

#### QA procedures

The objective of QA implementation is to involve reviewers that can conduct an unbiased review of the inventory and who may have a different technical perspective. It is important to use QA reviewers who have not been involved in preparing the inventory. These reviewers should preferably be independent experts from other

agencies or national experts or groups not closely connected to national inventory compilation.

Estonia's GHG inventory is checked annually by one or more independent experts. In the 2013 submission the inventory was reviewed in parts by the EERC, TUT and other national experts. A public review is also carried out. The draft NIR is uploaded to the MoE website, where all interested parties have the opportunity to comment on it. The comments received during these processes are reviewed and, as appropriate, incorporated into the inventory. In addition, the inventory is checked by different ministries and institutions (e.g. the Waste and Water Department of the MoE and Statistics Estonia).

UNFCCC reviews are part of QA. The reviews are performed by a team of experts from other countries. They examine the data and methods that Estonia is using and check the documentation, archiving system and national system. In conclusion they report on whether Estonia's overall performance is in accordance with current guidelines. The review report indicates the specific areas in which the inventory is in need of improvement.

#### **2.2.4. Changes to national inventory arrangements since the last National Communication**

Since the 5<sup>th</sup> National Communication (NC5) the following changes have occurred in Estonia's national inventory arrangements:

- Climate and Radiation Department was established under the MoE starting from 28 December 2009. Along with this change the Climate and Ozone Bureau in Estonian Environment Information Centre (EEIC) was closed and the people were relocated under the new department in MoE in April 2010. The Climate and Radiation Department of the MoE is responsible for organizing and coordinating GHG emission reporting activities under the UNFCCC, the Kyoto Protocol and European Union legislation (including GHG inventory). The MoE is responsible for submitting GHG inventory reports to the UNFCCC Secretariat and the European Commission.
- From 2011 submission the EERC is responsible for coordinating the GHG inventory preparation and the implementation of the QA/QC plan. Previously Climate and Ozone Bureau in EEIC was coordinating the inventory.
- Starting from 2011 submission the Department of the National Forest Inventory at the EEIC<sup>6</sup> is responsible for the inventory preparation in the LULUCF and KP LULUCF sectors. Previously Tallinn University of Technology (TUT) was preparing the estimates.
- From 2010 submission EERC is responsible for inventory preparation in the waste sector. Previously TUT was preparing the estimates for the waste sector.
- A contract agreement with EERC to prepare the estimates for the energy and agriculture sector was concluded for the first time in 2012 for the 2013 submission. EERC signed a contract agreement with the Department of Chemistry at TUT to prepare the estimates for the agriculture sector in 2013

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<sup>6</sup> The Estonian Environment Agency was formed in 2013 as a result of the merger of the Estonian Meteorological and Hydrological Institute and the Estonian Environment Information Centre and is the legal successor to both.

submission. Previously TUT was preparing the estimates in the energy and agriculture sector.

BR CTF Table 1. Emission trends: summary

Source: Submission 2014 v1.5, ESTONIA

	Base year <sup>a</sup> (kt CO <sub>2</sub> eq)	1991 (kt O <sub>2</sub> eq)	1992 (kt O <sub>2</sub> eq)	1993 (kt O <sub>2</sub> eq)	1994 (kt CO <sub>2</sub> eq)	1995 (kt CO <sub>2</sub> eq)	1996 (kt CO <sub>2</sub> eq)	1997 (kt O <sub>2</sub> eq)	1998 (kt O <sub>2</sub> eq)	1999 (kt O <sub>2</sub> eq)	2000 (kt CO <sub>2</sub> eq)	2001 (kt CO <sub>2</sub> eq)
CO <sub>2</sub> emissions including net CO <sub>2</sub> from LULUCF	27,784.35	24,781.69	14,886.51	8,926.77	9,291.34	7,383.03	8,288.64	8,764.37	9,053.65	10,871.63	16,239.54	20,072.21
CO <sub>2</sub> emissions excluding net CO <sub>2</sub> from LULUCF	36,635.00	33,634.58	24,180.88	18,770.35	19,639.00	17,981.46	18,688.03	18,236.49	16,657.46	15,508.39	15,143.30	15,497.77
CH <sub>4</sub> emissions including CH <sub>4</sub> from LULUCF	1,673.58	1,594.50	1,327.88	1,053.16	1,022.15	982.05	996.89	1,059.74	1,046.94	983.62	1,026.63	1,056.87
CH <sub>4</sub> emissions excluding CH <sub>4</sub> from LULUCF	1,673.18	1,594.34	1,324.57	1,051.91	1,021.24	981.63	995.70	1,057.41	1,046.77	982.34	1,024.95	1,056.64
N <sub>2</sub> O emissions including N <sub>2</sub> O from LULUCF	2,235.50	2,143.55	1,828.96	1,370.95	1,183.09	1,048.10	984.23	982.81	1,032.92	879.38	903.44	890.45
N <sub>2</sub> O emissions excluding N <sub>2</sub> O from LULUCF	2,233.95	2,142.04	1,826.88	1,369.24	1,181.44	1,046.55	982.54	980.90	1,031.41	877.66	901.65	888.93
HFCs	NA, NE, NO	NA, NE, NO	15.92	18.06	20.67	25.37	30.58	36.38	45.93	55.65	69.54	85.47
PFCs	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO
SF <sub>6</sub>	NA, NE, NO	0.05	0.09	1.45	3.11	3.22	3.49	2.99	2.99	3.01	2.73	1.74
<b>Total (including LULUCF)</b>	<b>31,693.44</b>	<b>28,519.79</b>	<b>18,059.37</b>	<b>11,370.39</b>	<b>11,520.36</b>	<b>9,441.77</b>	<b>10,303.83</b>	<b>10,846.29</b>	<b>11,182.41</b>	<b>12,793.29</b>	<b>18,241.88</b>	<b>22,106.75</b>
<b>Total (excluding LULUCF)</b>	<b>40,542.14</b>	<b>37,371.02</b>	<b>27,348.34</b>	<b>21,211.01</b>	<b>21,865.46</b>	<b>20,038.23</b>	<b>20,700.34</b>	<b>20,314.17</b>	<b>18,784.55</b>	<b>17,427.04</b>	<b>17,142.17</b>	<b>17,530.56</b>
1. Energy	35,956.90	32,967.77	23,816.15	18,603.92	19,225.41	17,596.48	18,341.04	17,857.11	16,205.29	15,103.37	14,770.96	15,129.28
2. Industrial Processes	1,048.23	1,026.78	603.45	344.86	633.43	675.54	682.88	719.51	754.13	707.69	705.92	746.39
3. Solvent and Other Product Use	26.44	28.12	21.69	20.85	23.03	26.02	27.56	28.34	30.25	30.03	26.76	24.47
4. Agriculture	3,166.84	3,007.95	2,584.47	1,954.14	1,702.42	1,483.71	1,375.32	1,372.75	1,422.66	1,190.93	1,203.70	1,188.80
5. Land Use, Land-Use Change and Forestry <sup>b</sup>	-8,848.70	-8,851.23	-9,288.97	-9,840.62	-10,345.10	-10,596.46	-10,396.51	-9,467.87	-7,602.14	-4,633.75	1,099.71	4,576.19
6. Waste	343.72	340.40	322.58	287.24	281.17	256.49	273.54	336.45	372.22	395.01	434.83	441.62
7. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>Total (including LULUCF)</b>	<b>31,693.44</b>	<b>28,519.79</b>	<b>18,059.37</b>	<b>11,370.39</b>	<b>11,520.36</b>	<b>9,441.77</b>	<b>10,303.83</b>	<b>10,846.29</b>	<b>11,182.41</b>	<b>12,793.29</b>	<b>18,241.88</b>	<b>22,106.75</b>

	2002 (kt CO <sub>2</sub> eq)	2003 (kt CO <sub>2</sub> eq)	2004 (kt CO <sub>2</sub> eq)	2005 (kt CO <sub>2</sub> eq)	2006 (kt CO <sub>2</sub> eq)	2007 (kt CO <sub>2</sub> eq)	2008 (kt CO <sub>2</sub> eq)	2009 (kt CO <sub>2</sub> eq)	2010 (kt CO <sub>2</sub> eq)	2011 (kt CO <sub>2</sub> eq)	Change from base to latest reported year (%)
CO <sub>2</sub> emissions including net CO <sub>2</sub> from LULUCF	18,339.99	17,487.43	14,691.96	11,378.41	8,838.86	10,755.46	9,224.65	6,808.82	11,852.77	14,563.07	-47.59
CO <sub>2</sub> emissions excluding net CO <sub>2</sub> from LULUCF	15,004.26	16,832.39	17,082.08	16,419.49	15,842.60	18,873.36	17,357.71	14,157.89	17,801.49	18,832.99	-48.59
CH <sub>4</sub> emissions including CH <sub>4</sub> from LULUCF	1,007.86	1,038.68	1,073.03	1,044.24	1,062.85	1,063.05	1,055.08	984.69	1,016.97	957.54	-42.79
CH <sub>4</sub> emissions excluding CH <sub>4</sub> from LULUCF	1,004.31	1,038.20	1,072.00	1,043.93	1,054.57	1,062.77	1,053.77	984.50	1,016.84	957.42	-42.78
N <sub>2</sub> O emissions including N <sub>2</sub> O from LULUCF	841.19	877.18	919.32	898.33	900.83	966.23	1,079.94	986.35	1,023.01	1,010.97	-54.78
N <sub>2</sub> O emissions excluding N <sub>2</sub> O from LULUCF	838.92	875.22	916.72	894.98	894.95	960.83	1,073.49	979.61	1,016.05	1,003.97	-55.06
HFCs	86.52	91.92	104.61	118.16	135.31	148.98	131.31	138.15	152.56	159.38	100.00
PFCs	NA, NE, NO	NA, NE, NO	NA, NE, NO	NA, NE, NO	0.07	0.06	0.04	NA, NE, NO	NA, NE, NO	NA, NE, NO	0.00
SF <sub>6</sub>	1.44	1.33	1.08	1.08	1.15	0.97	1.35	1.44	1.81	1.82	100.00
<b>Total (including LULUCF)</b>	<b>20,276.99</b>	<b>19,496.53</b>	<b>16,790.00</b>	<b>13,440.22</b>	<b>10,939.07</b>	<b>12,934.75</b>	<b>11,492.37</b>	<b>8,919.45</b>	<b>14,047.13</b>	<b>16,692.77</b>	<b>-47.33</b>
<b>Total (excluding LULUCF)</b>	<b>16,935.43</b>	<b>18,839.07</b>	<b>19,176.50</b>	<b>18,477.64</b>	<b>17,928.66</b>	<b>21,046.97</b>	<b>19,617.67</b>	<b>16,261.58</b>	<b>19,988.77</b>	<b>20,955.58</b>	<b>-48.31</b>
1. Energy	14,824.75	16,594.37	16,722.18	16,020.66	15,385.39	18,270.54	16,745.77	14,129.73	17,767.99	18,661.63	-48.10
2. Industrial Processes	545.35	605.39	764.67	807.11	871.47	1,059.00	1,051.13	451.04	493.86	613.82	-41.44
3. Solvent and Other Product Use	24.84	24.69	25.07	26.16	26.35	24.43	21.96	18.49	17.39	18.86	-28.69
4. Agriculture	1,112.73	1,163.64	1,196.40	1,170.78	1,166.40	1,209.27	1,329.85	1,230.60	1,256.59	1,270.52	-59.88
5. Land Use, Land-Use Change and Forestry <sup>b</sup>	3,341.56	657.47	-2,386.49	-5,037.42	-6,989.58	-8,112.22	-8,125.30	-7,342.13	-5,941.64	-4,262.81	-51.83
6. Waste	427.76	450.98	468.18	452.93	479.04	483.74	468.96	431.72	452.94	390.76	13.69
7. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
<b>Total (including LULUCF)</b>	<b>20,276.99</b>	<b>19,496.53</b>	<b>16,790.00</b>	<b>13,440.22</b>	<b>10,939.07</b>	<b>12,934.75</b>	<b>11,492.37</b>	<b>8,919.45</b>	<b>14,047.13</b>	<b>16,692.77</b>	<b>-47.33</b>
(1) Further detailed information could be found in the common reporting format tables of the Party's greenhouse gas inventory, namely "Emission trends (CO <sub>2</sub> )",											
(2) "Emission trends (CH <sub>4</sub> )", "Emission trends (N <sub>2</sub> O)" and "Emission trends (HFCs, PFCs and SF <sub>6</sub> )", which is included in an annex to this biennial report.											
(2) 2011 is the latest reported inventory year.											
(3) 1 kt CO <sub>2</sub> eq equals 1 Gg CO <sub>2</sub> eq.											
Abbreviation: LULUCF = land use, land-use change and forestry.											
<sup>a</sup> The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.											
<sup>b</sup> Includes net CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O from LULUCF.											



BR CTF Table 1. Emission trends: (CO<sub>2</sub>)

Source: Submission 2014 v1.5, ESTONIA

	Base year <sup>a</sup> (kt)	1991 (kt)	1992 (kt)	1993 (kt)	1994 (kt)	1995 (kt)	1996 (kt)	1997 (kt)	1998 (kt)	1999 (kt)	2000 (kt)	2001 (kt)
<b>1. Energy</b>	<b>35,565.96</b>	<b>32,585.73</b>	<b>23,576.37</b>	<b>18,428.92</b>	<b>19,011.55</b>	<b>17,314.04</b>	<b>18,017.54</b>	<b>17,534.17</b>	<b>15,928.44</b>	<b>14,836.41</b>	<b>14,490.57</b>	<b>14,820.85</b>
A. Fuel Combustion (Sectoral Approach)	35,565.96	32,585.73	23,576.37	18,428.92	19,011.55	17,314.04	18,017.54	17,534.17	15,928.44	14,836.41	14,490.57	14,820.85
1. Energy Industries	28,748.11	26,240.22	19,857.25	15,626.10	15,888.78	14,371.02	14,887.82	14,467.07	12,893.82	12,323.74	11,892.21	11,705.03
2. Manufacturing Industries and Construction	2,477.52	2,336.78	1,570.67	742.85	1,044.58	880.22	958.08	877.98	822.85	474.59	572.29	696.81
3. Transport	2,418.18	2,200.67	1,136.83	1,257.06	1,573.90	1,539.55	1,599.14	1,706.12	1,765.10	1,642.66	1,627.45	1,936.92
4. Other Sectors	1,878.61	1,754.69	977.37	792.11	493.29	494.46	556.24	469.32	429.46	378.23	381.75	463.57
5. Other	43.54	53.37	34.24	10.81	10.99	28.79	16.26	13.69	17.20	17.19	16.87	18.52
B. Fugitive Emissions from Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
1. Solid Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Oil and Natural Gas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>2. Industrial Processes</b>	<b>1,048.23</b>	<b>1,026.73</b>	<b>587.44</b>	<b>325.35</b>	<b>609.65</b>	<b>646.95</b>	<b>648.81</b>	<b>680.14</b>	<b>705.22</b>	<b>649.03</b>	<b>633.65</b>	<b>659.18</b>
A. Mineral Products	628.18	636.02	387.16	246.48	350.39	366.98	379.79	416.11	438.40	391.11	402.32	410.70
B. Chemical Industry	420.05	390.71	200.28	78.87	259.27	279.97	269.01	264.03	266.83	257.92	231.33	248.48
C. Metal Production	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
D. Other Production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Production of Halocarbons and SF <sub>6</sub>												
F. Consumption of Halocarbons and SF <sub>6</sub>												
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>3. Solvent and Other Product Use</b>	<b>20.77</b>	<b>22.09</b>	<b>17.04</b>	<b>16.04</b>	<b>17.76</b>	<b>20.44</b>	<b>21.67</b>	<b>22.14</b>	<b>23.74</b>	<b>22.90</b>	<b>19.01</b>	<b>17.69</b>
<b>4. Agriculture</b>												
A. Enteric Fermentation												
B. Manure Management												
C. Rice Cultivation												
D. Agricultural Soils												
E. Prescribed Burning of Savannas												
F. Field Burning of Agricultural Residues												
G. Other												
<b>5. Land Use,</b>	<b>-8,850.65</b>	<b>-8,852.89</b>	<b>-9,294.37</b>	<b>-9,843.58</b>	<b>-10,347.66</b>	<b>-10,598.43</b>	<b>-10,399.39</b>	<b>-9,472.12</b>	<b>-7,603.81</b>	<b>-4,636.76</b>	<b>1,096.24</b>	<b>4,574.43</b>

<b>Land-Use Change and Forestry</b>												
A. Forest Land	-9,212.15	-9,156.33	-9,492.22	-9,998.61	-10,463.64	-10,672.16	-10,406.88	-9,449.50	-7,582.29	-4,582.64	1,149.42	4,617.78
B. Cropland	125.37	100.81	40.69	14.84	-1.92	-6.05	-14.58	-7.48	35.19	47.06	46.91	65.07
C. Grassland	106.89	80.54	41.36	31.89	9.30	-29.74	-90.52	-129.95	-167.61	-214.03	-269.75	-314.99
D. Wetlands	129.24	122.09	115.81	102.60	102.60	102.60	102.60	102.60	102.60	102.60	102.60	102.60
E. Settlements	NE, NO	NE, NO	NE, NO	5.69	6.00	6.91	9.98	12.22	8.30	10.25	67.06	103.97
F. Other Land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Other	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
<b>6. Waste</b>	<b>0.03</b>	<b>0.03</b>	<b>0.03</b>	<b>0.03</b>	<b>0.03</b>	<b>0.02</b>	<b>0.01</b>	<b>0.03</b>	<b>0.06</b>	<b>0.04</b>	<b>0.06</b>	<b>0.04</b>
A. Solid Waste Disposal on Land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Waste-water Handling												
C. Waste Incineration	0.03	0.03	0.03	0.03	0.03	0.02	0.01	0.03	0.06	0.04	0.06	0.04
D. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>7. Other (as specified in the summary table in CRF)</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>
<b>Total CO<sub>2</sub> emissions including net CO<sub>2</sub> from LULUCF</b>	<b>27,784.35</b>	<b>24,781.69</b>	<b>14,886.51</b>	<b>8,926.77</b>	<b>9,291.34</b>	<b>7,383.03</b>	<b>8,288.64</b>	<b>8,764.37</b>	<b>9,053.65</b>	<b>10,871.63</b>	<b>16,239.54</b>	<b>20,072.21</b>
<b>Total CO<sub>2</sub> emissions excluding net CO<sub>2</sub> from LULUCF</b>	<b>36,635.00</b>	<b>33,634.58</b>	<b>24,180.88</b>	<b>18,770.35</b>	<b>19,639.00</b>	<b>17,981.46</b>	<b>18,688.03</b>	<b>18,236.49</b>	<b>16,657.46</b>	<b>15,508.39</b>	<b>15,143.30</b>	<b>15,497.77</b>
<b>Memo Items:</b>												
<b>International Bunkers</b>	682.06	703.88	427.39	529.64	445.96	331.57	338.57	379.57	379.40	416.96	395.44	363.23
Aviation	107.70	107.70	35.90	54.00	44.88	53.85	48.15	67.41	47.15	66.77	64.81	48.60
Marine	574.36	596.18	391.48	475.64	401.08	277.72	290.42	312.16	332.25	350.20	330.63	314.63
<b>Multilateral Operations</b>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>CO<sub>2</sub> Emissions from Biomass</b>	927.21	910.13	871.56	830.41	1,345.91	2,181.45	2,605.56	2,659.18	2,265.19	2,279.44	2,298.29	2,418.95

	2002 (kt)	2003 (kt)	2004 (kt)	2005 (kt)	2006 (kt)	2007 (kt)	2008 (kt)	2009 (kt)	2010 (kt)	2011 (kt)	Change from base to latest reported year (%)
<b>1. Energy</b>	<b>14,528.06</b>	<b>16,301.62</b>	<b>16,404.21</b>	<b>15,711.61</b>	<b>15,086.67</b>	<b>17,944.61</b>	<b>16,422.21</b>	<b>13,832.39</b>	<b>17,449.42</b>	<b>18,366.41</b>	<b>-48.36</b>
A. Fuel Combustion (Sectoral Approach)	14,528.06	16,301.62	16,404.21	15,711.61	15,086.67	17,944.61	16,422.21	13,832.39	17,449.42	18,366.41	-48.36
1. Energy Industries	11,425.98	13,224.50	13,144.25	12,360.55	11,629.43	13,875.70	12,575.99	10,656.87	14,194.43	14,829.11	-48.42
2. Manufacturing Industries and Construction	482.06	551.26	659.32	714.24	709.68	1,175.05	1,070.37	586.81	505.98	784.01	-68.36
3. Transport	2,067.74	1,986.29	2,033.48	2,104.92	2,269.26	2,394.47	2,277.72	2,100.24	2,221.90	2,236.96	-7.49
4. Other Sectors	537.60	520.57	539.39	497.06	446.65	468.76	487.35	459.34	486.26	496.52	-73.57
5. Other	14.68	18.99	27.76	34.84	31.65	30.62	10.78	29.13	40.86	19.82	-54.47
B. Fugitive Emissions from Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00



1. Solid Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
2. Oil and Natural Gas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
<b>2. Industrial Processes</b>	<b>457.40</b>	<b>512.14</b>	<b>658.98</b>	<b>687.87</b>	<b>734.93</b>	<b>908.99</b>	<b>918.43</b>	<b>311.45</b>	<b>339.49</b>	<b>452.62</b>	<b>-56.82</b>
A. Mineral Products	393.87	375.56	408.26	415.74	463.32	648.93	647.74	281.80	339.49	452.62	-27.95
B. Chemical Industry	63.53	136.58	250.71	272.13	271.61	260.05	270.69	29.66	NO	NO	-100.00
C. Metal Production	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	0.00
D. Other Production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
E. Production of Halocarbons and SF <sub>6</sub>											
F. Consumption of Halocarbons and SF <sub>6</sub>											
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
<b>3. Solvent and Other Product Use</b>	<b>18.78</b>	<b>18.62</b>	<b>18.89</b>	<b>20.00</b>	<b>21.00</b>	<b>19.77</b>	<b>17.07</b>	<b>14.05</b>	<b>12.58</b>	<b>13.95</b>	<b>-32.83</b>
<b>4. Agriculture</b>											
A. Enteric Fermentation											
B. Manure Management											
C. Rice Cultivation											
D. Agricultural Soils											
E. Prescribed Burning of Savannas											
F. Field Burning of Agricultural Residues											
G. Other											
<b>5. Land Use, Land-Use Change and Forestry</b>	<b>3,335.73</b>	<b>655.03</b>	<b>-2,390.12</b>	<b>-5,041.08</b>	<b>-7,003.74</b>	<b>-8,117.90</b>	<b>-8,133.06</b>	<b>-7,349.07</b>	<b>-5,948.72</b>	<b>-4,269.92</b>	<b>-51.76</b>
A. Forest Land	3,649.43	1,317.60	-1,576.92	-4,406.33	-6,695.80	-8,132.81	-8,596.93	-8,108.58	-6,850.70	-5,184.22	-43.72
B. Cropland	81.60	95.79	117.11	146.85	179.25	192.85	203.73	185.46	193.47	175.83	40.25
C. Grassland	-684.02	-1,093.93	-1,350.62	-1,374.88	-1,180.07	-860.14	-486.89	-124.59	160.57	282.29	164.09
D. Wetlands	109.21	109.19	124.56	148.22	155.93	151.18	178.40	165.29	155.10	129.35	0.09
E. Settlements	179.51	226.39	278.67	346.50	416.51	391.52	421.82	397.27	323.84	262.01	100.00
F. Other Land	NO	NO	17.07	98.56	120.43	139.49	146.80	136.08	68.98	64.82	100.00
G. Other	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	0.00
<b>6. Waste</b>	<b>0.02</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.00</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>	<b>-100.00</b>
A. Solid Waste Disposal on Land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
B. Waste-water Handling											
C. Waste Incineration	0.02	0.01	0.01	0.01	0.00	NO	NO	NO	NO	NO	-100.00
D. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
<b>7. Other (as specified in the summary table in CRF)</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>0.00</b>
<b>Total CO<sub>2</sub> emissions including net CO<sub>2</sub> from LULUCF</b>	<b>18,339.99</b>	<b>17,487.43</b>	<b>14,691.96</b>	<b>11,378.41</b>	<b>8,838.86</b>	<b>10,755.46</b>	<b>9,224.65</b>	<b>6,808.82</b>	<b>11,852.77</b>	<b>14,563.07</b>	<b>-47.59</b>
<b>Total CO<sub>2</sub> emissions excluding net CO<sub>2</sub> from LULUCF</b>	<b>15,004.26</b>	<b>16,832.39</b>	<b>17,082.08</b>	<b>16,419.49</b>	<b>15,842.60</b>	<b>18,873.36</b>	<b>17,357.71</b>	<b>14,157.89</b>	<b>17,801.49</b>	<b>18,832.99</b>	<b>-48.59</b>

<b>Memo Items:</b>											
<b>International Bunkers</b>	428.61	410.17	560.84	523.64	767.15	930.04	877.45	809.82	809.10	701.03	2.78
Aviation	55.84	55.48	89.10	146.63	97.50	153.54	85.37	100.89	113.97	104.06	-3.38
Marine	372.77	354.69	471.74	377.01	669.66	776.50	792.07	708.93	695.13	596.97	3.94
<b>Multilateral Operations</b>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
<b>CO<sub>2</sub> Emissions from Biomass</b>	2,451.88	2,582.86	2,681.81	2,625.34	2,358.71	2,667.04	2,868.35	3,148.01	3,725.36	3,599.05	288.16
Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.											
<sup>a</sup> The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance											
<sup>b</sup> Fill in net emissions/removals as reported in CRF table Summary 1.A of the latest reported inventory year. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).											

BR CTF Table 1. Emission trends: (CH<sub>4</sub>)

Source: Submission 2014 v1.5, ESTONIA												
	Base year <sup>a</sup> (kt)	1991 (kt)	1992 (kt)	1993 (kt)	1994 (kt)	1995 (kt)	1996 (kt)	1997 (kt)	1998 (kt)	1999 (kt)	2000 (kt)	2001 (kt)
<b>1. Energy</b>	<b>13.33</b>	<b>13.14</b>	<b>8.03</b>	<b>5.24</b>	<b>7.13</b>	<b>9.85</b>	<b>11.21</b>	<b>11.36</b>	<b>9.67</b>	<b>9.53</b>	<b>9.99</b>	<b>10.42</b>
A. Fuel Combustion (Sectoral Approach)	4.70	4.52	3.00	2.70	3.50	5.74	6.70	6.95	5.48	5.45	5.37	5.42
1. Energy Industries	0.36	0.33	0.23	0.22	0.27	0.30	0.35	0.33	0.33	0.33	0.31	0.36
2. Manufacturing Industries and Construction	0.15	0.14	0.10	0.05	0.07	0.06	0.07	0.06	0.07	0.04	0.05	0.07
3. Transport	0.92	0.86	0.41	0.44	0.53	0.50	0.50	0.57	0.43	0.51	0.46	0.53
4. Other Sectors	3.27	3.19	2.25	1.99	2.63	4.88	5.78	5.99	4.65	4.57	4.54	4.45
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive Emissions from Fuels	8.62	8.62	5.03	2.54	3.63	4.11	4.52	4.41	4.19	4.08	4.63	5.00
1. Solid Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Oil and Natural Gas	8.62	8.62	5.03	2.54	3.63	4.11	4.52	4.41	4.19	4.08	4.63	5.00
<b>2. Industrial Processes</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>
A. Mineral Products	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Chemical Industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal Production	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
D. Other Production												
E. Production of Halocarbons and SF <sub>6</sub>												
F. Consumption of Halocarbons and SF <sub>6</sub>												
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>3. Solvent and Other Product Use</b>												
<b>4. Agriculture</b>	<b>52.29</b>	<b>48.89</b>	<b>41.98</b>	<b>33.27</b>	<b>30.17</b>	<b>26.78</b>	<b>25.18</b>	<b>24.97</b>	<b>24.23</b>	<b>20.88</b>	<b>20.64</b>	<b>21.43</b>
A. Enteric Fermentation	48.43	45.38	39.46	31.18	28.15	24.88	23.64	23.39	22.65	19.53	19.21	19.90
B. Manure Management	3.60	3.25	2.35	1.88	1.88	1.76	1.36	1.40	1.43	1.24	1.25	1.38

C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural Soils	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	0.26	0.25	0.17	0.21	0.14	0.14	0.17	0.18	0.15	0.11	0.19	0.15
G. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>5. Land Use, Land-Use Change and Forestry</b>	<b>0.02</b>	<b>0.01</b>	<b>0.16</b>	<b>0.06</b>	<b>0.04</b>	<b>0.02</b>	<b>0.06</b>	<b>0.11</b>	<b>0.01</b>	<b>0.06</b>	<b>0.08</b>	<b>0.01</b>
A. Forest Land	0.02	0.00	0.15	0.06	0.04	0.02	0.05	0.11	0.01	0.06	0.08	0.01
B. Cropland	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Grassland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Wetlands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E. Settlements	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
F. Other Land	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
G. Other	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
<b>6. Waste</b>	<b>14.05</b>	<b>13.90</b>	<b>13.07</b>	<b>11.58</b>	<b>11.33</b>	<b>10.11</b>	<b>11.02</b>	<b>14.02</b>	<b>15.94</b>	<b>16.37</b>	<b>18.18</b>	<b>18.47</b>
A. Solid Waste Disposal on Land	8.56	9.10	9.59	10.52	10.94	9.54	10.26	12.99	15.12	15.45	17.17	17.61
B. Waste-water Handling	5.47	4.77	3.44	1.03	0.36	0.53	0.64	0.78	0.80	0.87	0.90	0.72
C. Waste Incineration	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Other	0.03	0.03	0.03	0.03	0.03	0.04	0.13	0.26	0.03	0.04	0.11	0.14
<b>7. Other (as specified in the summary table in CRF)</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>
<b>Total CH<sub>4</sub> emissions including CH<sub>4</sub> from LULUCF</b>	<b>79.69</b>	<b>75.93</b>	<b>63.23</b>	<b>50.15</b>	<b>48.67</b>	<b>46.76</b>	<b>47.47</b>	<b>50.46</b>	<b>49.85</b>	<b>46.84</b>	<b>48.89</b>	<b>50.33</b>
<b>Total CH<sub>4</sub> emissions excluding CH<sub>4</sub> from LULUCF</b>	<b>79.68</b>	<b>75.92</b>	<b>63.07</b>	<b>50.09</b>	<b>48.63</b>	<b>46.74</b>	<b>47.41</b>	<b>50.35</b>	<b>49.85</b>	<b>46.78</b>	<b>48.81</b>	<b>50.32</b>
<b>Memo Items:</b>												
<b>International Bunkers</b>	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Aviation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Marine	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
<b>Multilateral Operations</b>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>CO<sub>2</sub> Emissions from Biomass</b>												

	2002 (kt)	2003 (kt)	2004 (kt)	2005 (kt)	2006 (kt)	2007 (kt)	2008 (kt)	2009 (kt)	2010 (kt)	2011 (kt)	Change from base to latest reported year (%)
<b>1. Energy</b>	<b>9.55</b>	<b>10.13</b>	<b>11.06</b>	<b>10.60</b>	<b>10.48</b>	<b>11.48</b>	<b>11.34</b>	<b>9.91</b>	<b>10.48</b>	<b>9.31</b>	<b>-30.18</b>
A. Fuel Combustion (Sectoral Approach)	5.38	5.50	5.64	5.02	4.82	5.83	5.93	6.22	6.52	5.73	21.76
1. Energy Industries	0.38	0.38	0.40	0.44	0.37	0.35	0.40	0.46	0.61	0.64	77.88
2. Manufacturing Industries and Construction	0.05	0.07	0.08	0.08	0.09	0.15	0.13	0.07	0.07	0.10	-35.07
3. Transport	0.47	0.42	0.38	0.37	0.37	0.36	0.36	0.36	0.36	0.21	-77.37

4. Other Sectors	4.47	4.64	4.78	4.12	3.99	4.98	5.05	5.33	5.48	4.78	46.20
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-54.49
B. Fugitive Emissions from Fuels	4.17	4.63	5.41	5.58	5.66	5.65	5.40	3.70	3.96	3.58	-58.51
1. Solid Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
2. Oil and Natural Gas	4.17	4.63	5.41	5.58	5.66	5.65	5.40	3.70	3.96	3.58	-58.51
<b>2. Industrial Processes</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>0.00</b>
A. Mineral Products	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
B. Chemical Industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C. Metal Production	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	0.00
D. Other Production											
E. Production of Halocarbons and SF <sub>6</sub>											
F. Consumption of Halocarbons and SF <sub>6</sub>											
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
<b>3. Solvent and Other Product Use</b>											
<b>4. Agriculture</b>	<b>20.27</b>	<b>20.96</b>	<b>21.20</b>	<b>21.44</b>	<b>21.51</b>	<b>21.18</b>	<b>21.24</b>	<b>21.02</b>	<b>21.55</b>	<b>21.72</b>	<b>-58.47</b>
A. Enteric Fermentation	18.77	19.12	19.35	19.49	19.55	19.23	19.27	18.99	19.31	19.56	-59.62
B. Manure Management	1.37	1.70	1.70	1.76	1.81	1.95	1.97	2.03	2.24	2.16	-39.96
C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
D. Agricultural Soils	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field Burning of Agricultural Residues	0.14	0.13	0.15	0.19	0.15	NO	NO	NO	NO	NO	-100.00
G. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
<b>5. Land Use, Land-Use Change and Forestry</b>	<b>0.17</b>	<b>0.02</b>	<b>0.05</b>	<b>0.01</b>	<b>0.39</b>	<b>0.01</b>	<b>0.06</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>-71.43</b>
A. Forest Land	0.16	0.02	0.05	0.01	0.39	0.01	0.05	0.01	0.00	0.00	-84.18
B. Cropland	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C. Grassland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-80.27
D. Wetlands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.28
E. Settlements	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00
F. Other Land	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	0.00
G. Other	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	0.00
<b>6. Waste</b>	<b>18.01</b>	<b>18.35</b>	<b>18.79</b>	<b>17.67</b>	<b>18.22</b>	<b>17.95</b>	<b>17.60</b>	<b>15.94</b>	<b>16.39</b>	<b>14.57</b>	<b>3.65</b>
A. Solid Waste Disposal on Land	16.85	16.60	16.89	15.45	15.23	14.58	14.58	13.02	12.92	12.11	41.54
B. Waste-water Handling	0.76	0.56	0.29	0.30	0.30	0.29	0.28	0.25	0.29	0.28	-94.79
C. Waste Incineration	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
D. Other	0.40	1.19	1.61	1.92	2.68	3.08	2.74	2.67	3.18	2.17	7,503.51
<b>7. Other (as specified in the summary table in CRF)</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>0.00</b>
<b>Total CH<sub>4</sub> emissions including CH<sub>4</sub> from LULUCF</b>	<b>47.99</b>	<b>49.46</b>	<b>51.10</b>	<b>49.73</b>	<b>50.61</b>	<b>50.62</b>	<b>50.24</b>	<b>46.89</b>	<b>48.43</b>	<b>45.60</b>	<b>-42.79</b>

<b>Total CH<sub>4</sub> emissions excluding CH<sub>4</sub> from LULUCF</b>	47.82	49.44	51.05	49.71	50.22	50.61	50.18	46.88	48.42	45.59	-42.78
<b>Memo Items:</b>											
<b>International Bunkers</b>	0.03	0.02	0.03	0.03	0.05	0.05	0.05	0.05	0.05	0.04	3.70
Aviation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.54
Marine	0.02	0.02	0.03	0.03	0.04	0.05	0.05	0.05	0.05	0.04	3.67
<b>Multilateral Operations</b>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
<b>CO<sub>2</sub> Emissions from Biomass</b>											
Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.											
<sup>a</sup> The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.											

BR CTF Table 1. Emission trends: (N<sub>2</sub>O)

Source: Submission 2014 v1.5, ESTONIA												
	Base year <sup>a</sup> (kt)	1991 (kt)	1992 (kt)	1993 (kt)	1994 (kt)	1995 (kt)	1996 (kt)	1997 (kt)	1998 (kt)	1999 (kt)	2000 (kt)	2001 (kt)
<b>1. Energy</b>	<b>0.36</b>	<b>0.34</b>	<b>0.23</b>	<b>0.21</b>	<b>0.21</b>	<b>0.24</b>	<b>0.28</b>	<b>0.27</b>	<b>0.24</b>	<b>0.22</b>	<b>0.23</b>	<b>0.29</b>
A. Fuel Combustion (Sectoral Approach)	0.36	0.34	0.23	0.21	0.21	0.24	0.28	0.27	0.24	0.22	0.23	0.29
1. Energy Industries	0.06	0.06	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.04	0.05
2. Manufacturing Industries and Construction	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01
3. Transport	0.07	0.07	0.03	0.04	0.07	0.08	0.10	0.09	0.08	0.08	0.10	0.16
4. Other Sectors	0.20	0.19	0.14	0.12	0.09	0.11	0.13	0.12	0.10	0.08	0.08	0.07
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive Emissions from Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
1. Solid Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Oil and Natural Gas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>2. Industrial Processes</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>
A. Mineral Products	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Chemical Industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal Production	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D. Other Production												
E. Production of Halocarbons and SF <sub>6</sub>												
F. Consumption of Halocarbons and SF <sub>6</sub>												
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>3. Solvent and Other Product Use</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.03</b>	<b>0.02</b>
<b>4. Agriculture</b>	<b>6.67</b>	<b>6.39</b>	<b>5.49</b>	<b>4.05</b>	<b>3.45</b>	<b>2.97</b>	<b>2.73</b>	<b>2.74</b>	<b>2.95</b>	<b>2.43</b>	<b>2.48</b>	<b>2.38</b>
A. Enteric Fermentation												
B. Manure Management	0.99	0.93	0.78	0.63	0.58	0.51	0.47	0.47	0.45	0.39	0.39	0.40
C. Rice Cultivation												
D. Agricultural Soils	5.68	5.46	4.71	3.42	2.87	2.46	2.26	2.27	2.49	2.04	2.09	1.98
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

F. Field Burning of Agricultural Residues	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
G. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>5. Land Use, Land-Use Change and Forestry</b>	<b>0.01</b>	<b>0.00</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.00</b>	<b>0.01</b>	<b>0.01</b>	<b>0.00</b>
A. Forest Land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Cropland	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO	NA, NO
C. Grassland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Wetlands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E. Settlements	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
F. Other Land	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO
G. Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
<b>6. Waste</b>	<b>0.16</b>	<b>0.16</b>	<b>0.16</b>	<b>0.14</b>	<b>0.14</b>	<b>0.14</b>	<b>0.14</b>	<b>0.14</b>	<b>0.12</b>	<b>0.17</b>	<b>0.17</b>	<b>0.17</b>
A. Solid Waste Disposal on Land												
B. Waste-water Handling	0.15	0.15	0.15	0.13	0.13	0.13	0.13	0.11	0.11	0.11	0.11	0.11
C. Waste Incineration	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.05	0.05	0.05
D. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.01	0.01
<b>7. Other (as specified in the summary table in CRF)</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>
<b>Total N<sub>2</sub>O emissions including N<sub>2</sub>O from LULUCF</b>	<b>7.21</b>	<b>6.91</b>	<b>5.90</b>	<b>4.42</b>	<b>3.82</b>	<b>3.38</b>	<b>3.17</b>	<b>3.17</b>	<b>3.33</b>	<b>2.84</b>	<b>2.91</b>	<b>2.87</b>
<b>Total N<sub>2</sub>O emissions excluding N<sub>2</sub>O from LULUCF</b>	<b>7.21</b>	<b>6.91</b>	<b>5.89</b>	<b>4.42</b>	<b>3.81</b>	<b>3.38</b>	<b>3.17</b>	<b>3.16</b>	<b>3.33</b>	<b>2.83</b>	<b>2.91</b>	<b>2.87</b>
<b>Memo Items:</b>												
<b>International Bunkers</b>	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aviation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Marine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Multilateral Operations</b>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>CO<sub>2</sub> Emissions from Biomass</b>												

	2002 (kt)	2003 (kt)	2004 (kt)	2005 (kt)	2006 (kt)	2007 (kt)	2008 (kt)	2009 (kt)	2010 (kt)	2011 (kt)	Change from base to latest reported year (%)
<b>1. Energy</b>	<b>0.31</b>	<b>0.26</b>	<b>0.28</b>	<b>0.28</b>	<b>0.25</b>	<b>0.27</b>	<b>0.28</b>	<b>0.29</b>	<b>0.32</b>	<b>0.32</b>	<b>-10.14</b>
A. Fuel Combustion (Sectoral Approach)	0.31	0.26	0.28	0.28	0.25	0.27	0.28	0.29	0.32	0.32	-10.14
1. Energy Industries	0.05	0.05	0.06	0.08	0.07	0.07	0.08	0.08	0.10	0.11	65.46
2. Manufacturing Industries and Construction	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	-32.89
3. Transport	0.15	0.08	0.08	0.08	0.06	0.06	0.06	0.06	0.06	0.06	-19.27
4. Other Sectors	0.10	0.12	0.12	0.11	0.11	0.12	0.12	0.14	0.14	0.14	-28.47
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-56.92
B. Fugitive Emissions from Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
1. Solid Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00

2. Oil and Natural Gas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
<b>2. Industrial Processes</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>NA, NO</b>	<b>0.00</b>
A. Mineral Products	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
B. Chemical Industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C. Metal Production	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
D. Other Production											
E. Production of Halocarbons and SF <sub>6</sub>											
F. Consumption of Halocarbons and SF <sub>6</sub>											
G. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
<b>3. Solvent and Other Product Use</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.01</b>	<b>0.02</b>	<b>0.02</b>	<b>-13.51</b>
<b>4. Agriculture</b>	<b>2.22</b>	<b>2.33</b>	<b>2.42</b>	<b>2.32</b>	<b>2.31</b>	<b>2.47</b>	<b>2.85</b>	<b>2.55</b>	<b>2.59</b>	<b>2.63</b>	<b>-60.63</b>
A. Enteric Fermentation											
B. Manure Management	0.38	0.36	0.36	0.35	0.34	0.33	0.34	0.33	0.33	0.34	-65.89
C. Rice Cultivation											
D. Agricultural Soils	1.83	1.97	2.06	1.97	1.96	2.13	2.51	2.21	2.26	2.29	-59.69
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
F. Field Burning of Agricultural Residues	0.00	0.00	0.00	0.00	0.00	NO	NO	NO	NO	NO	-100.00
G. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00
<b>5. Land Use, Land-Use Change and Forestry</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>351.20</b>
A. Forest Land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-84.18
B. Cropland	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02	100.00
C. Grassland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-80.27
D. Wetlands	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	9.28
E. Settlements	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00
F. Other Land	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	NE, NO	0.00
G. Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00
<b>6. Waste</b>	<b>0.16</b>	<b>0.21</b>	<b>0.24</b>	<b>0.26</b>	<b>0.31</b>	<b>0.34</b>	<b>0.32</b>	<b>0.31</b>	<b>0.35</b>	<b>0.27</b>	<b>74.77</b>
A. Solid Waste Disposal on Land											
B. Waste-water Handling	0.11	0.11	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	-24.96
C. Waste Incineration	0.02	0.01	0.01	0.01	0.00	0.00	NO	0.00	0.00	NO	-100.00
D. Other	0.03	0.09	0.12	0.14	0.20	0.23	0.21	0.20	0.24	0.16	7,502.08
<b>7. Other (as specified in the summary table in CRF)</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>0.00</b>
<b>Total N<sub>2</sub>O emissions including N<sub>2</sub>O from LULUCF</b>	<b>2.71</b>	<b>2.83</b>	<b>2.97</b>	<b>2.90</b>	<b>2.91</b>	<b>3.12</b>	<b>3.48</b>	<b>3.18</b>	<b>3.30</b>	<b>3.26</b>	<b>-54.78</b>
<b>Total N<sub>2</sub>O emissions excluding N<sub>2</sub>O from LULUCF</b>	<b>2.71</b>	<b>2.82</b>	<b>2.96</b>	<b>2.89</b>	<b>2.89</b>	<b>3.10</b>	<b>3.46</b>	<b>3.16</b>	<b>3.28</b>	<b>3.24</b>	<b>-55.06</b>
<b>Memo Items:</b>											
<b>International Bunkers</b>	<b>0.00</b>	<b>0.00</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>-0.53</b>

Aviation	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-5.98
Marine	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	3.67
<b>Multilateral Operations</b>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
<b>CO<sub>2</sub> Emissions from Biomass</b>											

Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.

<sup>a</sup> The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

BR CTF Table 1. Emission trends: HFCs, PFCs and SF<sub>6</sub>

Source: Submission 2014 v1.5, ESTONIA

	Base year <sup>a</sup> (kt)	1991 (kt)	1992 (kt)	1993 (kt)	1994 (kt)	1995 (kt)	1996 (kt)	1997 (kt)	1998 (kt)	1999 (kt)	2000 (kt)	2001 (kt)
<b>Emissions of HFCs<sup>c</sup> - (kt CO<sub>2</sub> eq)</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>15.92</b>	<b>18.06</b>	<b>20.67</b>	<b>25.37</b>	<b>30.58</b>	<b>36.38</b>	<b>45.93</b>	<b>55.65</b>	<b>69.54</b>	<b>85.47</b>
HFC-23	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-32	NO	NO	NO	NO	NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-41	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-43-10mee	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-125	NO	NO	NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-134	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-134a	NO	NO	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.04
HFC-152a	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00	0.00
HFC-143	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-143a	NO	NO	NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-227ea	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00	0.00
HFC-236fa	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
HFC-245ca	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of listed HFCsd - (kt CO <sub>2</sub> eq)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>Emissions of PFCs<sup>c</sup> - (kt CO<sub>2</sub> eq)</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>
CF <sub>4</sub>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C <sub>2</sub> F <sub>6</sub>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C 3F8	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C <sub>4</sub> F <sub>10</sub>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
c-C <sub>4</sub> F <sub>8</sub>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C <sub>5</sub> F <sub>12</sub>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C <sub>6</sub> F <sub>14</sub>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Unspecified mix of listed PFCs <sup>(4)</sup> - (Gg CO <sub>2</sub> equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>Emissions of SF<sub>6</sub><sup>(3)</sup> - (Gg CO<sub>2</sub> equivalent)</b>	<b>NA, NE, NO</b>	<b>0.05</b>	<b>0.09</b>	<b>1.45</b>	<b>3.11</b>	<b>3.22</b>	<b>3.49</b>	<b>2.99</b>	<b>2.99</b>	<b>3.01</b>	<b>2.73</b>	<b>1.74</b>
SF <sub>6</sub>	NA, NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	2002 (kt)	2003 (kt)	2004 (kt)	2005 (kt)	2006 (kt)	2007 (kt)	2008 (kt)	2009 (kt)	2010 (kt)	2011 (kt)	Change from base to latest reported year (%)
<b>Emissions of HFCs<sup>c</sup></b>	<b>86.52</b>	<b>91.92</b>	<b>104.61</b>	<b>118.16</b>	<b>135.31</b>	<b>148.98</b>	<b>131.31</b>	<b>138.15</b>	<b>152.56</b>	<b>159.38</b>	<b>100.00</b>



- (kt CO <sub>2</sub> eq)												
HFC-23	NO	NO	NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
HFC-32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
HFC-41	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-43-10mee	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-125	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	100.00
HFC-134	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-134a	0.04	0.04	0.05	0.05	0.06	0.06	0.04	0.04	0.04	0.04	0.04	100.00
HFC-152a	0.00	0.00	0.01	0.01	0.01	0.02	0.04	0.04	0.03	0.04	0.04	100.00
HFC-143	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-143a	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	100.00
HFC-227ea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
HFC-236fa	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
HFC-245ca	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Unspecified mix of listed HFCsd - (kt CO <sub>2</sub> eq)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
<b>Emissions of PFCs<sup>c</sup> - (kt CO<sub>2</sub> eq)</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>0.07</b>	<b>0.06</b>	<b>0.04</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>NA, NE, NO</b>	<b>0.00</b>
CF <sub>4</sub>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C <sub>2</sub> F <sub>6</sub>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C <sub>3</sub> F <sub>8</sub>	NO	NO	NO	NO	0.00	0.00	0.00	NO	NO	NO	NO	0.00
C <sub>4</sub> F <sub>10</sub>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
c-C <sub>4</sub> F <sub>8</sub>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C <sub>5</sub> F <sub>12</sub>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
C <sub>6</sub> F <sub>14</sub>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
Unspecified mix of listed PFCs <sup>(d)</sup> - (Gg CO <sub>2</sub> equivalent)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
<b>Emissions of SF<sub>6</sub><sup>(3)</sup> - (Gg CO<sub>2</sub> equivalent)</b>	<b>1.44</b>	<b>1.33</b>	<b>1.08</b>	<b>1.08</b>	<b>1.15</b>	<b>0.97</b>	<b>1.35</b>	<b>1.44</b>	<b>1.81</b>	<b>1.82</b>	<b>1.82</b>	<b>100.00</b>
SF <sub>6</sub>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00

Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.

<sup>a</sup> The column "Base year" should be filled in only by those Parties with economies in transition that use a base year different from 1990 in accordance with the relevant decisions of the Conference of the Parties. For these Parties, this different base year is used to calculate the percentage change in the final column of this table.

<sup>c</sup> Enter actual emissions estimates. If only potential emissions estimates are available, these should be reported in this table and an indication for this be provided in the documentation box. Only in these rows are the emissions expressed as CO<sub>2</sub> equivalent emissions.

<sup>d</sup> In accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories", HFC and PFC emissions should be reported for each relevant chemical. However, if it is not possible to report values for each chemical (i.e. mixtures, confidential data, lack of disaggregation), this row could be used for reporting aggregate figures for HFCs and PFCs, respectively. Note that the unit used for this row is kt of CO<sub>2</sub> equivalent and that appropriate notation keys should be entered in the cells for the individual chemicals.)

### **3. QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET**

Estonia signed the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) on 3 December 1998. The Protocol was ratified by the Estonian parliament in September 2002. According to the Kyoto Protocol, Estonia had to reduce its GHG emissions by 8 per cent in comparison with the 1990 level during the period 2008-2012. The obligation to reduce GHG emissions according to the Kyoto Protocol has been achieved in Estonia as a result of the significant re-organization of economic sectors (particularly energy production, but also industry and agriculture) mainly in the early 1990s.

The EU and its Member States communicated an independent quantified economy-wide emission reduction target of a 20 per cent emission reduction by 2020 compared with 1990 levels. This is documented in the UNFCCC document FCCC/SB/2011/INF.1/Rev.1 of 7 June 2011. In the EU submission to the UNFCCC from 20 March 2012 (FCCC/AWGLCA/2012/MISC.1) the EU target is explained further.

Estonia will as a part of the EU take on a quantified economy-wide emission reduction target jointly with all Member States. The EU's commitment to meeting the 20% target is underlined by the fact that it is already enshrined in EU legislation. In December 2008 the European Parliament and the European Council agreed on the EU Climate and Energy Package, which for the first time provided an integrated and ambitious package of policies and measures to tackle climate change. The Climate and Energy Package was formally adopted in 2009. It includes the 20-20-20 targets, which set the following key objectives:

- to reduce GHG emissions by at least 20% compared to 1990 by 2020;
- to achieve 20% of energy from renewable sources by 2020; and
- a commitment to save 20% of total primary energy consumption by 2020 compared to a business as usual baseline.

In order to meet these key objectives, the Climate and Energy Package comprises four pieces of complementary legislation<sup>7</sup>:

- a Directive revising the EU Emissions Trading Scheme (EU ETS), which covers some 40% of EU greenhouse gas emissions;
- an "effort-sharing" Decision setting binding national targets for emissions from sectors not covered by the EU ETS;
- a Directive setting binding national targets for increasing the share of renewable energy sources in the energy mix.
- a Directive creating a legal framework for the safe and environmentally sound use of carbon capture and storage technologies.

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<sup>7</sup> [http://europa.eu/rapid/press-release\\_IP-09-628\\_en.htm](http://europa.eu/rapid/press-release_IP-09-628_en.htm)

The Effort Sharing Decision (Decision No 406/2009/EC<sup>8</sup> - ESD) sets annual national emission targets for all Member States for the period 2013-2020 for those sectors not covered by the EU emissions trading system (ETS) (e.g. transport (except aviation), buildings, agriculture (excluding LULUCF) and waste), expressed as percentage changes from 2005 levels. In March 2013, the Commission formally adopted the national annual limits throughout the period for each Member State. By 2020, the national targets will collectively deliver a reduction of around 10% in total EU emissions from the sectors covered compared with 2005 levels. Under the ESD Estonia is allowed for an 11 per cent increase in GHG emissions outside the emissions trading directive scope by 2020, compared to the 2005 level.

The EU common goal is to achieve emission reduction of 21% below 2005 emission levels by 2020 from the sectors covered by the EU ETS.

The use of carbon credits from international market-based mechanisms is explained in the EU submission from 2012. With regard to the role of land use, land-use change and forestry (LULUCF), the EU pledge does not include emissions/removals from LULUCF.

More detailed information on emission reduction target is given in CTF Table 2.

BR CTF Table 2. Description of quantified economy-wide emission reduction target

Emission reduction target: base year and target				
		Comments		
Base year/ base period	1990	Legally binding target trajectories for the period 2013-2020 are enshrined in both the EU-ETS Directive (Directive 2003/87/EC and respective amendments) and the Effort Sharing Decision (Decision No 406/2009/EC). These legally binding trajectories not only result in a 20% GHG reduction in 2020 compared to 1990 but also define the EU's annual target pathway to reduce EU GHG emissions from 2013 to 2020. The Effort Sharing Decision sets annual national emission targets for all Member States for the period 2013-2020 for those sectors not covered by the EU emissions trading system (ETS), expressed as percentage changes from 2005 levels. In March 2013, the Commission formally adopted the national annual limits throughout the period for each Member State. By 2020, the national targets will collectively deliver a reduction of around 10% in total EU emissions from the sectors covered compared with 2005 levels. The emission reduction to be achieved from the sectors covered by the EU ETS will be 21% below 2005 emission levels.		
Emission reductions target (% of base year/base period)	20.00			
Emission reductions target (% of 1990) <sup>b</sup>	20.00			
Period for reaching target	BY-2020			
Gases and sectors covered. GWP values.				
Gases covered	Covered	Base Year	GWP <sup>c</sup> reference source	Comments
CO <sub>2</sub>	Yes	1990	4nd AR	As adopted in UNFCCC reporting guidelines for national GHG inventories of Annex I Parties and as adopted under the EU Monitoring Mechanism Regulation.
CH <sub>4</sub>	Yes	1990	4nd AR	As adopted in UNFCCC reporting guidelines for national GHG inventories of Annex I Parties and as adopted under the EU Monitoring Mechanism Regulation.
N <sub>2</sub> O	Yes	1990	4nd AR	As adopted in UNFCCC reporting guidelines for national GHG inventories of Annex I Parties and as adopted under the EU Monitoring Mechanism Regulation.
HFCs	Yes	1990	4nd AR	As adopted in UNFCCC reporting guidelines for national GHG inventories of Annex I Parties and as adopted under the EU Monitoring Mechanism Regulation.
PFCs	Yes	1990	4nd AR	As adopted in UNFCCC reporting guidelines for national GHG inventories of Annex I Parties and as adopted under the EU Monitoring Mechanism Regulation.

<sup>8</sup> OJ L 140, 5.6.2009, p. 136.

				Monitoring Mechanism Regulation.
SF <sub>6</sub>	Yes	1990	4nd AR	As adopted in UNFCCC reporting guidelines for national GHG inventories of Annex I Parties and as adopted under the EU Monitoring Mechanism Regulation.
NF <sub>3</sub>	Yes	to be determined	4nd AR	As adopted in UNFCCC reporting guidelines for national GHG inventories of Annex I Parties and as adopted under the EU Monitoring Mechanism Regulation. Base year not yet determined.
Other gases (specify) <sup>d</sup>				
Sectors covered <sup>e</sup>			Covered	Comments
Energy			Yes	
Transport <sup>f</sup>			Yes	
Industrial processes <sup>g</sup>			Yes	
Agriculture			Yes	
LULUCF			No	
Waste			Yes	
Other sectors (specify) <sup>h</sup>				
Aviation in the scope of the EU-ETS			Yes	CO <sub>2</sub> emissions from all flights falling within the aviation activities listed in Annex I of the EU ETS Directive which depart from an aerodrome situated in the territory of a Member State and those which arrive in such an aerodrome from a third country, excluding small commercial emitters.
Add a sector				
Role of LULUCF sector				
LULUCF in base year level and target			Excluded	
Contribution of LULUCF is calculated using				
Market-based mechanisms				
Possible scale of contributions of market-based mechanisms under the Convention (estimated kt CO <sub>2</sub> eq)	NE	The Climate and Energy Package allows Certified Emission Reductions (CERs) and Emission Reduction Units (ERUs) to be used for compliance purposes, subject to a number of restrictions in terms of origin and type of project and up to an established limit. In addition, the legislation foresees the possible recognition of units from new market mechanisms. Under the EU ETS the limit does not exceed 50% of the required reduction below 2005 levels. In the sectors not covered by the ETS, annual use shall not exceed to 3% of each Member States' non-ETS greenhouse gas emissions in 2005.		
CERs	NE	The exact number of units that can be used during the period 2013-2020 can only be determined following the availability of final data concerning the use of these units during the period 2008-2012 and relevant greenhouse gas emissions data. The use of these units under the ETS Directive and the Effort Sharing Decision is subject to the limits specified above which do not separate between CERs and ERUs, but include additional criteria for the use of CERs.		
ERUs	NE	The exact number of units that can be used during the period 2013-2020 can only be determined following the availability of final data concerning the use of these units during the period 2008-2012 and relevant greenhouse gas emissions data. The use of these units under the ETS Directive and the Effort Sharing Decision is subject to the limits specified above which do not separate between CERs and ERUs, but include additional criteria for the use of ERUs.		
AAUs <sup>i</sup>	NE	AAUs for the period 2013-2020 have not yet been determined. The EU expects to achieve its 20% target for the period 2013-2020 with the implementation of the ETS Directive and the ESD Decision in the non-ETS sectors which do not allow the use of AAUs from non-EU Parties.		
Carry-over units <sup>j</sup>	NE	The exact number of carry-over units for the EU and its Member States from the first commitment period that can be used for compliance during the period 2013-2020 can only be determined after the true-up period of the first commitment period. In the second commitment period the use of such units in the PPSR account depend on the extent by which emissions during the second commitment period exceed the assigned amount for that commitment period, which can only be determined at the end of the second commitment period. At CMP.9 the EU made a declaration when adopting the Doha amendment of the Kyoto Protocol that the European Union legislation on Climate-Energy Package for the implementation of its emission reduction objectives for the period 2013-2020 does not allow the use of surplus AAUs carried over from		

		the first commitment period to meet these objectives.
<b>Other mechanism units under the Convention (specify)<sup>k</sup></b>		There are general provisions in place in the EU legislation that allow for the use of such units provided that the necessary legal arrangements for the creation of such units have been put in place in the EU which is not the case at the point in time of the provision of this report.
<b>Possible scale of contributions of other market-based mechanisms (estimated kt CO<sub>2</sub> eq)</b>		None
<b>Any other information</b>		
Any other information: <sup>l</sup>		In December 2009, the European Council reiterated the conditional offer of the EU to move to a 30% reduction by 2020 compared to 1990 levels as part of a global and comprehensive agreement for the period beyond 2012, provided that other developed countries commit themselves to comparable emission reductions and that developing countries contribute adequately according to their responsibilities and respective capabilities.

## 4. PROGRESS IN ACHIEVEMENT OF QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGETS AND RELEVANT INFORMATION

### 4.1. Mitigation actions and their effects

#### 4.1.6. Joint implementation and international emissions trading

Estonia is using two of the three Kyoto flexible mechanisms – Joint Implementation (JI) and International Emissions Trading. According to the National GHG Inventories, Estonia's emissions decreased significantly between 1990 and 1993 due to the restructuring of the economy after the collapse of the Soviet Union (almost 50 per cent). Since then, annual emissions have remained approximately 50 per cent below the 1990 level. This is a clear indication that Estonia does not have problems meeting its Kyoto target. As a consequence, Estonia is acting as a seller within both mechanisms. The Clean Development Mechanism (CDM) is not used, as Estonia is not a developing country.

#### *Joint implementation*

In 1993 Estonia started working with Sweden on projects preceding Joint Implementation – Activities Implemented Jointly – where no actual emissions reductions were transferred. A total of 12 projects were implemented. Information on these projects is available on the UNFCCC website ([http://ji.unfccc.int/JI\\_Parties/DB/ZY0IK6ZF2CQKOTBPPY1MKN130ITMM7/view/DFP](http://ji.unfccc.int/JI_Parties/DB/ZY0IK6ZF2CQKOTBPPY1MKN130ITMM7/view/DFP)).

Since 2002, Estonia has been active in carrying out JI projects under the Kyoto flexible mechanisms. There were seven early mover projects that started generating emission reductions before 2008 and for those years Assigned Amount Units (AAUs each equal to 1 ton of CO<sub>2</sub> equivalent) were transferred to investor countries.

In 2004 Estonia signed a Memorandum of Understanding for JI projects with Austria, Denmark, Finland, the Netherlands and Sweden. Also, Estonia has signed the Agreement on a Testing Ground for Application of the Kyoto Mechanisms on Energy Projects in the Baltic Sea Region. Parties to the agreement (Denmark, Estonia, Finland, Germany, Iceland, Latvia, Lithuania, Norway, Poland, Russia and Sweden) agreed to establish a Testing Ground for the Baltic Sea Region to gain experience from and facilitate the use of JI under Article 6 and International Emissions Trading under Article 17 of the Kyoto Protocol and to implement projects generating emission reductions prior to and during the commitment period commencing in 2008, in order to reduce anthropogenic emissions of GHG in a cost-effective way.

Since May 2006 the Minister of the Environment has been designated by the Government to sign international agreements for JI projects. The Designated National Focal Point for Joint Implementation is the Ministry of the Environment. Guidelines for the procedure and implementation of JI projects in Estonia are available on the UNFCCC website.

During the JI commitment period 2008-2012 there were all together twelve JI projects (including the seven early mover projects) implemented in Estonia which all have been registered in UNFCCC as Track 1 projects. During the commitment period Emission Reduction Units (ERUs, each equal to 1 tonne of CO<sub>2</sub> equivalent) were transferred to investor countries for the generated emission reductions.

JI and CDM, as Kyoto flexible mechanisms, and their relation to the EU Emission Trading Scheme (EU ETS) and the national registry are regulated by the Ambient Air Protection Act.

By 31 December 2012, the twelve JI projects that have been implemented in Estonia resulted in a total emission reduction around 1.34 Mt CO<sub>2</sub>-eq (see Table 4.1).

**Table 4.1.** Emission reductions from JI projects in Estonia (2002-2012)

<b>Project</b>	<b>Emission reductions, t CO<sub>2</sub>-eq.</b>
<b>Tamsalu District Heating Project</b>	52,115
<b>Kadrina District Heating Project</b>	37,217
<b>Paide Bioenergy Project</b>	139,043
<b>Saaremaa Animal Waste Management Project</b>	57,155
<b>Virtsu III Wind Power Project</b>	48,994
<b>Esivere and Virtsu II Wind Farm</b>	214,223
<b>Viru-Nigula Wind Farm</b>	231,703
<b>Pakri Wind Farm Project</b>	379,139
<b>Jägala-Joa Hydropower Joint Implementation Project</b>	31,978
<b>Paldiski Wind Farm</b>	0
<b>Vanaküla Wind Power Project</b>	52,656

Project	Emission reductions, t CO <sub>2</sub> -eq.
<b>Tooma Wind Power Project</b>	99,469
<b>Total</b>	<b>1,343,692</b>

### *International Emissions Trading*

Estonia ratified the Kyoto Protocol in 2002, taking an obligation to reduce its GHG emissions by 8 per cent during 2008 to 2012 compared to 1990. Mainly due to the collapse of the Soviet Union in 1991, followed by a complete restructuration of the economy together with the implementation of energy efficiency measures, increase in the use of renewable energy and modern technologies, a significant emission reduction (about 50 per cent) has taken place since 1990. Therefore only 103,000,000 AAUs out of the total 196,000,000 AAUs distributed to Estonia are used for the first commitment period reserve. The surplus of AAUs can be used for trading (Article 17 of the Kyoto Protocol).

In 2010 the Ambient Air Act was amended with provisions on AAU trading and procedures for the use of revenue from surplus AAUs in the framework of the Green Investment Scheme (GIS). All revenue from sales of surplus AAUs will be invested in environmentally friendly projects and programmes via the GIS. Also an inter-ministerial working group was formed with the aim to coordinate the preparation of the legal framework and to prepare projects and programs for the use of the revenues.

The MoE with the help of external experts is responsible for trade with AAUs (negotiations and signing the AAU sale and purchase agreements (SPAs)). For sales of AAUs, a government regulation is issued to approve each AAU SPA. The use of AAU revenue exclusively via GIS is required by the State Budget Act and the government regulation for the approval of AAU SPAs.

The GIS provides that the money received must be directed to environmentally friendly projects aimed at reducing CO<sub>2</sub> and other greenhouse gas emissions. The main projects and programmes invested via the GIS are the following:

- energy efficiency (including thermal refurbishment) of buildings and district heating sector;
- efficient and environmentally benign transport;
- development of wind energy farms; and
- use of renewable energy.

Since 2010 Estonia has concluded 21 SPAs with Austria, Spain, Luxembourg and Japan. By 2013 Estonia has sold AAUs worth of more than 388 million euros<sup>9</sup>.

#### **4.1.7. EU legislation**

Directive 2009/28/EC (amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC) on the promotion of the use of energy from renewable sources sets

<sup>9</sup> More detailed information of the GIS is given in the overview on sectors.



for Estonia a target (25 per cent) for the share of energy from renewable sources in gross final consumption of energy by 2020.

Directive 2010/31/EC lays down requirements as regards:

- the common general framework for a methodology to calculate the integrated energy performance of buildings and building units;
- the application of minimum requirements for the energy performance of new buildings and new building units;
- national plans to increase the number of nearly zero-energy buildings;
- energy certification of buildings or building units;
- regular inspection of heating and air-conditioning systems in buildings; and
- independent control systems for energy performance certificates and inspection reports.

In 2011, the European Commission (EC) published 'A Roadmap for moving to a competitive low-carbon economy in 2050'. Estonia finalized its report on 'Opportunities for a Low-Carbon Economy in Estonia' in 2013.

#### **4.1.8. Emissions trading under the EU Emission Trading Scheme**

The European Union Emissions Trading Scheme (EU ETS) is one of the key policy instruments implemented in the EU to achieve its climate policy objectives. It was established by Directive 2003/87/EC (the Emissions Trading Directive) and entered into force on 1 January 2005. The EU ETS was established in the context of international mitigation commitments under the Kyoto Protocol and aimed at helping Member States reach their individual Kyoto targets in a cost-effective manner.

Estonia's first National Allocation Plan (NAP) for the EU Emissions Trading Scheme (EU ETS) for 2005-2007 included 43 installations. The first NAP for greenhouse gas emission allowances provided the right to emit 56.7 million tons of carbon dioxide from 2005-2007.

On 30 June 2006, Estonia submitted its second NAP for the EU ETS for 2008-2012 to the European Commission for approval. On 4 May 2007, the European Commission published the decision on the second NAP, reducing the total quantity of Estonia's allowances by 47.8 per cent, to 12.7 million tonnes of carbon dioxide per year. Based on this decision the Government of the Republic adopted, on 20 December 2007, Regulation No 257 on 'Total Allowance of Greenhouse Gases Emitted by Stationary Sources of Pollution and Allocation Plan Thereof for 2008-2012', which was used to implement the EU ETS in Estonia during 2008 and 2009. On 16 July 2007, Estonia contested the decision in the Court of First Instance of the European Communities. The Court agreed with Estonia's positions and annulled the Commission Decision of 4 May 2007 in its judgement of 23 September 2009. On 11 December 2009, the Commission took a new decision by revoking Estonia's NAP of 30 June 2006. As requested in the Decision of 11 December 2009, Estonia, following numerous consultations with the EC, submitted the revised second NAP to the European Commission for approval in February 2011. In the revised NAP2 Estonia applied for 71.65 Mt of allowances (14.44 Mt/a). In April 2011 the Commission, with its decision, also rejected the revised NAP2. Another revised plan was compiled and



presented to the EC in September 2011. In December 2011 the EC adopted the NAP2 of Estonia. Finally, the NAP2 for the period 2008-2012 was legally enforced in December 2011 with a Regulation of the Government (No 183; 22.12.2011). This plan provides the right to emit 66.51 Mt of CO<sub>2</sub> eq. (13.3 Mt/a). This quantity includes a reserve of 3.47 Mt of CO<sub>2</sub> eq. for new entrants and a JI reserve of 0.99 Mt of CO<sub>2</sub> eq.

Article 10c of the EU Emissions Trading Directive (Directive 2003/87/EC as amended by Directive 2009/29/EC) allows several Member States (incl. Estonia) to allocate carbon emission allowances free of charge, provided that the funds are used to modernize the energy system. Estonia has applied for free allocation of a certain amount of allowances for the electricity sector. In June 2012 the EC concluded that provisions of Estonia's development plan for the electricity sector allocating carbon emissions trading allowances free of charge are in line with EU state aid rules. During the transition period (2013-2019) Estonia is permitted to allocate 18 Mt of emission allowances free of charge to electricity producers included in the EU emission credit trading system.

#### **4.1.9. Effort Sharing Decision**

The Effort Sharing Decision (Decision No 406/2009/EC – ESD) establishes annual targets for the GHG emissions of Member States between 2013 and 2020, which are legally binding and only refer to GHG emissions that are not included within the scope of the EU ETS (e.g. transport (except aviation), buildings, agriculture (excluding LULUCF) and waste). According to the ESD, each Member State must define and implement national policies and measures to limit the GHG emissions covered by the ESD. The inclusion of the ESD within the EU's climate and energy package ensures that the abatement potential from non-ETS sectors contribute to the delivery of the EU-wide target of reducing GHG emissions by 20 per cent below 1990 levels by 2020.

#### **4.1.10. Cross-cutting measures**

##### **4.1.10.2. National programmes and EU assistance**

The National Reform Programme '*Estonia 2020*' (approved by the Government in 2011) established two major priorities of the Government in moving towards an environmentally sustainable economy and energy sector:

- implementing long-term structural changes in the energy sector in harmony with Estonia's energy security and energy efficiency objectives; and
- reducing general resource intensity, including the energy intensity of the economy, by increasing energy efficiency.

In the Programme, the Government has set an ambitious goal for making final energy consumption more efficient in Estonia – to keep final energy consumption in 2020 at the same level as 2010, i.e. reducing final consumption of energy by approx. 11 per cent compared to the forecast for 2020 (see Table 4.2). Accordingly, final energy consumption in 2015 should not significantly exceed current consumption and it should remain between 123 and 125 PJ (approx. 4 per cent lower than the projected

level for 2015). Keeping final consumption of energy at the 2010 level will require decreased energy use combined with an increase in energy efficiency.

**Table 4.2.** Final consumption of energy, PJ

<b>Actual</b>	<b>Targets</b>	
<b>2010</b>	<b>2015</b>	<b>2020</b>
120	123-125	120

Regarding GHG emissions, the National Reform Programme 'Estonia 2020' provides that according to EU goals, Estonia's emissions from non-ETS sectors should not increase by more than 11 per cent by 2020 compared to the 2005 level. This situation is illustrated in Table 4.3.

**Table 4.3.** GHG emissions from non-ETS sectors, kt CO<sub>2</sub> eq.

<b>Actual</b>	<b>Targets</b>	
<b>2005</b>	<b>2015</b>	<b>2020</b>
5,627	6,183	6,246

The level of GHG emissions is related to the plans set in the Programme for the wider utilization of renewable energy sources (RES) developing relevant solutions in all sectors (see Table 4.4).

**Table 4.4.** Share of renewable resources in final energy consumption, per cent

<b>Actual</b>	<b>Targets</b>	
<b>2009</b>	<b>2015</b>	<b>2020</b>
19.5	23.6	25.0

The total target is in accordance with Directive 2009/28/EC – Estonia must ensure that the share of energy from renewable sources amounts to 25 per cent of the gross final consumption of energy by 2020. The same directive also provides that each Member State shall adopt a national renewable energy action plan. In Estonia, the *National Renewable Energy Action Plan up to 2020* (NREAP) was approved by the Government in November 2010 (Order No 452, 26.11.2010). The national goals for Estonia in the EU 20-20-20 package require a 25 per cent share of energy from renewable sources in gross final energy consumption by 2020 and allow for an 11 per cent increase in greenhouse gas emissions outside the emissions trading directive scope by 2020, compared to the 2005 level. The 10 per cent share of renewable energy sources in road transport fuels by 2020 is an EU-wide goal. The *National Renewable Energy Action Plan* presents estimations and planned policies and measures to achieve the national targets. The *Implementation plan for 2010-2013 of the 'National Renewable Energy Action Plan up to 2020'* has also been adopted. It

should be noted that the Plan predicted the share of renewable energy in final consumption to be 20.9 per cent in 2010, but it actually reached 24.0 per cent.

In September 2011, the Ministry of Economic Affairs and Communications (MoEAC) presented a mid-term overview of the implementation of the Energy Efficiency Plan 2007-2013 and the further implementation plan that was presented to the EC as the *Second energy efficiency action plan of Estonia* (NEEAP2). The action plan focuses on the following aspects of energy efficiency:

- continued support programmes for energy conservation activities in apartment buildings;
- a new measure for energy conservation in small houses;
- implementation of the programme for renovation of public sector buildings;
- improving energy efficiency to increase the competitiveness of industry and small enterprises;
- energy conservation in the transport sector;
- energy efficiency in the service sector; and
- improving the quality of implementation of energy conservation policy.

NEEAP2 includes 99 measures to increase energy efficiency in all sectors. In the current document, the key measures are described in sector overviews.

Both NEEAP2 and NREAP present a long-term forecast of the final energy consumption in Estonia by 2020 (see Table 4.5). The forecast was compiled by the MoEAC when drawing up the NREAP until 2020. According to this forecast, Estonia's final energy consumption would be 137 PJ in the case of the basic (reference) scenario and 131 PJ in the case of the additional energy efficiency scenario in 2020.

**Table 4.5.** Final consumption of energy by sector, PJ

Sector	2009	2020	
		Reference scenario	Efficiency scenario
Industry	20.9	36.5	35.6
Agriculture	3.7	4.7	4.6
Transport	20.3	26.8	26.2
Services	16.7	16.9	16.4
Households	51.3	52.1	48.1
<b>Total</b>	<b>112.9</b>	<b>137.0</b>	<b>130.9</b>

In Estonia, oil shale is the main domestic fuel, therefore to ensure the long-term balanced use of it, the *National Development Plan for the Use of Oil Shale 2007-2015* was prepared to specify the plans for use of oil shale as a nationally strategic

indigenous energy resource. These plans include an assessment of the use of shale fuel oil and oil shale gas taking into account economic, social, security and environmental issues. In the Plan, the upper limit on the amount of annual mining of oil shale has been set at 20 million tons with the intention to reduce it to 15 million tons by 2015. The Plan was endorsed by the Parliament in October 2008. In current legislation, the limit of 20 million tons is set.

During the EU financial period of 2007-2013, the EU funds for supporting agriculture and fisheries are no longer regarded as structural assistance as was the case from 1999-2006. Therefore, planning for the use of respective funds is undertaken separately from structural assistance planning – although in the same general framework of the *State Budget Strategy 2007-2010* preparations. The *Rural Strategy 2007-2013* as a strategic document and the *Rural Development Plan 2007-2013* (RDP) as its implementation document are bases for using the resources of the European Agricultural Fund for Rural Development. Environmental issues are mainly included in the following priority axes of the RDP:

1. improving the competitiveness of the agricultural and forestry sector; and
2. improving the environment and countryside.

To promote the use of biomass and bio-energy, in January 2007 the Government approved the *Development Plan 2007-2013 for Enhancing the Use of Biomass and Bio-energy*. The objective of the plan is to create favourable conditions for the development of domestic biomass and bio-energy production to reduce Estonia's dependence on imported resources and fossil fuels and decrease pressure on the natural environment. The measures of the development plan are directed at supporting the research and development of biomass and bio-energy and raising the awareness of consumers, operators and market regulators. After carrying out appropriate analyses, the employment of a range of market-based instruments will be considered to promote the use of biomass and bio-energy. Investment in bio-energy production will be supported using the measures of the *Estonian Rural Development Plan 2007-2013*.

#### **4.1.10.3. Fiscal measures**

Fiscal measures with an impact on GHG emissions in Estonia include excise duties and pollution charges.

##### *Excise duties*

As a Member State, Estonia must comply with EU requirements (Directive 2003/96/EC) for the taxation of fuels and energy. Nevertheless, Estonia has been granted a transitional period for the introduction of relevant taxes. Regarding oil shale, Directive 2004/74/EC stipulates that until 1 January 2013 Estonia is allowed to apply a reduced level of taxation for oil shale, provided that it does not result in taxation falling below 50 per cent of the relevant Community minimum rate as of 1 January 2011. Regarding shale oil (oil produced from oil shale), Estonia was eligible to apply a transitional period until 1 January 2010 to adjust the national level of taxation on shale oil used for district heating purposes to the EU minimum level of taxation. Nevertheless, Estonia had already introduced the tax on shale oil by that date. The tax exemption for natural gas (methane) is permitted by Directive

2003/96/EC, which allows an exemption on natural gas in Member States where the share of natural gas in energy end-use was less than 15 per cent in 2000. The exemption applies for a maximum of ten years after the directive's entry into force or until the national share of natural gas in energy end-use reaches 25 per cent, whichever comes first. In fact, Estonia has imposed an excise duty on natural gas since 1 January 2008. Directive 2004/74/EC allowed Estonia to apply a transitional period until 1 January 2010 to introduce output taxation on electricity. Despite this exemption, Estonia introduced an excise duty on electricity on 1 January 2008. It should be noted that some excise rates exceed the minimum level provided by Directive 2003/96/EC: for example, for light fuel oil (gas oil) the rate is 5.3 times higher, while for electricity it is 4.5 times higher (non-business use) or 8.9 times higher (business use).

The current tax rates stipulated in the Alcohol, Tobacco, Fuel and Electricity Excise Duty Act are presented in Table 4.6.

**Table 4.6.** Excise tax on fuels and energy (as of 1 March 2013)

<b>Fuel / energy type</b>	<b>Unit</b>	<b>EUR/unit</b>
Unleaded petrol	1,000 l	422.77
Kerosene	1,000 l	330.10
Gas oil (diesel fuel)	1,000 l	392.92
Gas oil fuel for specific purposes	1,000 l	110.95
LPG	t	125.26
Gas oil (light fuel oil)	1,000 l	110.95
Heavy fuel oil	t	15.01
Shale oil	t	15.01
Coal, coke	GJ	0.30
Natural gas (as heating fuel)	1,000 m <sup>3</sup>	23.45
Oil shale	GJ	0.30
Electricity	MWh	4.47

### *Pollution charges*

The Government's tax policy is based on objectives aimed at reducing environmental impact by increasing the rates of charges on pollution and resource use. According to the *Environmental Charges Act*, pollution charges and charges on the use of natural resources will be gradually increased in subsequent years. The sums derived from environmental charges go to the state budget and are mainly directed to environmental protection projects through the Environmental Investment Centre.

In Estonia a pollution charge for releasing carbon dioxide into the ambient air was introduced in 2000. Currently, the *Environmental Charges Act* (enforced in 2006) obliges the owners of combustion equipment to pay pollution charges for several

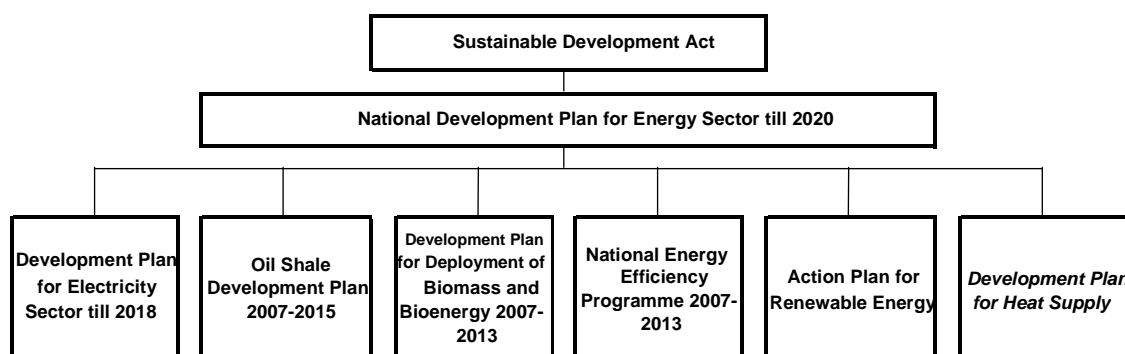
pollutants emitted into the air. The pollution charge in the case of emissions into ambient air must be paid by all enterprises that are required to have an air pollution permit. According to the regulation of the Minister of the Environment the air pollution permit is obligatory for all enterprises which own and operate combustion equipment (utilizing solid, liquid or gas fuel) with a rated capacity equal to or higher than 0.3 MW in one location. As an exception, the CO<sub>2</sub> charge must only be paid by enterprises producing heat. Since 2009 the rate of the CO<sub>2</sub> charge has been 2 EUR/t. In the case of CO<sub>2</sub> emissions in quantities larger than those provided in the emission permit, higher charge rates apply: since 1 January 2008 the penalty rate has been 100 EUR/t. Installations that emit nitrous oxide into the ambient air also pay a pollution charge. Methane and fluorinated gases (HFC, PFC and SF<sub>6</sub>) are not subject to pollution charges.

As an exception, the Environmental Charges Act provides the option of replacing the pollution charge (incl. the CO<sub>2</sub> charge) with environmental investment by enterprises. The financing replaces the pollution charge if the polluter implements, at its own expense, environmental protection measures that reduce pollutants or waste by 15 per cent from their initial value.

#### 4.1.11. Energy supply

##### 4.1.6.1. General development programmes

Regarding the energy sector, Estonia's second *National Long-term Development Plan for the Fuel and Energy Sector until 2015* (approved by the Parliament in 2004) was replaced in 2009 with the *National Development Plan of the Energy Sector until 2020*. The present structure of strategy documents for the development of the energy sector is presented in Figure 4.1. One plan – Development Plan for Heat supply (in italics in the figure) – has yet to be prepared.



**Figure 4.1.** The current structure of strategy documents for energy sector

The *National Development Plan for Energy Sector until 2020* was passed by the Parliament in June 2009. The plan defines the mission of Estonia's energy sector: to ensure a steady, efficient, environmentally benign energy supply with reasonable prices, whilst ensuring the sustainable use of energy. In the plan, three groups of major goals are set, all accompanied by relevant sets of specified measures:

- a continuous energy supply is ensured for the Estonian population (five measures);

- energy supply and consumption is more sustainable in Estonia (six measures); and
- energy supply at a justified price has been ensured for consumers (five measures).

The major measures (or sub-measures) to be taken that have an impact on the emission of GHGs include:

- developing and applying support schemes for the use of renewable energy;
- preparing and implementing measures that foster the cogeneration of heat and electricity;
- improving the energy efficiency of oil shale use;
- developing and introducing up-to-date energy technologies;
- developing and implementing an action plan for the deployment of renewable energy;
- developing and implementing an action plan for heat supply (district heating) systems;
- transposing and implementing EU regulations on sustainable energy use; and
- analysing taxation alternatives for the energy sector.

For several measures, target level indicators have been set. Some quantitative indicators related to the emission of GHG are presented in Table 4.7.

**Table 4.7.** Key indicators for energy sector development

Indicator	Current level <sup>1)</sup>	Target level
Share of oil shale in meeting domestic energy	45% (2007)	<30% (2020)
Shares of other energy sources in energy balance	Every source <20% (2007)	Every source <20% (2020)
Share of renewables in energy end-use	17.5% (2006)	25% (2020)
Share of CHP electricity in gross electricity use	10.2% (2007)	20% (2020)
Energy saving (annually)	5 TJ (2007)	9,800 TJ (2016)
Share of renewables in fuel use of transport	0.06% (2007)	10% (2020)
CO <sub>2</sub> emissions from energy sector	15.7 Mt (2007)	7.85 Mt (2020)

1) indicator level presented as current in Plan

Activities provided in the development plan are to be financed from the state budget and from the budgets of energy companies. The amount of state expenditure on the activities planned will be approximately EUR 2,045,000,000 until 2020. Together with the involvement of private capital and loan capital, the full implementation of the *Development Plan for the Energy Sector* will cost more than EUR 6,000,000,000. The



final actual amount of investments will depend on administrative and political decisions.

Currently, a new *Development Plan for the Energy Sector 2030+* is under development.

#### 4.1.6.2. Electricity Production

The major national-level document aimed at the electricity sector is the *National Development Plan for Electricity Sector until 2018* (NDPES 2018) approved by the Government in February 2009. The plan foresees a significant decrease in electricity production from oil shale and an increase in the proportion of other sources of energy. The construction of an Estonian nuclear power plant is being considered as a potential development option.

The plan emphasizes that Estonia's electricity sector requires fundamental changes as the impact of electricity generation on the environment must be reduced. This process is also affected by the need to use the resources of oil shale in a more sustainable way. Therefore, the plan provides scenarios for the restructuring of electricity production in Estonia within the next 10-15 years. For this purpose, combined heat and power production should be expanded from the existing level of 200 MW to 300 MW by 2014 and two more units in the Narva power plants should be reconstructed with a total capacity of 600 MW. Also, the capacity of wind turbines (mainly wind farms) could be increased significantly (up to 900 MW) together with the required capacity reserves.

Estonia has exported a large share of its generated electricity, e.g. *ca* 20 per cent in 2007, while in 2011 net export made up 27.6 per cent of gross production. The plan stipulates the construction of a second submarine cable (EstLink 2) to Finland.

Regarding options for electricity generation, the plan considers four main development scenarios. The projected annual increase rate of the peak load is 1.6-3.8 per cent, the average taken as 2.3 per cent per annum. As for consumption, the target is set to keep the domestic final consumption of electricity at the current level or lower (7,180 GWh in 2007). The main precondition is that total electricity demand (with a peak load of 1,800 MW in 2016) must be covered by domestic generation. All scenarios include the following common elements for generation:

- 1) the currently used oil shale-based units with fluidized bed boilers are still in operation;
- 2) at least 200 MW of cogeneration units firing various fuels; and
- 3) some old units of oil shale pulverized combustion with desulphurization equipment.

Some quantitative indicators related to the GHG emissions are presented in Table 4.8.

**Table 4.8.** National Development Plan for Electricity sector until 2018

Indicator	Current level <sup>1)</sup>	Target level
Share of renewable electricity in gross electricity use	1.5% (2007)	5.1% (2010) 15% (2015)
Share of oil shale-based electricity in gross	93.6% (2007)	<70% (2018)



Indicator	Current level <sup>1)</sup>	Target level
electricity production		
Share of CHP electricity in gross electricity use	10.2% (2007)	20% (2020)
Electricity end-use	7,180 GWh (2007)	max 7,180 GWh (until 2015)
Household electricity use (per capita)	1,320 kWh (2007)	EU27 average (2018)
Losses in electricity transmission networks	3.0% (2007)	<3% (2015)
Losses in electricity distribution networks	7.8% (2007)	<6% (2015)
CO <sub>2</sub> emissions from electricity sector	15.7 Mt (2007)	5 Mt (2018)

1) indicator level presented as current in Plan

### *Latest actual developments*

The development of oil shale-based power production using environmentally sound technologies is an issue of growing importance in Estonia. In order to comply with the requirements of Directive 2001/80/EC the owner of the largest power plants, Eesti Energia AS, must reconstruct several units in the power plants of Narva Elektriijaamad AS (Narva Power Plants, including the Eesti and Balti plants). Until 2004 only the pulverized combustion technology of oil shale had been used in these power plants. Electricity generation based on such oil shale is characterized by low net average efficiency (27-29 per cent). This, together with the peculiarities of oil shale as a fuel, resulted in an extremely high specific emission of carbon dioxide per amount of electricity generated – approximately 1.2 t CO<sub>2</sub>/MWh<sub>e</sub>.

Therefore, the gradual replacement of oil shale pulverized combustion with circulating fluidized bed combustion (CFBC) method commenced. The higher combustion efficiency reduces fuel consumption, which in turn means substantially lower CO<sub>2</sub> emissions – approximately 0.9 t CO<sub>2</sub>/MWh<sub>e</sub>. The first two new units (both 215 MW) in Narva Elektriijaamad AS, one at the Eesti and the other at the Balti Power Plant, equipped with new CFBC boilers, were commissioned in 2004. The NDPES 2018 foresees the construction of two more CFBC units. In May 2012, the construction of a new 300 MW<sub>e</sub> CFBC-based power plant began in Auvere. The owner – the state-owned Eesti Energia AS – plans to commission a new plant by the end of 2015.

Special attention has been paid to the promotion of renewable energy in producing electricity. In 2010 the Government approved a new *National Renewable Energy Action Plan until 2020* and its implementation plan for 2010-2013. According to RES Directive 2009/28/EC Estonia must increase the share of renewable energy sources in total energy consumption up to 25 per cent by 2020. The plan includes implemented and planned policies and measures to meet the target by 2020.

The primary measures to support energy generation from renewable resources are feed-in tariffs and investment support. Feed-in tariffs are also provided for efficient heat and power cogeneration (CHP) plants. The major sources of investment support are:

- the funds of EU structural assistance combined with Estonia's own budgetary sources; and

- GIS based on revenue from sales of surplus AAUs.

Electricity producers are eligible to receive operational support in the cases indicated in Table 4.9.

**Table 4.9.** Support for renewable or efficient CHP-based electricity production (2012)

Support rate	Electricity source
53.7 EUR/MWh	Renewable sources, except biomass
	Biomass, in cogeneration regime
32.0 EUR/MWh	Waste (as defined in Waste Act), peat or oil-shale processing retort gas, all only if in efficient cogeneration regime
	Generation capacity not exceeding 10 MW <sub>e</sub> in efficient cogeneration regime

The support is paid by the transmission network operator (AS Elering) and funded by all electricity consumers according to the volume of network services used and the amount of electricity consumed. In 2012, the total sum of paid operational support was EUR 67,000,000, including EUR 62,800,000 for renewable-based electricity.

A rapid increase has taken place as a result of the wider deployment of wind energy, and during the last two to three years also due to firing biomass in new CHP plants and co-firing wood chips with oil shale in large power plants. In 2010, the installed capacity of wind generators reached 108 MW; by the end of 2011 it was already 184 MW, with electricity generation having increased by 32.5 per cent compared to 2010. In 2012, three new wind farms have been commissioned: two in Paldiski (both 25 MW) and one (39 MW) on the former ash field of Narva Power Plant.

As for biomass firing, three new privately owned efficient cogeneration plants have launched operations in recent years:

Tallinna Elektriiaam in Vão – 21 MW<sub>e</sub>/49 MW<sub>th</sub>, 2009;

Tartu Elektriiaam (AS Fortum Tartu) – 25 MW<sub>e</sub>/50 MW<sub>th</sub>, 2009; and

Pärnu Fortum Eesti AS plant – 24 MW<sub>e</sub>/48 MW<sub>th</sub>, 2010.

All three plants primarily use wood chips (but also wood waste and peat) as fuel. Also, several smaller cogeneration plants are planned or under construction. In addition to planned plants firing wood chips, there are four new CHP plants firing biogas under construction (see the section on heat production).

Regarding the use of oil shale in electricity production, it is proposed in the National Electricity Sector Development Plan until 2018 to increase the net efficiency of oil shale-based electricity generation up to 35 per cent, but at the same time to gradually reduce the share of oil shale electricity in the gross consumption of electricity. Also, it should be emphasized that Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control) set out stricter limit emission values for SO<sub>2</sub>, NO<sub>x</sub>, CO and dust emitted by combustion plants. The Directive provides an exception for cases where the units will not be operated for more than 17,500 hours, starting from 1 January 2016 and ending on 31 December 2023 at the latest.

#### 4.1.6.3. Heat production

Heat supply, particularly district heating, is the next important sector with significant potential for increasing energy efficiency, which in turn will result in lower GHG emissions. Combined with the deployment of renewable energy sources, biomass in particular, it should have an increasing role in mitigating the impact of heat supply on the environment in Estonia.

Regarding biomass, a large amount of the primary energy arising from fuel wood (logs, chips, pellets and wood waste) is used in heat production. However, development is hindered by the large-scale exporting of biomass, due to which local energy producers in some cases do not have enough biomass resources. Exports result in elevated prices for some biomass products, especially wood pellets. The deployment of smaller-scale cogeneration of heat and electricity (CHP) as an element of decentralized energy production strategy would increase the security of energy supply in Estonia. A small heat load and the fact that new equipment producing only heat alone has already been installed in many areas with a favourable heat load can be indicated as hindrances to the development of combined heat and power production based on biomass.

As a rule, district heating is more environmentally benign as a heat supply option than local heating. Therefore, it is important that the *District Heating Act* enables the zoning of district heating as an element of regional heat supply planning. The Act gives local governments the power to introduce the zoning of heat supply based on analyses, carried out for alternative heat supply options during the planning phase. The zoning of heat supply as an instrument of regulation of the energy sector gives municipalities the authority to avoid chaotic disconnection from district heating (DH) systems. The latter process had been taking place in some towns and cities for many years.

Energy efficiency and the use of renewable energy in small boiler plants and improvements to district heating networks are supported from the European Regional Development Fund (ERDF) as well as through the GIS. The support scheme was started in the framework of the *National Strategic Reference Framework 2007-2013* that combines EU structural assistance with Estonia's own budgetary funds (24.03.2009 Regulation No 14 of the Minister of Environment). The measures supporting wider use of renewables for energy production are targeted at the following activities:

- construction of small-scale combined heat and power plants; establishment or reconstruction of CHP plants with a total installed power capacity of more than 2 MW located outside the Estonian islands is not supported;
- fuel switching from fossil to renewable energy sources in existing boiler plants; establishment or reconstruction of DH boiler plants with a total installed capacity of more than 4 MW is not supported; and
- energy conservation through the improvement and reconstruction of DH networks, including expansion of DH networks.

Later, similar targets were set for support measures financed from the AAU sales in the framework of the GIS (30.08.2010 Regulation No 42 of the Minister of Environment).

21 projects have received EUR 9,560,000 in investment support from the ERDF, with an estimated reduction of 60,000 t of CO<sub>2</sub> annually. The supported projects include:

- construction of biogas-based CHP plants – 4 projects;
- switching boiler plants to renewable sources (wood chips) – 2 projects; and
- renovation of DH systems – 15 projects.

Since 2010 an additional financing source has been made available: in the framework of the GIS, financed from sales of AAUs, 41 projects in the field of heat (and partially also electricity) supply have received investment grants. The projects include the construction of six biomass-based CHP plants, the rest being renovations of DH networks.

There is a ceiling for the level of heat losses in DH pipelines that can be included in the heat price as a cost item. The maximum level of losses accepted by the CA in the cost calculation is being reduced annually:

2012 – max.	20 per cent
2013 – max.	19 per cent
2014 – max.	18 per cent
2015 – max.	17 per cent
2016 – max.	16 per cent
2017 – max.	15 per cent

#### **4.1.6.4. Shale oil production**

Shale oil production can be highlighted as a rapidly growing branch of industry. The quantities of oil shale used to produce other fuels have been growing year by year: in 2012, 4.71 Mt (50.0 PJ) of oil shale was processed and the production of shale oil was 599,000 t. There are three companies processing oil shale into oil, mainly fuel oil. Two technologies are used for the thermal processing of oil shale:

- gaseous heat carrier (Kiviter-type) technology; and
- solid heat carrier technology.

Due to the growing crude oil prices on the world market, the economic feasibility of shale oil production is improving and new facilities for thermal processing of oil shale will be commissioned in the near future. Eesti Energia AS is commissioning a new shale oil plant (solid heat carrier) known as Enefit-280 in Auvere. The plant will produce approximately 2,000,000 bbl (310,000 tons) of oil and 75,000,000 m<sup>3</sup> of retort gas per year. The oil plant is combined with an integrated 37.5 MW steam-driven turbine that uses residual heat to generate electricity to run the plant. The company has longer-term plans to establish two more Enefit-280 shale oil plants and a post-processing plant to upgrade the oil produced. In 2014, VKG Oil AS plans to commission a new shale oil solid heat carrier plant (Petroter II) in Kohtla-Järve producing approximately 140,000 tons of shale oil per year. The company has planned to launch construction of Petroter III in 2013. The Kiviõli Oil Shale Processing & Chemical Plant is currently commissioning new Galoter-type technology (TSK-500). The Kiviõli Oil Shale & Chemical Plant additionally plans to build one more TSK-

500 plant (with a production capacity of 500 tons of shale oil per day) and a TSK-3000 plant (with a production capacity of 3,000 tons of shale oil per day) by 2020.

#### **4.1.12. Energy consumption – industry and industrial processes**

The latest national-level document setting policy targets for energy performance in industry is the second Energy Efficiency Action Plan (NEEAP2) presented to the EC in September 2011. The Plan declares that energy consumption in industry has become more efficient due to measures that are related to the wider energy policy, such as the opening up of the electricity market, the renewable energy charge, fuel and electricity excise duties and reduced differences in excise duty rates. Therefore, NEEAP2 concludes that energy efficiency measures for industry must focus primarily on improving the skills and awareness of specialists. It is stated that these energy conservation measures must be implemented at the same time as other activities to improve the competitiveness of companies, and energy conservation policy must be based on the following principles:

- encouragement of the performance of energy audits in industrial plants and small enterprises;
- contribution to improving energy auditors' qualifications with respect to industrial energy conservation issues and fostering energy consultants' participation in EU projects related to energy conservation in industries;
- better financing opportunities for energy conservation measures in industries and small enterprises; and
- development of databases and methods of benchmarking companies' energy performance.

As for direct emissions of GHG from technological processes, in Estonian industry carbon dioxide is formed mainly in the processes of cement and lime manufacturing. Limestone decomposes when heated and carbon dioxide is emitted. There are only two companies operating in this sub-sector: Kunda Nordic Cement AS (Heidelberg Cement Northern Europe) and Rakke Plant (Nordkalk), both of which form part of large international industrial groups. These companies have been awarded the environmental standard ISO 14001 as well as the quality management standard ISO 9001 and publish environmental reports annually.

As early as 2008, both of these manufacturing branches had almost reached their maximum output levels. Further growth is now impossible, except by means of plant renovation and/or expansion. Some reduction in GHG emissions can be achieved, but only through the introduction of more up-to-date production technologies. For example, in Kunda Nordic Cement there is a preliminary projection plan to convert from a wet to a dry kiln system. This conversion would enable specific CO<sub>2</sub> emissions from the current 1,162 kg CO<sub>2</sub>/t of clinker to be reduced to 760-770 kg CO<sub>2</sub>/t. However, the plan is not feasible for the foreseeable future.

Since 2007 an amendment to the Integrated Pollution Prevention and Control Act has been in force with stricter requirements of integrated environmental permits for the use of the best available technique (BAT).

#### 4.1.13. Energy consumption – residential, commercial and other sectors

The *Second National Energy Efficiency Action Plan* points out that according to Directive 2006/32/EC, the 2016 target for Estonia is to achieve 9.9 PJ savings as a result of the energy conservation measures implemented in the period from 2008-2016.

##### *Residential sector*

Regarding the residential sector, the key document of policy and measures is the *National Development Plan for Housing Sector 2008-2013*, approved by the Government. One of the main objectives of the Plan is targeted at improving the quality and sustainability of housing stock in Estonia.

The energy-saving effect of this Plan has not been ex-ante estimated. Nevertheless, target values (to be reached by 2013) are foreseen in the Plan for certain measures. The following are relevant to the energy performance of buildings:

- number of apartment buildings refurbished with support – 8,000;
- share of apartment building types with energy performance mapped – 95 per cent;
- energy audits carried out (of total number of buildings in target group) – 30 per cent; and
- share of apartment buildings with indicators of highest energy performance category – 10 per cent.

In May 2009 the Minister of Economic Affairs and Communications issued an order (No 137, 07.05.2009) adopting a new programme on loans for the renovation of apartment buildings. The programme is implemented by the state-owned foundation KredEx. The scheme and relevant procedures for long-term loans were developed in cooperation with the German development bank KfW Bankengruppe. The scheme allows banks to combine finances from the structural funds of the EU (financed from the European Regional Development Fund) and additional loans from the CEB (Council of Europe Development Bank) to issue more advantageous loans with a longer repayment period (of up to 20 years) to apartment buildings constructed before 1993. The aim of the renovation loan is to improve the energy efficiency of apartment buildings by at least 20 per cent in buildings with an area of up to 2000 m<sup>2</sup> and by at least 30 per cent in buildings with an area of more than 2000 m<sup>2</sup>. Estonia was the first country to launch this type of reuse of EU structural funds. The KredEx support scheme is able to cover approximately 6-7 per cent of all apartment buildings. For example, in the framework of the scheme 167 loan contracts were entered into in 2011 in the sum of EUR 16,700,000, the total investment being EUR 23,200,000 (including own financing). The resulting average energy saving is estimated at 39.3 per cent. It is estimated that if the scheme continues, 15 per cent of apartment buildings will be refurbished by 2020.

In 2010 a new financial opportunity arose with the successful sale of surplus AAUs (Kyoto Protocol, Article 17). In August 2010 the Minister of Economic Affairs and Communications issued Regulation No 52 (17.08.2010) 'Terms and Procedures of Using Green Investment Scheme *'Apartment Building Renovation Grants'*'. In



September 2010 KredEx started issuing renovation grants in the amount of 15-35 per cent of the total cost of renovation projects. The total budget for renovation grants is EUR 28,000,000. The grant is first of all meant to accompany the renovation loan of KredEx to decrease the required share of self-financing, but the grant may also be combined with own funds of the applicant. The grant is financed from the sale of surplus AAUs to Luxembourg in the framework of the GIS. The grant limits are 15 per cent, 25 per cent and 35 per cent of the total project cost depending on the level of integration in the reconstruction of apartment buildings. To obtain a grant of 15 per cent, an apartment building must achieve an energy saving of at least 20 per cent in a building with a closed net area of 2,000 m<sup>2</sup> and at least 30 per cent in a building with a closed net area of over 2,000 m<sup>2</sup>. By performing reconstruction work, the accordance of indoor climate to requirements must be ensured, and the apartment building must achieve energy label class E (i.e. annual specific energy consumption in the range of 201-250 kWh/m<sup>2</sup>) as a minimum. To obtain a grant of 25 per cent, in addition to the fulfilment of the above terms, an apartment building must reconstruct its heating system so that it is locally adjustable, and mount devices that make it possible to divide and measure heating costs individually by apartment, partly or fully insulate and reconstruct the façade, replace all windows with energy-saving ones and insulate or/and reconstruct the roof, achieving an energy saving of at least 40 per cent, resulting in being eligible to be issued with energy label class D (151-200 kWh/(m<sup>2</sup>·a)). To obtain a grant of 35 per cent, in addition to the fulfilment of all of the above terms, the applicant must install a ventilation system with heat return, achieving an energy saving of at least 50 per cent on consumption of heating energy, and energy label class C (121-150 kWh/(m<sup>2</sup>·a)) for the building.

By the end of 2011, 243 apartment buildings had received a positive decision from KredEx regarding the renovation grant in the framework of the GIS. The total amount of grants was EUR 6,710,000, while the estimated average energy savings were up to 40 per cent.

In 2012, a similar grant was made available for small private (single- or two-family) homes. The measure has a budget of EUR 4,000,000, including EUR 3,000,000 for thermal refurbishment and EUR 1,000,000 for the use of renewable energy sources (solar and wind) locally. The popularity of the grant demonstrated the demand for such measures – there were 254 applications (to a total of EUR 3,220,000) for refurbishment grants, 111 of which were awarded.

### *Public sector*

The Government has gradually concentrated the development and management of state assets into one company: Riigi Kinnisvara AS (RKAS; State Real Estate Ltd), which was established in 2001 with the objective of guaranteeing the saving and effective provision of real estate services to the executors of state authority. RKAS creates preconditions for the state to operate on the real estate market as one entity and with a single objective – to guarantee the prudent and effective management of state assets. RKAS was issued with the ISO quality management certificate (9001) in 2007 and the environmental certificate (14001) in 2009.

In the framework of the GIS financed from the sale of surplus AAUs, the renovation of public buildings is also supported to increase energy efficiency. The renovation process is arranged by RKAS under the supervision of the Ministry of Finance.

Applications were received from 201 of 226 municipalities for the renovation of 862 buildings:

- 63 per cent – schools and kindergartens;
- 26 per cent – cultural institutions;
- 7 per cent – social and health care establishments; and
- 4 per cent – other buildings.

The actual number of state- and municipally owned buildings currently being renovated is 490, with a total floor area of more than 1,100,000 m<sup>2</sup>. The total renovation budget is approximately EUR 146,500,000, while the resulting CO<sub>2</sub> reduction is estimated to be *ca* 680 Gg over a 30-year period.

Regarding the possible exemplary role of the public sector in the use of energy in buildings, NEEAP2 sets a target to construct at least 10 publicly accessible nearly zero-energy buildings of various types with a total usable area of not less than 5,000 m<sup>2</sup> in Estonia by 2015. In early 2013, the guidelines for constructing nearly zero-energy buildings were developed by Tallinn University of Technology and RKAS.

#### *Legal acts*

In terms of improving the energy efficiency of buildings, EU Directive 2002/91/EC and its recast Directive 2010/31/EU on the energy performance of buildings have played important roles. The main provisions were and will be introduced in the *Building Act*. The objectives of the amendments already made were to introduce the energy auditing and labelling of buildings, to improve the energy performance of new and existing buildings and to provide users of buildings with easier access to information about the building's energy consumption and energy-saving measures.

Several detailed requirements have been enforced using acts of secondary legislation. The major secondary-level act is the Regulation of the Government on *Minimum Requirements for Energy Performance of Buildings* (No 258 of 20 December 2007). The Regulation provides detailed requirements for energy performance of buildings. In 2009 another regulation (No 194 of 30 December 2008) related to energy performance certificates entered into force providing a list of the types of buildings where the certificate must be placed in a prominent place that is clearly visible to the public.

Directive 2010/31/EU on energy performance of buildings requires Member States to develop and implement measures to reconstruct public buildings to become nearly zero-energy buildings. Minimum requirements for nearly zero-energy buildings are enforced with Regulation No 68 of the Government (30 August 2012).

#### *Auditing of energy performance of buildings*

The legal institution of the energy auditor plays an important role in the monitoring of the results of the thermal refurbishment of buildings. Regarding experts performing energy audits and/or issuing relevant certificates, the *Building Act* provides that only registered legal entities may issue an energy certificate or perform an energy audit on a building. The legal entities providing services of energy certification or energy auditing must fulfil following requirements:



- they should be in the register of economic activities;
- they should have a legal relationship (i.e. a contract) with a competent person, who is a specialist in charge; and
- they should keep records of issued energy audits and/or energy certificates and linked documents.

The Estonian Technical Surveillance Authority has the authority to carry out the quality control of energy audits and building energy certificates.

As for the training of experts, the MoEAC initiated a project entitled 'Development of energy audit practices' in 2007. The professional standards for energy auditors and energy certification specialists were established and a training programme developed as the standardized training course for energy auditors. Three professional levels of energy auditors were established:

- level IV – auditor for residential buildings;
- level V (diploma) – auditor for residential and public buildings; and
- level V (chartered) – auditor for all types of buildings (incl. industrial).

#### *Public procurement*

According to Directive 2006/32/EC, Member States must implement at least two measures to ensure energy efficiency and conservation via public procurements. Of these, Estonia has decided to implement the following measures:

1. requirements to purchase equipment and vehicles based on lists of energy-efficient product specifications of different categories of equipment and vehicles; and
2. requirements to use energy audits and implement the resulting cost-effective recommendations.

#### *Dissemination of information*

The programme for informing residents of the energy performance of buildings was approved by the Minister of Economic Affairs and Communications in Directive No 146 of 28 April 2008. The aim of the programme is to improve people's awareness of energy conservation and promote, through KredEx, intelligent energy conservation measures that ensure a good indoor climate in buildings, reduce pollution of the ambient air and increase energy savings in apartment buildings.

In particular, the residential sector has been the focus of several studies commissioned by the MoEAC. For example, in-depth studies were carried out by Tallinn University of Technology into the condition of the stock of residential houses. The main types of houses – concrete panel, brick and wooden – have been studied separately and options for their renovation analysed.

Energy efficiency information is disseminated by KredEx and a number of energy companies. The only institution especially targeted at energy efficiency is the Tartu Regional Energy Agency (*Tartu Regiooni Energiaagentuur*), which was established in

2009 as a regional energy agency to promote sustainable energy and energy management in the region.

#### *Electrical appliances*

In the *National Energy Efficiency Programme for 2007-2013* the target level for the share of A-label electric appliances sold on the Estonian market by 2013 was set at 75 per cent, the level in 2006 being approximately 50 per cent (estimate). The projected saving as a result of the increased effectiveness of electrical appliances will increase 10 per cent by 2020, which is estimated to lead to a potential saving of 0.5 PJ of electricity annually.

The wider use of heat pumps is gaining popularity in the country. The Heat Pump Association of Estonia has estimated that in the period from 1993-2010 around 47,500 heat pumps, including *ca* 41,500 air-sourced (air-to-air) heat pumps and *ca* 6,000 geothermal (ground-to-water) heat pumps, have been installed in Estonia. The total installed capacity of heat pumps is approximately 275 MW (estimation of Heat Pump Association of Estonia).

#### *Street lighting*

In 2012, the Estonian Environmental Investment Centre launched a programme to provide seven Estonian cities (with populations of 8,000-15,000) with energy-efficient street lighting. The total cost of the programme is estimated to be tens of millions of euros. Its goal is to provide high-quality, efficient street lighting. The expected energy saving is around 5 GWh per year.

### **4.1.14. Energy consumption – transport**

The latest policy document setting targets for energy consumption in transport is the second Energy Efficiency Action Plan (NEEAP2) presented to the EC in September 2011. It states that in Estonia the main energy conservation measure in the transport sector is the excise duty on motor fuel. Nevertheless, NEEAP2 presents 17 specific energy efficiency measures for implementation in the transport sector, as set out below.

- Sectoral legislative acts
  - Energy conservation criteria in public procurements, i.e. procurements for motor vehicles that take the entire service life of a vehicle into account: its energy efficiency, CO<sub>2</sub> and other emissions (since 2010)
  - Introduction of larger (60 m<sup>3</sup> instead of 40 m<sup>3</sup>) trucks (planned)
  - Development of standard energy performance certificates for cars (planned)
- Financing and other support
  - GIS-based projects for the development of public transport (since 2009)

- Pilot project for widespread introduction of electric cars (in the framework of GIS; since 2011)
- Tax policy
  - To offer EU support for the devising and introduction of technical solutions that contribute to the efficient use of infrastructure and to a reduction in CO<sub>2</sub> emissions (new pricing and taxation systems for the road network, intelligent transport systems and programmes to increase capacity) (planned)
  - Free parking for electric and sustainable cars (current measure)
- Provision of know-how
  - New study programme at Tallinn University of Technology: integrated transport management (current measure)
  - Eco-driving courses in driving schools (current measure)
- Research and development
  - To launch national programmes supporting the devising of sustainable transport technologies and development of new environmentally friendly technologies (e.g. engines and alternative fuels) where possible (planned)
  - Introduction of transport based on electricity, hydrogen and hybrid technology and increasing their share (planned)
- Awareness
  - Information campaigns to increase awareness of cars' impact on the environment and to promote public transport and non-motorised vehicles (current measure)
- Other measures
  - More efficient spatial planning: promotion and development of non-motorised vehicle traffic (development/construction of bike lanes/lanes in larger cities); development of sustainable transport, incl. priority development of public transport (planned)
  - Improvement of the railway network and development of a rail connection to Europe (Rail Baltica) in compliance with EU standards, allowing travel from Estonia to Western Europe by express train (planned)
  - Renewal of public transport rolling stock and transition to electricity-powered transport (the new residential districts of Tallinn must have an environmentally friendly connection with the city centre, by electric transport) (planned)
  - To start using intelligent mobility systems, such as the European Intelligent Transport System (ITS), new-generation systems to arrange multimodal transport and information exchange (planned)

### *Taxation*

The rates of excise taxes on fuels have been raised in several cases during the past few years. This has been done, among other reasons, with the objective of affecting the fuel demand of transport and making it more environmentally sustainable. The Government has increased fuel excise duties faster than stipulated in EU directives. According to Directive 2003/96/EC, the minimum rates of fuel excise duty were to be reached by the beginning of 2010 in Estonia, but the Government decided to raise the excise duties to the EU minimum level at the start of 2008.

The *Heavy Goods Vehicles Tax Act* establishes tax rates for heavy goods vehicles. The rates are differentiated according to the number of axles, maximum weight and type of suspension of driving axle. At present, the quarterly paid rates for trucks (lorries) range from EUR 7.90 to EUR 134.40 and for road trains (a truck with a trailer) from EUR 3.50 to EUR 133.80.

### *Biofuels in transport*

Regarding the use of biofuels in transport, the EU has set common objectives for the share of biofuels in the consumption of all motor fuels: 5.75 per cent by 2010 and 10 per cent by 2020. In Estonia, the corresponding share was 0.2 per cent in 2010. To promote the growth of biofuel use in transport, the amendment (made in 2005) to the *Alcohol, Tobacco, Fuel and Electricity Excise Duty Act* provides that if biofuel has been added to motor fuel, the portion of biofuel contained in the motor fuel is exempt from excise duty. This provision, considered as state aid, needed approval from the EC. In July 2005, the EC authorized Estonia to exempt from excise duty non-synthetic biodiesel, vegetable oils made from biomass and bioethanol made of agriculture products or plant products. The exemption remained in force until June 2011 and was not extended. This measure had no effect on the use of biofuels in transport.

The new *National Energy Sector Development Plan until 2020* declares that Estonia considers targets concerning biofuels binding only if the use of second generation biofuels is economically feasible and fully sustainable. Some specific measures are foreseen in the *National Renewable Energy Action Plan* to reach the 10 per cent renewables target in the transport sector:

- stipulating a 5-7 per cent mixed fuel requirement for liquid fuels. Relevant amendments to legal acts are planned for proposal. The estimated increase of the share of biofuels in transport is up to 5 per cent by 2015;
- the transfer of public transport to renewable energy. A financing plan and conditions for implementation will be prepared by 2013. The expected increase of the share of biofuels is 2 per cent by 2020; and
- as a result of technology development, the share of vehicles using alternative fuels (other than biodiesel and bioethanol) is also estimated to increase. The estimated share by 2020 is 1 per cent of total use of fuels in transport.

*National transport development programme*

In January 2007, the Parliament approved the *Transport Development Plan for 2006-2013*, which includes at least three measures aimed at making transport more environmentally friendly:

- developing the traffic management and coordination system;
- enhancing the competitiveness of public transport; and
- promoting light traffic.

There are certain differences between the goals set in the EU sustainable development strategy and the target set in the *Transport Development Plan 2006-2013*. While the EU strategy establishes a goal for the average CO<sub>2</sub> emission level of passenger cars (120 g/km by 2012), the Estonian plan sets a similar goal for a 30 per cent share of new cars.

The new *Transport Development Plan 2014-2020* is under development.

*Public transport*

Currently, public transport subsidies are used to compensate up to 60 per cent of the costs connected with providing public transport services on local bus lines. Compensation payments are paid in accordance with Regulation No 1370/2007 of the European Parliament and of the Council. However, the compensation mechanism has not motivated public transport service providers to make sufficient investments in rolling stock. Therefore a measure through the GIS (financed from the sale of surplus AAUs) was introduced which is based on the principle that new buses are rented to a public transport service provider. In 2010 EUR 21,000,000 was invested in energy-efficient and environmentally friendly buses (approximately 100 buses) for the public transport system – the Estonian Road Administration purchased new environmentally friendly buses that were provided for the use of public transport service providers only for the duration of the public service contract. The new buses can use gas (including biogas) as their fuel. In the City of Tartu, the first five buses using natural gas were introduced in 2012. All of the new buses exceed the requirements of the European emission standard for motor vehicles EURO5.

In May 2011, a considerable investment in the framework of the GIS in public transport was made. The sum of EUR 45,000,000 (from AAU sales revenue) was used for energy-efficient and environmentally benign trams for the City of Tallinn. The trams must use electricity generated from renewable energy sources. Currently, the average age of the trams in Tallinn is 25 years. AAU-based investment enables the purchasing of 15-16 modern trams that will be used on a 16 km route from 2014.

Since 1 January 2013, the use of public transport of the capital city Tallinn is free of charge for persons who are registered in Tallinn.

*Electric mobility programme*

Estonia has set itself the goal of achieving a 10 per cent share of renewable energy use in the transport sector. To reach this target the wider introduction of biofuels is needed, but there is another development option that supports reaching this target as well – the use of electricity in transport if the electricity is generated using renewable sources. This option is possible as the generation of renewable electricity in Estonia has increased rapidly in recent years: from 110.8 GWh in 2005 to 1,046 GWh in 2010.

In March 2011 the Government decided to launch the *Electric Mobility Programme* (EMP) for Estonia combining the extensive introduction of electric vehicles with financing available from the sales of surplus AAUs via the GiS in the amount of 10 million AAUs. The EMP includes three parts:

- the Ministry of Social Affairs adopting 507 electric cars (Mitsubishi model i-MiEV) as a pilot project;
- the MoEAC developing a grant scheme to support the acquisition of electric cars by individuals (up to 500 cars); and
- recharging infrastructure for electric cars covering the entry country being established.

Both the grant scheme and the building of infrastructure are administered by KredEx. The support measure for the acquisition of electric cars is available to accelerate the introduction of electric cars in Estonia. Acquisition and the financial/operational leasing of electrical vehicles by individuals are supported within the framework of the support measure. The grant scheme will enable up to 500 Estonians to acquire an electric car. Their choice must be made from among those electric cars that have obtained EU type approval. Grants are awarded to new cars that are fully electric vehicles or plug-in hybrids. The maximum grant rate for electric vehicles is EUR 18,000, although the grant will not exceed 50 per cent of the acquisition price of the car or EUR 1,000 per 1 kWh of battery capacity, whichever is the lower of the two.

In order to guarantee the full environmental effect of the programme, including the reduction of GHG emissions related to conventional fossil energy sources, all owners of electric vehicles must only consume electricity generated from renewable energy sources through a 'guarantee of origin' scheme. It is estimated that owners of electric cars will each use 1-2 MWh of electricity per year.

#### **4.1.15. Fluorinated gases**

In Estonia, the use of F-gases has been growing in recent years. The main reason for that is the increasing use of F-gases (mainly HFC) as substitutes for ozone-depleting substances. In terms of international multilateral agreements on ozone-depleting substances, Estonia ratified the *Vienna Convention for the Protection of the Ozone Layer* and *Montreal Protocol on the Substances that Deplete the Ozone Layer* in 1996. The *National Programme for Phasing out Ozone-Depleting Substances* was approved by the Government in 1999. From 2000 the programme was co-financed from the Global Environmental Facility (GEF) and it was successfully completed in 2005.

There has been some delay in the full harmonisation of national legislation with EU provisions related to F-gases in Estonia. Nevertheless, in July 2012, a voluminous set

of amendments to the *Ambient Air Act* related to F-gases was approved by the Parliament. In addition to tens of detailed amendments in many articles, a completely new section (section 4 in Chapter 7 of the Act) regulating issues relevant to F-gases was added. These amendments, together with the relevant secondary-level acts, formed the basis and infrastructure for the full implementation of the major requirements of all related EU acts covering:

- training, certification and attestation systems;
- containment provisions;
- proper recovery of F-gases;
- labelling requirements;
- reporting obligations; and
- bans and penalties.

With regard to information dissemination, there have been international projects in which Estonia has been involved. For example, there was a project entitled *REAL Skills Europe* in the framework of the European Commission's Lifelong Learning Programme in which the achievements of a UK programme developed in 2009 to achieve reductions in refrigerant leakage through improved awareness, education and training were introduced in several countries. The Ozone/F-gases Unit (*Osoonibüroo*) of the Estonian Environmental Research Centre (*Eesti Keskkonnauuringute Keskus OÜ*; EERC) was the participant institution from Estonia.

No quantitative assessments have been made on measures regarding F-gases.

#### **4.1.16. Agriculture**

The use of environmentally friendly methods in agriculture is encouraged in the *Rural Development Plan 2007-2013* (RDP), which is the implementation document of the *Rural Strategy 2007-2013*. The RDP was prepared in order to support the regionally balanced development of rural areas through EU Common Agricultural Policy (CAP) measures.

In September 2011, a special commission was established to launch preparations for the drafting of the rural development plan for the period 2014-2020 (Order of Minister of Agriculture No 117, 13.09.2011).

In terms of impact on the environment, organic farming can play an essential role. In Estonia, the development of organic farming began in 1989 when the Estonian Biodynamic Association was founded. The Association adopted the standards of IFOAM (the International Federation of Organic Agriculture Movements) to develop the first Estonian organic agriculture standards, started using the 'ÖKO' trademark and also introduced a control system over producers. In 1997, the *Organic Farming Act* came into force and the Centre for Ecological Engineering started actively organising educational events, published informational brochures and launched several development projects. Information about organic farming was made available from many sources.



Officially, organic farming as an environmentally friendly form of agricultural production has been supported since 2000. It was during that year that the Estonian Organic Farming Foundation was created, and it has been very active in developing organic farming ever since. The Agro-Environment Bureau was founded by the Ministry of Agriculture in 2000. In 2007, the *Organic Farming Development Action Plan 2007-2013* and the relevant action plan were approved by the Minister of Agriculture.

Operational support for organic farming has been paid out yearly since 2000. When Estonia joined the EU in 2004, the basis for the distribution of support money became the agro-environment support provided in the RDP. 80 per cent of the support money is covered by EU funds and 20 per cent by the Estonian Government. By applying for support the applicant assumes the duty of pursuing organic farming for at least five years. In 2011, the rates of support payments for organic production were as follows:

- cereals, legumes, oil and fibre crops, potatoes and fodder roots; black fallow; grassland used as cover crop for up to two years; grass seed field – 119.20 EUR/ha annually;
- open area vegetables, medicinal herbs and aromatic herbs, fruit crops and berries – 349.60 EUR/ha annually; and
- in the case of grasslands (except where the grassland is used for up to two years as cover crop and grass seed field) if at least 0.2 livestock units are kept per hectare of organically kept animals – 76.69 EUR/ha annually.

The *Organic Farming Development Plan 2007-2013* sets the objective of increasing the organically farmed area from 72,800 ha to 120,000 ha; the number of organic producers from 1,173 to 2,000; the number of enterprises processing organic products from 14 to 75; and the share of Estonian organic products on the market of foodstuffs from 0.15 per cent to 3 per cent by the end of 2013. In fact, the area of land used for organic production has grown rapidly since 2000. In 2011, a total of 134,100 hectares of agricultural land was in organic use by 1,431 farms, equating to 14 per cent of total agricultural land. Organic production has increased rapidly, one of the reasons being the financial support provided per organic hectare since 2000. However, developments in organic processing and marketing have been modest. In 2011, the organic farming register had a total of 127 organic food processors and traders.

Regarding organic animal husbandry, nearly two-thirds of organic farmers (899) in Estonia raise animals. Foremost are organically raised sheep (46,496 in 2011) and cattle (28,701 in 2011).

Organic products are labelled with the EU organic logo, which has been compulsory on pre-packaged products since 1 July 2011. In addition, the Estonian organic logo can be used. Labelled products must originate from organic land or organic animals. In processed products at least 95 per cent of ingredients of agricultural origin by weight must be organic and the only non-organic ingredients used must be listed in Regulation (EC) No 889/2008 Annex IX.



#### 4.1.17. Waste

In 2008, a strategy document entitled *National Waste Management Plan 2008-2013* was endorsed by the Government. According to the plan, the closure of non-conforming landfills is supported. In addition, the establishment of regional landfills and other regional waste handling facilities, including incineration plants and facilities for the treatment of biological waste (e.g. for use in composting fields) that comply with the designated requirements, is promoted by the Government. Among other things, it plans to set up a waste handling system for biodegradable waste and to improve the options for sorting waste in its place of generation. According to the *Waste Act*, all landfills had to meet EU requirements by 16 July 2009. Landfills closed for waste deposit by this date had to be conditioned in accordance with the requirements by 16 July 2013.

In May 2012, the Minister of the Environment initiated the preparation of the *National Waste Management Plan* for the period 2014-2020.

General waste-related requirements and rules are provided by the *Waste Act*. Rules on municipal waste planning, producer responsibility and tax on landfilling of waste and prohibition of mixed waste are expected to lead to a reduction in waste generation and recycling. The objective regarding the share of waste recycled by 2020 is 50 per cent so as to meet the requirements of Directive 2009/98/EC.

In 2004 and 2005, research was carried out to investigate the amount of landfilled biodegradable waste and to increase the share of biodegradable waste recycling. In 2007, the *Action Plan for Biodegradable Waste 2008-2013* was compiled for the handling of such waste, offering opportunities to attain the objectives of sustainable waste management in handling biodegradable waste, and also providing suitable solutions for each county.

Prohibition concerning the percentage of biodegradable waste deposited is stipulated in the *Waste Act*. The percentage of biodegradable waste in the total amount by weight of municipal waste deposited in landfills in Estonia shall not exceed:

- 45 per cent by 16 July 2010;
- 30 per cent by 16 July 2013; and
- 20 per cent by 16 July 2020.

In 2010, 11.7 million tonnes of waste was deposited in 15 landfills (with 59.6 per cent of all waste being landfilled). To initiate the process of using waste as a source of energy, the development of incineration technologies and combined heat and power production from landfill gas emitted from closed landfills has begun. General requirements for the construction, operation and closing down of waste management facilities design for waste disposal are provided by a Regulation of the Minister of the Environment (No 38, 29.04.2004). This includes requirements with regard to establishing methane collection, recycling and disposal systems. The provisions for waste incineration plants are stipulated in a Regulation of the Minister of the Environment (No 66, 04.06.2004).

Regarding energy use of waste in Estonia, there are some small-scale CHP plants utilizing landfill gas in Tallinn (two plants), Jõelähtme (Harju County), Väätsa (Järva

County) and Rääma (Pärnu County). Feasibility studies for the construction of more plants have been carried out.

In 2008, the first mechanical biological treatment (MBT) plant processing waste in the Baltic States was commissioned at the Sillamäe landfill combining sorting with biological treatment (composting). As a result, waste which is not suitable for recycling is separated, recyclable materials are extracted and the rest is utilized to produce fuel (solid recovered fuel – SRF; also refuse-derived fuel – RDF). At present, there are two more plants that use MBT technology for waste-processing to produce SRF, but mixed municipal waste has not yet been used for direct energy production. In Tallinn a new energy unit burning municipal waste is under construction combined with the existing Iru CHP plant (owned by Eesti Energia AS) supplying heat to the DH system of the City of Tallinn. It is planned to launch the new energy unit (17 MW<sub>e</sub> / 50 MW<sub>th</sub>) in Iru in 2013. The unit can incinerate up to 220,000 tons of mixed municipal waste per year, converting around 85 per cent of the energy in waste into electricity and heat. It is estimated that the biodegradable content of the mixed municipal waste to be used at the Iru Power Plant is around 60 per cent by weight.

As to the promotion of sustainable waste management, over the last few years numerous projects have received investment support from national and international sources. As a rule, the support that has been granted has been administered by the Environment Investment Centre (EIC). For example, in 2011 a total of EUR 27,150,000 in grants was paid out to 42 waste-related projects (see Table 4.10).

**Table 4.10.** Payments for waste management projects in 2011

Subprogram	Number of projects	Payments, MEUR
Closure and redevelopment of non-conforming oil-shale industry landfills (CF*)	2	12.71
Closure of non-conforming non-hazardous waste landfills (CF)	15	8.74
Management and development of waste collection, sorting and recycling (CF)	18	4.42
Extension of landfill areas of waste treatment centres with landfill areas (CF)	1	0.85
Non-hazardous waste management (CF)	10	0.30
Non-hazardous waste management (CF)	6	0.14
<b>Total</b>	<b>42</b>	<b>27.15</b>

\* CF – projects financed from EU Cohesion Fund

In 2011, four landfill closure projects were completed with the help of the EU Cohesion Fund measure, the most relevant and extensive being the Rääma landfill in Pärnu. At the end of 2011 there were still three landfill closure projects in the processing phase in EIC.

The adaptation or closure of landfill sites that contain waste from the oil shale industry and oil shale-fired power plants that did not comply with environmental

requirements helps reduce the load on the environment caused by energy production. Such landfills include the oil shale semi-coke landfills of Kiviõli and Kohtla-Järve and the ash landfills near Narva.

#### **4.1.18. Land use, land use change and forestry (LULUCF)**

In light of climate change mitigation, it is important to preserve and protect areas that have high carbon sequestration capacity: forests, wetlands, peatland and grasslands. It is also important to promote carbon sequestration through sustainable forest management, reforestation and afforestation and the improvement of cropland management practices and to resume supportive activities like mowing and grazing in order to preserve the natural state of meadows and semi-natural grasslands.

In Estonia, there are currently no policies targeted directly at reducing greenhouse gases in the LULUCF sector, but there are cross-cutting strategies as well as land use-specific acts that comprise different issues under the LULUCF sector, e.g. promoting the use of wood as a renewable material and energy source to other materials and non-renewable sources with higher greenhouse gas emissions in the framework of Development Plan 2007-2013 for Enhancing the Use of Biomass and Bioenergy. Since half of Estonian's territory is covered with forest, of which 10 per cent is strictly protected, forestry is of great importance to the Estonian economy and environment. Therefore, forest policies have a major effect on the development of the LULUCF sector as a whole.

##### *Policies and measures implemented*

The Forest Act<sup>10</sup> provides the legal framework for the management of forests in Estonia. The main objective of this is to ensure the protection and sustainable management of forests as an ecosystem. The Act provides legal basis for forest surveys, planning and management. Among other sustainable forest management practices, the Forest Act regulates the implementation of forest regeneration and requires forest owners to apply the reforestation methods specified in the Act in order to ensure the regeneration of forests no later than five years after the occurrence of final felling or natural disturbances.

According to the Forest Act and the Sustainable Development Act, a forestry development plan is to be drafted every ten years. The Estonian Forestry Development Programme until 2020<sup>11</sup>, approved by the Parliament in 2011, is the official sustainable development strategy for the Estonian forest sector. The programme determines objectives and describes measures and tools to achieve them for the period 2011-2020. The main objective of the development plan is to ensure productivity and viability and to assure multiple and efficient use of forests. One of the aims is to increase the annual increment along with carbon sequestration in forests by implementing appropriate forest management activities like regeneration, cleaning and thinning. In Table 4.11 the main indicators and target levels are presented for the current situation and for 2020.

<sup>10</sup> <https://www.riigiteataja.ee/akt/MS>

<sup>11</sup> [https://www.riigiteataja.ee/.../Eesti\\_per\\_cent20metsanduse\\_arengukava.pdf](https://www.riigiteataja.ee/.../Eesti_per_cent20metsanduse_arengukava.pdf)

**Table 4.11.** Indicators and target levels of forest management

Indicator	Baseline level	Target level
Growing stock	442 Mm <sup>3</sup>	450 Mm <sup>3</sup>
Annual increment	12.1 Mm <sup>3</sup>	12.5 Mm <sup>3</sup>
Annual volume and area of regeneration felling	22,400 ha	34,500 ha
Annual area of cleaning	22,200 ha	32,400 ha
Annual area of thinning	14,200 ha	34,500 ha
Woody biomass used in energy production	22 PJ (2009)	30 PJ/yr

National timber production is dependent on the existence of mature stands, the forest market situation, demand for renewable sources in energy production, taxes, subsidies and other factors that all have a complex impact on harvesting intensity. Taking into account these factors, primarily the availability of wood resources in mature stands, several scenarios were constructed for possible harvest rates until 2040. Optimal and maximum sustainable harvest rates under a moderate scenario are highlighted in the current forestry development programme as the two most likely estimates used in future forestry development plans. The optimal and maximum sustainable harvest rates are 12.670 million m<sup>3</sup> and 15.826 million m<sup>3</sup> per year respectively. The general goal is to promote and increase the use of wood as a renewable material and energy source instead of non-renewable materials and resources with higher GHG emissions.

The Estonian Forestry Development Programme is supported by the Estonian Rural Development Plan 2007-2013<sup>12</sup> (ERDP), which funds measures designed for private forest owners, who hold a share of 45 per cent of all forests in Estonia (NFI 2010). The ERDP was prepared in order to support regionally balanced development of rural areas through the European Union Common Agricultural Policy measures. The overall objective of the ERDP is to improve the competitiveness of the agricultural and forestry sector as well as to improve the environment and countryside. Under measure 1.5 'Improving the economic value of forests and adding value to forestry products' there are activities directed at the improvement of the economic value of forest, at the restoration of forests damaged in natural disasters or forest fires and at the prevention of fires to ensure the sustainable and efficient management of private forest and to protect the function of forests. The target of the measure is to restore 3,500 ha of forest damaged by natural disturbances or fires and the additional creation of 7,000 ha of forest area with measures for the prevention of forest fires.

Analysis of the additional CO<sub>2</sub> sequestered through the implementation of these measures under the Rural Development Plan has not been carried out.

The Estonian Earth's Crust Act<sup>13</sup> entered into force in 2005 and stipulates that the owner of an extraction permit is obliged to restore the land disturbed by mining. According to the National Greenhouse Gas Abatement Programme 2003-2012<sup>14</sup>

<sup>12</sup> [http://www.agri.ee/public/juurkataloog/MAK/RDP\\_2007-2013.pdf](http://www.agri.ee/public/juurkataloog/MAK/RDP_2007-2013.pdf)

<sup>13</sup> <https://www.riigiteataja.ee/akt/1011618>

<sup>14</sup> <http://www.envir.ee/orb.aw/class=file/action=preview/id=1159256/20a.pdf>

(NGGAP), approved by the Government in 2004, an additional 7 Gg CO<sub>2</sub> could be sequestered per year through afforestation if 250-300 ha of exhausted mines were recultivated. Another measure aimed at increasing the uptake of CO<sub>2</sub> is afforestation of abandoned croplands. Currently, more than 100,000 ha of agricultural land is not actively managed in Estonia. Pursuant to the NGGAP, an additional 700 Gg CO<sub>2</sub> could be sequestered annually if 100,000 ha of abandoned arable land were afforested.

#### *Planned policies and measures*

The **Estonian Rural Development Plan 2014-2020**<sup>15</sup> is currently under development. Under priority No 5: Resource-saving and environmental-friendly economy, one of the objectives is promoting CO<sub>2</sub> uptake in agriculture and forest sectors. Detailed targets and activities to achieve the targets have not yet been determined.

## **4.2. Domestic institutional arrangements**

The major documents on environment-related issues are either passed by the Parliament (Riigikogu) or adopted by the Government. The relevant measures can be taken at the national and/or local level. The Parliament is the highest legislative body in Estonia. The Government of Estonia is the supreme executive body and the Ministry of the Environment (MoE) is the highest executive body responsible for carrying out national environmental policy.

The Minister of the Environment has been designated by the Government to sign international agreements for JI projects. The Designated National Focal Point for Joint Implementation is the Ministry of the Environment. Guidelines for the procedure and implementation of JI projects in Estonia are available on the UNFCCC website.

The MoE with the help of external experts is responsible for trade with AAUs (negotiations and signing the AAU sale and purchase agreements (SPAs)). For sales of AAUs, a government regulation is issued to approve each AAU SPA. The use of AAU revenue exclusively via GIS is required by the State Budget Act and the government regulation for the approval of AAU SPAs.

The Environmental Board was formed on 1 February 2009. It was established by merging the functions of three previous bodies: the State Nature Conservation Centre, the Radiation Centre and the departments of environmental services. Similarly, the Estonian Environment Agency was formed on 1 June 2013, by merging the functions of Estonian Environmental Information Centre and Estonian Meteorological and Hydrological Institute.

Some aspects having an impact on the environment and climate are in the scope of responsibilities of other ministries. The Ministry of Economic Affairs and Communications is responsible for energy-related issues, including energy efficiency and conservation, transport and the use of renewable sources in the energy sector. The Ministry of Agriculture advises the Government in the field of agriculture and rural life. Some responsibilities of the Ministry of Finance include matters important to

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<sup>15</sup> [http://www.agri.ee/public/juurkataloog/MAAELU/MAK\\_20142020/prioriteetid/Prioriteet\\_5\\_ressursisaast\\_01.05.2012.pdf](http://www.agri.ee/public/juurkataloog/MAAELU/MAK_20142020/prioriteetid/Prioriteet_5_ressursisaast_01.05.2012.pdf)

environmental management – taxation, use of state budget funds etc. All ministries are in charge of national development plans and programmes.

Coordination Council of EU issues ensures effective inter-ministerial cooperation. It is chaired by the director of EU affairs (in case of his/her absence by the head of EUS) and is comprised of representatives of all ministries and the Bank of Estonia.

In September 2009 the decision was taken to establish an energy and climate agency subordinated to the Ministry of Economic Affairs and Communications. The main tasks of this institution were analysing and surveying energy- and climate-related activities and promoting sustainable development with relevant supporting investments. In summer 2011 the responsibilities of the agency were transferred to the financing institution KredEx, which belongs to the administrative area of the Ministry of Economic Affairs and Communications.

To administer environment-related financial support measures, the Environmental Fund was established in 1993. In 2000 the Fund was reorganized as the Environmental Investments Centre (EIC). Since 2010 the EIC has acted as the implementing agency for the Green Investment Scheme, i.e. selling the surplus of AAUs and supervising the relevant investments. In 2011, the EIC distributed foreign aid (ERDF and CF and other smaller EU grant funds), including co-financing, to a total value of EUR 149,000,000, which was twice as much as in 2010, when foreign aid and co-financing amounted to EUR 74,000,000.

Regulation No 525/2013 on a mechanism for monitoring and reporting GHG emissions and for reporting other information at national and EU level relevant to climate change (Monitoring Mechanism Regulation) was adopted in May 2013, repealing Decision No 280/2004/EC (Monitoring Mechanism Decision). The new regulation which entered into force on 8 July 2013 represents an important change to the domestic institutional arrangement for monitoring and reporting of GHG emissions and climate related information in the EU, and evaluation of the progress towards the EU's economy wide emission reduction target. The new Regulation significantly enhances the EU monitoring mechanism to meet requirements arising from current and future international climate agreements as well as the 2009 climate and energy package.

The monitoring and regular evaluation of policies and measures adopted is usually performed by the institution that is implementing the relevant strategy document or action plan. For GHG emission estimates PAMs are updated and evaluated every two years under Regulation No 525/2013 of the European Parliament (on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC). The last report was submitted in March 2013.

### 4.3. Estimates of emission reductions and removals and the use of units from the market-based mechanisms and land use, land-use change and forestry activities

In Table 4.12 the GHG emissions of Estonia in 1990 and 2011 are presented. This table is based on the April 2013 submission.

**Table 4.12.** Estonia's GHG emissions by sector in 1990 and in 2011

Sector	Gg CO <sub>2</sub> eq		Change from base year to latest reported year (%)
	1990	2011	
Energy	35,956.90	18,661.63	-48.10
Industrial Processes	1,048.23	613.82	-41.44
Solvent and Other Product Use	26.44	18.86	-28.67
Agriculture	3,166.84	1,270.52	-59.88
Waste	343.72	390.76	13.69
Total (excluding LULUCF)	40,542.13	20,955.59	-48.31
LULUCF	-8,848.70	-4,262.81	-51.83
Total (including LULUCF)	31,693.43	16,692.78	-47.33



BR CTF Table 3: Progress in achievement of the quantified economy wide emission reduction target: information on mitigation actions and their effects

Name of mitigation action <sup>a</sup>	Sectors affected <sup>b</sup>	GHGs affected	Objective and/or activity affected	Type of instrument <sup>c</sup>	Status of implementation <sup>d</sup>	Brief description <sup>e</sup>	Start year of implementation	Implementing entity or entities	Mitigation impact <sup>f</sup>				
									Estimate of mitigation impact (not cumulative) (kt CO <sub>2</sub> eq)	2015 <sup>†</sup>	2020	2025 <sup>†</sup>	2030 <sup>†</sup>
Improvement of efficiency of use of oil shale	Energy	CO <sub>2</sub> , N <sub>2</sub> O	To comply with the requirements of Directives 2001/80/EC and 88/609/EEC. Reduction of use of oil shale and atmospheric emissions.	Regulatory	Implemented	Reconstruction of two units in Narva Power Plants (2x215 MW)	2005	Eesti Energia AS	kt CO <sub>2</sub> eq	744.61	744.61	744.61	744.61
Improvement of efficiency of use of oil shale	Energy	CO <sub>2</sub> , N <sub>2</sub> O	To comply with the requirements of Directives 2001/80/EC and 88/609/EEC. Reduction of use of oil shale and atmospheric emissions.	Regulatory	Implemented	Reconstruction of one unit in Narva Power Plants (300 MW)	2015	Eesti Energia AS	kt CO <sub>2</sub> eq	507.73	507.73	507.73	507.73
Transform energy supply structure towards renewable energy. 1. Feed-in tariff for renewable electricity production; 2. Investment support for inland wind parks	Energy	CO <sub>2</sub>	Increased electricity production from renewable resources.	Economic, Fiscal, Regulatory	Implemented	Support for renewable electricity production is regulated by the Electricity Market Act. Investment support is provided under different schemes (including JI projects and GIS)	2003	Elering AS	kt CO <sub>2</sub> eq	815.57	815.57	815.57	815.57
Support for efficient cogeneration of heat and electricity	Energy	CH <sub>4</sub> , CO <sub>2</sub> , N <sub>2</sub> O	Increased energy production from renewable resources and promotion of efficient cogeneration.	Economic, Fiscal, Regulatory	Implemented	Support to efficient cogeneration of heat and electricity is regulated by the Electricity Market Act	2007	Elering AS	kt CO <sub>2</sub> eq	292.45	292.45	292.45	292.45
Energy efficiency and use of renewable energy in small boiler houses and improvement of district heating networks.	Energy	CH <sub>4</sub> , CO <sub>2</sub> , N <sub>2</sub> O	Decrease in fossil fuel use, use of local fuels (biomass) and reduction in heat price.	Economic	Implemented	This measure is also supported partially under the GIS. Activities supported: 1) Construction of small CHP plants; 2) Fuel switch to renewable energy sources at existing boilerhouses	2010	Government, Owners	kt CO <sub>2</sub> eq	156.56	156.56	156.56	156.56



Energy efficiency in manufacturing industries and construction	Energy, Industry/ industrial processes	CH <sub>4</sub> , CO <sub>2</sub> , N <sub>2</sub> O	Improve energy efficiency in manufacturing industries and construction. Expected annual saving 0.6 PJ of heat by 2016, 0.7 PJ of electricity by 2016 and 0.9 PJ of fuels by 2016	Economic, Education, Research	Planned	e.g. Development and provision of training events on energy conservation to increase energy management competences of enterprises; Analysis and development of energy efficient technical solutions; Encouragement of investments into energy conservation of industries within the financial instruments of energy conservation in industries.		Ministry of Economic Affairs and Communications	kt CO <sub>2</sub> eq	276.52	332.12	332.12	296.09
Energy efficiency in residential sector. Investment support and grants for energy efficient renovation of residential buildings (multiapartment and private houses)	Energy	CH <sub>4</sub> , CO <sub>2</sub> , N <sub>2</sub> O	Improve energy efficiency in residential sector.	Economic	Implemented	Improve energy efficiency in residential sector.		KredEx	kt CO <sub>2</sub> eq	28	28	28	28
Promotion of use of energy efficient electrical appliances	Energy	CO <sub>2</sub> , N <sub>2</sub> O	The increased efficiency of electrical appliances is expected to lead to annual saving of 0.5 PJ electricity by 2020	Regulatory, Information	Implemented			Government	kt CO <sub>2</sub> eq	102.77	153.14	152.33	151.52
Grants for energy audits in residential buildings	Energy	CH <sub>4</sub> , CO <sub>2</sub> , N <sub>2</sub> O	Estimation and further improving of energy efficiency in private buildings	Economic, Information	Implemented		2003	Government	kt CO <sub>2</sub> eq	IE	IE	IE	IE
Energy efficiency improvement in public buildings. Investment support for energy efficient renovation of public buildings.	Energy	CH <sub>4</sub> , CO <sub>2</sub> , N <sub>2</sub> O	Improve energy efficiency in public buildings	Economic, Information	Implemented	Measure under Green Investment Scheme	2010	Government	kt CO <sub>2</sub> eq	27.29	27.29	27.29	27.29

Introduction of regulation regarding use of biofuels	Transport	CO <sub>2</sub>	Objective is to achieve 10% of transport fuels are from renewable resources by 2020.	Regulatory	Planned	Includes of 2 main measures: 1) Introduction of obligation of 5-7% biofuel share in liquid motor fuels; 2) Introduction of obligation of 50% biofuel share in liquid fuels for public transport		Government	kt CO <sub>2</sub> eq	110.43	235.42	251.13	267.85
Promotion of public transport: 1) Subsidies to public transport; 2) Investments into the rolling stock	Transport	CH <sub>4</sub> , CO <sub>2</sub> , N <sub>2</sub> O	Promotion of use of public transport	Economic	Implemented	Includes estimates of measure under Green Investment Scheme (support into the rolling stock)		Government	kt CO <sub>2</sub> eq	21.37	21.37	18.31	18.31
Modernisation of agricultural holdings. Investments in livestock buildings	Agriculture, Energy	CH <sub>4</sub>	Maintenance of the environment; maintenance of landscapes; supply certainty of raw materials for energy production; diversity of energy sources; distributed energy production	Economic	Implemented	Possible investments to manure handling and biogas equipment		Government	kt CO <sub>2</sub> eq	127.99	127.99	127.99	127.99
Prohibition concerning percentage of biodegradable waste deposited	Waste management /waste	CH <sub>4</sub>	The percentage of biodegradable waste in the total amount by weight of municipal waste deposited in a landfill shall not exceed: 1) 45% by 16 July 2010; 2) 30% by 16 July 2013; 3) 20% by 16 July 2020	Regulatory	Implemented	Requirement arising from Waste Act. This Act provides the general requirements for preventing waste generation and the health and environmental hazards arising therefrom, for organising waste management with the objective to reduce the harmfulness and quantity of waste, and liability for violation of the established requirements		Government	kt CO <sub>2</sub> eq	85.09	144.98	144.07	134.4

Support for organic farming	Agriculture	N <sub>2</sub> O	Maintaining and increasing biological and landscape diversity and to maintain and improve soil fertility and water quality	Economic	Implemented	The objective is to increase organically farmed area from 72,800 ha to 120,000 ha. This will lead to a reduction of use of mineral fertilizers		Government	kt CO <sub>2</sub> eq	100.90	128.77	57.33	57.33
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Note: The two final columns specify the year identified by the Party for estimating impacts (based on the status of the measure and whether an ex post or ex ante estimation is available).

Abbreviations: GHG = greenhouse gas; LULUCF = land use, land-use change and forestry.

<sup>a</sup> Parties should use an asterisk (\*) to indicate that a mitigation action is included in the 'with measures' projection.

<sup>b</sup> To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors, cross-cutting, as appropriate.

<sup>c</sup> To the extent possible, the following types of instrument should be used: economic, fiscal, voluntary agreement, regulatory, information, education, research, other.

<sup>d</sup> To the extent possible, the following descriptive terms should be used to report on the status of implementation: implemented, adopted, planned.

<sup>e</sup> Additional information may be provided on the cost of the mitigation actions and the relevant timescale.

<sup>f</sup> Optional year or years deemed relevant by the Party.

BR CTF Table 4: Reporting on progress

	Unit	Base year (1990)	2010	2011	2012
Total (without LULUCF)	kt CO <sub>2</sub> eq				
Contribution from LULUCF <sup>c</sup>	kt CO <sub>2</sub> eq				
Market-based mechanisms under the Convention	number of units			14,345,407.00	15,229,972.00
	kt CO <sub>2</sub> eq				
Other market-based mechanisms	number of units				
	kt CO <sub>2</sub> eq				
Note: Parties may add additional columns for years other than those specified below.					
Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.					
<sup>a</sup> Reporting by a developed country Party on the information specified in the common tabular format does not prejudice the position of other Parties with regard to the treatment of units from market-based					

mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.
b For the base year, information reported on the emission reduction target shall include the following: (a) total GHG emissions, excluding emissions and removals from the LULUCF sector; (b) emissions and/or removals from the LULUCF sector based on the accounting approach applied taking into consideration any relevant decisions of the Conference of the Parties and the activities and/or land that will be accounted for; (c) total GHG emissions, including emissions and removals from the LULUCF sector. For each reported year, information reported on progress made towards the emission reduction targets shall include, in addition to the information noted in paragraphs 9(a-c) of the UNFCCC biennial reporting guidelines for developed country Parties, information on the use of units from market-based mechanisms
c Information in this column should be consistent with the information reported in table 4(a)I or 4(a)II, as appropriate. The Parties for which all relevant information on the LULUCF contribution is reported in table 1 of this common tabular format can refer to table 1.

BR CTF Table 4(a)I: Progress in achieving the quantified economy-wide emission reduction targets – further information on mitigation actions relevant to the contribution of the land use, land-use change and forestry sector<sup>a,b</sup>

	Unit	Net GHG emissions/removals from LULUCF categories <sup>c</sup>	Base year/period or reference level value <sup>d</sup>	Contribution from LULUCF for reported year	Cumulative contribution from LULUCF <sup>e</sup>
2011 and 2012					
<b>Total LULUCF</b>	kt CO <sub>2</sub> eq				
<b>A. Forest land</b>	kt CO <sub>2</sub> eq				
1. Forest land remaining forest land	kt CO <sub>2</sub> eq				
2. Land converted to forest land	kt CO <sub>2</sub> eq				
3. Other <sup>g</sup>	kt CO <sub>2</sub> eq				
<b>B. Cropland</b>	kt CO <sub>2</sub> eq				
1. Cropland remaining cropland	kt CO <sub>2</sub> eq				
2. Land converted to cropland	kt CO <sub>2</sub> eq				
3. Other <sup>g</sup>	kt CO <sub>2</sub> eq				
<b>C. Grassland</b>	kt CO <sub>2</sub> eq				
1. Grassland remaining grassland	kt CO <sub>2</sub> eq				
2. Land converted to grassland	kt CO <sub>2</sub> eq				
3. Other <sup>g</sup>	kt CO <sub>2</sub> eq				
<b>D. Wetlands</b>	kt CO <sub>2</sub> eq				

1. Wetland remaining wetland	kt CO <sub>2</sub> eq				
2. Land converted to wetland	kt CO <sub>2</sub> eq				
3. Other <sup>g</sup>	kt CO <sub>2</sub> eq				
<b>E. Settlements</b>	kt CO <sub>2</sub> eq				
1. Settlements remaining settlements	kt CO <sub>2</sub> eq				
2. Land converted to settlements	kt CO <sub>2</sub> eq				
3. Other <sup>g</sup>	kt CO <sub>2</sub> eq				
<b>F. Other land</b>	kt CO <sub>2</sub> eq				
1. Other land remaining other land	kt CO <sub>2</sub> eq				
2. Land converted to other land	kt CO <sub>2</sub> eq				
3. Other <sup>g</sup>	kt CO <sub>2</sub> eq				
Harvested wood products	kt CO <sub>2</sub> eq				
Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.					
<sup>a</sup> Reporting by a developed country Party on the information specified in the common tabular format does not prejudice the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.					
<sup>b</sup> Parties that use the LULUCF approach that is based on table 1 do not need to complete this table, but should indicate the approach in table 2. Parties should fill in a separate table for each year, namely 2011 and 2012, where 2014 is the reporting year.					
<sup>c</sup> For each category, enter the net emissions or removals reported in the most recent inventory submission for the corresponding inventory year. If a category differs from that used for the reporting under the Convention or its Kyoto Protocol, explain in the biennial report how the value was derived.					
<sup>d</sup> Enter one reference level or base year/period value for each category. Explain in the biennial report how these values have been calculated.					
<sup>e</sup> If applicable to the accounting approach chosen. Explain in this biennial report to which years or period the cumulative contribution refers to.					
<sup>f</sup> Label each accounting approach and indicate where additional information is provided within this biennial report explaining how it was implemented, including all relevant accounting parameters (i.e. natural disturbances, caps).					
<sup>g</sup> Specify what was used for the category "other". Explain in this biennial report how each was defined and how it relates to the categories used for reporting under the Convention or its Kyoto Protocol.					

CTF Table 4(a)II: Progress in achievement of the quantified economy-wide emission reduction targets – further information on mitigation actions relevant to the counting of emissions and removals from the land use, land-use change and forestry sector in relation to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol<sup>a,b,c</sup>

Greenhouse Gas Source and Sink Activities	Base year <sup>d</sup>	Net emissions/removals <sup>e</sup>					Accounting Parameters <sup>h</sup>	Accounting Quantity <sup>i</sup>
		2008	2009	2010	2011	Total <sup>g</sup>		
		(kt CO <sub>2</sub> eq)						
A. Article 3.3 activities								
A.1. Afforestation and Reforestation								-495.23
A.1.1. Units of land not harvested since the beginning of the commitment period <sup>j</sup>		-97.88	-121.26	-131.07	-145.01	-495.23		-495.23
A.1.2. Units of land harvested since the beginning of the commitment period <sup>j</sup>								NA,NO
A.2. Deforestation		721.53	638.44	475.74	377.12	2,212.82		22,12.81746
B. Article 3.4 activities								
B.1. Forest Management (if elected)		NA	NA	NA	NA	NA		NA
3.3 offset <sup>k</sup>							1,717.59147	NA
FM cap <sup>l</sup>							1,833.33333	NA
B.2. Cropland Management (if elected)	0	NA	NA	NA	NA	NA	0	0
B.3. Grazing Land Management (if elected)	0	NA	NA	NA	NA	NA	0	0
B.4. Revegetation (if elected)	0	NA	NA	NA	NA	NA	0	0
Note: 1 kt CO2 eq equals 1 Gg CO2 eq.								
Abbreviations: CRF = common reporting format, LULUCF = land use, land-use change and forestry.								
<sup>a</sup> Reporting by a developed country Party on the information specified in the common tabular format does not prejudice the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.								
<sup>b</sup> Developed country Parties with a quantified economy-wide emission reduction target as communicated to the secretariat and contained in document FCCC/SB/2011/INF.1/Rev.1 or any update to that document, that are Parties to the Kyoto Protocol, may use table 4(a)II for reporting of accounting quantities if LULUCF is contributing to the attainment of that target.								
<sup>c</sup> Parties can include references to the relevant parts of the national inventory report, where accounting methodologies regarding LULUCF are further described in the documentation box or in the biennial reports.								
<sup>d</sup> Net emissions and removals in the Party's base year, as established by decision 9/CP.2.								
<sup>e</sup> All values are reported in the information table on accounting for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, of the CRF for the relevant inventory year as reported in the current submission and are automatically entered in this table.								

<sup>f</sup> Additional columns for relevant years should be added, if applicable.
<sup>g</sup> Cumulative net emissions and removals for all years of the commitment period reported in the current submission.
<sup>h</sup> The values in the cells "3.3 offset" and "Forest management cap" are absolute values.
<sup>i</sup> The accounting quantity is the total quantity of units to be added to or subtracted from a Party's assigned amount for a particular activity in accordance with the provisions of Article 7, paragraph 4, of the Kyoto Protocol.
<sup>j</sup> In accordance with paragraph 4 of the annex to decision 16/CMP.1, debits resulting from harvesting during the first commitment period following afforestation and reforestation since 1990 shall not be greater than the credits accounted for on that unit of land.
<sup>k</sup> In accordance with paragraph 10 of the annex to decision 16/CMP.1, for the first commitment period a Party included in Annex I that incurs a net source of emissions under the provisions of Article 3 paragraph 3, may account for anthropogenic greenhouse gas emissions by sources and removals by sinks in areas under forest management under Article 3, paragraph 4, up to a level that is equal to the net source of emissions under the provisions of Article 3, paragraph 3, but not greater than 9.0 megatonnes of carbon times five, if the total anthropogenic greenhouse gas emissions by sources and removals by sinks in the managed forest since 1990 is equal to, or larger than, the net source of emissions incurred under Article 3, paragraph 3.
<sup>l</sup> In accordance with paragraph 11 of the annex to decision 16/CMP.1, for the first commitment period of the Kyoto Protocol only, additions to and subtractions from the assigned amount of a Party resulting from Forest management under Article 3, paragraph 4, after the application of paragraph 10 of the annex to decision 16/CMP.1 and resulting from forest management project activities undertaken under Article 6, shall not exceed the value inscribed in the appendix of the annex to decision 16/CMP.1, times five.

BR CTF Table 4(b): Reporting in progress<sup>a,b,c</sup>

	Quantity of units	kt CO <sub>2</sub> eq.
2011		
<b>Kyoto Protocol Units<sup>d</sup></b>	14,345,407.00	
AAUs	14,345,407.00	
ERUs	NO	
CERs	NO	
tCERs	NO	
ICERs	NO	
<b>Units from market-based mechanisms under the Convention<sup>d,e</sup></b>		
<b>Units from other market-based mechanisms<sup>d,e</sup></b>		
<b>Total</b>	14,345,407.00	
2012		
<b>Kyoto Protocol Units<sup>d</sup></b>	15,229,972.00	
AAUs	15,072,383.00	
ERUs	141,034.00	

CERs	16,555.00	
tCERs	NO	
ICERs	NO	
<b>Units from market-based mechanisms under the Convention<sup>d, e</sup></b>		
<b>Units from other market-based mechanisms<sup>d, e</sup></b>		
<b>Total</b>	<b>15,229,972.00</b>	
Abbreviations: AAUs = assigned amount units, CERs = certified emission reductions, ERUs = emission reduction units, ICERs = long-term certified emission reductions, tCERs = temporary certified emission reductions.		
Note: 2011 is the latest reporting year.		
<sup>a</sup> Reporting by a developed country Party on the information specified in the common tabular format does not prejudice the position of other Parties with regard to the treatment of units from market-based mechanisms under the Convention or other market-based mechanisms towards achievement of quantified economy-wide emission reduction targets.		
<sup>b</sup> For each reported year, information reported on progress made towards the emission reduction target shall include, in addition to the information noted in paragraphs 9(a-c) of the reporting guidelines, on the use of units from market-based mechanisms.		
<sup>c</sup> Parties may include this information, as appropriate and if relevant to their target.		
<sup>d</sup> Units surrendered by that Party for that year that have not been previously surrendered by that or any other Party.		
<sup>e</sup> Additional rows for each market-based mechanism should be added, if applicable.		



## **5. PROJECTIONS**

### **5.1. Introduction**

The main objective of this chapter is to give an indication of future trends in GHG emissions in Estonia, given the policies and measures implemented and adopted within the current national climate policies. Projections are given for all greenhouse gases considered in the Kyoto Protocol, presented in the following sectors (CRF categories): energy (including transport); industrial processes; solvent and other product use; agriculture; waste; and LULUCF. Projections of GHG emissions have been calculated for the period from 2010-2030. 2010 has been used as a reference year (historical data).

Two scenarios are presented. The 'With Measures' (WM) scenario evaluates future GHG emission trends under current policies and measures. In the second scenario a number of additional measures and their impact are taken into consideration forming the basis of the 'With Additional Measures' (WAM) scenario.

The projections in current First Biennial Report (BR1) are updated, compared to the previous National Communication (NC5). The reason behind the updated projections is that according to Regulation No 525/2013 of the European Parliament and Council, EU Member States must update their GHG projections every two years. Key assumptions and differences in assumptions between the current Biennial Report and the previous NC are presented in Chapter 5.2.1.

### **5.2. Methodology**

Projections in the energy sector are calculated using LEAP (the Long-range Energy Alternatives Planning system), which was developed at the Stockholm Environment Institute. LEAP is an integrated modelling tool that can be used to track energy consumption, production and resource extraction in all sectors of an economy. It can be used to account for both energy sector and non-energy sector GHG emission sources and sinks. In LEAP, different approaches are taken to model the demand and supply side. On the demand-side a spectrum from bottom-up, end-use accounting technique to top-down macroeconomic modelling is covered. The supply side offers a spectrum of physical energy and environmental accounting as well as simulation methodologies. Although LEAP includes a built-in technology and environmental database (Emission Factors), then country-specific issues have to be inserted separately.

The modelling with LEAP enables to create a whole energy system. Therefore some of the measures, that are implemented in one sector, but actually affect the GHG emissions in another sector are correctly taken into account. (e.g. energy savings in residential sector, that are using district heating).

The projections in NC5 were compiled using NEEDS model. This energy development model is elaborated in the framework of the Sixth Framework Program

within the project 'New Energy Externalities Development for Sustainability (NEEDS)'.

The estimated final consumption of fuels in future years is based on the projections of the Ministry of Economic Affairs and Communications presented in the National Renewable Energy Action Plan (NREAP) of Estonia (corrected with updated GDP assumptions and updated historical data). Consumption of electricity (including losses) is projected according to the report compiled by the transmission network operator of Estonia AS Elering (*Varustuskindluse aruanne 2012*). Consumption of heat (including losses) is projected according to the report compiled by the Estonian Renewable Energy Association and the Estonian Council of Environmental NGOs (*Renewable Energy 100*).

Consumption of fuels for electricity, heat and shale oil production is calculated by LEAP. The calculations take current legislation and future investment plans for this sector into account.

Projections in the industrial processes sector are based on data received from companies that are included in the industrial processes sector. Emission projections from the consumption of halocarbons and SF<sub>6</sub> are based on expert judgement.

Projections in the solvent and other product use sector are calculated based on historical data (2005-2010) and are also based on the projection of the population.

Projections in the agriculture sector are based on information received from the Ministry of Agriculture and also expert judgements.

Projections in LULUCF are calculated using land use data from 1990-2010 and emissions reported in the *National Inventory Report 2012* and CRF tables. Projections of CO<sub>2</sub> are calculated as an average of linear forecasts over the time series 1990-2010 and 2004-2010. The main reason for using the second forecast in calculations is 2004 was the starting point for the current trend of all relevant factors - both the intensive felling period and the afforestation of agricultural areas stopped at this time. Projections of CH<sub>4</sub> and N<sub>2</sub>O are calculated as a linear forecast over the entire time series 1990-2010.

Projections in the waste sector are based on the National Waste Management Plan for 2008-2013 and on expert judgements.

The key underlying assumptions used in the projections are presented in Table 5.1.

**Table 5.1.** Main assumptions used in the projections

	Historic	Projected			
	2010	2015	2020	2025	2030
<b>GDP growth, %</b>	2.3	3.5	2.3	2.1	2.3
<b>Population, thousand people</b>	1,340.1	1,332.4	1,328.3	1,315.9	1,296.4
<b>International coal import prices, €(2010)/boe</b>		22	22.6	23.7	24
<b>International oil import prices, €(2010)/boe</b>		86	88.5	89.2	93.1
<b>International gas import prices,</b>		53.8	61.5	58.9	64.5

	Historic	Projected			
	2010	2015	2020	2025	2030
€(2010)/boe					
Oil shale mining limit, Mt	20	20	20	20	20
Net electricity import, GWh	-3,570	-871	1,485	3,300	5,358
Number of total cattle, thousand heads	236.3	236.9	273.7	241	241
Number of sheep, thousand heads	78.6	80	82	84	86
Number of swine, thousand heads	371.7	360.4	351.9	360	365
Number of poultry, thousand heads	2,046.4	2046	2,046	2,046	2,046
Municipal solid waste generation, kt	304.6	334.9	354.3	373.3	395.2
Area of managed forest, 1000 hectares	2,253.5	2,252.3	2,251.1	2,249.9	2,248.8

To ensure the timeliness, completeness, consistency, comparability, transparency and accuracy of the projections, certain quality checks were carried out by the European Topic Centre on Air pollution and Climate change Mitigation (ETC/ACM) on behalf of the EEA (according to the 'Quality assurance procedure for the reporting of policies and measures by Member States under Decision 280/2004/EC').

The ETS and non-ETS sector emissions are calculated using historical inventory data (proportion of different sectors), projections received from different companies belonging to the ETS, and the total projections in WM and WAM scenarios.

The methodology for sensitivity analysis is described in Chapter 5.3.4.

The total effect of PaMs is calculated as the sum of all PaMs (See Chapter 5.4).

### 5.2.1. Comparison of projections between NC5 and BR1

In NC5, the projections on the GHG emissions of Estonia were compiled by Tallinn University of Technology using the energy supply development model NEEDS (or NEEDS/TIMES). These projections had 2006 as a base year and were made up to 2020. Some of the main assumptions and results of the previous NC and current BR projections are presented in Table 5.2.

**Table 5.2.** Comparison of projections between previous NC and current BR

	2010	2015	2020	2025	2030
NC5 Population growth rates, %	-0.20	-0.10	-0.20	-0.30	-0.10
BR1 Population growth rates, %	-0.14	-0.10	-0.06	-0.19	-0.30
NC5 Annual GDP growth rates, %	3.00	2.70	2.70	2.50	2.30

	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>
<b>BR1 Annual GDP growth rates, %</b>	2.30	3.50	2.30	2.10	2.30
<b>NC5 WM total consumption of electricity (incl. losses), GWh</b>	10,307	11,216	11,857		
<b>BR1 WM total consumption of electricity (incl. losses), GWh</b>	7,943	9,283	10,442	11,743	13,044
<b>NC5 Net import of electricity, GWh</b>	-750	0	0		
<b>BR1 Net import of electricity, GWh</b>	-3,571	-871	1,270	3,300	5,108
<b>NC5 Production of electricity from wind, GWh</b>	278	789	1,900		
<b>BR1 Production of electricity from wind, GWh</b>	997	3,294	3,294	3,294	3,294
<b>NC5 WM total emissions, Gg CO<sub>2</sub> equivalent</b>	15,960		15,615		
<b>BR1 WM total emissions, Gg CO<sub>2</sub> equivalent</b>	19,962	18,089	17,060	16,535	16,165
<b>NC5 WAM total emissions, Gg CO<sub>2</sub> equivalent</b>	15,974		13,012		
<b>BR1 WAM total emissions, Gg CO<sub>2</sub> equivalent</b>	19,962	17,671	16,550	15,951	15,797

As seen in Table 5.2 the assumptions and the results of the two projections are quite different. The total GHG emissions in the WM and WAM scenarios in 2020 of the previous NC are lower than in the current BR (*ca* 1,445 Gg CO<sub>2</sub> equivalent in the WM scenario and 3,538 Gg CO<sub>2</sub> equivalent in the WAM scenario).

### 5.3. Projections

#### 5.3.1. With Measures (WM) scenario for 2010-2030

‘With Measures’ projections encompass currently implemented and adopted policies and measures.

### 5.3.1.1. Demographic assumptions and macroeconomic outlook

Data on the population for the period 2010-2030 was received from Statistics Estonia. Annual projected gross domestic product (GDP) growth rates for 2010-2015 are according to the projections of the Ministry of Finance from summer 2012. GDP growth rates for 2015-2030 are according to the 'Recommendations for reporting on projections in 2013' provided by the European Commission (see Table 5.3).

**Table 5.3.** Population and GDP growth rates 2010-2030

	2010	2015	2020	2025	2030
<b>Population (thousand people)</b>	1340.1	1332.4	1328.3	1315.9	1296.4
<b>Annual GDP growth rates</b>	2.3%	3.5%	2.3%	2.1%	2.3%

### 5.3.1.2. Energy

The energy sector includes GHG emissions from consumption and production of fuels and energy (electricity and heat). The main sub-sectors in this sector are energy industries (including public electricity and heat production and shale oil production); manufacturing industries; and construction, transport and other sectors (including commercial/institutional, residential and agriculture/forestry/fisheries).

Final consumption of energy in Estonia's energy sector according to Statistics Estonia in 2010 was 119 PJ, including 64 PJ fuels and 55 PJ electricity and heat. Total GHG emissions in 2010 in the energy sector were 17,867.34<sup>16</sup> Gg CO<sub>2</sub> equivalent (January 15, 2013 submission to the European Commission National Inventory Report of Estonia).

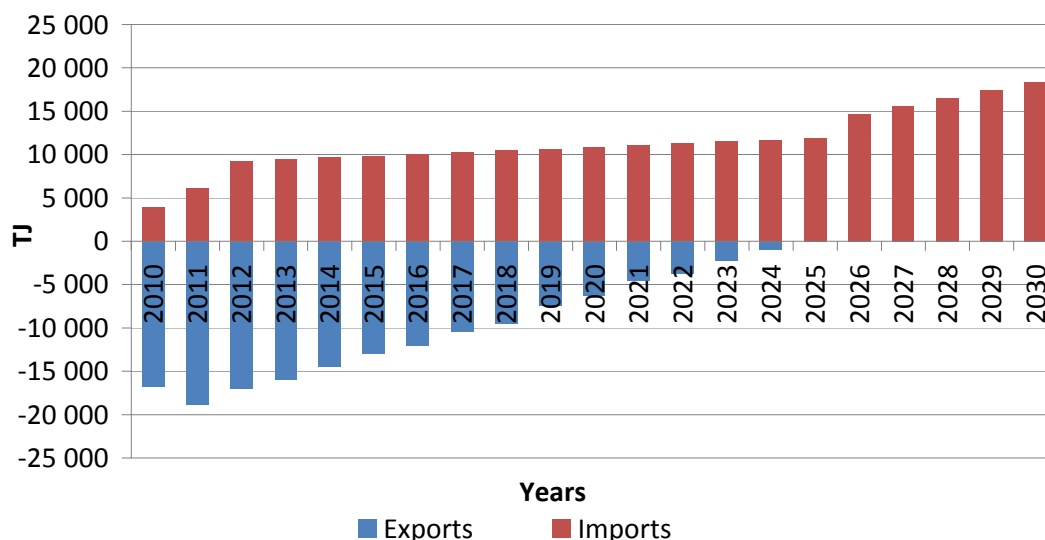
#### 5.3.1.2.1. Energy industries

The main electricity producer is Narva Elektriijaamad AS (Narva Power Plants) including the Eesti Power Plant and the Balti Power Plant. Both of these plants mainly use oil shale for electricity production. Narva Power Plants are also the largest producers of GHG emissions in Estonia. In 2010 there were a total of 10 pulverized combustion (PC) blocks and two circulating fluidised bed (CFB) blocks in Narva Power Plants. The process of building one more CFB block in Narva is currently underway. Construction of the new CFB block should be completed in 2015 (with a capacity of 300MW).

In recent years the share of electricity produced from renewable energy sources has grown rapidly, achieving over 9 per cent from gross electricity production in 2010. The main reason for this growth has been the support paid by Elering AS to electricity produced from renewable energy sources, as shown in the Policies and Measures chapter.

<sup>16</sup> The GHG emissions from energy sector are from the Estonian National Inventory Report January 15, 2013 submission to the European Commission, because the projections were compiled at the beginning of 2013, and no official data for 2011 existed.

Historically, Estonia has been an exporter of electricity. In 2010, for example, Estonia exported over 30 per cent of its gross produced electricity. In the WM scenario it is projected that export of electricity will start declining linearly from 2012 and that by 2025 there will be no more exports of electricity. This will lead to a decrease in GHG emissions due to the fact that Estonia has been exporting oil shale-based electricity. Projected export and import of electricity is presented in Figure 5.1.



**Figure 5.1.** Projected export and import of electricity in WM scenario, TJ

**Table 5.4.** Production and consumption of electricity and heat in WM scenario, TJ

	2010	2015	2020	2025	2030
<b>Production of electricity</b>	41,447	36,553	32,011	30,393	27,433
... including wind	997	3,294	3,294	3,294	3,294
... including hydro	97	115	115	115	115
... including CHP	4,806	6,094	6,769	6,769	6,769
... including condensing PPs	35,547	27,050	22,842	20,217	18,390
<b>Production of heat</b>	33,467	32,290	31,115	29,509	27,899
... including CHP	12,323	15,954	17,730	17,730	17,730
<b>Losses of electricity</b>	3,769	4,177	4,511	4,862	5,165
<b>Losses of heat</b>	3,730	3,358	2,975	2,718	2,458
<b>Net import of electricity</b>	-12,854	-3,135	4,572	11,880	18,390
<b>Final consumption of electricity</b>	24,825	29,241	33,081	37,413	41,793
<b>Final consumption of heat</b>	29,540	28,932	28,141	26,791	25,441

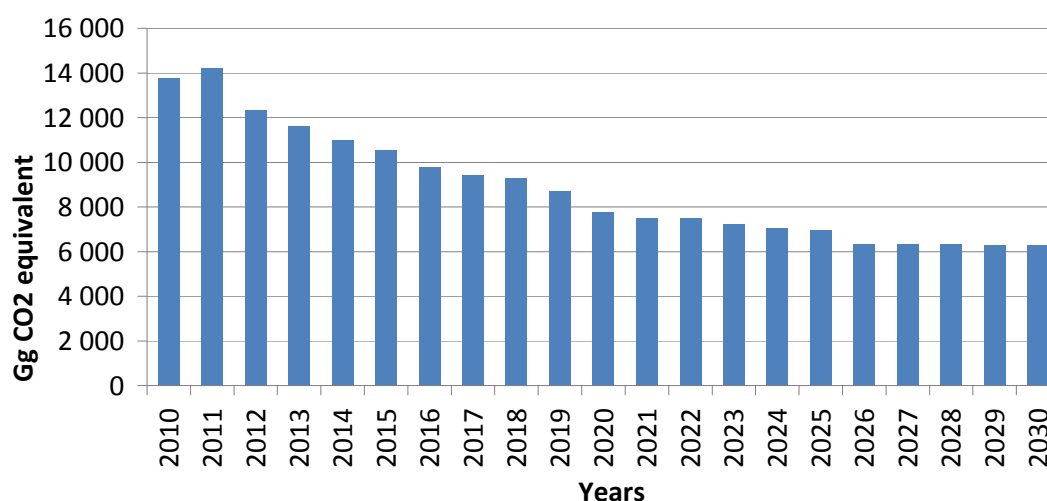
In the WM scenario it is expected that two of the PC blocks using oil shale will be closed down by 2016. For four of the PC blocks there are plans to install SO<sub>2</sub> and NO<sub>x</sub> emissions abatement technology; as such, they are expected to continue operating until 2025. For the remaining four PC blocks, an exception under the Industrial

Emissions Directive (IED) is granted so that each block can operate for 17,500 hours between 2016 and 2023 – after which they will be shut down. The limit on oil shale mining is set at 20 Mt (approximately 178,000 TJ). The priority in oil shale use is to produce shale oil; what remains of the 20 Mt will be available to power plants. (The amount of oil shale used for shale oil production in different technologies is presented in Table 5.6).

**Table 5.5.** Total GHG emissions from public electricity and heat production in WM scenario, Gg

		2010	2015	2020	2025	2030
<b>Public electricity and heat production</b>	<b>CO<sub>2</sub></b>	13,741.7	10,493.9	7,730.1	6,937.3	6,258.9
	<b>CH<sub>4</sub></b>	0.5	0.5	0.5	0.5	0.4
	<b>N<sub>2</sub>O</b>	0.1	0.1	0.1	0.1	0.1
	<b>Total CO<sub>2</sub> eq.</b>	13,781.3	10,530.8	7,771.3	6,977.0	6,296.8

Emissions from public electricity and heat production are expected to decrease by around 54 per cent by 2030 compared to 2010 (see Table 5.5 and Figure 5.2). The main reason for this decrease is the increase in wind electricity production and also the projection that Estonia will change from an exporting to an importing country of electricity.



**Figure 5.2.** Total GHG emissions from public electricity and heat production in WM scenario, Gg CO<sub>2</sub> equivalent

There are two different technologies in use for shale oil production in Estonia: technology for the processing of large-particle oil shale in vertical retorts with a gaseous heat carrier (GHC); and technology for the processing of fine-grained oil shale with a solid heat carrier (SHC). GHC technology is universal technology and suitable for retorting high-calorific oil shale. Thermal processing of oil shale using GHC technology takes place without any contact with the ambient atmosphere –

therefore no pollutants are emitted. GHG emissions only occur only in SHC technology. The data on both technologies is presented in Table 5.6.

**Table 5.6.** Oil shale consumption and shale oil production in WM scenario, TJ

	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>
<b>Oil shale for shale oil production using SHC technology</b>	17,170	52,170	107,259	107,259	107,259
<b>Oil shale for shale oil production using GHC technology</b>	25,252	25,377	25,377	25,377	25,377
<b>Oil shale for shale oil production total</b>	42,422	77,547	132,636	132,636	132,636
<b>Shale oil production using SHC technology</b>	8,818	29,331	60,623	60,623	60,623
<b>Shale oil production using GHC technology</b>	13,275	14,130	14,130	14,130	14,130
<b>Shale oil production total</b>	22,093	43,461	74,753	74,753	74,753

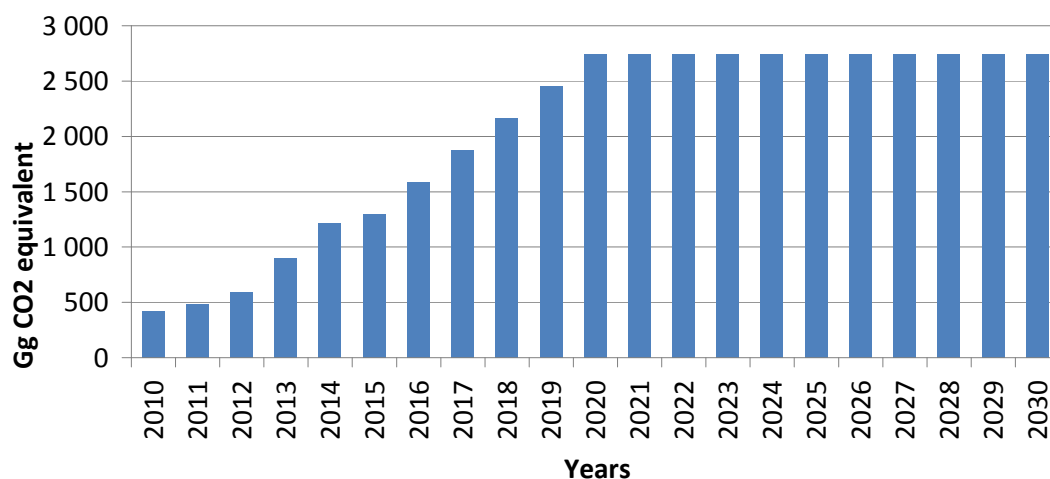
As can be seen from Table 5.6, the production of shale oil is expected to increase *ca* three-fold by 2030 compared to 2010.

**Table 5.7.** Total GHG emissions from shale oil production in WM scenario, Gg

		<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>
<b>Shale oil production</b>	<b>CO<sub>2</sub></b>	418.7	1,292.4	2,737.9	2,737.9	2,737.9
	<b>CH<sub>4</sub></b>	0.0	0.1	0.1	0.1	0.1
	<b>N<sub>2</sub>O</b>	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	419.6	1,295.2	2,743.5	2,743.5	2,743.5

Due to the significant increase in the use of oil shale in shale oil production, GHG emissions from such production are also expected to increase rapidly (see Table 5.7 and Figure 5.3).





**Figure 5.3.** Total GHG emissions from shale oil production in WM scenario, Gg CO<sub>2</sub> equivalent

GHG emissions from shale oil production are expected to increase from 464 Gg of CO<sub>2</sub> equivalent in 2010 to 2,743 Gg of CO<sub>2</sub> equivalent by 2030.

#### 5.3.1.2.2. Manufacturing industries and construction

The manufacturing industries and construction sector is divided into the following sub-sectors: iron and steel; non-ferrous metals; chemicals; pulp, paper and print; food beverages and tobacco; and other industries. Under 'other industries' the majority of fuel (mainly oil shale and coal) is used in cement production. Also diesel and natural gas is used extensively in manufacturing and construction.

**Table 5.8.** Fuel and energy consumption in manufacturing industries and construction sector in WM scenario, TJ

	2010	2015	2020	2025	2030
<b>Fuels in iron and steel</b>	16.0	17.7	19.5	21.5	23.8
<b>Fuels in non-ferrous metals</b>	89.0	98.3	108.5	119.8	132.2
<b>Fuels in chemicals</b>	221.0	244.0	269.4	297.4	328.4
<b>Fuels in pulp, paper and print</b>	88.0	97.2	107.3	118.4	130.8
<b>Fuels in food, beverages and tobacco</b>	112.0	123.7	136.5	150.7	166.4
<b>Fuels in other</b>	6,349.0	7,009.8	7,739.4	8,544.9	9,434.3
<b>Electricity</b>	7,534.0	9,893.0	11,260.6	12,713.4	14,181.9
<b>Heat</b>	7,660.0	7,848.0	8,035.2	8,179.2	8,323.2
<b>Total energy in manufacturing industries and construction</b>	22,069.0	25,331.6	27,676.3	30,145.4	32,721.0

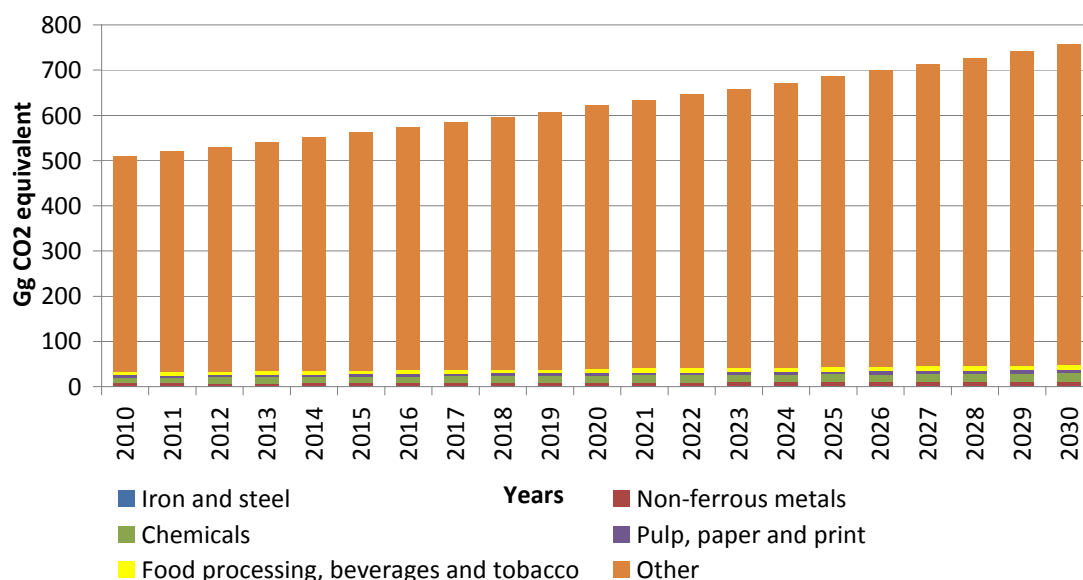
The overall energy consumption in the manufacturing industries and construction sector is expected to grow by almost 50 per cent by 2030 compared to 2010 (see Table 5.8).

Since the most fuels are used in other industries, then also the main share of GHG emissions come from this sub-sector. The share of GHG emissions from coal and oil shale use for cement production was almost 50 per cent of total GHG emissions in the manufacturing industries and construction sector due to their relatively high carbon emission factor. GHG emissions from diesel, natural gas, oil shale and coal combined emitted around 80 per cent of total emissions from the manufacturing industries and construction sector in 2010.

**Table 5.9.** Total GHG emissions from manufacturing industries and construction in WM scenario, Gg

		2010	2015	2020	2025	2030
<b>Manufacturing industries and construction</b>	<b>CO<sub>2</sub></b>	504.9	557.4	615.5	679.5	750.2
	<b>CH<sub>4</sub></b>	0.1	0.1	0.1	0.1	0.1
	<b>N<sub>2</sub>O</b>	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	509.1	562.1	620.6	685.2	756.5

The overall structure of fuels and energy consumed in the manufacturing industries and construction sector is expected to remain quite steady for the entire period from 2010-2030. No major structural changes are projected.



**Figure 5.4.** Total GHG emissions from manufacturing industries and construction in WM scenario, Gg CO<sub>2</sub> equivalent

GHG emissions are expected to increase by around 49 per cent in 2030 compared to 2010 in the WM scenario (see Table 5.9 and Figure 5.4).

### 5.3.1.2.3. Transport (excluding international aviation and marine bunkering)

The main share of GHG emissions in the transport sector originate from road transport. Historically the share of road transport GHG emissions has been over 90 per cent of total transport GHG emissions. Although new vehicles are more environmentally friendly and efficient, the share of those vehicles is relatively small. Therefore the consumption of motor fuels is expected to increase in future.

**Table 5.10.** Fuel and energy consumption in transport sector in WM scenario, TJ

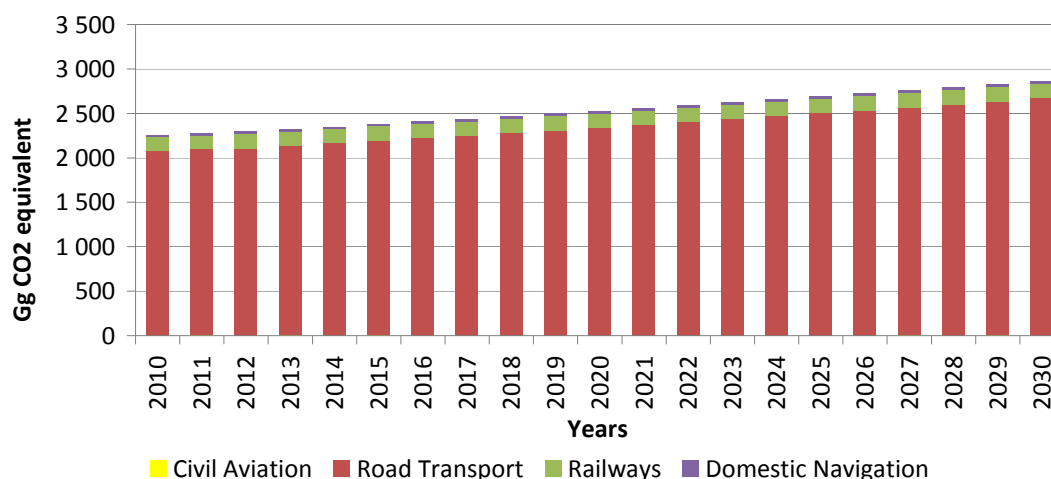
	2010	2015	2020	2025	2030
<b>Fuels in national aviation</b>	24.3	26.8	29.6	32.6	36.0
<b>Fuels in road transport</b>	28,374.0	30,233.0	32,219.9	34,343.9	36,614.6
<b>Fuels in railways</b>	2,125.0	2,146.3	2,167.9	2,189.7	2,211.6
<b>Fuels in inland waterways</b>	319.0	335.3	352.4	370.3	389.2
<b>Electricity</b>	206.0	348.2	394.9	445.9	497.4
<b>Heat</b>	100.0	107.8	112.9	118.3	123.9
<b>Total energy in transport</b>	<b>31,148.3</b>	<b>33,197.4</b>	<b>35,277.6</b>	<b>37,500.7</b>	<b>39,872.7</b>

Total fuel and energy consumption in the transport sector is expected to increase by around 28 per cent by 2030 compared to 2010 (see Table 5.10). This increase is mainly related to the increase in gasoline and diesel consumption in road transportation.

**Table 5.11.** GHG emissions from transport sector in WM scenario, Gg

		2010	2015	2020	2025	2030
<b>Transport</b>	<b>CO<sub>2</sub></b>	2,233.8	2,351.5	2,500.0	2,661.8	2,831.3
	<b>CH<sub>4</sub></b>	0.3	0.4	0.4	0.4	0.4
	<b>N<sub>2</sub>O</b>	0.1	0.1	0.1	0.1	0.1
	<b>Total CO<sub>2</sub> eq.</b>	2,258.9	2,378.1	2,528.2	2,691.6	2,862.9

Total GHG emissions from the transport sector are expected to increase by around 27 per cent by 2030 compared to 2010 (see Table 5.11 and Figure 5.5). The share of GHG emissions from road transport is projected to increase slightly throughout the period from 2010-2030 (by around 1 per cent total).



**Figure 5.5.** Total GHG emissions from transport in WM scenario, Gg CO<sub>2</sub> equivalent

#### 5.3.1.2.4. Other sectors

Other sectors include energy consumption in the commercial/institutional, residential and agriculture/forestry/fisheries sectors. In current projections GHG emissions from military use of fuels is included in other sectors. (In the National Inventory Report of Estonia these GHG emissions are reported separately under 1.A.5, not 1.A.4.) Historically the most energy (including fuels) has been consumed in the residential sector. The share of biomass used in households was *ca* 85 per cent of all fuels used in households in 2010. Diesel used in off-road transportation forms the biggest share of fuels in agriculture/forestry/fisheries. The activity data used in the projections is presented in Table 5.12.

**Table 5.12.** Fuel and energy consumption in other sectors in WM scenario, TJ

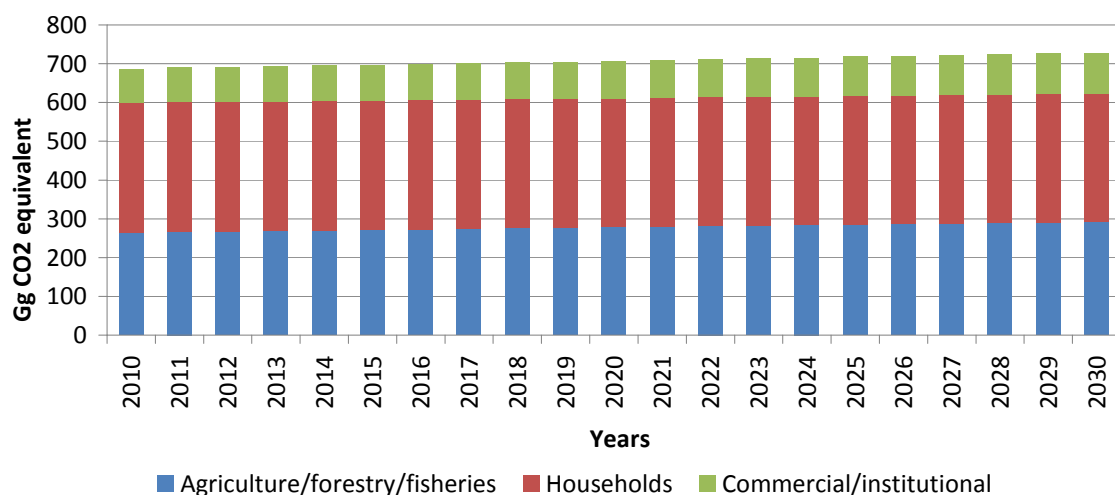
		2010	2015	2020	2025	2030
<b>Commercial/ institutional</b>	<b>Fuels</b>	1,644.0	1,723.7	1,803.2	1,886.6	1,974.0
	<b>Electricity</b>	9,123.0	10,339.2	11,725.8	13,238.6	14,767.8
	<b>Heat</b>	6,542.0	6,270.0	5,999.0	5,596.0	5,193.0
<b>Residential</b>	<b>Fuels</b>	20,900.0	20,723.7	20,549.1	20,376.3	20,205.2
	<b>Electricity</b>	7,283.0	7,767.0	8,686.6	9,871.9	11,070.0
	<b>Heat</b>	14,792.0	14,249.0	13,526.0	12,421.0	11,316.0
<b>Agriculture/forestry/ fisheries</b>	<b>Fuels</b>	2,785.0	2,854.2	2,925.1	2,997.9	3,072.6
	<b>Electricity</b>	679.0	893.1	1,012.9	1,143.6	1,275.7
	<b>Heat</b>	446.0	457.0	468.0	477.0	485.0
<b>Total</b>	<b>Fuels</b>	<b>25,329.0</b>	<b>25,301.6</b>	<b>25,277.4</b>	<b>25,260.8</b>	<b>25,251.8</b>
	<b>Electricity</b>	<b>17,085.0</b>	<b>18,999.3</b>	<b>21,425.3</b>	<b>24,254.1</b>	<b>27,113.5</b>
	<b>Heat</b>	<b>21,780.0</b>	<b>20,976.0</b>	<b>19,993.0</b>	<b>18,494.0</b>	<b>16,994.0</b>

Heat consumption is expected to decrease in other sectors. This decrease is a result of measures and programmes that cover the development and implementation of regulations on the energy performance of buildings, the modernisation of the renovation and construction of buildings, tax policy measures, improvement of the skills of construction specialists, applied R&D to ensure analysis of the state of repairs of buildings and technical options in modernising them.

**Table 5.13.** Total GHG emissions from other sectors in WM scenario, Gg

		<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>
<b>Commercial/institutional</b>	<b>CO<sub>2</sub></b>	86.2	90.7	94.9	99.4	104.0
	<b>CH<sub>4</sub></b>	0.0	0.0	0.0	0.0	0.0
	<b>N<sub>2</sub>O</b>	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	87.4	91.8	96.1	100.6	105.3
<b>Residential</b>	<b>CO<sub>2</sub></b>	198.3	198.3	198.3	198.3	198.3
	<b>CH<sub>4</sub></b>	5.4	5.4	5.3	5.3	5.2
	<b>N<sub>2</sub>O</b>	0.1	0.1	0.1	0.1	0.1
	<b>Total CO<sub>2</sub> eq.</b>	335.0	333.7	332.4	331.1	329.8
<b>Agriculture/forestry/ fisheries</b>	<b>CO<sub>2</sub></b>	241.9	248.4	254.6	261.0	267.6
	<b>CH<sub>4</sub></b>	0.0	0.0	0.0	0.0	0.0
	<b>N<sub>2</sub>O</b>	0.1	0.1	0.1	0.1	0.1
	<b>Total CO<sub>2</sub> eq.</b>	264.6	271.7	278.5	285.6	292.7
<b>TOTAL</b>	<b>CO<sub>2</sub></b>	526.5	537.4	547.9	558.7	570.0
	<b>CH<sub>4</sub></b>	5.5	5.4	5.4	5.3	5.3
	<b>N<sub>2</sub>O</b>	0.1	0.1	0.1	0.1	0.2
	<b>Total CO<sub>2</sub> eq.</b>	687.0	697.2	707.0	717.2	727.8

The reduction in biomass used in households will lead to a decrease in GHG emissions from the residential sector. Other fuels used in households are expected to remain at the same level throughout the period from 2010-2030. Therefore CO<sub>2</sub> emissions from the residential sector will also remain at the 2010 level. The increase in GHG emissions from agriculture/forestry/fisheries is related to growing demand for and use of motor fuels in agricultural machines. GHG emissions from other sectors are expected to grow by around 6 per cent by 2030 compared to 2010 (see Table 5.13 and Figure 5.6).



**Figure 5.6.** Total GHG emissions from other sectors in WM scenario, Gg CO<sub>2</sub> equivalent

#### 5.3.1.2.5. Energy sector total

Total GHG emissions in the WM scenario are presented in Table 5.14.

**Table 5.14.** Total GHG emissions in energy sector in WM scenario, Gg

		2010	2015	2020	2025	2030
Energy industries	CO <sub>2</sub>	14,160.5	11,786.3	10,468.0	9,675.3	8,996.8
	CH <sub>4</sub>	0.6	0.6	0.6	0.6	0.5
	N <sub>2</sub> O	0.1	0.1	0.1	0.1	0.1
	Total CO <sub>2</sub> eq.	14,201.0	11,825.9	10,514.8	9,720.5	9,040.3
Manufacturing industries and construction	CO <sub>2</sub>	504.9	557.4	615.5	679.5	750.2
	CH <sub>4</sub>	0.1	0.1	0.1	0.1	0.1
	N <sub>2</sub> O	0.0	0.0	0.0	0.0	0.0
	Total CO <sub>2</sub> eq.	509.1	562.1	620.6	685.2	756.5
Transport	CO <sub>2</sub>	2,233.8	2,351.5	2,500.0	2,661.8	2,831.3
	CH <sub>4</sub>	0.3	0.4	0.4	0.4	0.4
	N <sub>2</sub> O	0.1	0.1	0.1	0.1	0.1
	Total CO <sub>2</sub> eq.	2,258.9	2,378.1	2,528.2	2,691.6	2,862.9
Other sectors	CO <sub>2</sub>	526.5	537.4	547.9	558.7	570.0
	CH <sub>4</sub>	5.5	5.4	5.4	5.3	5.3
	N <sub>2</sub> O	0.1	0.1	0.1	0.1	0.2
	Total CO <sub>2</sub> eq.	687.0	697.2	707.0	717.2	727.8
Fugitive emissions from fuels	CH <sub>4</sub>	4.0	4.3	4.0	3.9	3.8
	Total CO <sub>2</sub> eq.	83.2	89.5	83.4	81.6	79.8
Energy total	CO <sub>2</sub>	17,425.7	15,232.7	14,131.4	13,575.3	13,148.3

		2010	2015	2020	2025	2030
	<b>CH<sub>4</sub></b>	10.4	10.7	10.4	10.3	10.1
	<b>N<sub>2</sub>O</b>	0.3	0.3	0.3	0.3	0.3
	<b>Total CO<sub>2</sub> eq.</b>	17,739.3	15,552.9	14,454.0	13,896.1	13,467.4

Total GHG emissions from the energy sector are expected to decrease by around 24 per cent by 2030 compared to 2010.

### 5.3.1.3. Industrial processes

The mineral products and chemical industry are the sources of CO<sub>2</sub> emissions in the industrial processes sector. Data from eight companies is included in the projections. In the mineral products sector the main share of emissions (*ca* 91 per cent in 2010) comes from cement production. Other CO<sub>2</sub> emissions from the production of mineral products come from lime, glass, lightweight gravel, bricks and tiles production and from soda ash use.

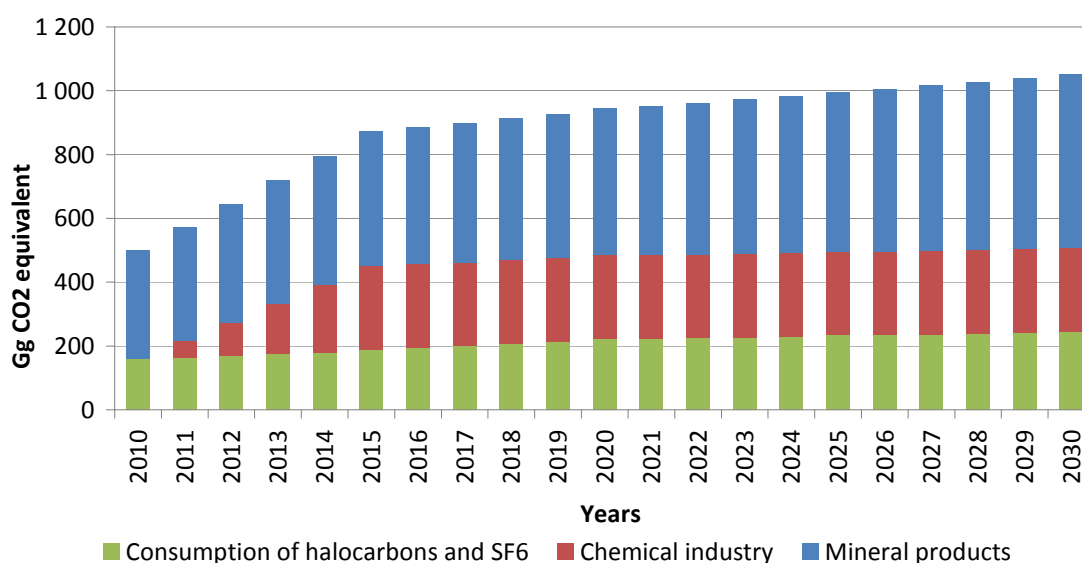
Ammonia production is the only production in the chemical industry branch. There is also only one company in Estonia producing ammonia (AS Nitrofert). Due to the low market prices of ammonia there was no ammonia production in 2010. However, it is expected that production of ammonia will resume in the future.

The consumption of fluorinated GHGs (HFCs, PFCs and SF<sub>6</sub>) in Estonia depends on imports. F-gases are imported either in bulk by trade or industry for domestic productive consumption (manufacturing) – filling newly manufactured products and refilling of equipment – or imported preliminary and final products respective equipment already filled with F-gases.

**Table 5.15.** Total GHG emissions from industrial processes sector in WM scenario, Gg

		2010	2015	2020	2025	2030
<b>Mineral products</b>	<b>CO<sub>2</sub></b>	339.4	421.4	458.6	499.6	544.5
<b>Chemical industry</b>	<b>CO<sub>2</sub></b>	0.0	262.9	262.9	262.9	262.9
<b>Consumption of halocarbons and SF<sub>6</sub></b>	<b>HFCs (CO<sub>2</sub> eq.)</b>	156.3	184.7	218.1	229.1	240.5
	<b>SF<sub>6</sub> (CO<sub>2</sub> eq.)</b>	3.8	4.1	4.3	4.5	4.7
	<b>Total CO<sub>2</sub> eq.</b>	160.1	188.8	222.5	233.6	245.2
<b>Industrial processes total</b>	<b>Total CO<sub>2</sub> eq.</b>	499.5	873.1	944.0	996.1	1,052.7

GHG emissions are projected to increase in all sub-sectors under industrial processes. Total GHG emissions are expected to more than double by 2030 compared to 2010 (see Table 5.15 and Figure 5.7). The main share of this increase is related to cement and ammonia production.



**Figure 5.7.** Total GHG emissions from industrial processes in WM scenario, Gg CO<sub>2</sub> equivalent

#### 5.3.1.4. Solvent and other product use

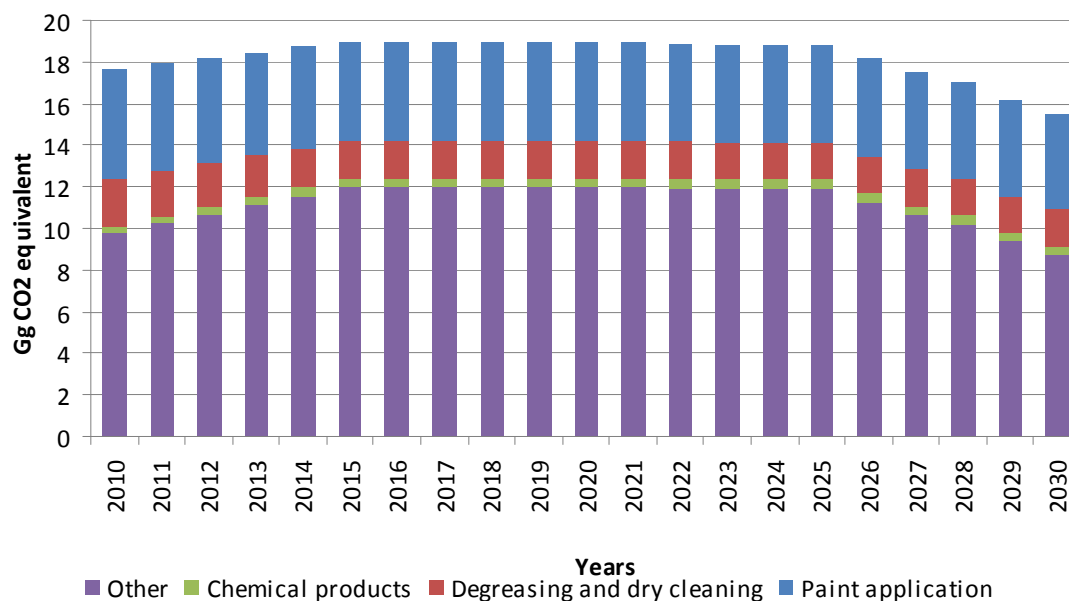
Emissions from solvent and other product use sector in Estonia are divided into the following categories: paint application; degreasing and dry cleaning; chemical products; manufacturing and processing; and other (including the printing industry, domestic solvent use and other product use). Under this category, mainly CO<sub>2</sub> emissions are occurring (except N<sub>2</sub>O emissions from the use of N<sub>2</sub>O for anaesthesia).

**Table 5.16.** Total GHG emissions from solvent and other product use in WM scenario, Gg

		2010	2015	2020	2025	2030
<b>Paint application</b>	CO <sub>2</sub>	5.2	4.7	4.7	4.7	4.6
<b>Degreasing and dry cleaning</b>	CO <sub>2</sub>	2.3	1.8	1.8	1.8	1.8
<b>Chemical products, manufacturing and processing</b>	CO <sub>2</sub>	0.3	0.4	0.4	0.4	0.4
<b>Other</b>	CO <sub>2</sub>	5.0	5.8	5.8	5.7	5.7
	N <sub>2</sub> O	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	9.8	12.0	12.0	11.9	8.8
<b>Solvent and other product use total</b>	CO <sub>2</sub>	12.9	12.8	12.7	12.6	12.4
	N <sub>2</sub> O	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	17.6	19.0	18.9	18.8	15.5

The decrease in total GHG emissions from the solvent and other product use sector is expected to be 12 per cent by 2030 compared to 2010 (see Table 5.16 and Figure 5.8).





**Figure 5.8.** Total GHG emissions from solvent and other product use in WM scenario, Gg CO<sub>2</sub> equivalent

### 5.3.1.5. Agriculture

In the agriculture sector CH<sub>4</sub> is emitted from enteric fermentation and manure management. N<sub>2</sub>O is emitted from manure management and agricultural soils. No CO<sub>2</sub> emissions occur in the agriculture sector. CH<sub>4</sub> and N<sub>2</sub>O emissions from field burning of agricultural residues occurred in Estonia from 1990-2006. Since 2007 the burning of crop residues is prohibited by Estonian law. Therefore no GHG emissions have occurred in this sector since 2007.

Projections on the number of livestock are received from the Ministry of Agriculture and are presented in Table 5.17.

**Table 5.17.** Projected number of livestock, thousand heads

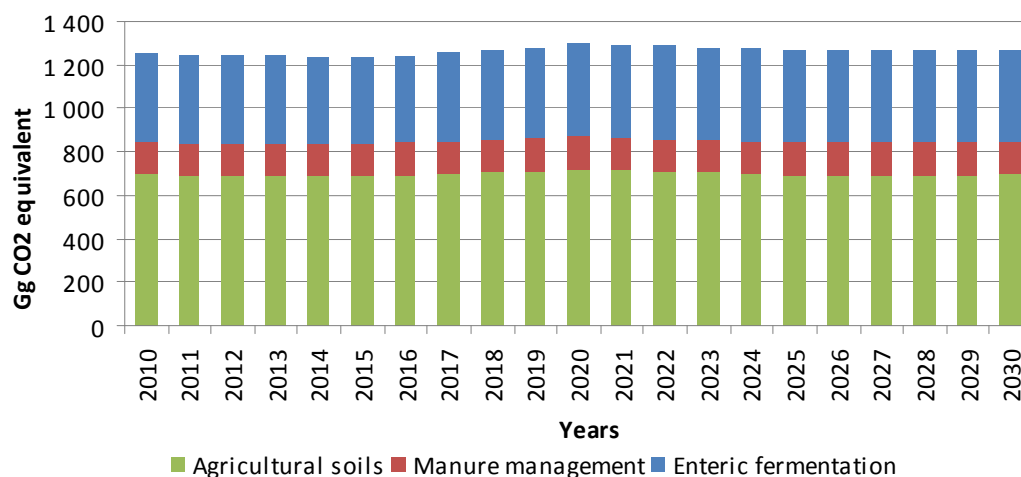
	2010	2015	2020	2025	2030
<b>Cattle</b>	236.3	236.9	243.7	241.0	241.0
<b>Sheep</b>	78.6	80.0	82.0	84.0	86.0
<b>Goats</b>	4.1	4.2	4.4	4.6	4.8
<b>Horses</b>	6.8	5.1	5.0	5.0	5.0
<b>Swine</b>	371.7	360.0	352.0	360.0	365.0
<b>Poultry</b>	2,046.4	2,046.0	2,046.0	2,046.0	2,046.0

Projections on GHG emissions from agriculture are presented in Table 5.18.

**Table 5.18.** Total GHG emissions from agriculture in WM scenario, Gg

		2010	2015	2020	2025	2030
<b>Enteric fermentation</b>	<b>CH<sub>4</sub></b>	19.3	19.0	20.2	20.3	20.3
	<b>Total CO<sub>2</sub> eq.</b>	405.4	398.2	425.2	426.5	426.6
<b>Manure management</b>	<b>CH<sub>4</sub></b>	2.3	2.3	2.4	2.4	2.4
	<b>N<sub>2</sub>O</b>	0.3	0.3	0.3	0.3	0.3
	<b>Total CO<sub>2</sub> eq.</b>	150.0	149.2	150.7	151.2	151.5
<b>Agricultural soils</b>	<b>N<sub>2</sub>O</b>	2.3	2.2	2.3	2.2	2.2
	<b>Total CO<sub>2</sub> eq.</b>	698.2	688.3	719.8	694.6	695.4
<b>Agriculture total</b>	<b>CH<sub>4</sub></b>	<b>21.7</b>	<b>21.3</b>	<b>22.6</b>	<b>22.7</b>	<b>22.7</b>
	<b>N<sub>2</sub>O</b>	<b>2.6</b>	<b>2.5</b>	<b>2.6</b>	<b>2.6</b>	<b>2.6</b>
	<b>TOTAL CO<sub>2</sub> eq.</b>	<b>1,253.6</b>	<b>1,235.7</b>	<b>1,295.6</b>	<b>1,272.3</b>	<b>1,273.5</b>

GHG emissions from the agriculture sector are expected to remain at around the same level from 2010-2030 (with an increase of 1.6 per cent by 2030 compared to 2010). This slight increase is related to the fact that both the number of cattle and the amount of fertilizers used in agricultural lands are expected to increase by 2030 compared to 2010 (see Table 5.18 and Figure 5.9).

**Figure 5.9.** Total GHG emissions from agriculture in WM scenario, Gg CO<sub>2</sub> equivalent

### 5.3.1.6.LULUCF

The LULUCF sector includes emissions and removals of GHGs from forest land, cropland, grassland, wetlands, settlements and other land. There are a number of factors that have affected the use of land over the last 20 years. The most important of these is land reform, but also accession to the European Union and economic peaks and troughs.

Forest area grew steadily until 2004. As there are several EU support schemes at present for agriculture activities, only a slight increase in forest land is foreseen in the future (mainly conversion of grassland to forest land). The area of cropland increased since 2004-2010 and is not expected to increase further. Grasslands should continue to decline in the near future, mainly due to natural afforestation. The area of infrastructure and settlements is expanding continuously, at the expense of all other mineral lands. The predicted area of land use classes is shown in Table 5.19.

**Table 5.19.** Projected land use in LULUCF sector in WM scenario, kHa

	2010	2015	2020	2025	2030
<b>Forest land</b>	2,253.5	2,252.3	2,251.1	2,249.9	2,248.8
<b>Cropland</b>	1,078.3	1,076.4	1,074.5	1,072.6	1,070.7
<b>Grassland</b>	346.3	340.9	335.5	330.1	324.7
<b>Wetlands</b>	499.1	501.3	503.4	505.5	507.7
<b>Settlements</b>	300.7	309.1	317.5	325.9	334.3
<b>Other land</b>	44.8	42.7	40.7	38.6	33.6
<b>Total</b>	4,522.7	4,522.7	4,522.7	4,522.7	4,522.7

**Table 5.20.** Total GHG emissions and removals from LULUCF sector in WM scenario, Gg

		2010	2015	2020	2025	2030
<b>Forest land</b>	<b>CO<sub>2</sub></b>	-4,013.2	-3,925.4	-3,837.5	-3,749.7	-3,661.9
	<b>CH<sub>4</sub></b>	0.0	0.1	0.1	0.1	0.1
	<b>N<sub>2</sub>O</b>	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	-4,013.1	-3,923.5	-3,835.5	-3,747.6	-3,659.6
<b>Cropland</b>	<b>CO<sub>2</sub></b>	103.2	101.8	100.4	99.0	97.6
<b>Grassland</b>	<b>CO<sub>2</sub></b>	-160.7	-147.1	-133.4	-119.7	-106.0
	<b>CH<sub>4</sub></b>	0.0	0.0	0.0	0.0	0.0
	<b>N<sub>2</sub>O</b>	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	-160.7	-147.0	-133.2	-119.5	-105.8
<b>Wetlands</b>	<b>CO<sub>2</sub></b>	13.6	24.7	35.8	46.8	57.9
	<b>N<sub>2</sub>O</b>	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	14.5	25.6	36.7	47.8	58.8
<b>Settlements</b>	<b>CO<sub>2</sub></b>	298.4	307.8	317.2	326.6	336.1
<b>Other land</b>	<b>CO<sub>2</sub></b>	0.0	20.9	41.8	62.6	83.5
<b>TOTAL</b>	<b>CO<sub>2</sub></b>	-3,758.7	-3,617.3	-3,475.8	-3,334.3	-3,192.8
	<b>CH<sub>4</sub></b>	0.0	0.1	0.1	0.1	0.1
	<b>N<sub>2</sub>O</b>	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	-3,757.8	-3,614.4	-3,472.7	-3,331.1	-3,189.5

In general, GHG emissions are expected to remain stable or increase in the near future (see Table 5.20).

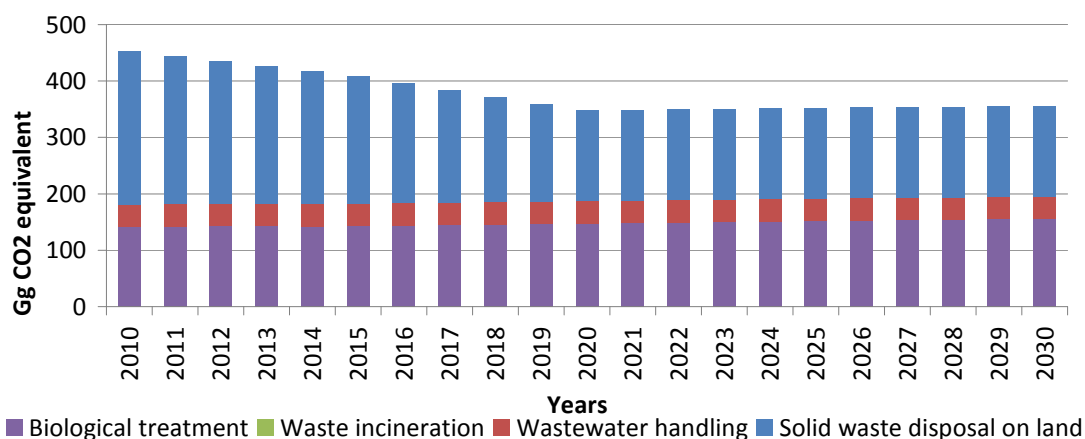
### 5.3.1.7. Waste

The main GHGs in the waste sector are methane and nitrous oxide. No CO<sub>2</sub> is emitted from the waste sector. The main share of methane from the waste sector comes from solid waste disposal on land. Nitrous oxide is emitted from wastewater handling, biological treatment and waste incineration. The measure concerning solid waste disposal on land is taken into account in the projections – the percentage of biodegradable waste in the total amount by weight of municipal waste deposited in a landfill shall not exceed 45 per cent by 2010, 30 per cent by 2013 and 20 per cent by 2020.

**Table 5.21.** Total GHG emissions from waste sector in WM scenario, Gg

		2010	2015	2020	2025	2030
<b>Solid waste disposal on land</b>	<b>CH<sub>4</sub></b>	12.9	10.7	7.6	7.6	7.6
	<b>Total CO<sub>2</sub> eq.</b>	271.3	225.1	160.0	160.0	160.0
<b>Wastewater handling</b>	<b>CH<sub>4</sub></b>	0.3	0.3	0.3	0.3	0.3
	<b>N<sub>2</sub>O</b>	0.1	0.1	0.1	0.1	0.1
	<b>Total CO<sub>2</sub> eq.</b>	40.1	40.6	40.6	40.4	39.9
<b>Waste incineration</b>	<b>N<sub>2</sub>O</b>	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	0.1	0.1	0.1	0.1	0.1
<b>Other (biological treatment)</b>	<b>CH<sub>4</sub></b>	3.2	3.2	3.3	3.4	3.5
	<b>N<sub>2</sub>O</b>	0.2	0.2	0.2	0.3	0.3
	<b>Total CO<sub>2</sub> eq.</b>	140.9	142.7	147.0	151.5	156.0
<b>Waste total</b>	<b>CH<sub>4</sub></b>	16.4	14.2	11.2	11.3	11.5
	<b>N<sub>2</sub>O</b>	0.3	0.4	0.4	0.4	0.4
	<b>Total CO<sub>2</sub> eq.</b>	452.4	408.5	347.7	351.9	356.0

The decrease in GHG emissions from the waste sector is mainly related to the decrease in the percentage of biodegradable waste in the total amount of municipal waste deposited in landfill. This will lead to a reduction in GHG emissions in solid waste disposal on land of 41 per cent by 2030 compared to 2010. The total reduction in GHG emissions in the waste sector is projected to be 21 per cent by 2030 compared to 2010 (see Table 5.21 and Figure 5.10).



**Figure 5.10.** Total GHG emissions from waste in WM scenario, Gg CO<sub>2</sub> equivalent

### 5.3.1.8. Total GHG emissions in WM scenario

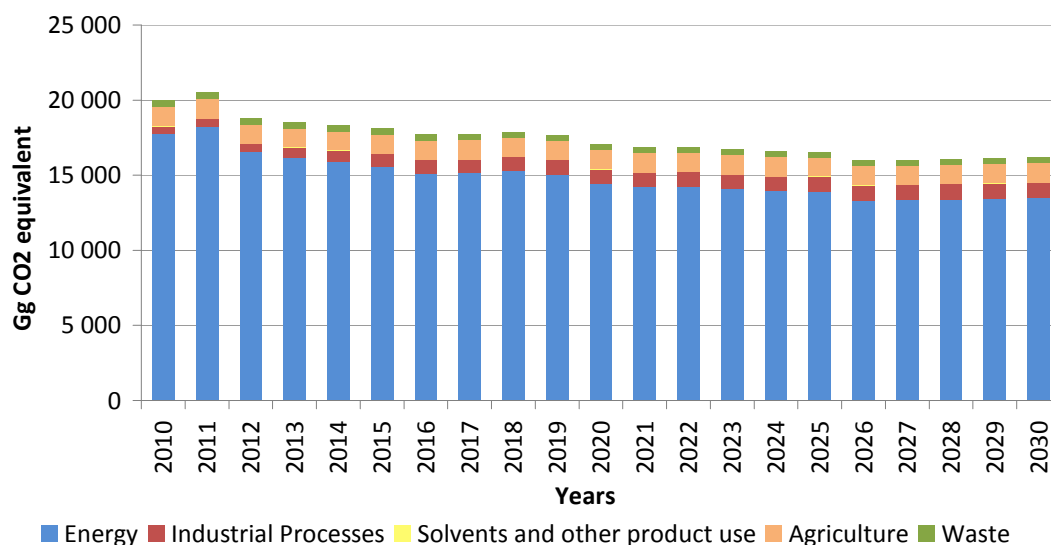
Total GHG emissions in the WM scenario are presented in Table 5.22.

**Table 5.22.** Total GHG emissions in WM scenario (without LULUCF), Gg

		2010	2015	2020	2025	2030
<b>Energy (including fugitive emissions from fuels)</b>	<b>CO<sub>2</sub></b>	17,425.7	15,232.7	14,131.4	13,575.3	13,148.3
	<b>CH<sub>4</sub></b>	10.4	10.7	10.4	10.3	10.1
	<b>N<sub>2</sub>O</b>	0.3	0.3	0.3	0.3	0.3
	<b>Total CO<sub>2</sub> eq.</b>	17,739.3	15,552.9	14,454.0	13,896.1	13,467.4
<b>Industrial processes</b>	<b>Total CO<sub>2</sub> eq.</b>	499.5	873.1	944.0	996.1	1,052.7
<b>Solvent and other product use</b>	<b>CO<sub>2</sub></b>	12.9	12.8	12.7	12.6	12.4
	<b>N<sub>2</sub>O</b>	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	17.7	19.0	18.9	18.8	15.5
<b>Agriculture</b>	<b>CH<sub>4</sub></b>	21.7	21.3	22.6	22.7	22.7
	<b>N<sub>2</sub>O</b>	2.6	2.5	2.6	2.6	2.6
	<b>Total CO<sub>2</sub> eq.</b>	1,253.6	1,235.7	1,295.6	1,272.3	1,273.5
<b>Waste</b>	<b>CH<sub>4</sub></b>	16.4	14.2	11.2	11.3	11.5
	<b>N<sub>2</sub>O</b>	0.3	0.4	0.4	0.4	0.4
	<b>Total CO<sub>2</sub> eq.</b>	452.4	408.5	347.7	351.9	356.0
<b>Total WM scenario</b>	<b>CO<sub>2</sub></b>	17,938.1	16,118.5	15,088.1	14,584.0	14,213.4
	<b>CH<sub>4</sub></b>	48.5	46.2	44.3	44.3	44.3
	<b>N<sub>2</sub>O</b>	3.2	3.2	3.4	3.3	3.3
	<b>Total CO<sub>2</sub> eq.</b>	19,962.3	18,089.2	17,060.3	16,535.2	16,165.1

The total GHG emissions of Estonia in the WM scenario (without LULUCF) are expected to decrease by around 19 per cent by 2030 compared to 2010, as shown in

Table 5.22 and Figure 5.11. This decrease is mostly connected to the reduction in GHG emissions from the energy sector.



**Figure 5.11.** Total GHG emissions in WM scenario (without LULUCF), Gg CO<sub>2</sub> equivalent

### 5.3.2. With Additional Measures (WAM) scenario for 2010-2030

The WAM scenario includes all policies and measures applied in the WM scenario as well as additional measures that are planned but have yet to be implemented or adopted.

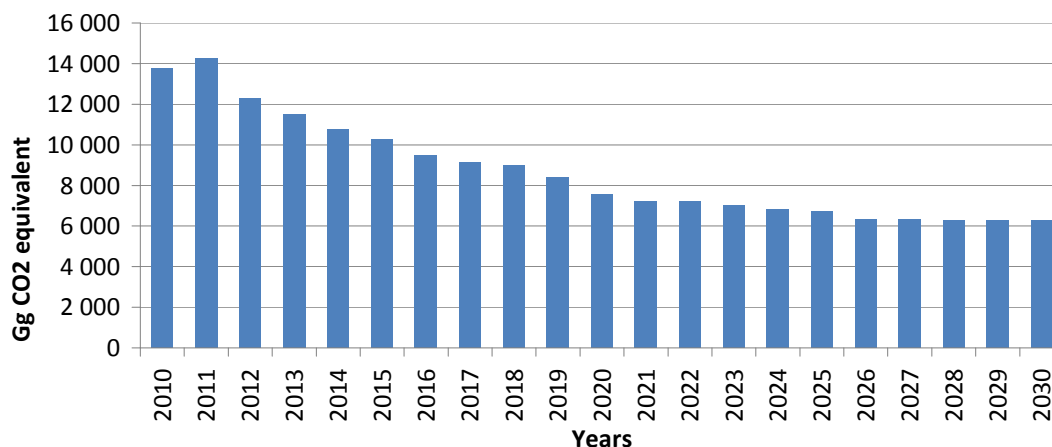
#### 5.3.2.1. Energy industries

The measures taken into account in the WAM scenario are actually planned to be implemented in manufacturing industries and construction. These measures are basically energy efficiency measures that will lead to a reduction in consumption of heat and electricity. This reduction in consumption will in turn lead to a reduction in heat and electricity produced. Therefore these measures will reduce GHG emissions from public electricity and heat production.

**Table 5.23.** Total GHG emissions from public electricity and heat production in WAM scenario, Gg

		2010	2015	2020	2025	2030
Public electricity and heat production	CO <sub>2</sub>	13,741.7	10,244.7	7,525.5	6,675.3	6,229.5
	CH <sub>4</sub>	0.5	0.5	0.5	0.5	0.4
	N <sub>2</sub> O	0.1	0.1	0.1	0.1	0.1
	Total CO <sub>2</sub> eq.	13,781.4	10,281.1	7,566.1	6,714.3	6,266.8

In the WAM scenario, the total GHG emissions from public electricity and heat production are expected to decrease by 55 per cent by 2030 compared to 2010 (see Table 5.23 and Figure 5.12).



**Figure 5.12.** Total GHG emissions from public electricity and heat production in WAM scenario, Gg CO<sub>2</sub> equivalent

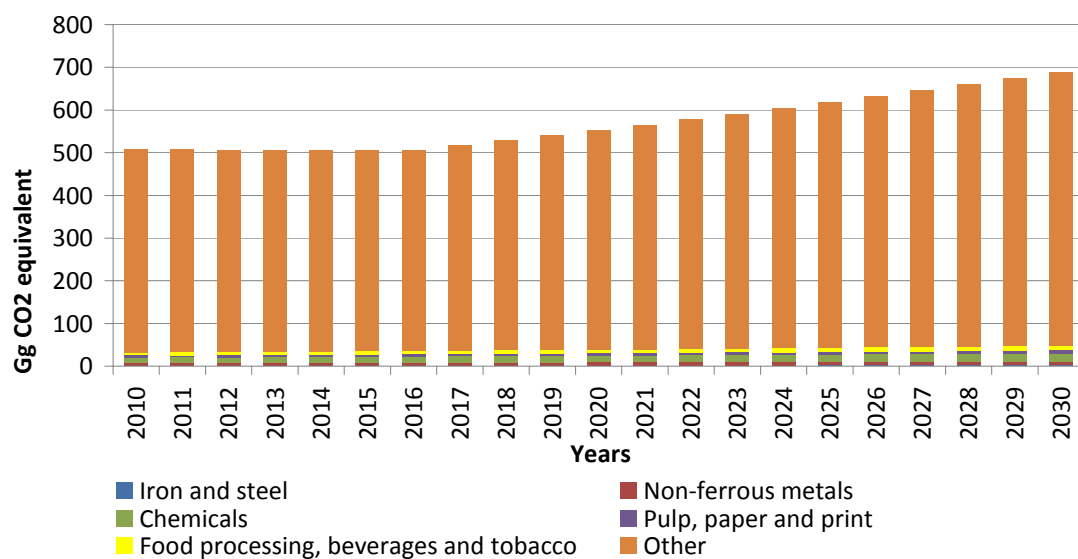
### 5.3.2.2. Manufacturing industries and construction

The measures included in the WAM scenario in the manufacturing industries and construction sector are mainly related to energy conservation – encouragement to perform energy audits in industries and small enterprises; contribution to the improvement of energy auditors' qualifications with respect to industrial energy conservation issues; fostering energy consultants' participation in European Union projects related to energy conservation in industry; better financing opportunities for energy conservation measures in industries and small enterprises; and development of databases and methods for the benchmarking of companies.

**Table 5.24.** Total GHG emissions from manufacturing industries and construction in WAM scenario, Gg

		2010	2015	2020	2025	2030
<b>Manufacturing industries and construction</b>	<b>CO<sub>2</sub></b>	504.9	501.3	548.1	612.1	682.9
	<b>CH<sub>4</sub></b>	0.1	0.1	0.1	0.1	0.1
	<b>N<sub>2</sub>O</b>	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	509.1	505.7	552.9	617.5	688.9

GHG emission reductions in the WAM scenario under the manufacturing industries and construction sector only include fuel use reduction. The energy saved through reduced consumption of electricity and heat will lead to additional GHG emission reductions in the energy industries sector.



**Figure 5.13.** Total GHG emissions from manufacturing industries and construction in WAM scenario, Gg CO<sub>2</sub> equivalent

### 5.3.2.3. Transport (excluding international aviation and marine bunkering)

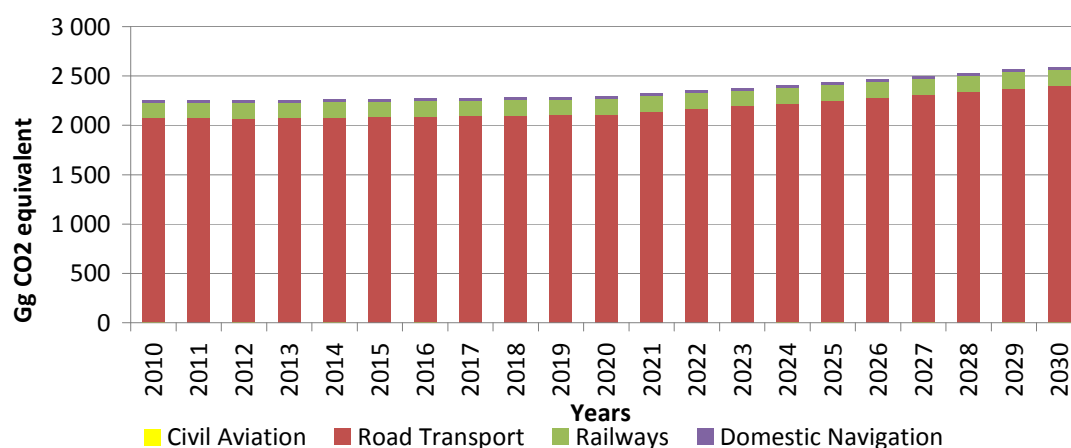
In the WAM scenario it is projected that the share of renewable fuels used in transport will increase to 10 per cent by 2020 from fuels used in transport.

**Table 5.25.** Total GHG emissions from transport in WAM scenario, Gg

		2010	2015	2020	2025	2030
Transport	CO <sub>2</sub>	2,233.8	2,242.1	2,266.6	2,412.8	2,565.7
	CH <sub>4</sub>	0.3	0.3	0.3	0.4	0.4
	N <sub>2</sub> O	0.1	0.1	0.1	0.1	0.1
	<b>Total CO<sub>2</sub> eq.</b>	<b>2,258.9</b>	<b>2,267.7</b>	<b>2,292.8</b>	<b>2,440.5</b>	<b>2,595.1</b>

The increase of the share of renewable fuels used in transport is expected to lead to decreased GHG emissions in the WAM scenario compared to the WM scenario in 2020. The increase of GHG emissions in the WAM scenario is expected to be around 15 per cent by 2030 compared to 2010 (see Table 5.25 and Figure 5.14).





**Figure 5.14.** Total GHG emissions from transport in WAM scenario, Gg CO<sub>2</sub> equivalent

#### 5.3.2.4. Other sectors

Since no additional measures are foreseen to reduce GHG emissions from industrial processes, agriculture, LULUCF and the waste sector, the projections of emissions in the WAM scenario are expected to be equal to those in the WM scenario.

#### 5.3.2.5. Total GHG emissions in WAM scenario

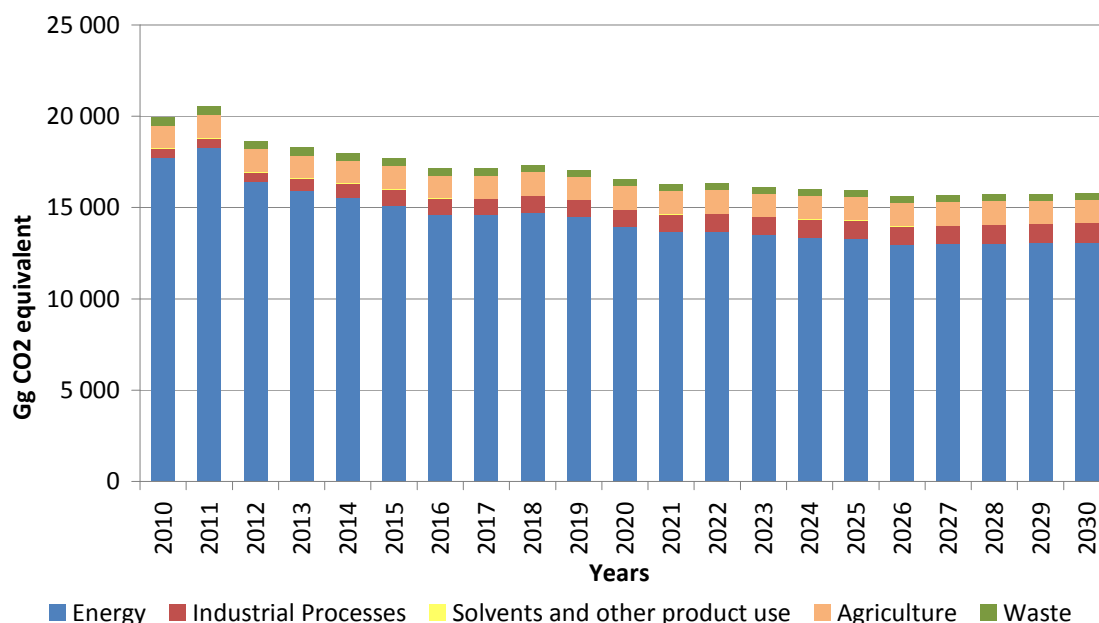
Projections on GHG emissions in the WAM scenario are presented in Table 5.26.

**Table 5.26.** Total GHG emissions in WAM scenario (without LULUCF), Gg

		2010	2015	2020	2025	2030
<b>Energy (including fugitive emissions from fuels)</b>	<b>CO<sub>2</sub></b>	17,425.7	14,817.9	13,626.0	12,996.9	12,785.9
	<b>CH<sub>4</sub></b>	10.4	10.6	10.3	10.1	10.0
	<b>N<sub>2</sub>O</b>	0.3	0.3	0.3	0.3	0.3
	<b>Total CO<sub>2</sub> eq.</b>	17,739.3	15,134.3	13,943.4	13,312.3	13,099.5
<b>Industrial processes</b>	<b>Total CO<sub>2</sub> eq.</b>	499.5	873.1	944.0	996.1	1,052.7
<b>Solvent and other product use</b>	<b>CO<sub>2</sub></b>	12.9	12.8	12.7	12.6	12.4
	<b>N<sub>2</sub>O</b>	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	17.6	19.0	18.9	18.8	15.5
<b>Agriculture</b>	<b>CH<sub>4</sub></b>	21.7	21.3	22.6	22.7	22.7
	<b>N<sub>2</sub>O</b>	2.6	2.5	2.6	2.6	2.6
	<b>Total CO<sub>2</sub> eq.</b>	1,253.6	1,235.7	1,295.6	1,272.3	1,273.5
<b>Waste</b>	<b>CH<sub>4</sub></b>	16.4	14.2	11.2	11.3	11.5
	<b>N<sub>2</sub>O</b>	0.3	0.4	0.4	0.4	0.4
	<b>Total CO<sub>2</sub> eq.</b>	452.4	408.5	347.7	351.9	356.0

		2010	2015	2020	2025	2030
<b>Total WAM scenario</b>	<b>CO<sub>2</sub></b>	17,938.1	15,703.8	14,582.7	14,005.6	13,851.0
	<b>CH<sub>4</sub></b>	48.5	46.1	44.1	44.2	44.2
	<b>N<sub>2</sub>O</b>	3.2	3.2	3.4	3.3	3.3
	<b>Total CO<sub>2</sub> eq.</b>	19,962.3	17,670.7	16,949.7	15,951.4	15,797.2

The total GHG emissions of Estonia are projected to decrease by 21 per cent by 2030 compared to 2010. The additional reduction in total GHG emissions of the WAM scenario compared to the WM scenario is solely related to the GHG emissions reduction in the energy sector.



**Figure 5.15.** Total GHG emissions in WAM scenario (without LULUCF), Gg CO<sub>2</sub> equivalent

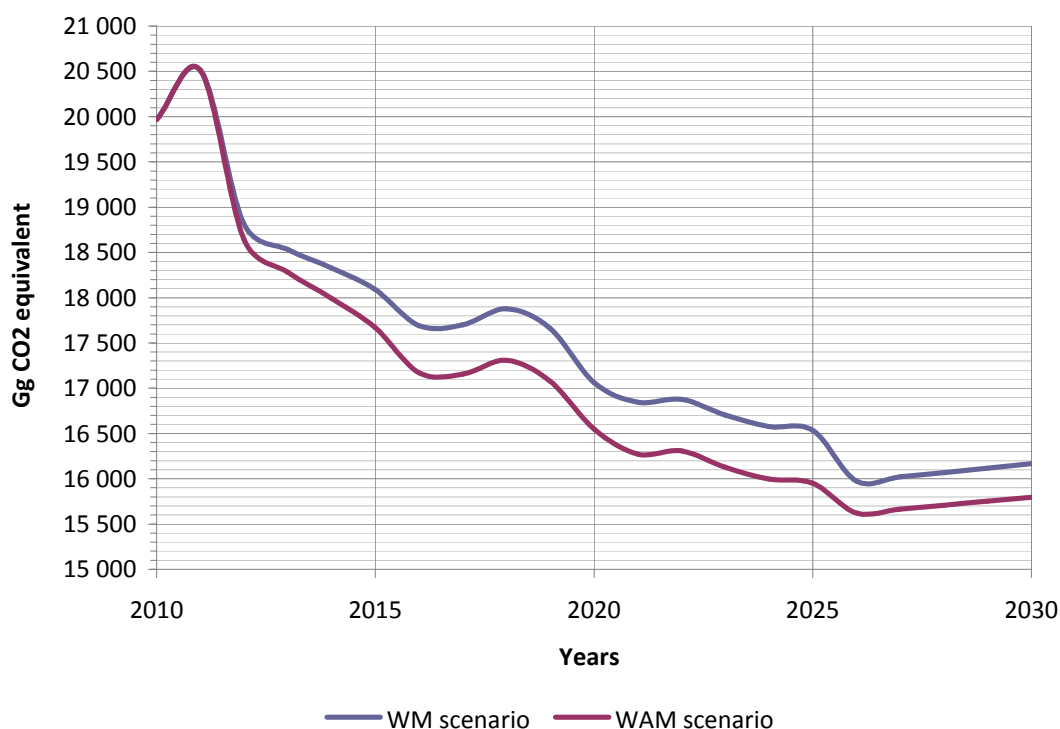
### 5.3.3. Comparison of WM and WAM scenarios and national GHG target

The main difference in the results of the WM and WAM scenarios is related to measures foreseen to be implemented regarding energy efficiency and use of biofuels. This will lead to smaller final consumption of energy in the WAM scenario compared to the WM scenario.

**Table 5.27.** Final consumption of energy in WM and WAM scenarios, TJ

	2010	2015	2020	2025	2030
<b>WM</b>	128,632	135,249	141,326	147,585	154,157
<b>WAM</b>	128,632	133,094	138,806	145,064	151,636

Comparison of both scenarios (see Table 5.27) in 2030 shows that final consumption of energy is expected to decrease from the level of 154,157 TJ in the WM scenario to 151,636 TJ in the WAM scenario. The decrease in fuel consumption will lead to decreased GHG emissions in final consumption sectors. The decrease in electricity and heat consumption will lead to decreased GHG emissions in the energy supply sector.



**Figure 5.16.** Total GHG emissions in WM and WAM scenarios (without LULUCF), Gg CO<sub>2</sub> equivalent

The difference in total GHG emissions between the WAM and WM scenarios is expected to be around 368 Gg CO<sub>2</sub> equivalent by 2030.

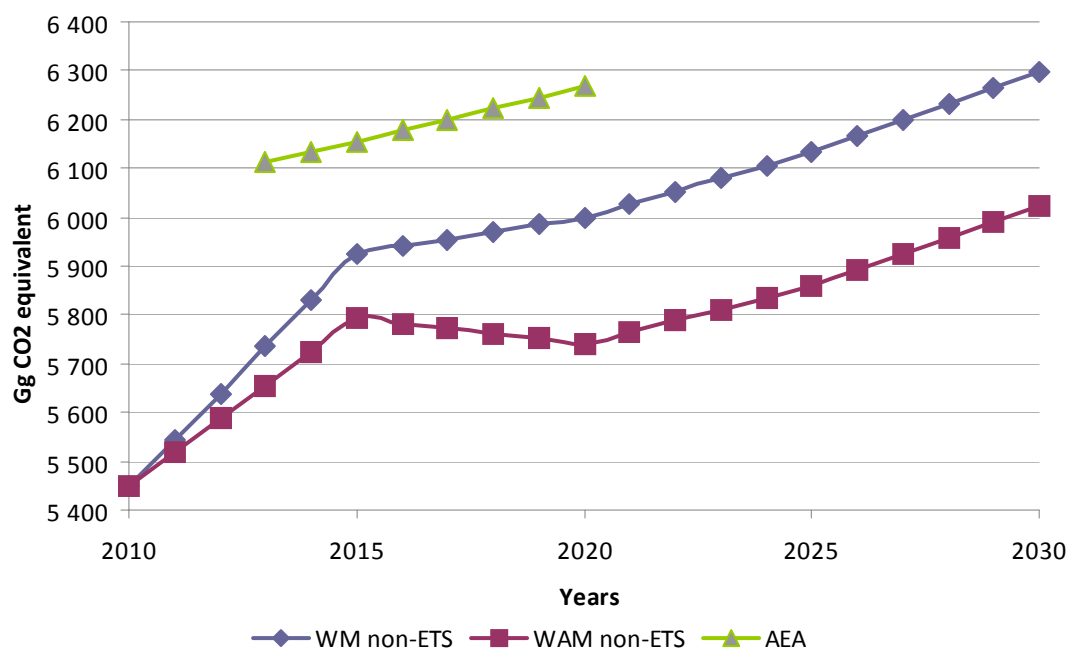
In the EU level Estonia has national GHG emissions target on the emissions that are not covered with the EU ETS. According to the Effort Sharing Decision (406/2009/EC) the emissions not covered with the EU ETS could increase 11 per cent by 2020 compared to 2005 level in Estonia and there are binding annual GHG emission targets for the period 2013-2020. Therefore projected GHG amounts are divided between ETS and non-ETS sectors. The results are presented in Table 5.28.

**Table 5.28.** GHG emissions in ETS and non-ETS sectors in WM and WAM scenarios, Gg CO<sub>2</sub> equivalent

	2005	2010	2015	2020	2025	2030
<b>WM ETS</b>	12,621.8	14,627.1	12,288.8	11,199.9	10,554.9	10,034.9
<b>WM non-ETS</b>	5,825.8	5,448.9	5,925.9	5,999.0	6,133.3	6,299.0

	2005	2010	2015	2020	2025	2030
<b>WAM ETS</b>	12,621.8	14,627.1	12,002.9	10,946.6	10,247.2	9,942.9
<b>WAM non-ETS</b>	5,825.8	5,448.9	5,793.2	5,741.8	5,857.2	6,023.2

As seen in Figure 5.17, the projected GHG emissions in non-ETS sectors are expected to stay below the Annual Emission Allocations (AEA) levels.



**Figure 5.17.** Non-ETS projections in WM and WAM scenarios compared to AEA, Gg CO<sub>2</sub> equivalent

The GHG emissions in non-ETS sectors are expected to increase about 16 per cent in the WM and about 11 per cent in the WAM scenario by 2030 compared to 2010.

#### 5.3.4. Sensitivity analysis

The main share of GHG emissions in Estonia is emitted from electricity generation in condensing power plants using oil shale as fuel. Also, Estonia has historically been an exporter of electricity that is produced from oil shale. In 2010, export of electricity was 4,354 GWh and import was 1,100 GWh. This means that net export was around 25 per cent of gross produced electricity. This resulted in higher GHG emissions than in a case where Estonia was an importer of electricity. Therefore the projections on how electricity flows with other countries are expected to change in the future plays an essential role in future GHG emissions.

In the projections, the mining limit of oil shale is set to at 20 Mt per year. Since use of oil shale in the shale oil production industry is expected to increase rapidly from

2010-2020, the availability of oil shale for the production of electricity will decrease (the priority in oil shale use being given to the shale oil industry).

To show that the sensitivity of projections is mostly dependant on electricity flows and oil shale, an alternative scenario was compiled. In this scenario it is assumed that although there remains an oil shale mining limit of 20 Mt per year, oil shale will also be able to be imported from Russia. Furthermore, it is assumed that after 2012 no electricity imports or exports will occur. This means that Estonia would meet its entire electricity demand domestically. The production, losses, net imports and final consumption of electricity in the alternative scenario are presented in Table 5.29.

**Table 5.29.** Production, losses, net imports and final consumption of electricity in alternative scenario, TJ

	2015	2020	2025	2030
<b>Production of electricity</b>	33,417	37,592	42,275	28,568
... including wind	3,294	3,294	3,294	3,294
... including hydro	115	115	115	115
... including CHP	6,094	6,769	6,769	6,769
... including condensing PPs	23,914	27,414	32,097	18,390
<b>Losses of electricity</b>	4,177	4,511	4,862	5,165
<b>Net import of electricity</b>	0	0	0	19,525
<b>Final consumption of electricity</b>	29,241	33,081	37,413	41,793

The increased production of electricity from oil shale will lead to higher GHG emissions. The results of the GHG emissions of the alternative scenario and WM scenario are presented in Table 5.30.

**Table 5.30.** Total GHG emissions in alternative scenario and WM scenario, Gg CO<sub>2</sub> equivalent

	2015	2020	2025	2030
Total GHG emissions in alternative scenario	17,925.2	19,846.3	21,509.3	17,110.1
Total GHG emissions in WM scenario	18,089.2	17,060.4	16,535.2	16,165.1

As seen in Table 5.30, the GHG emissions in the alternative scenario would be around 945 Gg CO<sub>2</sub> equivalent higher in 2030 compared to the WM scenario.

Another important part is played in GHG emissions projections by the development of electricity generation from renewable energy sources. In current projections it is expected that since support for electricity produced from renewable sources is paid

until 600 GWh of electricity from renewable sources is produced, investors will have no interest in investing in power units that do not receive the support. If the limit of 600 GWh of renewable electricity produced is raised, more capacities producing electricity from renewable energy sources are likely to be built.

### 5.3.5. International bunker fuels

International bunkers cover international aviation and navigation according to IPCC Guidelines. GHG emissions from international bunkers are not included in national totals. Projections for international bunkers are presented in Table 5.31.

**Table 5.31.** Total GHG emissions in international bunkers sector, Gg

		2010	2015	2020	2025	2030
<b>International maritime transport</b>	<b>CO<sub>2</sub></b>	695.1	698.2	701.4	704.6	707.8
	<b>CH<sub>4</sub></b>	0.0	0.0	0.0	0.0	0.0
	<b>N<sub>2</sub>O</b>	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	697.7	700.9	704.1	707.4	710.6
<b>International aviation</b>	<b>CO<sub>2</sub></b>	113.6	125.5	138.5	153.0	168.9
	<b>CH<sub>4</sub></b>	0.0	0.0	0.0	0.0	0.0
	<b>N<sub>2</sub>O</b>	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	113.6	125.5	138.5	153.0	168.9
<b>International bunkers total</b>	<b>CO<sub>2</sub></b>	808.7	823.7	839.9	857.5	876.7
	<b>CH<sub>4</sub></b>	0.0	0.0	0.0	0.0	0.0
	<b>N<sub>2</sub>O</b>	0.0	0.0	0.0	0.0	0.0
	<b>Total CO<sub>2</sub> eq.</b>	811.4	826.4	842.6	860.4	879.5

GHG emissions from international bunkers are expected to increase by around 8.4 per cent by 2030 compared to 2010.

### 5.4. Assessment of aggregate effect of policies and measures

The total effect of implemented PaMs is presented in Table 5.32.

**Table 5.32.** Total effect of implemented and adopted PaMs, Gg CO<sub>2</sub> equivalent

	2015	2020	2025	2030
<b>CO<sub>2</sub></b>	2,711.2	2,761.5	2,757.6	2,756.8
<b>CH<sub>4</sub></b>	84.7	144.6	139.7	134.0
<b>N<sub>2</sub>O</b>	86.9	114.9	43.4	43.7

The total effect of planned PaMs is calculated as the difference between the WM and WAM scenarios and is presented in Table 5.33.

**Table 5.33.** Total effect of planned PaMs, Gg CO<sub>2</sub> equivalent

	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>
<b>GHG</b>	418.6	510.6	583.8	368.8

### **5.5. Supplimentarity relating to mechanisms under Article 6, 12 and 17 of the Kyoto Protocol**

Estonia is using Joint Implementation (JI) and International Emissions Trading (IET). In April 2004 the Government approved the National Programme of Greenhouse Gas Emission Reduction for 2003-2012 (RT L 2004, 59, 990). On 5 May 2004 the Government approved the Ambient Air Protection Act (RT I 2004, 43, 298) where § 153 changed the Law for Ratifying the Kyoto Protocol and conditions and authorization were set for use of the Kyoto flexible mechanisms. Amendments to the Ambient Air Protection Act of 11 March 2007 regulate the use of JI and the issue of double counting concerning the linking of the EU Emission Trading Scheme with the Kyoto flexible mechanisms.

Regarding activities under Kyoto Protocol article 17, in August 2009 the Government decided to sell excess Assigned Amount Units through the Green Investment Scheme. A special working group led by the State Chancellery was created to develop environmentally friendly projects and programmes so as to offer these to potential buyers. Each agreement shall be approved by the Government and the Government will give the mandate to sign the Agreements to the Minister of the Environment.

The legal framework for the Green Investment Scheme is stipulated in the Ambient Air Protection Act. Also, the Kyoto Protocol Ratification Act adopted by the Riigikogu in 2002 established some conditions for International Emission Trading.

Estonia had entered into six agreements with different European governments and 15 agreements with different Japanese companies by February 2013. The proceeds received from these agreements are solely disbursed for Green Investment Scheme projects or programmes.

The primary fields of investments in frames of GIS include:

- renovation (incl. thermal refurbishment) of buildings;
- efficient and environment benign transport;
- development of wind energy farms; and
- efficiency improvements and wider use of renewables in the district heating sector.

Estonia's national designated focal point for JI has been notified to the UNFCCC:

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Climate and Radiation Department

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Estonia has also submitted its Joint Implementation Guidelines to the UNFCCC secretariat. This document is available at <http://ji.unfccc.int/UserManagement/FileStorage/QJMAH2PV90E4TGI17O8CLFKWXUDRYZ>.

CO<sub>2</sub> emissions in Estonia are below the Kyoto target and Estonia does not need to make any quantitative contributions. Estonia is a host country in JI and a seller in IET. Therefore Estonia does not have a budget for the total use of Kyoto mechanisms.

**Table 5.34.** Quantitative contribution of Kyoto mechanisms for first commitment period

Kyoto mechanism	Total projected quantities for first commitment period (Gg CO <sub>2</sub> equivalent)
Total for all Kyoto mechanisms (*)	73,619
<i>International emissions trading</i>	<i>72,592(as of March 2013)</i>
<i>All project-based activities</i>	<i>1,027</i>
<i>Joint implementation</i>	<i>1,027</i>
<i>Clean development mechanism</i>	-

(\*) *These are quantities that Estonia has transferred or intends to transfer as a JI host country and has sold in IET.*

The Government of the Republic of Estonia has approved and signed Memorandums of Understanding with the Netherlands (RTL, 06.08.2003, 90, 1341), Denmark (RT II, 06.10.2003, 25, 126), Sweden (RTII, 28.06.2005, 16, 49) and Austria (RTII, 07.11.2006, 22, 57) and an Agreement on Joint Implementation of Emission Reductions of Greenhouse Gases with Finland (RT II, 16.12.2002, 37, 183). On 1 May 2004 the Agreement on a Testing Ground For Application of the Kyoto Mechanisms on Energy Projects in the Baltic Sea Region was approved (II, 16.06.2004, 22, 92). Estonia is one of the Parties.



BR CTF Table 5: Summary of key variables and assumptions used in the projections analysis

Key underlying assumptions	Unit	Historical <sup>b</sup>						Projected				Comments
		1990	1995	2000	2005	2010	2011	2015	2020	2025	2030	
Population	thousands	1,570.60	1,448.08	1,372.07	1,347.51	1,340.13	1,340.19	1,332.42	1,328.26	1,315.93	1,296.38	
Gross Domestic Product	Million Euros		5,724.66	7,914.53	11,181.74	11,175.06	12,243.16	13,487.00	15,111.00	16,766.00	18,784.00	
International oil price	€ (2010) /boe							86.00	88.50	89.20	93.10	
International coal price	€ (2010)/boe							22.00	22.60	23.70	24.00	
International gas price	€(2010)/boe							53.80	61.50	58.90	64.50	
GDP growth rate	%							3.50	2.30	2.10	2.30	
Number of Cattle	1000 heads	755.80	369.70	252.80	249.50	236.30	238.30	236.90	273.70	241.00	241.00	
Number of Sheep	1000 heads	138.00	48.20	29.00	49.60	78.60	83.90	80.00	82.00	84.00	86.00	
Number of Swine	1000 heads	859.90	448.80	300.20	346.50	371.70	365.70	360.40	351.90	360.00	365.00	
Area of managed forest	1000 hectares					2,253.46		2,252.29	2,251.12	2,249.95	2,248.78	
Municipal solid waste disposed to landfills	1000 tonnes					265.01		117.22	70.86	74.65	79.05	
GDP (in EUR 2005 constant prices)	Million Euros		5,724.66	7,914.53	11,181.74	11,177.00	12,243.16	13,487.00	15,111.00	16,766.00	18,784.00	
Oil shale mining limit	Mt					20.00	20.00	20.00	20.00	20.00	20.00	
Net electricity import	GWh	-7,002.00	-760.00	-929.00	-1,608.00	-3,570.00	-3,562.00	-871.00	1,485.00	3,300.00	5,358.00	



BR CTF Table 6: Information on updated greenhouse gas projections

GHG emissions projections	Unit	GHG emissions and removals <sup>b</sup>						
		Base year (1990)	1990	1995	2000	2005	2010	2011
Energy	kt CO <sub>2</sub> eq	33,496.42	33,496.42	16,021.52	13,103.83	13,883.28	15,519.75	16,401.76
Transport	kt CO <sub>2</sub> eq	2,460.48	2,460.48	1,574.96	1,667.13	2,137.38	2,248.24	2,259.87
Industry/industrial processes	kt CO <sub>2</sub> eq	1,074.67	1,074.67	701.56	732.68	833.27	511.25	632.68
Agriculture	kt CO <sub>2</sub> eq	3,166.84	3,166.84	1,483.71	1,203.79	1,170.78	1,256.59	1,270.52
Forestry/LULUCF	kt CO <sub>2</sub> eq	-8,848.70	-8,848.70	-10,596.46	1,099.71	-5,037.42	-5,941.64	4,262.81
Waste management/waste	kt CO <sub>2</sub> eq	343.72	343.72	256.49	434.83	452.93	452.94	390.76
Other (specify)	kt CO <sub>2</sub> eq	26.44	26.44	26.02	26.76	26.16	17.39	18.86
Solvent and Other Product Use	kt CO <sub>2</sub> eq							
Aviation in the scope of the EU-ETS	kt CO <sub>2</sub> eq							
CO <sub>2</sub> emissions including net CO <sub>2</sub> from LULUCF	kt CO <sub>2</sub> eq	27,784.35	27,784.35	7,383.03	16,239.54	11,378.41	11,852.77	14,563.07
CO <sub>2</sub> emissions excluding net CO <sub>2</sub> from LULUCF	kt CO <sub>2</sub> eq	36,635.00	36,635.00	17,981.46	15,143.30	16,419.49	17,801.49	18,832.99
CH <sub>4</sub> emissions including CH <sub>4</sub> from LULUCF	kt CO <sub>2</sub> eq	1,673.58	1,673.58	982.05	1,026.63	1,044.24	1,016.97	957.54
CH <sub>4</sub> emissions excluding CH <sub>4</sub> from LULUCF	kt CO <sub>2</sub> eq	1,673.18	1,673.18	981.63	1,024.95	1,043.93	1,016.84	957.42
N <sub>2</sub> O emissions including N <sub>2</sub> O from LULUCF	kt CO <sub>2</sub> eq	2,235.50	2,235.50	1,048.10	903.44	898.33	1,023.01	1,010.97
N <sub>2</sub> O emissions excluding N <sub>2</sub> O from LULUCF	kt CO <sub>2</sub> eq	2,233.95	2,233.95	1,046.55	901.65	894.98	1,016.05	1,003.97
HFCs	kt CO <sub>2</sub> eq	0.00	0.00	25.37	69.54	118.16	152.56	159.38
PFCs	kt CO <sub>2</sub> eq	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SF <sub>6</sub>	kt CO <sub>2</sub> eq	0.00	0.00	3.22	2.73	1.08	1.81	1.82
Other (specify)	kt CO <sub>2</sub> eq							
Total with LULUCF <sup>f</sup>	kt CO <sub>2</sub> eq	31,693.43	31,693.43	9,441.77	18,241.88	13,440.22	14,047.12	16,692.78
Total without LULUCF	kt CO <sub>2</sub> eq	40,542.13	40,542.13	20,038.23	17,142.17	18,477.64	19,988.75	20,955.58

GHG emissions projections	Unit	GHG emission projections - Scenarios				Comments
		With measures		With additional measures		
		2020	2030	2020	2030	
Energy	kt CO <sub>2</sub> eq	11,925.84	10,604.44	11,650.64	10,504.45	
Transport	kt CO <sub>2</sub> eq	2,528.20	2,862.92	2,292.78	2,595.06	
Industry/industrial processes	kt CO <sub>2</sub> eq	962.94	1,068.21	962.94	1,968.21	GHG emissions from Solvent and Other Product Use are included under Industry/industrial processes sector
Agriculture	kt CO <sub>2</sub> eq	1,295.64	1,273.47	1,295.64	1,273.47	
Forestry/LULUCF	kt CO <sub>2</sub> eq	-3,472.75	-3,189.46	-3,472.75	-3,189.46	
Waste management/waste	kt CO <sub>2</sub> eq	347.73	356.01	347.73	356.01	
Other (specify)	kt CO <sub>2</sub> eq					
Solvent and Other Product Use	kt CO <sub>2</sub> eq					Included under Industry/industrial processes
Aviation in the scope of the EU-ETS	kt CO <sub>2</sub> eq					
CO <sub>2</sub> emissions including net CO <sub>2</sub> from LULUCF	kt CO <sub>2</sub> eq	11,389.81	10,775.33	10,884.49	10,412.97	
CO <sub>2</sub> emissions excluding net CO <sub>2</sub> from LULUCF	kt CO <sub>2</sub> eq	14,865.60	13,968.16	14,360.27	13,605.80	
CH <sub>4</sub> emissions including CH <sub>4</sub> from LULUCF	kt CO <sub>2</sub> eq	931.66	932.96	928.45	929.72	
CH <sub>4</sub> emissions excluding CH <sub>4</sub> from LULUCF	kt CO <sub>2</sub> eq	929.89	930.96	926.68	927.73	
N <sub>2</sub> O emissions including N <sub>2</sub> O from LULUCF	kt CO <sub>2</sub> eq	1,043.65	1,022.08	1,041.57	1,019.82	
N <sub>2</sub> O emissions excluding N <sub>2</sub> O from LULUCF	kt CO <sub>2</sub> eq	1,042.38	1,020.71	1,040.30	1,018.45	
HFCs	kt CO <sub>2</sub> eq	218.14	240.55	218.14	240.55	

PFCs	kt CO <sub>2</sub> eq	0.00	0.00	0.00	0.00	
SF <sub>6</sub>	kt CO <sub>2</sub> eq	4.34	4.68	4.34	4.68	
Other (specify)	kt CO <sub>2</sub> eq					
Total with LULUCF <sup>f</sup>	kt CO <sub>2</sub> eq	13,587.60	12,975.60	13,076.99	12,607.74	
Total without LULUCF	kt CO <sub>2</sub> eq	17,060.35	16,165.06	16,549.73	15,797.21	
Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry.						
Note: 2014 is the reporting due-date year (i.e. 2014 for the first biennial report).						
<sup>a</sup> In accordance with the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications", at a minimum Parties shall report a 'with measures' scenario, and may report 'without measures' and 'with additional measures' scenarios. If a Party chooses to report 'without measures' and/or 'with additional measures' scenarios they are to use tables 6(b) and/or 6(c), respectively. If a Party does not choose to report 'without measures' or 'with additional measures' scenarios then it should not include tables 6(b) or 6(c) in the biennial report.						
<sup>b</sup> Emissions and removals reported in these columns should be as reported in the latest GHG inventory and consistent with the emissions and removals reported in the table on GHG emissions and trends provided in this biennial report. Where the sectoral breakdown differs from that reported in the GHG inventory Parties should explain in their biennial report how the inventory sectors relate to the sectors reported in this table.						
<sup>d</sup> In accordance with paragraph 34 of the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications", projections shall be presented on a sectoral basis, to the extent possible, using the same sectoral categories used in the policies and measures section. This table should follow, to the extent possible, the same sectoral categories as those listed in paragraph 17 of those guidelines, namely, to the extent appropriate, the following sectors should be considered: energy, transport, industry, agriculture, forestry and waste management.						
<sup>e</sup> To the extent possible, the following sectors should be used: energy, transport, industry/industrial processes, agriculture, forestry/LULUCF, waste management/waste, other sectors (i.e. cross-cutting), as appropriate.						
<sup>f</sup> Parties may choose to report total emissions with or without LULUCF, as appropriate.						

## **6. PROVISION OF FINANCIAL, TECHNOLOGICAL AND CAPACITY BUILDING SUPPORT TO DEVELOPING COUNTRIES**

Estonia is not included in Annex II to the Convention, therefore the provisions of Decision 2/CP 17, Annex I 'UNFCCC biennial reporting guidelines for developed country Parties', section VI (A, B, C) are not applicable.

Estonia's contribution to fast start finance is covered in Chapter IX of NC6.

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