The Netherlands
Fourth Biennial Report
Under the United Nations Framework Convention On Climate Change

Ministry of Economic Affairs and Climate Policy

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1. Summary

Introduction

This report presents the fourth Biennial Report from the Netherlands, as required under the United Nations Framework Convention on Climate Change (UNFCCC). It describes the information in accordance with the UNFCCC biennial reporting guidelines for developed country Parties. Tabular information as defined in the common tabular format (CTF) is submitted using the electronic reporting facility provided by the UNFCCC Secretariat.

Greenhouse gas (GHG) emissions and trends

In 2017, total GHG emissions (including indirect CO_2 emissions, excluding emissions from LULUCF) in the Netherlands were estimated at 193.7 Tg CO_2 eq. This is 12.6% lower than the 221.7 Tg CO_2 eq. reported in the base year (1990).

Figure 1.1 shows the trends and contributions of the different gases to the aggregated national GHG emissions. In the period 1990–2017, emissions of carbon dioxide (CO_2) increased by 1.0% (excluding LULUCF). Emissions of non-CO_2 GHGs methane (CH_4), nitrous oxide (N_2O) and F-gases decreased by 43.4%, 51.7% and 76.1%, respectively.

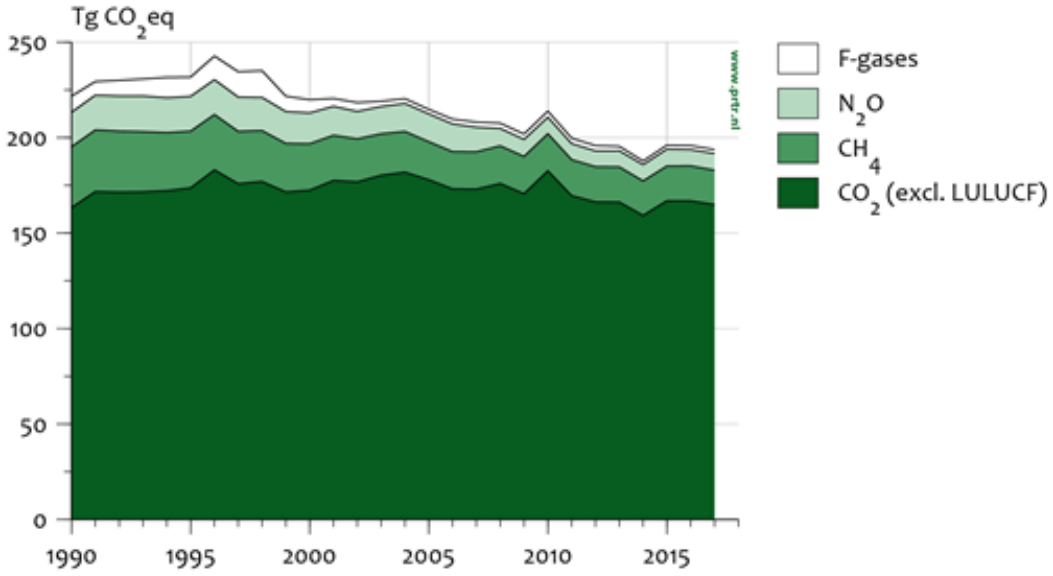

Figure 1.1: Greenhouse gases: trend and emissions levels (excl. LULUCF), 1990–2017

As a Party to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, the Netherlands has in place a National System for estimating anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol. The Netherlands established its National System in 2005. During the initial review, it was found to comply with all the necessary requirements. Since then the system as such has remained unchanged, with the exception of an organisational change that came into effect as of January 1st 2010.

The Ministry of Economic Affairs and Climate Policy is the coordinating Ministry in the Netherlands for Climate Change Policy. The Netherlands Enterprise Agency (RVO.nl) coordinated the establishment of the National System and was subsequently also assigned the role of 'single national entity' (NIE).

Quantified economy-wide emission reduction targets

In 2010, the EU submitted a pledge to reduce its GHG emissions by 2020 by 20% compared to 1990 levels, in order to contribute to achieving the ultimate objective of the UNFCCC: 'to stabilise GHG concentrations at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system', or, in other words, to limit the global temperature increase to less than 2°C compared to temperature levels before industrialization. The definition of the Convention target for 2020 is documented in the revised note provided by the UNFCCC Secretariat on the 'Compilation of economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention'. The EU provided additional information relating to its quantified economy wide emission reduction target in a submission as part of the process of clarifying the developed country Parties' targets in 2012.

In 2009, the EU established internal rules under its '2020 climate and energy package'[1] which underpin the EU implementation of the target under the Convention. The package introduced a clear approach to achieving the 20% reduction of the total GHG emissions from the 1990 levels, which is equivalent to a 14% reduction compared to the 2005 levels. This 14% reduction objective is divided between the ETS and ESD sectors. These two sub-targets are: a 21% reduction target compared to 2005 for emissions covered by the ETS (including domestic and international aviation) and a 10% reduction target compared to 2005 for ESD sectors, shared between the 28 Member States (MS) through individual national GHG targets.

The Netherlands is committed to jointly meeting the EU economy-wide emission reduction target under the Convention. As part of this target, Dutch companies have to fulfil their emission reduction commitments under the EU Emission Trading Scheme (EU ETS). The Netherlands is committed to reducing its emissions in sectors covered by the ESD (non-ETS) by 16% compared to 2005. The quantified annual reduction targets for the Netherlands, as set by EU Decisions and expressed as annual emission allocations (AEAs) in tonnes CO_2-equivalent, are 122.9 million in 2013, decreasing to 107.4 million in 2020 (according to AR4 GWPs). The cumulative amount of AEAs for the period 2013–2020 is set at 921 Mton CO_2 equivalents.

1 http://ec.europa.eu/clima/policies/package/index_en.htm

Progress in achievement of quantified economy-wide emission reduction target

The non-ETS emissions in the period 2013–2018 were 612.7 Mton CO2-eq. In 2013 and 2014, emissions fell due to mild winters, resulting in less energy use for space heating and reduced transport emissions. In 2015, emissions increased again, mainly due to a colder winter. In 2016, emissions increased yet again, partly due to another relatively cold winter but also as the result of increased industrial activities, more transport movements and a larger dairy herd. In 2017, emissions were higher due to increased industrial activities, more transport movements and higher emissions from manure. The non-ETS emissions in the remaining period (2017–2020) are projected to decrease, mainly due to further energy savings in buildings and in the agricultural sector, lower sales of fossil fuels for transport and lower non-CO_2 emissions. By 2020, the non-ETS emissions are expected to have dropped to 98 Mton CO_2-eq. The cumulative non-ETS emissions in the entire budget period (2013–2020) are projected at 814 Mton CO_2-eq., excluding weather influences. As a result, it is expected that the Netherlands will meet its reduction targets for the period up to 2020 (see Figure 1.2).

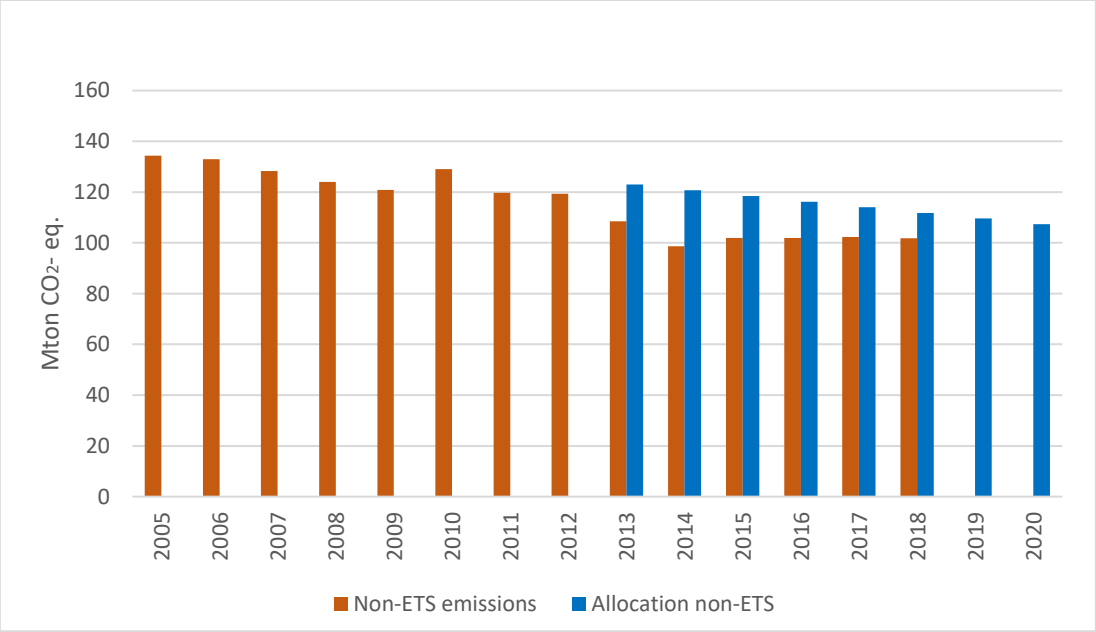

Figure 1.2 Greenhouse gas emissions for non-ETS sectors in 2005–2018 and annual emission allocations for 2013–2020, in Mton CO_2-eq. Emissions in 2018 are based on provisional data.

Policies and measures are presented as groups of policies and measures, organised per sector and greenhouse gas. Only the most relevant measures, that are especially relevant for meeting the 2020 targets, are described in detail. Most of these policies have already been implemented (included in the WEM projection scenario). The policy descriptions in the main text include the actual and expected interactions with other relevant policies and measures, as well as with Common and Coordinated Policies and Measures (CCPMs) of the European Union. The projected effects have been estimated on the basis of the projections described in the national Climate and Energy Outlook 2019. The most important PAMs are mentioned below. Table 4.2 presents the impact of policies and measures on the reduction of greenhouse gas emissions in 2020.

In its coalition agreement, drawn up in 2017, the current government set the target to reduce these emissions nationally by 49% between 1990 and 2030. The government proposed new

policies in June 2019. These policies were largely based on the Climate Agreement, which was negotiated by many national stakeholders and builds on the 2013 Energy Agreement. In June 2019, the government also announced measures in order to comply with the court ruling in the 'Urgenda' case to reduce emissions by 25% in 2020 compared to 1990.

Agreement on energy for Sustainable Growth ("Energy agreement")
The Energy Agreement is pivotal for the climate and energy policies for the period up to 2020. In 2013, the Netherlands concluded a cross-sectoral agreement with more than 40 parties, including central and regional governments. This Agreement on Energy for Sustainable Growth marks a significant step in the transition towards a sustainable energy system in the Netherlands. Signatories to the Agreement share a responsibility and commitment to achieve the following overarching objectives:

- An average improvement in energy efficiency of 1.5% per year (adding up to a reduction of 100 PJ by 2020)
- A 14% share of renewable energy in the total Dutch consumption of energy by 2020 and 16% by 2023
- The creation of at least 15,000 additional jobs by 2020, of which a significant number are to be created in the next few years

This agreement includes some 160 actions for the signatories to implement this commitment, including actions by the central government. While some of the actions were new, others implied the intensification or modification of then-existing policy measures. In 2015, additional actions were agreed in order to attain the 2020 targets for energy efficiency and renewable energy.

SDE+: Stimulation of Sustainable Energy Production incentive scheme
The production of renewable energy has been encouraged by the government for many years, mostly using feed-in premium schemes which evolved over time. The current scheme is the so-called SDE+ (Stimulation of Sustainable Energy Production) incentive scheme, which has been in place since 2011. Primary target groups for SDE+ are companies, institutions and non-profit organisations. The project must be implemented in the Netherlands The SDE+ scheme is a floating feed-in premium system, financed by a surcharge on the energy tax paid by the end consumers of natural gas and electricity. This surcharge is referred to as the Sustainable Energy Surcharge (ODE). Annual budgets for the tenders are set by the government. The budgets have increased substantially in recent years. In 2011, the annual budget was set at €2 billion, while this was in 2019 €19 billion.

Long-Term Agreements on Energy Efficiency (LTA / LEE)

Long-Term Agreements on Energy Efficiency are voluntary agreements on energy efficiency between the national government, the trade associations and the participating companies and are in place since 1992. The most recent one is the LTA3 started in 2008 for the period up to 2020. In this LTA3 businesses should aim to attain an improvement in energy efficiency of 30 per cent in the period 2001–2020, there is also an increased focus on chain efficiency and cooperation across sectors and roadmaps for the longer term (2030) have been introduced as well. Within the scope of the Agreement on Energy for Sustainable Growth, a series of reinforcing measures were agreed in 2013. In 2015, additional measures were adopted in order to meet the target of 100 PJ in energy savings contained in the Agreement on Energy for Sustainable Growth. One of the measures is to intensify the promotion and facilitation of energy savings at LTA companies. Long-Term Agreements are enforced using environmental permits.

For companies that are obliged to participate in the EU ETS, a separate LTA – the Long-Term Agreement on Energy Efficiency for ETS companies (LEE) – was adopted in 2009. Participants in

LTA draw up an Energy Efficiency Plan (EEP) every four years for the next four-year period. In addition to their results, they have to submit annual monitoring reports on projects that have actually been implemented. In 2016, the companies submitted new four-year plans, which were scrutinised by the Netherlands Enterprise Agency. In addition to the four-year plans, the LEE companies committed themselves to achieve an additional 9 PJ in energy savings to meet the 2020 targets.
The Climate Agreement stipulates that the LTA/LEE covenants will not be continued after 2020.

Agro covenant

In 2008, the agriculture and horticulture sectors agreed with the government on ambitious targets and measures in the Agro covenant (also referred to as the Clean and Efficient programme for the agricultural sectors). The main aims of the Agro) are: a reduction in CO_2 emissions of 3.5 to 4.5 Mton in 2020 as compared to 1990; a reduction in non-CO_2 greenhouse gas emissions of 4.0 to 6.0 Mton CO_2-eq. in 2020 as compared to 1990; an average annual energy efficiency improvement (energy saving) of 2% over the period 2011–2020; and a generation of 200 PJ through biomass and 12 PJ through wind energy by 2020. The 2013 Energy Agreement sets a target for energy savings in the horticulture sector of 11 PJ in 2020 (this figure is equivalent to a CO_2 reduction of 0.7 Mton).

EU Emissions Trading System (ETS)

On 1 January 2005, a trading system for CO_2 emissions from large industrial emitters. It is a 'cap and trade' system, in which participants are assigned a set amount of allowances up front and are required to report on their actual emissions each year. The EU ETS includes more than 11,000 power stations and industrial plants in 31 countries, as well as airlines. It covers around 45% of the EU's greenhouse gas emissions. In the Netherlands, around 450 companies take part in the ETS. They are responsible for around 45% of the total emission of greenhouse gases in the Netherlands. In 2013, the EU ETS entered its third phase, running up to 2020. A major revision means that the third phase is significantly different from the first two phases and is based on rules that are far more harmonised than was previously the case. One of the changes is a single, EU-wide cap on emissions instead of the previous system of national caps. Auctioning is now the default method for allocating allowances. For those allowances that are not used up, harmonised allocation rules apply that are based on ambitious EU-wide benchmarks for emissions performance. The ETS now also includes more sectors (i.e. aviation) and gases (nitrous oxide, PFCs). Its allowances will be reduced by 21% between 2005 and 2020 in order to lower the total emissions
In 2018, the ETS directive was revised to enable in order to achieve the EU's 2030 emission reduction targets in line with the 2030 climate and energy policy framework. The revision defines the fourth trading period as running from 2021 up until 2030 and includes a sharper rate for the reduction of allowances in the period after 2020, as well as a reinforcement of the market stability reserve.

A package of policy instruments for buildings
For buildings, a broad package of national policy instruments has been developed over the years, which also implement European policy instruments such as the Energy Performance of Buildings Directive (EPBD) and the Energy Efficiency Directive (EED). The EU Ecodesign Directive is the main policy instrument for appliances. The main policy framework for the building sector up to 2020 is the 2013 Energy Agreement. In the Energy Agreement, parties set the ambition for the sector to reduce energy consumption by some 110 PJ between 2008 and 2020 (and CO2 by some 22.5 Mton CO2-eq. in 2020). This reduction should mainly be realised by renovating existing residential buildings. The renovation should be such that energy performance is increased by two steps on the

energy label scale. In addition, the energy performance of new buildings should be improved so that as from 2020, new buildings will be nearly energy-neutral.

Transition to sustainable mobility

In the 2013 Energy Agreement, an ambitious goal was agreed to limit CO_2 emissions to 25 Mton CO_2 by 2030 and 12.2 Mton by 2050. To realise this ambition, a new government vision on fuels for transport was adopted in 2014. This vision encompasses a wide variety of low-CO_2 fuel combinations for transport, including electricity, hydrogen, advanced biofuels and LNG. In 2015, actions were proposed in order to meet the target. One of the adopted measures was a Green Deal on electric vehicles. The Climate Agreement contains new ambitions and measures for the period up to 2030, relating to sustainable fuels, non-emission vehicles (100% of newly sold cars by 2030), switching to more sustainable modalities (i.e. from car to bicycle) and sustainable logistics (i.e. introduction of a kilometre tariff for trucks, zero-emission zones in cities and an aviation tax).

Sustainable fuels

European Directive 2009/28/EC on renewable energy has been implemented into Dutch legislation. This Directive states that Member States should ensure that a minimum of 10% of all energy consumption in transport must come from renewable sources by 2020. In practice, this target is met through biofuels. In 2018, the share of this energy source was 8,9% and it was mainly produced from waste (72%). Dutch policy is aimed at maximising the share of advanced biofuels that are not produced from food/feed crops. In 2018, the share of advanced biofuels was 0.8%. Because blending biofuels is obligatory, there are no additional tax incentives or subsidy programmes. Due to the 'Urgenda' court ruling, the minimum share of renewable energy sources will be extended to include fuel consumption by inland navigation vessels.

Projections and the total effects of policies and measures

The projections described in this chapter are based on the National Climate and Energy Outlook (KEV) 2019 which describes the most plausible developments based on the available information on prices, markets, technology and policies. The KEV takes assumptions on policies into account up to May 2019, meaning that policies announced in the June 2019 Climate Agreement are not included. The projections distinguish two different policy variants, which are based on both national and European policies. They also contain measures made binding by market participants, public organisations and other government bodies on or before 1 May 2019.
The v*ariant "With Existing Measures" (WEM)* encompasses currently implemented and adopted policies and measures as from 1 May 2019. It includes measures that are sufficiently concrete and have been made binding, such as the European Emissions Trading System (ETS), energy taxation, subsidies for renewable energy, the abolition of the milk quota and the concrete and binding measures of the Energy Agreement. The projections are described according to this policy variant (unless otherwise stated). In addition to all measures from the WEM variant, the variant *"With Additional Measures" (WAM)* also encompasses planned policies and measures that have been published but not yet officially implemented by May 2019. Nevertheless, they were specific enough to incorporate in the calculations; for example, new energy performance standards for new buildings after 2020, a kilometre tariff for trucks and the flight tax. Policies announced in the Climate Agreement from June 2019 are also not included in the WAM. A variant "Without Measures" is not included in the projections, because climate and energy policies have already been implemented in the Netherlands from the early 1990s onwards.

Compared to projections, as reported in the BR3, the difference between the policy variants in the KEV is relatively small, as there have been few changes to the policies up to 2020.

Between 2005 and 2012, the emissions of Dutch businesses that took part in the European emissions trading system **(ETS**) fluctuated around 80 Mton of carbon dioxide equivalents. In 2013, ETS emissions increased substantially, mainly due to an administrative reallocation of (emission-related) activities from non-ETS to ETS. In 2015 and 2016, the total ETS emissions rose to around 94 Mton of CO_2 equivalents as a result of substantial emissions in the electricity sector. Subsequently, in 2017 and 2018, the total levels of ETS emissions dropped to 91 and 87 Mton of CO_2 equivalents. This reduction was due to lower emission levels in the electricity sector resulting from less electricity being generated in coal-fired power stations and more in gas-fired power stations. Since 2015, ETS emissions from the industrial sector have increased slightly due to favorable economic conditions, among other factors. Compared with 2017, ETS emissions are expected to fall by 18 Mton of CO_2 equivalents to 73 [69-80] Mton by 2020 (see figure 1.3). This reduction is due to lower levels of electricity being generated by coal- and gas-fired power stations. Beyond 2020, ETS are expected to continue declining, to 56 [51-66] Mton of CO_2 equivalents by 2030. This sharp decline is mainly due to a 16-megatonne reduction in emissions from electricity generation in the period between 2020 and 2030 (closure of coal-fired power stations and greater share of renewable energy). ETS emissions in the industrial sector will fall by 1 megatonne of CO_2 equivalents between 2020 and 2030 (from 43 to 42 Mton).

Non-ETS emissions have fallen from 134 Mton in carbon dioxide equivalents in 2005 to 108 Mton in 2013. The reduction in the period from 2005 to 2013 was mainly due to the approx. 20 Mton CO_2-eq reduction in non-ETS emissions from the industrial sector. During the same period, reductions were also achieved in the electricity (3 Mton) and mobility (4 Mton) sectors. In 2013, ETS emissions decreased due to an administrative reallocation of emission-related activities from non-ETS to ETS, among other factors. Between 2015 and 2018, non-ETS emissions stabilised at a level of around 102 Mton of CO_2 equivalents. Emissions of non-carbon dioxide greenhouse gases also significantly decreased during this period, namely by 8 Mton, primarily due to reduction measures in relation to the production of nitric acid. In the period 2018-2020, a further reduction to 98 Mton of CO_2 equivalents is expected. This reduction mainly stems from a decline in emissions from the built environment (7 Mton), industry and mobility (both less than 2 Mton). The maximum permitted cumulative emissions for the Netherlands for the 2013-2020 period amount to 921 Mton in carbon dioxide equivalents. Based on existing policies, the cumulative emissions for that period are projected to be 814 megatons of CO_2 equivalents. This level is still considerably below the mandatory cumulative emission cap.

The maximum permitted cumulative emissions for the Netherlands for the 2021-2030 period are expected to amount to 891 Mton in carbon dioxide equivalents. Based on existing policies, cumulative emissions for 2021-2030 are expected to amount to 931 Mton of CO_2 equivalents, with a deficit of 39 Mton in carbon dioxide equivalents remaining (which poses a policy effort) for the established period. Based on additional policies, the projected cumulative emissions for 2021-2030 amount to 925 Mton of CO_2 equivalents: this is 6 Mton lower than with existing policies. This represents a deficit – and therefore a policy effort– of 34 Mton of CO_2 equivalents for this period. The calculation for the cumulative target above already implicitly accounts for the possibility of compensating for deficits with surpluses between the years (banking and borrowing). The calculations also do not take into account the opportunity – as stipulated in the European rules – to make use of LULUCF credits

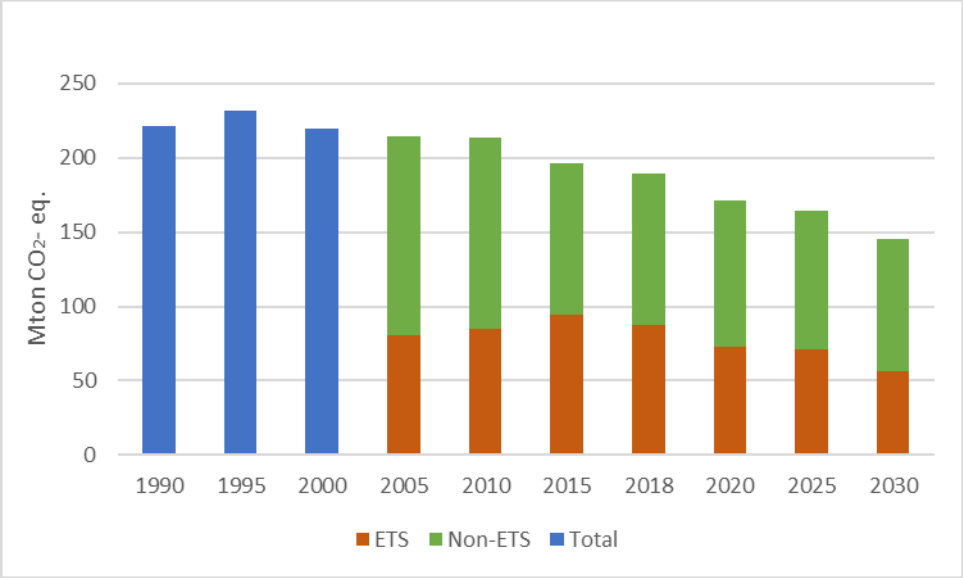

Figure 1.3: Historical emissions and projections (split ETS/non-ETS), 1990–2030, in Mton CO_2 eq. (excl. LULUCF) (with existing policies)

Provision of financial, technological and capacity-building support to developing countries

Dutch support for climate action in developing countries is an integral part of its development cooperation, financed from the Netherlands' budget for foreign trade and development cooperation. Committed to scaling up its support for mitigation and adaptation activities in developing countries, the Netherlands has continued to realise an increase in its climate finance after delivering on its Fast-Start Finance commitment in the 2010–2012 period. Public climate finance reached €419 million in 2017 and €575 million in 2018. In addition, public finance from the Netherlands mobilised €335 million in private finance for climate-relevant activities in developing countries in 2017 and €411 million in 2018. Increases in climate finance can be credited to a better integration of climate action into bilateral and multilateral development activities, the allocation of additional budget for climate-specific activities and strengthened efforts to mobilise private finance for climate-relevant activities.

Adaptation expenditure amounted to €165 million (39% of total) in 2017, rising to €186 million (32% of total) in 2018, while mitigation expenditure amounted to €44 million (11% of total) in 2017 and increased to €71 million (12% of total) in 2018. Most public climate finance supported crosscutting activities, thanks to substantial contributions received through multilateral and other channels to support both adaptation and mitigation activities. Crosscutting support amounted to €210 million (50% of total) in 2017 and €319 million (55% of total) in 2018.

As Dutch support for climate action is part of development cooperation, we have a strong focus on poverty. Poorer people and communities are typically affected the most by climate change, not only because they are often the most exposed but also because they have the least resources to cope and adapt. To support mitigation, we focus on providing access to renewable energy and on halting deforestation; to support adaptation, we focus on climate-smart agriculture, integrated water resource management and the provision of climate-resilient water, sanitation and hygiene services (WASH). Disaster risk reduction is an integral part of our programmes for integrated water

resource management, while it also receives support through Partners for Resilience and the Climate Risk and Early Warning Systems Initiative (CREWS). Gender is an important crosscutting issue, as climate action is most effective when it builds on the capacities and addresses the needs as well as the vulnerabilities of both genders.

The results of the Dutch development cooperation, including our support for climate action, are reported to Parliament and published online. Some quantitative results of Dutch climate finance reported in 2018 were:

- an additional 2.6 million people gained access to clean energy, bringing the total to 7.2 million people since 2015;
- more than 1.1 million hectares of land and forest were brought under improved sustainable management;
- almost 2.4 million people became more resilient by living in better managed river basins; 754,000 farming businesses became more resilient to climate change.

2. Information on green house gas emissions and trends, GHG inventory including information on national inventory system

2.1. Summary tables

The Netherlands submitted its most recent greenhouse gas inventory (period 1990–2017) to the UNFCCC in April 2019. Summary tables, including trend tables for CO_2-equivalent emissions, are shown in CTF table 1. The main trends are explained in Section 2.2 below.

2.2. Descriptive summary

This section summarises the trends in GHG emissions during the period 1990–2017 by GHG and by sector, as described in the National Inventory Report (NIR) 2019. More detailed explanations are provided in the NIR 2019.[2]

Emission trends for aggregated greenhouse gas emissions
In 2017, total GHG emissions (including indirect CO_2 emissions, excluding emissions from LULUCF) in the Netherlands were estimated at 193.7 Tg CO_2 eq. This is 12.6% lower than the 221.7 Tg CO_2 eq. reported in the base year (1990).

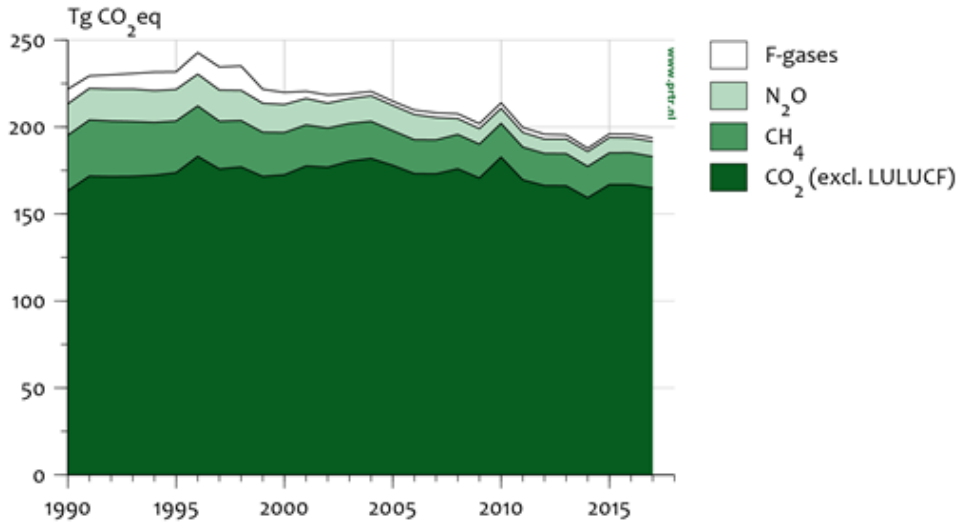

Figure 2.1: Greenhouse gases: trend and emissions levels (excl. LULUCF), 1990–2017

Figure 2.1 shows the trends and contributions of the different gases to the aggregated national GHG emissions. In the period 1990–2017, emissions of carbon dioxide (CO_2) increased by 1.0%

[2] Ruyssenaars et al., 2019
https://unfccc.int/sites/default/files/resource/nld-2019-nir-15apr19.zip

(excluding LULUCF). Emissions of non-CO_2 GHGs methane (CH_4), nitrous oxide (N_2O) and F-gases decreased by 43.4%, 51.7% and 76.1%, respectively.

Emissions from LULUCF-related sources decreased over the period 1990–2017 by 13.7%. Total GHG_emissions in the Netherlands for the year 2017 (including LULUCF) were 199.3 Tg CO_2 eq.

Emission trends by gas

Carbon dioxide
Figure 2.2 shows the contribution of the most important sectors to the trend in total national CO_2 emissions (excluding LULUCF). In the period 1990–2017, national CO_2 emissions increased by 1.0% (from 163.3 to 164.9 Tg). The Energy sector is by far the largest contributor to CO_2 emissions in the Netherlands (95.4%), the categories 1A1 Energy industries (38.2%), 1A4 Other sectors (20.1%) and 1A3 Transport (18.7%) being the largest contributors in 2017.

Compared with 2016, total CO_2 emissions decreased by 1.1% (1.9 Tg). One of the main reasons was a reduction in coal combustion for electricity and heat production (1A1a).

The relatively high level of CO_2 emissions in 2010 is mainly explained by the cold winter, which increased energy use for space heating in the residential sector. The resulting emissions are included in category 1A4 (Other sectors).

Indirect CO_2 emissions (calculated from the oxidation of NMVOC emissions from solvents) are only a minor source in the Netherlands (0.45 Tg in 2017).

Carbon Capture and Storage (CCS) is not applied in the Netherlands.

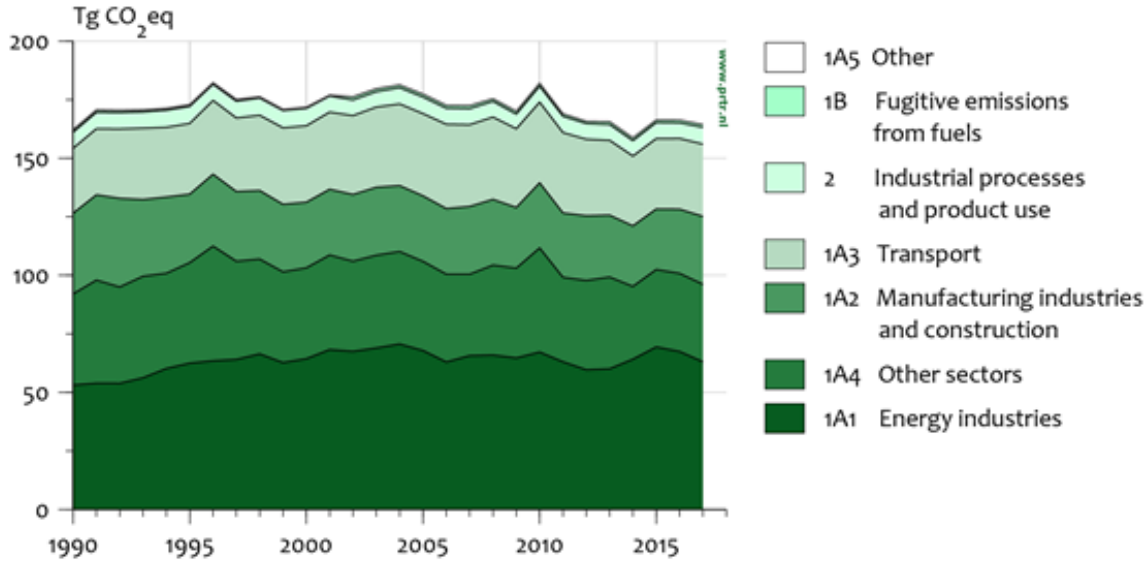

Figure 2.2: Trends and emission levels for CO_2 by sector, 1990–2017, in Tg CO_2 eq.

Methane
Figure 2.3 shows the contribution of the most relevant sectors to the trend in total CH_4 emissions. National CH_4 emissions decreased by 43.4% between 1990 and 2017, from 31.9 Tg to 18.0 Tg CO_2 eq. The Agriculture and Waste sectors (69.5% and 16.2%, respectively) were the largest contributors in 2017.

Compared with 2016, national CH_4 emissions decreased by about 1.7% in 2017 (0.3 Tg CO_2 eq.). CH_4 emissions mainly decreased in the category 3A (Enteric fermentation) and category 5A (Solid waste disposal on land); ca 0.1 Tg CO_2 eq.and 0.2 Tg CO_2 eq., respectively.

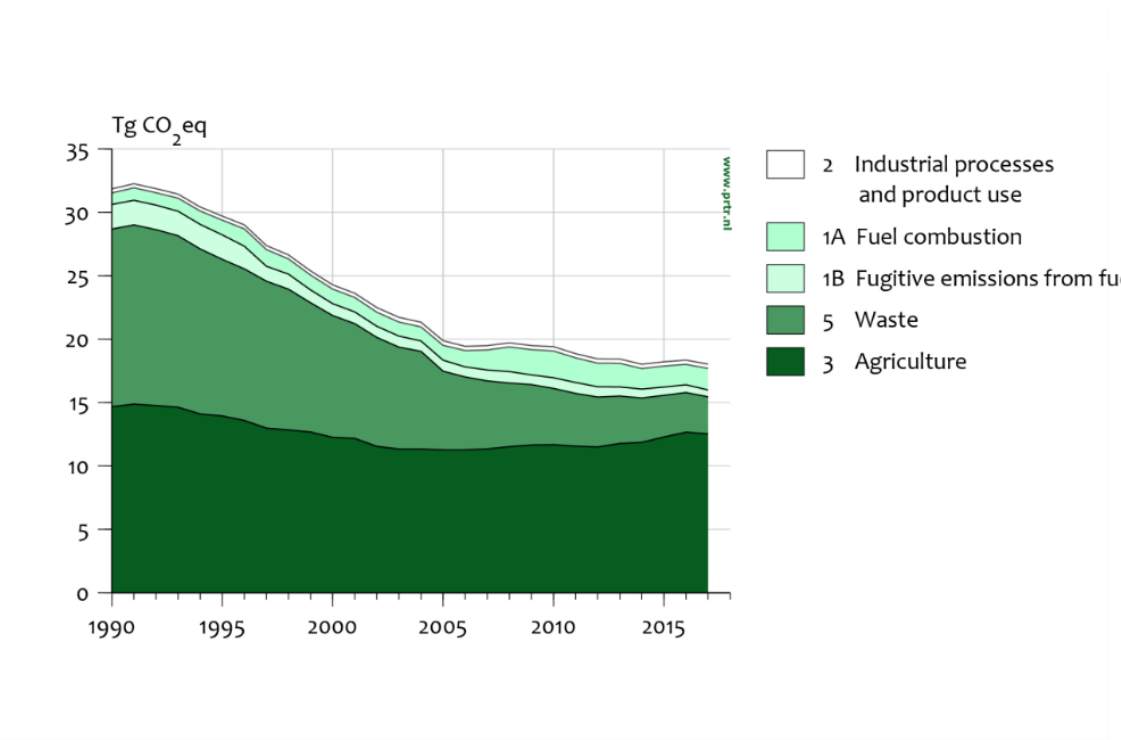

Figure 2.3: Trends and emission levels for CH_4 by sector, 1990–2017, in Tg CO_2 eq.

Nitrous oxide
Figure 2.4 shows the contribution of the most relevant sectors to the trend in national total N_2O emissions. The total national inventory of N_2O emissions decreased by about 51.7%, from 18.4 Tg CO_2 eq. in 1990 to 8.7 Tg CO_2 eq. in 2017. The IPPU sector contributed the most to this decrease in N_2O emissions (emissions decreased by 78.4% compared with the base year (1990)).

Compared with 2016, total N_2O emissions increased by 2.8% in 2017 (0.2 Tg CO_2 eq.), mainly due to an increase of emissions in category 3D (agricultural soils)

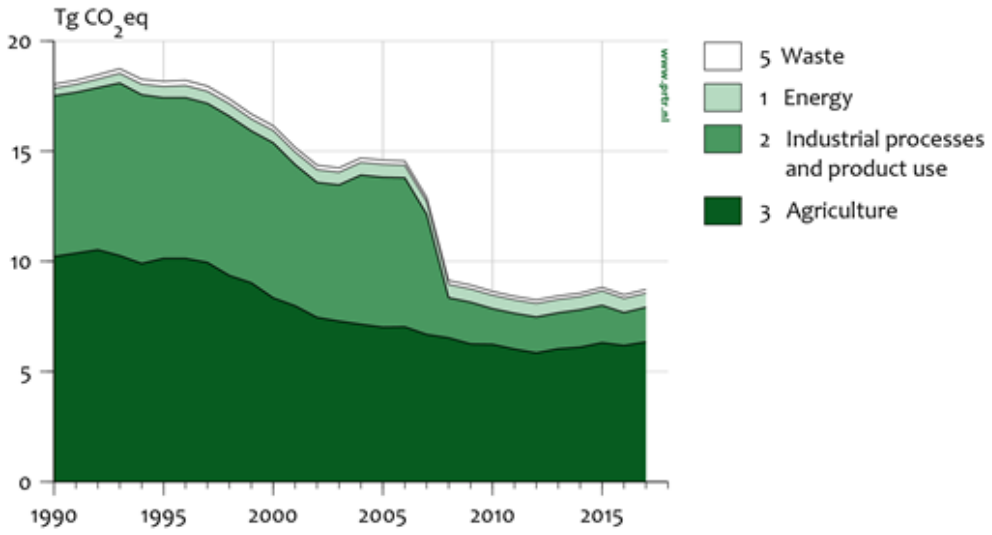

Figure 2.4: Trends and emission levels for N_2O by sector, 1990–2017, in Tg CO_2 eq.

Fluorinated gases
Figure 2.5 shows the trend in F-gas emissions included in the national GHG emissions inventory. Total emissions of F-gases decreased by 76.1 % from 8.2 Tg CO_2 eq. in 1990 to 2.0 Tg CO_2 eq. in 2017. Emissions of hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) decreased by 67.4% and 97.1%, respectively, during the same period, while sulphur hexafluoride (SF_6) emissions decreased by 38.9%. It should be noted that, due to the fact that there is no separate registration of NF_3 in the Netherlands, the emissions of NF_3 are included in the PFC emissions.

Between 2016 and 2017, aggregated emissions of F-gases decreased by 6.1%. HFCs emissions decreased by 2.7% and PFCs emissions decreased by 49.3% between 2016 and 2017. The latter decrease was mainly a result of a further implementation of an intensive reduction scheme in category 2E1 (Integrated circuit or semiconductor). SF_6 emissions decreased by 5.8% over the same period.

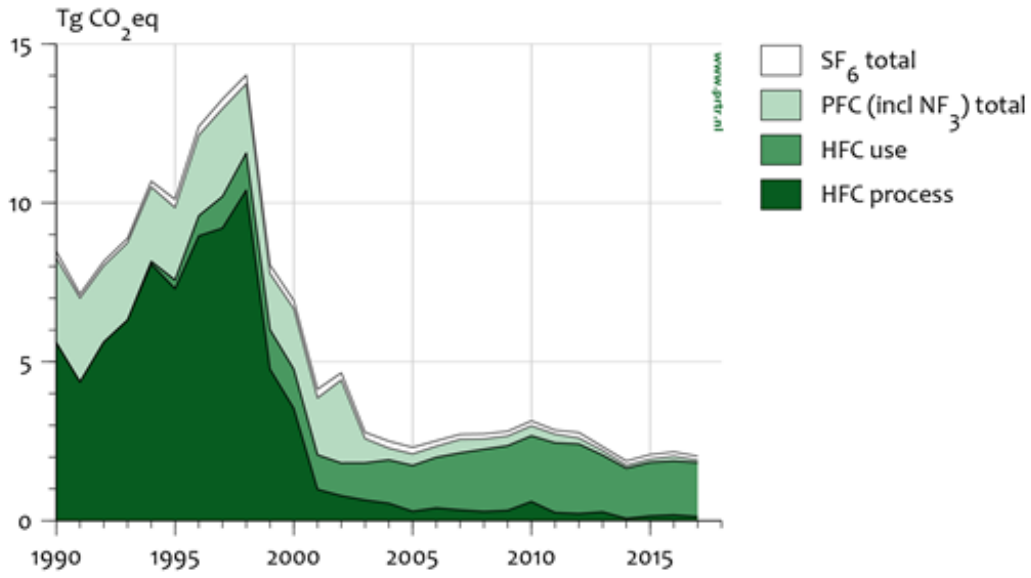

Figure 2.5: Trends and emission levels for individual fluorinated gases (F-gases), 1990–2017, in Tg CO_2 eq.

Emission trends specified by source category
Figure 2.6 provides an overview of emissions trends for each IPCC sector in Tg CO_2 equivalents.

The Energy sector is by far the largest contributor to total GHG emissions in the national inventory, contributing 71.5% in the base year (1990) and 82.7% in 2017. The emissions level of the Energy sector increased by approximately 1% in the period 1990–2017.

Total GHG emissions of all other sectors (IPPU, Agriculture, LULUCF and Waste) decreased by 51.7%, 24.5%, 13.7% and 78.3%, respectively, in 2017 compared with the base year (1990).

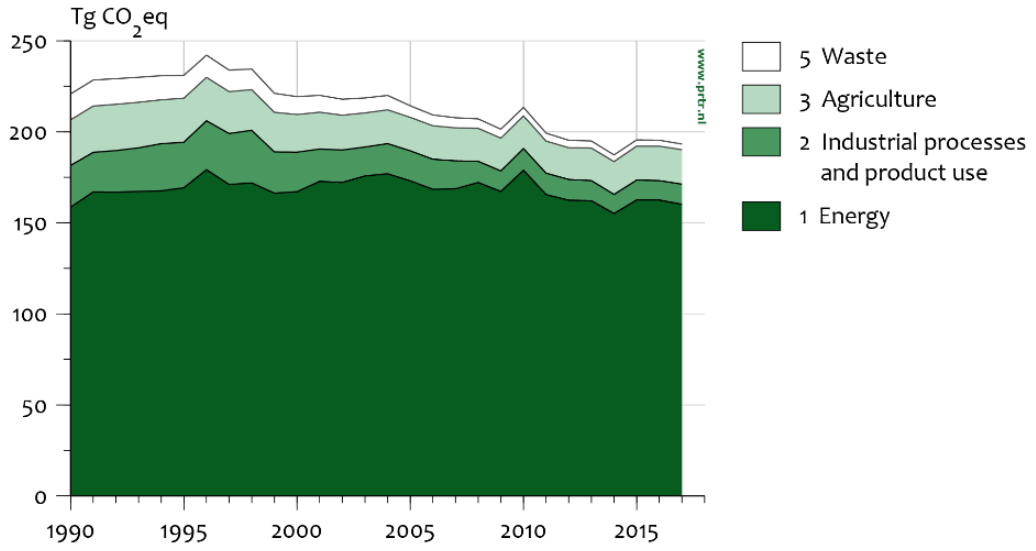

Figure 2.6: Trends and emission levels for aggregated greenhouse gases by sector, 1990–2017, in Tg CO_2 eq.

Emission trends for indirect greenhouse gases and SO_2
Figure 2.7 shows the trends in total emissions of carbon monoxide (CO), nitrogen oxides (NOx), non-methane volatile organic compounds (NMVOC) and sulphur dioxide (SO_2). Compared with 1990, in 2017 CO and NMVOC emissions decreased by 54% and 66%, respectively. For SO_2, the reduction was 86%; and for NOx, 2017 emissions were 62% lower than the 1990 level. With the exception of NMVOC, most of the emissions stem from fuel combustion.

Because of the problems (incomplete reporting) identified with annual environmental reports, emissions of indirect greenhouse gases and SO_2 from industrial sources have not been verified. Therefore, the emissions data for the years 1991–1994 and 1996–1998 are of lower quality.

In contrast to direct GHGs, calculations of the emissions of precursors from road transport are not based on fuel sales, as recorded in national energy statistics, but are directly related to transport statistics on a vehicle-kilometre basis. To some extent, this is different from the IPCC approach.

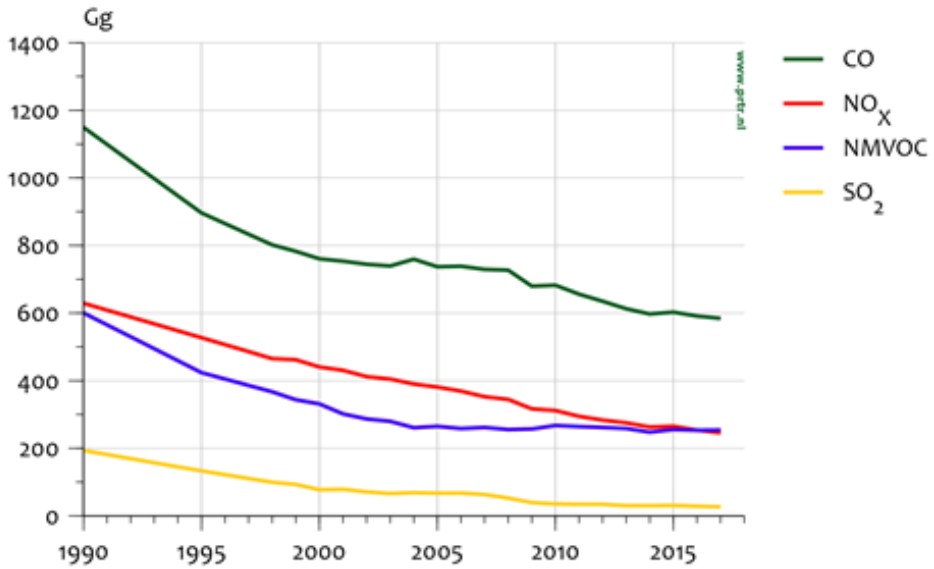

Figure 2.7: Trends and emission levels for NO_x, CO, NMVOC and SO_2, 1990–2017, in Gg.

2.3. Description of the National System

2.3.1. Scope and objectives of the National System

Introduction
As a Party to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, the Netherlands has in place a National System for estimating anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol. The Netherlands established its National System in 2005. During the initial review, it was found to comply with all the necessary requirements. Since then, the system as such has remained unchanged, with three exceptions:

- Until 1 January 2010, the coordination of the Pollutant Release and Transfer Register (PRTR) – in which emissions of about 350 substances are annually calculated – was performed by the Netherlands Environmental Assessment Agency (PBL). As from 1 January 2010, coordination has been assigned to the National Institute for Public Health and the Environment (RIVM). Since that time, the processes, protocols and methods have remained unchanged. Many of the former experts from PBL have also moved to RIVM.
- In 2015, the Netherlands replaced the 40 monitoring protocols (containing the methodological descriptions as part of the National System) with five methodology reports. The methodology reports are also part of the National System. From 2015 onwards, the NIRs have been based on these methodology reports. The main reason for this change is that updating five methodology reports is simpler than updating 40 protocols. In addition, the administrative procedure is simplified because the updated methodology reports do not require an official announcement in the Government Gazette. For this reason, the Act on the Monitoring of

Greenhouse Gases was updated in 2014. The methodology reports are reviewed and approved by the NIE and the PRTR project leader at RIVM. As part of the National System, the methodology reports are available at the National System website.[3]

- Finally, in 2017, the responsibility for climate policy shifted from the Ministry of Infrastructure and the Environment to the Ministry of Economic Affairs. The latter has been renamed the Ministry of Economic Affairs and Climate Policy. Other Ministries keep their responsibility for integrating environmental policy targets and endorsing the environmental policies within their respective fields (e.g. the Ministry of Infrastructure and Water Management is responsible for climate adaptation).

This report details the system as it operates on 31 December 2019, describing how the required functions are performed in the Netherlands using the outline from the reporting guidelines (see Box 2.1).

Objectives of the National System

Under the Kyoto Protocol, a National System (definitions used in this report are those used in UNFCCC guidelines) includes all institutional, legal and procedural arrangements made within a Party (included in Annex I) for estimating anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, as well as for reporting and archiving inventory information. The objectives of the Dutch National System, in accordance with the guidelines, are as follows:

- to enable the estimation and reporting of anthropogenic GHG emissions by sources and removals by sinks (as required by Article 5), and to report these emissions by sources and removals by sinks in accordance with Article 7(1) and relevant decisions of the Conference of the Parties (COP) and/or the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (COP/MOP);
- to facilitate meeting the commitments under Articles 3 and 7;
- to facilitate the review of the information submitted;
- to ensure and improve the quality of the inventory.

The Netherlands Enterprise Agency (RVO.nl) coordinated the establishment of the National System and was subsequently assigned the role of 'single national entity' (NIE).

Box 2.1 Outline

Institutional, legal and organisational aspects (Section 2.3.2), including:

(a) the name and contact information for the national entity and its designated representative with overall responsibility for the national inventory of the Party;
(b) the roles and responsibilities of various agencies and entities in relation to the inventory development process, as well as the institutional, legal and procedural arrangements made to prepare the inventory.

Methodology and process aspects (Section 2.3.3), including:

(c) a description of the process for collecting activity data, for selecting emission factors and methods, and for the development of emission estimates;
(d) a description of the process and the results of key source identification and, where relevant, archiving of test data;
(e) a description of the process for recalculating previously submitted inventory data.

Quality management aspects (Section 2.3.4), including:

[3] http://english.rvo.nl/nie.

Box 2.1 Outline (Cont'd)

(f) a description of the quality assurance and quality control plan, its implementation and the quality objectives established, and information on internal and external evaluation and review processes and their results in accordance with the guidelines for National Systems;

(g) a description of the procedures for the official consideration and approval of the inventory.

2.3.2. Institutional, legal and organizational aspects

Name and contact information for the national entity

The name and contact information for the national entity and its designated representative with overall responsibility for the national inventory of the Party

Contact information of the National Entity:
Netherlands Enterprise Agency (RVO.nl), PO Box 8242, 3503 RE Utrecht, the Netherlands.
Designated representative with overall responsibility for the inventory:
Harry Vreuls, harry.vreuls@rvo.nl , telephone: +31 88 0422258.

The Minister of Economic Affairs and Climate Policy (EZK) has appointed RVO.nl by law as the single national entity (NIE).

Roles and responsibilities in relation to the inventory process

(b) The roles and responsibilities of various agencies and entities in relation to the inventory development process, as well as the institutional, legal and procedural arrangements made to prepare the inventory

The section below describes these elements, distinguishing between arrangements for data collection, data processing and reporting.

Introduction
The Ministry of Economic Affairs and Climate Policy (EZK) is the coordinating Ministry in the Netherlands for climate change policy. As defined in the guidelines under Article 5.1 of the Kyoto Protocol, the Minister of Economic Affairs and Climate Policy (EZK) has been given the authority by law to appoint a single national entity (also known as an NIE). The Minister has appointed RVO.nl as the NIE with overall responsibility for the national inventory. RVO.nl is responsible – among other things – for assembling and providing the annual reports to the UNFCCC, coordinating the QA/QC process and operating as focal point for the UNFCCC in relation to the report, which includes supporting the UNFCCC review process. Parts of the annual report are provided by other organisations.

The inventory and reporting process is illustrated in Figure 2.8 and briefly described below in three parts:

- arrangements for data collection;
- arrangements for data processing;
- arrangement for reporting.

Arrangements for data collection
The emission data are taken from the Pollutant Release and Transfer Register project (PRTR). This collaborative project (started around 1974) involves a series of bodies and ministries in the

Netherlands. The objective of the project is to agree on one national data set for emissions inventories, covering some 350 pollutants to air, water and soil; this data set is used for a variety of international and national applications. Its coordination is assigned to RIVM (National Institute for Public Health and the Environment), an agency under the Ministry of Health, Welfare and Sport (Ministry of VWS).

The data sources, methods and processes used for elaborating the greenhouse gas emission estimates are described in the National System documentation, notably in the form of methodology reports. These reports are drafted by the PRTR Task Forces and reviewed and approved by the NIE and the PRTR project leader at RIVM.

The PRTR project uses primary data from various data suppliers, as described below.

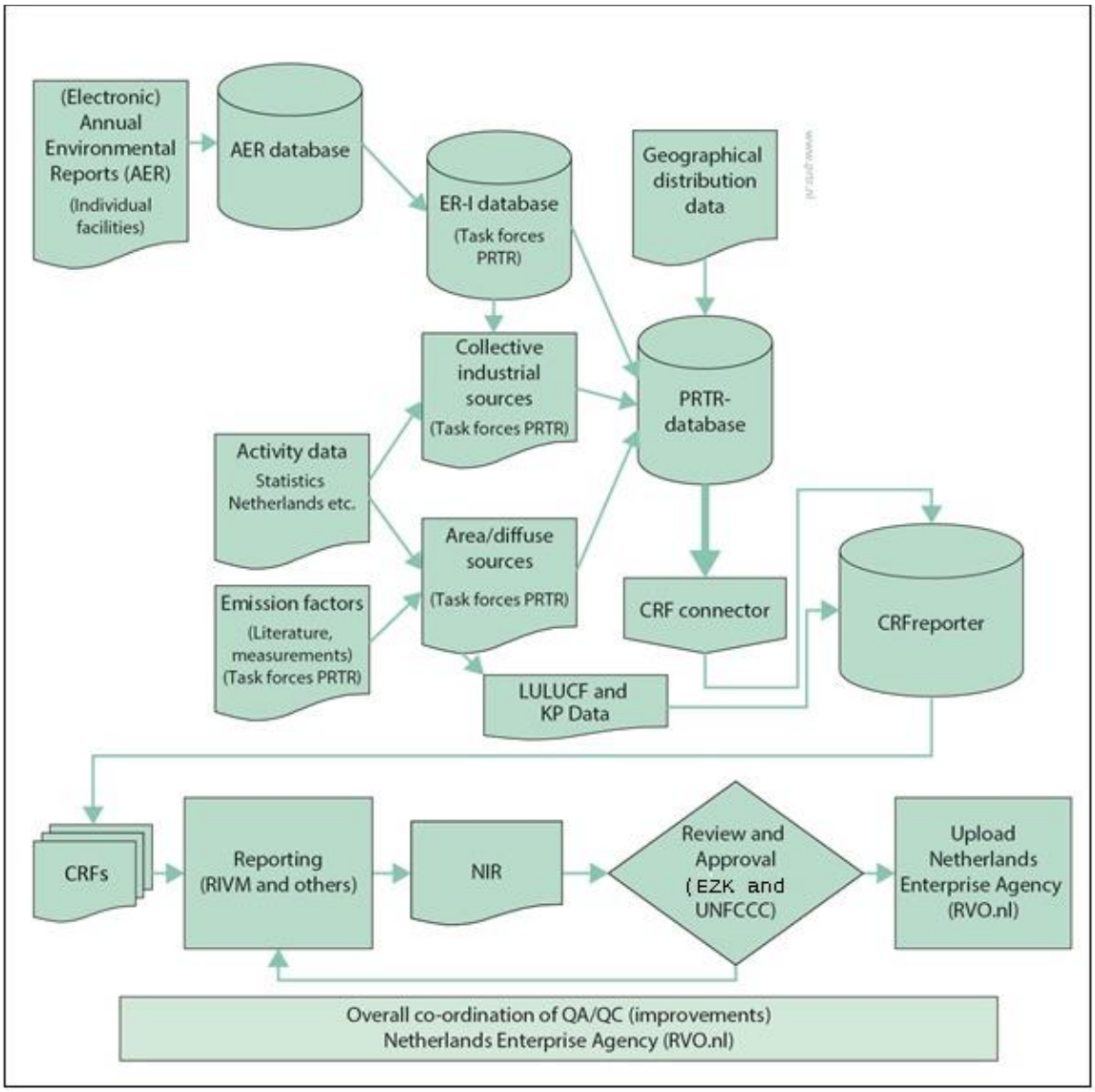

Figure 2.8: Schematic overview of main steps in the primary process; in practice, various feedback loops exist

Statistical data
Statistical data are provided under various obligations and legal arrangements (not specifically related to greenhouse gases). These arrangements include national statistics from Statistics Netherlands (CBS) as well as a number of other data sources on sinks, water and waste. The provision of relevant data on greenhouse gases is guaranteed through covenants and an Order in Decree prepared by the Ministry of Economic Affairs and Climate Policy (EZK). For greenhouse gases, relevant agreements with Statistics Netherlands and Rijkswaterstaat Environment on waste management are in place. An agreement with the Ministry of Agriculture, Nature and Food Quality (LNV) and related institutions was established in 2005.

Data from individual companies
Data from individual companies are provided in the form of electronic annual environmental reports (e-AERs). A large number of companies have a legal obligation to submit an e-AER which includes, in addition to other environment-related information, emissions data validated by the competent authorities (usually provincial and occasionally local authorities, which also issue environmental permits to these companies). Some companies provide data voluntarily within the framework of environmental covenants. Large companies are also obliged to participate in the European Emission Trading Scheme (EU ETS). These companies have to report their CO_2 emissions in specific annual ETS emission reports.

Whenever these reports from major industries contain plant-specific activity data and emission factors (EFs) of sufficient quality and transparency, these are used in the calculation of CO_2 emissions estimates for specific sectors.

The AERs from individual companies also provide essential information for calculating the emissions of substances other than CO_2. The calculations of industrial process emissions of non-CO_2 GHGs (e.g. N_2O, HFC-23 and PFCs released as by-products) are mainly based on information from these AERs, as are emissions figures for precursor gases (CO, NOx, NMVOC and SO_2). Only those AERs with high-quality and transparent data are used as a basis for calculating total source emissions in the Netherlands.

Many Dutch industrial (sub)sectors consist of just a single company. This is the reason why the Netherlands cannot report activity data (confidential business information) in the NIR or CRF on the most detailed level. Although this may hamper the review process, all confidential data can and will be made available (on request) to EU and UNFCCC review teams.

Additional data related to greenhouse gases
Additional data related to greenhouse gases are provided by other institutes and consultants specifically contracted to supply information on sectors not sufficiently covered by the aforementioned data sources. For example, RIVM concludes contracts and financial arrangements with various agricultural institutes and TNO. During 2004, the Ministry of Agriculture, Nature and Food Quality (LNV) issued contracts to a number of agricultural institutes; in particular, these contracts comprised the development of a monitoring system and a methodological description for the LULUCF data set. Based on a written agreement between the Ministry of Agriculture, Nature and Food Quality (LNV) and RIVM, these activities are also part of the PRTR.

Arrangements for data processing
The calculation of greenhouse gas emissions and sinks is the responsibility of the PRTR project. Data are collected and processed by five Task Forces (see Box 2.2) according to predetermined methods described in the methodology reports.

Arrangements for reporting, QA/QC coordination and review
The data are stored in the PRTR Central Database system. From this PRTR database, the CRF is generated automatically.

The overall annual report for the UNFCCC is drafted and coordinated by RVO.nl (the NIE). To ensure the involvement of the relevant experts from the various bodies (CBS, TNO, PBL, RIVM, Alterra, and so on) that supplied the relevant emission estimates, this procedure is implemented as an annual project in which each section of the NIR is assigned to one lead author. This lead author usually involves other experts, while a co-author is assigned for mutual checks. The NIE is closely involved, but the coordination and fine-tuning of the contents of Part 1 of the NIR is delegated to RIVM in order to ensure consistency with the PRTR data. Overall coordination, including the elaboration of Part 2 of the NIR, is carried out by RVO.nl/NIE. The elaboration of Part 2 involves various ministries (Ministry of Agriculture, Nature and Food Quality (LNV), Ministry of Economic Affairs and Climate Policy (EZK)) and institutes (Dutch Emissions Authority (NEa) and Alterra).

RVO.nl/NIE submits the annual report to the UNFCCC after approval by the Ministry of Economic Affairs and Climate Policy (EZK). It has also been assigned overall QA/QC coordination of the inventory, its process and the National System, facilitation of UNFCCC reviews and coordination of requests for clarification.

Box 2.2 Pollutant Release and Transfer Register (PRTR) project

Responsibilities for coordination of the PRTR project
Major decisions on tasks and priorities are taken by the Steering Committee ER (SCER) through approval of the Annual Work Plan. This committee consists of the representatives from the commissioning ministries, regional governments, RIVM and PBL.

The PRTR project leader at RIVM acts as coordinator and is responsible for the PRTR process; the outcomes of that process are the responsibility of the bodies involved. Contribution of the various bodies is ensured by means of contracts, covenants or other agreements.

Task Forces
Various emission experts from the participating organisations take part in the Task Forces that calculate the national emissions from 650 emission sources. A formal agreement is drawn up by all the participating organisations. After intensive checking, the national emissions are accepted by the project leader of the PRTR project and the data set is stored in the Central Database.

The 650 emission sources are logically divided into 55 work packages. An emission expert is responsible for one or more work packages, the collection of the data and the calculation of the emissions. The experts are also closely involved in developing the methodologies to calculate the emissions. Work packages are grouped into five Task Forces as described below.

Task Force on Energy, Industry and Waste Management (ENINA)
Covers the emissions to air from the Industry, Energy production, Refineries and Waste management sectors. ENINA includes emission experts from the following organisations: RIVM, TNO, Statistics Netherlands (CBS), Rijkswaterstaat Environment (Waste Management Department) and Fugro-Ecoplan.

Task Force on Transportation
Covers the emissions to soil and air from the Transportation sector (aviation, shipping, rail and road transport). The following organisations are represented: Netherlands Environmental

Box 2.2 Pollutant Release and Transfer Register (PRTR) project (Cont'd)
Assessment Agency (PBL), Statistics Netherlands (CBS), Rijkswaterstaat and TNO.

Task Force on Agriculture
Covers the calculation of emissions to soil and air from Agriculture. Participating organisations include RIVM, Netherlands Environmental Assessment Agency (PBL), Wageningen environmental Research (WenR), Wageningen economic Research (WecR) and Statistics Netherlands (CBS).

Task Force on Water – MEWAT
Covers the calculation of emissions from all sectors to water. MEWAT includes Rijkswaterstaat, Deltares, Netherlands Environmental Assessment Agency (PBL), RIVM, Statistics Netherlands (CBS) and TNO.

Task Force on Consumers and other sources of emissions – WESP
Covers the emissions caused by consumers, trade and services. The members are emission experts from RIVM and TNO.

Legal arrangements for the National System
The Greenhouse Gas Monitoring Act came into effect at the end of 2005. This Act established a National System for monitoring greenhouse gases and empowered the Ministry of Economic Affairs and Climate Policy to appoint an authority responsible for the National System and the National Inventory. The Minister has appointed RVO.nl as this authority (NIE; Government Gazette (Staatscourant), 2005[4]).

The Act also specifies that the National Inventory must be based on methodologies and processes as laid down in the methodology reports.

2.3.3. Methodology and process aspects

Introduction
The annual cycle is a key quality management tool (based on the Deming cycle of plan-do-check-act) and encompasses:

- inventory planning;
- inventory preparation;
- inventory evaluation;
- inventory improvement.

The following sections describe how the required specific functions are performed for each of these steps. Figure 2.9 illustrates the steps and the QA/QC tools used in each step.

[4] Government Gazette (Staatscourant), 2005 http://wetten.overheid.nl/BWBR0021265/2015-01-01

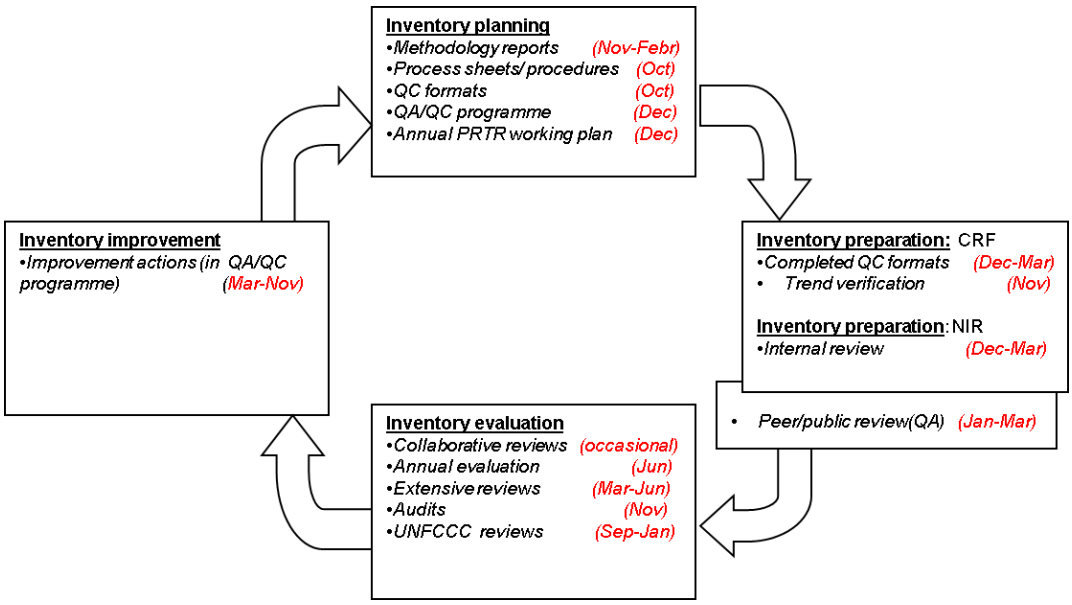

Figure 2.9: Annual cycle

(c) A description of the process for collecting activity data, for selecting emission factors and methods and for the development of emission estimates is included in the methods and processes to be used

The roles and responsibilities in the process of collecting activity data, selecting emission factors and developing emission estimates are described in the previous section. This section describes the methodology and process aspects of this procedure.

The choices in relation to the activity data to be used, the emission factors to be chosen, the methods to be selected and the steps to produce the emission estimates have been made in various ways.

During the establishment of the National System, an improvement programme was implemented together with the relevant bodies and experts as well as with independent experts. This programme assessed all relevant data, factors and methods, which was done in workshops and through special background studies, among other things. Choices were made in line with the IPCC and UNFCCC guidelines concerning changes in methods, data and factors. These choices were made together with the experts and a special committee in which relevant bodies participated. The resulting data sources, emission factors, methods and working processes were specified in monitoring protocols. In 2015, the Netherlands replaced the monitoring protocols (containing the methodological descriptions as part of the National System) with five methodology reports. These methodology reports are also part of the National System.

The annual QA/QC cycle (see above) guarantees that attention is constantly being paid to any necessary and/or possible improvements. Results of internal and external QA/QC and review processes form an important basis for this procedure.

More detailed information on how these processes have been implemented is provided through a description (in the section below) of the implementation of various functions in the National System as part of an annual management cycle in the Netherlands.

Inventory planning
This step comprises the annual planning. QA/QC tools include the following set of planning documents, updated annually as part of the evaluation and improvement cycle:

- *methodology reports*, describing methodologies and processes for estimating emissions and sinks. These methodology reports replace the system of monitoring protocols that was used until 2014. The methodology reports and any changes in them are reviewed and approved by the NIE and the PRTR project leader at RIVM. They are also made accessible on the National System website (http://english.rvo.nl/nie) and listed in Annual Work Plans (PRTR, 2019);
- *set of procedures,* describing other relevant key processes in the National System, including a list of applicable procedures;
- *set of agreements* on the basic institutional, legal and organisational structure. These agreements have been recorded in contracts, legal arrangements and covenants (see previous section);
- *QA/QC programme*, including the planning of activities and improvement projects. This programme is updated annually;
- *Annual Work Plans* of the ER (ER, 2019) providing more detail on planning of the PRTR process, such as the working procedures to be used and the documentation/registration sheets to be applied.

The agreements, methodology reports, procedures and QA/QC programme are reviewed annually, updated (if necessary) and approved for use in the next cycle. RVO.nl is responsible for updating the QA/QC programme, including the improvement cycle. Updates are approved by the Ministry of Economic Affairs and Climate Policy (EZK), in consultation with the Advisory Board NIE.[5] For LULUCF issues, the Ministry of Economic Affairs and Climate Policy (EZK) will seek agreement with the Ministry of Agriculture, Nature and Food Quality (LNV).

The annual planning is further detailed in the Annual Work Plans, which specify staffing, allocating time budgets and scheduling of the next inventory cycle. These plans also describe the tasks involved in performing the general QC (Tier 1), including the sample calculations, and further describe which work instructions, databases, documentation sheets and other tools should be used. The work plan is approved by the respective organisations[6] after consultation.

Inventory preparation
The inventory preparation comprises the following functions and activities:

- collecting data, processing data and estimating emissions in accordance with the methodology reports and the timetable in the Annual Work Plan. The actual process is documented in documentation sheets that include information on data used, any necessary deviations from the agreed methods (including their approval) and any other relevant information needed for the 'paper trail' of the estimates;
- performing the general QC procedures (Tier 1) as detailed in the Annual Work Plans (on non-confidential and confidential data), documenting results and corrections (as well as approval);
- elaborating the CRF and NIR in accordance with the related procedures, including the trend verification workshop and internal review.

5 Consisting of representatives from the Ministry of Economic Affairs and Climate Policy (EZK), the Ministry of Agriculture, Nature and Food Quality (LNV) and the following institutes: Statistics Netherlands (CBS), National Institute for Public Health and the Environment (RIVM), Dutch Emissions Authority (NEa), Netherlands Environmental Assessment Agency (PBL).

6 For the PRTR Work Plan, approval is given by the Steering Committee ER.

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(d) A description of the process and the results of key source identification and, where relevant, archiving of test data

The key source analysis is part of the annual process for the NIR (Part 1). This analysis will be executed by the PRTR under the responsibility of its coordinator after the annual emissions have been calculated. Any changes in key sources, together with the results of the uncertainty analyses, will be taken into account by the NIE in the improvement actions and planning for the next cycle. Performing the key source and uncertainty analyses is also described in the procedures of the National System.

(e) A description of the process for recalculating previously submitted inventory data

If necessary during the inventory preparation process, recalculations are also performed and documented in accordance with the related IPCC guidelines. Methods can only be changed after the formal approval of the revised methods by the NIE Advisory Board (Klankbordgroep NIE) and the Ministry of Economic Affairs and Climate Policy (EZK), since these changes also have to be included in the methodology reports. This approval is based on an assessment of the initiator's arguments for why a change in methods, data or factors is better and/or necessary. Such an assessment also looks into whether the change has been sufficiently reviewed and documented.

Changes can be initiated by all parties involved; they can be based on recommendations by the UNFCCC review team as well as on new scientific improvements and/or developments in data availability.

Inventory evaluation
The annual inventory evaluation consists of various elements:

- annual 'internal' review of the draft NIR before submission to the UNFCCC. This review is coordinated by the NIE and comprises internal quality assurance, a basic peer review and a public review;
- implementation of an annual internal evaluation and improvement cycle, performed jointly by NIE and PRTR. This cycle comprises two major steps:
    - around June – evaluating the previous cycle and updating the QA/QC programme;
    - around October – updating planning and methodology reports for the next cycle if needed.

Inventory improvement
The annual list of improvement actions is an integral part of the QA/QC programme. If any results – particularly those from UNFCCC reviews – give rise to urgent improvement actions, additional actions may be adopted. Improvements which influence methods or which may cause recalculations require formal approval in accordance with the relevant procedure. Proposals for methodological changes are submitted by the PRTR to the NIE, which adds a recommendation on the proposals and sends them to the NIE Advisory Board for approval (see also above under point (e)). In addition, the QA/QC programme includes non-annual review and audit activities which contribute to the evaluation and continuous improvement of the National System.

Inventory management
Management of the inventory in the Netherlands encompasses:

- documenting and archiving the relevant information for each cycle, using an annual file of relevant documents. The Dutch archiving system is centrally accessible to the NIE, with the exception of confidential information. Confidential information is not archived centrally but is accessible on-site, in line with PRTR procedures. Such confidential information can be accessed

by the project leader, the project secretary and the (deputy) work package leader. It is available on request for UNFCCC review in line with the CP decision and the code of practice. Non-confidential key documents are made accessible through the National System website as far as possible;
- facilitating UNFCCC reviews and responding to any related requests for clarification under the EU monitoring mechanism and the UNFCCC. This task is performed by RVO.nl as the NIE.

2.3.4. Quality management aspects

Introduction
The National System itself is a key tool in improving the quality and process management of the inventory process as described in the previous chapter. Various tools and QA/QC activities are further elaborated in the QA/QC programme. Several improvements have been implemented in recent years. The main inputs were the results of internal and external evaluation and review processes.

(f) A description of the quality assurance and quality control plan, its implementation and the quality objectives established, and information on internal and external evaluation and review processes and their results in accordance with the guidelines for National Systems.

The QA/QC system, programme and plan as well as their implementation are described in this section, which also highlights information on internal and external evaluations, as well as review processes and their results.

QA/QC programme
The QA/QC programme describes the quality objectives of the inventory, the National System and the QA/QC plan. It is based on previous experiences with the inventory process, including relevant information and results from internal and external evaluation and review processes as well as the results of recent UNFCCC reviews. The QA/QC programme includes a timetable, tasks and responsibilities. This programme is essentially an internal document that is available for UNFCCC review. RVO.nl is responsible for the coordination and implementation of the programme. It will be updated about once a year where necessary, usually in the autumn as part of the planning cycle. The objectives are further elaborated in the programme through the use of more specific quality objectives related to improving transparency, consistency, comparability, completeness and accuracy (the 'inventory principles').
This QA/QC plan consists of four groups of activities. In selecting activities, it takes into account general considerations such as practicality, acceptability, cost-effectiveness and existing experience. The activities are grouped as follows:
- quality control;
- quality assurance;
- documentation and archiving;
- evaluation and improvement.

Quality control
- Maintaining a transparent system through methodology reports, procedures and the QA/QC programme. This step is essential for the planning phase. It defines requirements and outputs.
- Regularly reviewing and updating the information on QA/QC by external agencies.

- Applying General QC (Tier 1) procedures as part of the standard working processes in accordance with the IPCC Guidelines and, where applicable, source-specific QC procedures for selected sources. The main responsibility for implementation lies with the PRTR, while the NIE regularly checks whether activities and outputs still comply with the guidelines.
- Updating Approach 1 and Approach 2 uncertainty analysis.

Quality assurance
This procedure is primarily implemented by staff not directly involved in the inventory process which is coordinated or implemented by RVO.nl. The main activities include:
- basic peer review process of CRF/NIR before submission to the UNFCCC – internal review, public review and peer reviews;
- annual audit on selected part(s) of the National System;
- outside agencies archiving the reports of internal audits as far as GHG activities are involved.

Documentation and archiving
The main activities relate to the cycle as a whole:
- documenting and archiving relevant information on the inventory, QA/QC programme, QA/QC activities, reviews and planned improvements;
- facilitating reviews and responses for clarification. The NIE coordinates this process.

Evaluation and improvement
The main activities include:
- implementation of the annual evaluation and improvement cycle as mentioned above; activities are determined annually in the QA/QC programme on the basis of experiences from reviews and QA/QC actions.

Results from internal and external evaluations and reviews
Various actions are taken to improve and maintain the quality of the National System, which include:
- annual UNFCCC reviews of the functioning of the National System. In 2007, the National System was reviewed during an initial review. The review team concluded that the Dutch National System had been established in accordance with the guidelines for National Systems under Article 5(1) of the Kyoto Protocol (decision 19/CMP.1) and that it met the requirements for implementation of the general functions of a National System as well as the specific functions of inventory planning, inventory preparation and inventory management. In the annual review reports, the expert review teams report that the National System continues to fulfil the requirements without providing further recommendations;
- follow-up to the annual recommendations of the UNFCCC reviews. In Chapter 10 of consecutive National Inventory Reports (NIR), an overview of recommendations and actions is incorporated. In a detailed table within this chapter, it is explained how the recommendations are implemented or why not (no data available, budget constraints, and so on). Of course, Saturday Paper issues are solved immediately, as was the case in 2016 for the emissions from Solid Waste Disposal (fraction of methane in landfill gas). This issue led to a resubmission of the CRF data in February 2017. In the 2017 and 2019 UNFCCC review the Netherlands did not receive a Saturday Paper;
- annual review by the Technical Expert Review Team (TERT) under the Effort Sharing Decision (ESD) on behalf of the European Commission. This review takes place in the period from January to June. The TERT checks the draft data for greenhouse gas emissions, the elaborations in the draft National Inventory Report and the changes compared to previous years. If possible, results from this review are used in finalising the reporting to the UNFCCC. Otherwise, the results are used in the submission for the next year;
- annual QA activities by RVO.nl in its role as NIE – internal reviews on the entire NIR, audits on part of the NIR and a peer review on part of the NIR, outsourced to an external expert. These

activities have led to separate recommendations on quality improvements of the NIR and methodological descriptions in the methodology reports.

Official consideration and approval

(g) A description of the procedures for the official consideration and approval of the inventory

The Ministry of Economic Affairs and Climate Policy (EZK) gives approval for the NIR/CRF to be submitted by the NIE to the UNFCCC after consulting the results of the checks by the NIE and, if needed, after consulting with the Ministry of Agriculture, Nature and Food Quality (LNV) on LULUCF issues.

2.3.5. Programmes to improve the quality of local emission factors, activity data and/or models (Art. 10 of the Kyoto Protocol)

The Netherlands actively aims for the continuous improvement of its inventory. Previous sections describe its quality improvement cycle and programmes as well as the main results. In addition, the Netherlands actively participates in what may be considered a 'regional programme' activity; experts within the EU regularly convene to discuss experiences with their respective inventories so as to identify and, where relevant, implement improvement actions. This procedure is achieved through expert workshops, working group meetings and joint EU research programmes.

The Netherlands has in recent years also participated in special programmes where experiences with inventories are exchanged. In 2016, the Netherlands received a delegation from Turkey within the framework of the EU-funded project 'Technical Assistance for Support to Mechanism for Monitoring Turkey's Greenhouse Gas Emissions'. The aim of the study tour was to improve reporting by Turkey to the UNFCCC, including national GHG inventories, National Communications and Biennial Reports. This programme consisted of presentations by and discussions with representatives from various ministries and bodies involved in the PRTR project.
In 2017 The Netherlands started a four-year programme in cooperation with the Indonesian government to improve the Indonesian GHG Monitoring Reporting and Verification system (MRV) and on the improvement of the Indonesia GHG inventory system.
The project is targeted to bring the Indonesian GHG inventory (and its MRV) to a higher level by sharing the experience from the Netherland and dedicated consultancy and capacity building to address specific Indonesian challenges.

3. Quantified economy-wide emissions reduction target

3.1. The EU target under the Convention

In 2010, the EU submitted a pledge to reduce its GHG emissions by 2020 by 20% compared to 1990 levels, in order to contribute to achieving the ultimate objective of the UNFCCC: 'to stabilise GHG concentrations at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system', or, in other words, to limit the global temperature increase to less than 2°C compared to temperature levels before industrialization (FCCC/CP/2010/7/Add.1). The definition of the Convention target for 2020 is documented in the revised note provided by the UNFCCC Secretariat on the 'Compilation of economy-wide emission reduction targets to be implemented by Parties included in Annex I to the Convention' (FCCC/SB/2011/INF.1/Rev.1 of 7 June 2011). EU provided additional information relating to its quantified economy wide emission reduction target in a submission as part of the process of clarifying the developed country Parties' targets in 2012 (FCCC/AWGLCA/2012/MISC.1).

The EU's accounting rules for the target under the UNFCCC are more ambitious than the rules under the Kyoto Protocol, for example, including outgoing flights, and adding an annual compliance cycle for emissions under the Effort Sharing Decision (ESD; non-ETS) or higher Clean Development Mechanism (CDM) quality standards under the EU Emissions Trading System (EU ETS) (FCCC/TP/2013/7). Accordingly, the following assumptions and conditions apply to the EU's -20% commitment under the UNFCCC:

- The EU Convention pledge does not include emissions/removals from Land Use, Land Use Change and Forestry; however this sector is estimated to be a net sink over the relevant period. EU GHG inventories include information on emissions and removals from LULUCF in accordance with relevant reporting commitments under the UNFCCC. Accounting for LULUCF activities only takes place under the Kyoto Protocol[7];
- The target covers the gases CO_2, CH_4, N_2O, HFCs, PFCs and SF_6;
- The target refers to 1990 as a single base year for all covered gases and all Member States. Emissions from outgoing flights are included in the target;,
- A limited number of CERs, ERUs and units from new market-based mechanisms may be used to achieve the target: in the ETS, the use of international credits was allowed up to specific levels set in the EU ETS Directive, amounting to over 1500 million CER and ERU entitlements in the period up to 2020). Quality standards also apply to the use of international credits in the EU ETS, including not allowing the use of credits from LULUCF projects and certain industrial gas projects. International credits will no longer be used for EU ETS compliance in the system's fourth trading period (2021-2030). In the ESD sectors, the annual use of international credits is currently limited to up to 3% of each Member State's ESD emissions in 2005, with a limited number of Member States being permitted to use an additional 1% from projects in Least Developed Countries (LDCs) or Small Island Developing States (SIDS), subject to conditions; from 2021 onwards, as with the EU ETS, international credits will no longer be used for compliance under the ESD.
- The Global Warming Potentials (GWPs) used to aggregate GHG emissions up to 2020 under EU legislation were those based on the Second Assessment Report of the IPCC when the target was submitted. For the implementation until 2020, GWPs from the IPCC AR4 will be used consistently with the UNFCCC reporting guidelines for GHG inventories.

The above information is summarised in Table 3.1.

[7] The LULUCF Decision (Decision 529/2013) requires to prepare and maintain annual LULUCF accounts according to the rules set out in the Kyoto Protocol; however, these accounts do not contribute to the achievement of the EU Convention pledge.

Parameters	Target
Base Year	1990
Target Year	2020
Emission Reduction target	-20 % in 2020 compared to 1990
Gases covered	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6
Global Warming Potential	AR4
Sectors Covered	All IPCC sources and sectors with the exception of LULUCF, as measured by the full annual inventory including international aviation (outgoing flights).
Land Use, Land-Use Change, and Forestry (LULUCF)	Accounted under KP, reported in EU inventories under the Convention. Assumed to produce no debits
Use of international credits (JI and CDM)	Possible subject to quantitative and qualitative limits

Table 3.1 Key facts of the Convention target of the EU-28

3.2. The EU target compliance architecture

3.2.1. The 2020 climate energy package

In 2009, the EU established internal rules under its '2020 climate and energy package'[8] which underpin the EU implementation of the target under the Convention. The package introduced a clear approach to achieving the 20% reduction of the total GHG emissions from the 1990 levels, which is equivalent to a 14% reduction compared to the 2005 levels. This 14% reduction objective is divided between the ETS and ESD sectors. These two sub-targets are:

- A 21% reduction target compared to 2005 for emissions covered by the ETS (including domestic and international aviation);
- A 10% reduction target compared to 2005 for ESD sectors, shared between the 28 Member States (MS) through individual national GHG targets.

Under the EU ETS Directive as revised for the system's current trading period from 2013 to 2020 (Directive 2009/29/EC), a single ETS cap covers the EU Member States and three participating non-EU countries (Norway, Iceland and Liechtenstein), and there are no further individual caps by country. Allowances allocated in the EU ETS from 2013 to 2020 decrease by 1.74% annually, starting from the average level of allowances emitted by Member States for the second trading period (2008–2012).

The vast majority of emissions within the EU which fall outside the scope of the EU ETS are addressed under the Effort Sharing Decision (ESD) (Decision No 406/2009/EC). The ESD covers emissions from all sources outside the EU ETS, except for the minimis aviation emissions, international maritime emissions, and emissions and removals from land use, land-use change and forestry (LULUCF). It thus includes a diverse range of small-scale emitters in a wide range of sectors: transportation (cars, vans), buildings (particularly heating), services, small industrial installations, fugitive emissions from the energy sector, emissions of fluorinated gases from

8 http://ec.europa.eu/clima/policies/package/index_en.htm

appliances and other sources, agriculture and waste. Such sources accounted for 55% of the total GHG emissions in the EU over 2013[9].

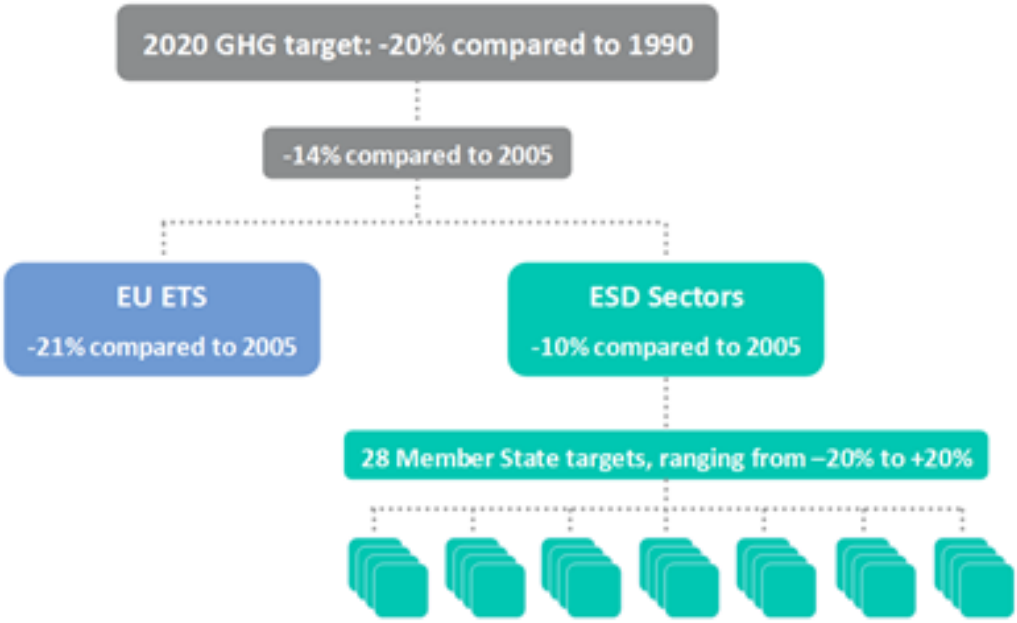

Figure 3.1 GHG targets under the 2020 climate and energy package

While the EU ETS target is to be achieved by the EU as a whole, the ESD target is divided into national targets to be achieved individually by each Member State (see Figure 3.1). Under the Effort Sharing Decision, national emission targets for 2020 are set, expressed as percentage changes from the 2005 levels. These changes have been transferred into binding quantified annual reduction targets for the period from 2013 to 2020 (Commission Decisions 2013/162/EU, 2013/634/EU and 2017/1471), denominated in Annual Emission Allocations (AEAs)[10,11,12]. At the country level, 2020 targets under the ESD range from -20% to +20% compared to the 2005 levels.

The target levels have been set on the basis of Member States' relative Gross Domestic Product per capita. Up to certain limitations, the ESD allows Member States to make use of flexibility provisions for meeting their annual targets: carry-over of over-achievements to subsequent years within each Member State, transfers of AEAs between Member States and the use of international credits (credits from the Joint Implementation and Clean Development Mechanism).

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[9] European Commission (2016). Commission Staff Working Document - Accompanying the document: Report from the Commission to the European Parliament and the Council on evaluating the implementation of Decision No 406/2009/EC pursuant to its Article 14 (SWD (2016) 251 final): https://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/10102-2016-251-EN-F1-1-ANNEX-1.PDF.

[10] Commission Decision of 26 March 2013 on determining Member States' annual emission allocations for the period from 2013 to 2020 pursuant to Decision No 406/2009/EC of the European Parliament and of the Council (2013/162/EU).

[11] Commission Implementing Decision of 31 October 2013 on the adjustments to Member States' annual emission allocations for the period from 2013 to 2020 pursuant to Decision No 406/2009/ EC of the European Parliament and of the Council (2013/634/EU).

[12] Commission Decision (EU) 2017/1471 of 10 August 2017 amending Decision 2013/162/EU to revise Member States' annual emission allocations for the period from 2017 to 2020 (notified under document C/2017/5556).

3.2.2. Monitoring progress towards the 2020 ESD targets

Monitoring, reporting and verification of the ESD targets mainly takes place through the submission of national GHG inventories by Member States. Chapter III of Commission Implementing Regulation 749/2014 sets out strict criteria on the basis of which the national GHG inventories and GHG emissions of Member States are reviewed annually at the EU level. Based on this review, the European Commission issues an implementing decision on Member States' ESD emissions in the given year, which might lead to Member States facing penalties or other consequences.

The ESD and the MMR have introduced an annual compliance cycle, requiring a review of Member States' greenhouse gas inventories to ensure compliance with their obligations under the ESD in the period 2013–2020. These reviews are carried out within a shorter time frame than the current UNFCCC inventory review so as to enable using flexibility provisions and taking corrective action, where necessary, at the end of each relevant year. The following progress has been made on the reviews:

- A comprehensive review was completed in 2016 to establish the GHG emission levels for the compliance years 2013 and 2014 in the ESD.
- A further review was completed in 2017 to establish the emission levels for the compliance year 2015.
- As of 2018, the annual review cycles continue.

3.3. The Dutch reduction targets

As elaborated ahead, the Netherlands is committed to jointly meeting the EU economy-wide emission reduction target under the Convention. As part of this target, Dutch companies have to fulfil their emission reduction commitments under the EU Emission Trading Scheme (EU ETS), while for the emissions not covered by the EU ETS, the emission reduction commitments are shared between the 28 Member States through individual national GHG targets.
In June 2015, the Dutch government faced judgment in the The Hague District Court in the case filed by Urgenda on the *overall national* reduction of greenhouse gas emissions in the Netherlands by 2020. The court ruled that by 2020, the Dutch government should have reduced national greenhouse gas emissions by 25% compared to the 1990 levels. Pending the government's appeal against this decision, it was obliged to start implementing the judgment. In October 2018, the The Hague Court of Appeal ruled in the case between Urgenda and the Dutch State that greenhouse gas emissions must have been reduced by at least 25% compared to the level of 1990 by the end of 2020. With this judgment, the Court of Appeal upheld the judgment of the The Hague District Court in the climate case.
In June 2019, in conjunction with the draft Climate Agreement, the Minister of Economic Affairs and Climate Policy informed Parliament about the implementation of the Urgenda judgment[13]. The government intends to implement the Urgenda judgment in conjunction with the measures in the Climate Agreement that it will be taking in the run-up to 2030, with the year 2020 a midway step leading up to 2030. As a consequence, the government believes that the measures required to implement the Urgenda judgment will enable a quick start to reducing CO_2 emissions, while at the same time ensuring that these measures do not erode support for its climate policy in the longer term. On 28 July 2019, the government announced a set of measures that will contribute towards

[13] Letter to the House of Representatives on the Urgenda judgment dated 18 June 2019
https://www.rijksoverheid.nl/documenten/kamerstukken/2019/06/28/kamerbrief-over-uitvoering-urgenda-vonnis

implementing the judgment, including a prohibition to use coal to generate electricity at Vattenfall NV's Hemweg power plant with effect from 1 January 2020.

3.3.1. The Dutch reduction target under the ETS

Under the revised EU ETS Directive (Directive 2009/29/EC), a single ETS cap covers the EU Member States and three participating non-EU countries (Norway, Iceland and Liechtenstein), while there are no further individual caps by country. There is therefore no specific Dutch reduction target under the ETS.
For more information on the EU ETS target, we refer to the EU's 4th Biennial Report.

3.3.2. The Dutch reduction target under the ESD (non-ETS)

The Netherlands is committed to jointly meeting the EU economy-wide emission reduction target under the Convention. As part of this target, the Netherlands is committed to reducing its emissions in sectors covered by the ESD (non-ETS) by 16% compared to 2005. The quantified annual reduction targets for the Netherlands, as set by EU Decisions[14] and expressed as annual emission allocations (AEAs) in tonnes CO_2-equivalent, are 122.9 million in 2013, decreasing to 107.4 million in 2020 (according to AR4 GWPs).

In accordance with Article 27 of Regulation (EU) No 525/2013 and on the basis of the GHG inventory data as reviewed under Article 19 of that Regulation, the Commission examined the impact of the use of the 2006 IPCC Guidelines – and of the changes to the UNFCCC methodologies used – on Member States' GHG inventories. The difference in the total greenhouse gas emissions relevant to Article 3 of Decision No 406/2009/EC exceeded 1% for most Member States. In the light of this outcome, all Member States' annual emission allocations for the years 2017 to 2020 as contained in Annex II to Decision 2013/162/EU should be revised in order to take into account the updated inventory data reported and reviewed pursuant to Article 19 of Regulation (EU) No 525/2013 in 2016.

Table 3.2 and Figure 3.3 present the AEAs for the period 2013–2020.

Year	Annual emission allocations (tonnes CO_2-eq.)	Year	Annual emission allocations (tonnes CO_2-eq.)
2013	122,948,129	2017	114,050,540
2014	120,675,928	2018	111,821,315
2015	118,403,725	2019	109,592,091
2016	116,131,523	2020	107,362,866

Table 3.2 Annual emission allocations (AEAs) assigned to the Netherlands using GWPs according to AR4, 2013–2020, in tonnes CO_2-eq.

[14] Decision 2013/162/EU http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013D0162&rid=1 and 2013/634/EU http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013D0634&rid=1 and Commission Decision (EU) 2017/1471 of 10 August 2017 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L:2017:209:TOC.

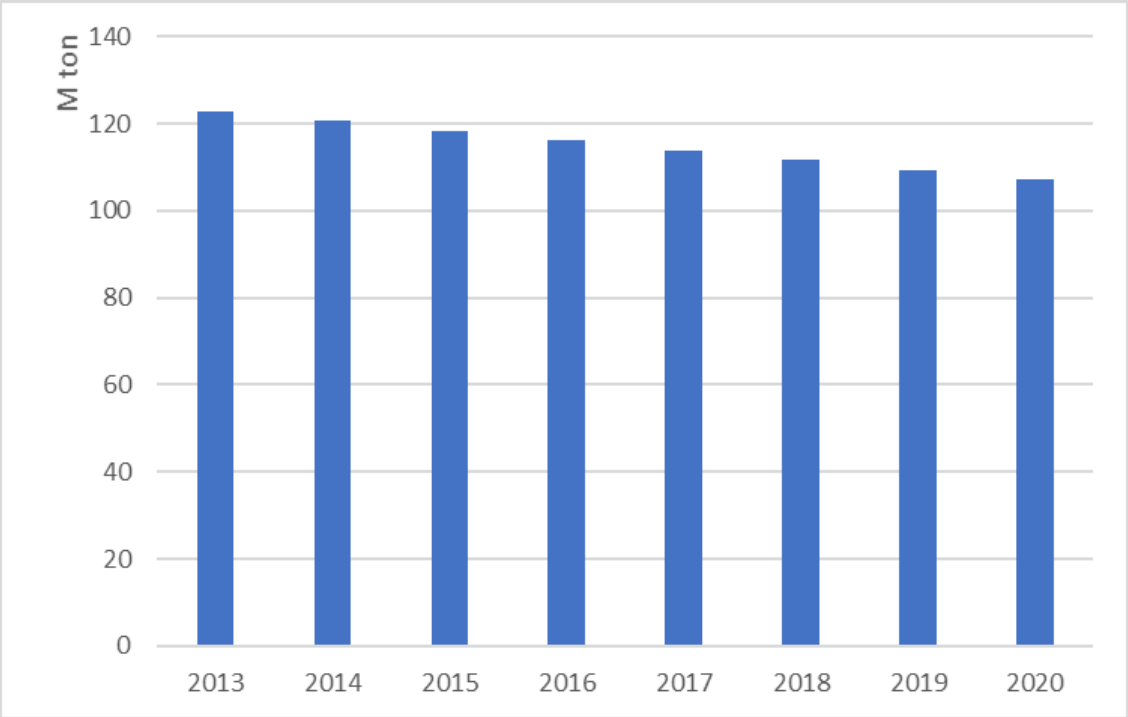

Figure 3.3 Annual emission allocations (AEAs) assigned to the Netherlands using GWPs according to AR4, 2013–2020, in Mton CO_2-eq.

4. Progress in the achievement of quantified economy-wide emission reduction targets and relevant information

4.1. Introduction

This chapter describes current policies and measures implemented since 1990 that have had (or are expected to have) a significant impact on greenhouse gas (GHG) emissions in the Netherlands, even if the primary objective of the policy is (or was) not directly related to climate change. It also describes cross-sectoral policies and measures. The scope of the chapter is limited to domestic and EU policies and measures implemented or planned in the Netherlands. A distinction is made between a scenario 'with existing measures' (WEM) and a scenario 'with additional measures' (WAM). The WEM scenario describes the policies that were implemented up to 1 May 2019. The WAM scenario is similar to the WEM scenario, but also includes policies that were formally planned by the government as known on that same date. The focus is also on policies that contribute to targets up to 2020. Most policies have an impact on the GHG emissions in both the Emission Trading Scheme (ETS) and non-ETS sectors.

As elaborated in section 3.3, the quantified annual reduction targets for the Netherlands up to 2020 are set by EU Decisions and amounted to 122.9 Mton CO2-eq. in 2013 for the non-ETS sectors, decreasing to 107.4 Mton in 2020. This target results in a cumulative amount of 921 Mton for the period 2013–2020. The non-ETS emissions in the period 2013–2018 were 612.7 Mton CO2-eq. (see Table 4.1). In 2013 and 2014, emissions fell due to mild winters, resulting in less energy use for space heating and reduced transport emissions. In 2015, emissions increased again, mainly due to a colder winter. In 2016, emissions increased yet again, partly due to another relatively cold winter but also as the result of increased industrial activities, more transport movements and a larger dairy herd. In 2017, emissions were higher due to increased industrial activities, more transport movements and higher emissions from manure.

Year	**Accounted Non-ETS emissions (tonnes CO_2-eq.)**	**Annual emission allocations (tonnes CO_2-eq.)**
2013	108,253,385	122,948,129
2014	97,887,338	120,675,928
2015	101,119,720	118,403,725
2016	101,333,437	116,131,523
2017	102,326,628	114,050,540
2018*	101,797,310	111,821,315

* 2018 preliminary data

Table 4.1 Non-ETS emissions and annual emission allocations (in tonnes CO_2-eq

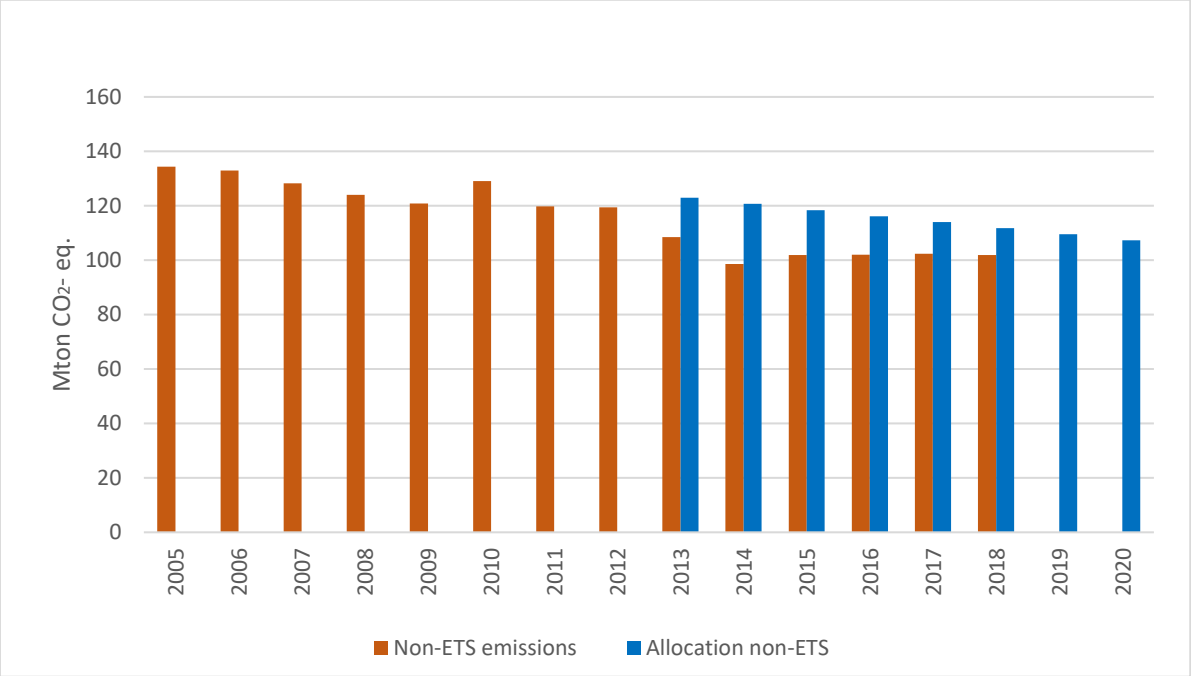

Figure 4.1 Greenhouse gas emissions for non-ETS sectors in 2005–2018 and annual emission allocations for 2013–2020, in Mton CO_2-eq. Emissions in 2018 are based on provisional data.

The non-ETS emissions in the remaining period (2017–2020) are projected to decrease, mainly due to further energy savings in buildings and in the agricultural sector, lower sales of fossil fuels for transport and lower non-CO_2 emissions. By 2020, the non-ETS emissions are expected to have dropped to 98 Mton CO_2-eq. (WEM). The cumulative non-ETS emissions in the entire budget period (2013–2020) are projected at 814 Mton CO_2-eq., excluding weather influences. As a result, it is expected that the Netherlands will meet its reduction targets for the period up to 2020 (see Figure 4.1). See for more details chapter 5.

The following sections further describe the groups of policies and measures, organised per sector and greenhouse gas. Only the most relevant measures are described in detail. The projected effects have been estimated on the basis of the projections described in the national Climate and Energy Outlook 2019. The estimated impacts of the main policy and measure packages on the reduction of GHG emissions are summarised in Table 4.1 as well as in CTF Table 3 within the CTF application.

The effects are usually presented for groups of policies and measures affecting the different sectors rather than for individual measures. In the analyses performed at a fairly high level of aggregation, it is often neither possible nor meaningful to distinguish the impacts of individual instruments and programmes that focus on the same emissions source or activity. In this way, double counting is largely avoided. The policy descriptions in the main text include the actual and expected interactions with other relevant policies and measures, as well as with Common and Coordinated Policies and Measures (CCPMs) of the European Union.

The policies described in the following sections are especially relevant for meeting the 2020 targets. With some exceptions, most of these policies have already been implemented (included in

the WEM projection scenario). Policies that are still at the planning stage (included in the WAM projection scenario) will be mentioned specifically.

In recent years, however, major policy developments have occurred that focus on the period up to 2030. In its coalition agreement, drawn up in 2017, the current government set the target to reduce these emissions nationally by 49% between 1990 and 2030. Some initial measures were announced, such as the ban on using coal for the generation of electricity and the introduction of a national minimum CO_2 price for power generators. Also, in accordance with the European Governance Regulation, national contributions were set to contribute to the European climate and energy targets for 2030[15]. To meet these targets, the government proposed new policies in June 2019[16]. These policies were largely based on the Climate Agreement[17], which was negotiated by many national stakeholders and builds on the 2013 Energy Agreement, which will expire in 2020 (2023 for renewable energy). Some major policy changes are briefly mentioned in the sections below, but they are not included in the WEM or WAM projection scenarios.

In June 2019[18], the government also announced measures in order to comply with the court ruling in the 'Urgenda' case to reduce emissions by 25% in 2020 compared to 1990. As these measures were announced too late for the modelling, they are not included in the projection scenarios, with the exception of the closure of a coal-fired power plant (the 'Hemweg' power plant) in 2020, which is included in the WAM projection scenario. This measure was announced earlier in 2019. The measures are briefly mentioned in the sections below.

Impacts other than emission reductions are included in the text as far as possible (including economic impacts, costs and non-greenhouse gas mitigation where feasible).

4.2. Cross-sectoral policies

This section describes the most relevant cross-cutting policies and measures, notably the Agreement on Energy for Sustainable Growth, the CO2 Emissions Trading System, the reduction programme for non-CO2 greenhouse gases (ROB), the Energy Tax and the Local Climate Agenda. By contrast, some other cross-cutting instruments such as the Energy Investment Tax Allowance (EIA), Sustainable Energy Generation (SDE+) schemes and Long-Term Agreements have a major impact in specific sectors and are consequently described in their respective sections.

4.2.1. Agreement on energy for Sustainable Growth ("Energy agreement")

As was the case in the previous Biennial Report, the Energy Agreement is pivotal for the climate and energy policies for the period up to 2020. In 2013, the Netherlands concluded a cross-sectoral agreement with more than 40 parties, including central and regional governments. This Agreement on Energy for Sustainable Growth marks a significant step in the transition towards a sustainable energy system in the Netherlands.

[15] https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/governance-energy-union/national-energy-climate-plans

[16] https://www.rijksoverheid.nl/documenten/rapporten/2019/06/28/klimaatakkoord

[17] https://www.klimaatakkoord.nl/documenten/publicaties/2018/09/19/proposal-for-key-points-of-the-climate-agreement

[18] https://www.rijksoverheid.nl/documenten/kamerstukken/2019/06/28/kamerbrief-over-uitvoering-urgenda-vonnis

Signatories to the Agreement share a responsibility and commitment to achieve the following overarching objectives:

- An average improvement in energy efficiency of 1.5% per year (adding up to a reduction of 100 PJ by 2020)
- A 14% share of renewable energy in the total Dutch consumption of energy by 2020 and 16% by 2023
- The creation of at least 15,000 additional jobs by 2020, of which a significant number are to be created in the next few years

The 2013 agreement includes some 160 actions for the signatories to implement this commitment, including actions by the central government. While some of the actions were new, others implied the intensification or modification of then-existing policy measures. In 2015, additional actions were agreed in order to attain the 2020 targets for energy efficiency and renewable energy (see also section 4.13). We describe the most relevant measures in the sections where they have the most impact.

4.2.2. CO_2 Emissions Trading

On 1 January 2005, a trading system for CO_2 emissions as prescribed by Directive 2003/87/EC was launched in the EU, focusing on CO_2 emissions from large industrial emitters. It is a 'cap and trade' system, in which participants are assigned a set amount of allowances up front and are required to report on their actual emissions each year. Companies are allowed to use credits from Kyoto mechanisms to comply with their obligations. The EU ETS includes more than 11,000 power stations and industrial plants in 31 countries, as well as airlines. It covers around 45% of the EU's greenhouse gas emissions. In the Netherlands, around 450 companies take part in the ETS. They are responsible for around 45% of the total emission of greenhouse gases in the Netherlands[19].

In 2013, the EU ETS entered its third phase, running up to 2020. A major revision (Directive 2009/29/EC) in 2009 to reinforce the system means that the third phase is significantly different from the first two phases and is based on rules that are far more harmonised than was previously the case. One of the changes is a single, EU-wide cap on emissions instead of the previous system of national caps. Auctioning is now the default method for allocating allowances. For those allowances that are not used up, harmonised allocation rules apply that are based on ambitious EU-wide benchmarks for emissions performance. The ETS now also includes more sectors (i.e. aviation) and gases (nitrous oxide, PFCs). Its allowances will be reduced by 21% between 2005 and 2020 in order to lower the total emissions

Although emission allowances are decreasing, the carbon price has remained below €10 per tonne of CO_2 since shortly after the start of the third phase. According to analysts, this was mainly due to a growing surplus of allowances, largely because of the economic crisis which limited emissions more than anticipated. Increasing renewable energy generation and energy savings also contributed to a lower demand for allowances. As a consequence, measures to strengthen the ETS have been debated within the EU. In 2014, the 'backloading' amendment was implemented, resulting in the postponed auctioning of 900 million allowances. Moreover, a market stability reserve was started in 2019 in order to absorb shocks in the market. The postponed allowances and any other unallocated allowances were transferred to the reserve. These measures have had a

[19] https://www.emissieautoriteit.nl/documenten/publicatie/2019/04/04/emissiecijfers-2013-2018

limited impact on the CO_2 price, as the total number of allowances in the third phase remains unchanged.

In 2018, the ETS directive was revised to enable in order to achieve the EU's 2030 emission reduction targets in line with the 2030 climate and energy policy framework. The revision defines the fourth trading period as running from 2021 up until 2030 and includes a sharper rate for the reduction of allowances in the period after 2020, as well as a reinforcement of the market stability reserve. The revised ETS is included in the WEM and WAM scenarios.

As one of the Green Deals (see section 4.2.5), the Netherlands is initiating a pilot of a national carbon market for emissions that are not covered by the EU ETS. This market will enable organisations to sell certificates that prove emission reductions and allow other parties to offset their emissions by buying these certificates, creating a market value for CO_2 emissions. The parties to the Green Deal aim to reduce their emissions by 0.5 Mton CO_2-eq. annually, starting from 2020. This measure is not included in the WEM and WAM scenario.

4.2.3. Energy tax

The objective of this policy is to boost energy savings by incentivising the reduction of gas and electricity consumption, which should incentivise consumers to adopt more energy-efficient behaviour. The Regulatory Energy Tax (REB) was introduced in 1996, changing its name to Energy Tax in 2004. Taxing energy use makes saving energy (by changing behaviour or investing in energy-saving measures) more attractive. The energy tax is levied on electricity and natural gas, while the level of the tax depends on 1) the consumer's energy consumption – the higher the consumption, the lower the energy tax levied (degressive tariff structure) – and 2) specific agreements between different sectors and the government. Tariffs are updated annually.

For small, residential consumers, the energy tax accounted for approximately 40% of the market price for natural gas and 30% of the market price for electricity in 2018. Industrial consumers pay a much lower tariff in order to secure a level playing field for these exposed companies. In addition, companies that are considered as energy-intensive according to the European Energy Tax Directive (2003/96/EC) and who have entered into a Long-Term Agreement with the government (see section 4.4.1) are eligible for a tax refund insofar as the overall tax tariff for electricity exceeds the minimum tariff of €0.05 per kWh. The energy tax also has a separate lower gas tariff for the horticulture sector, linked to the specific sectoral emission system in that sector.

In recent years, several changes have been made to promote the generation of renewable energy for cooperatives or associations of private homeowners. Since 2004, private homeowners have been allowed to settle the amount of electricity returned to the grid with their consumption (up to their annual consumption taken from the grid since 2012). This is referred to as net metering, which stimulates the installation of PV panels on the roofs of homeowners. In 2014, a lower tariff was introduced for cooperatives and associations of private homeowners that generate their own renewable energy. Since 2015, the electricity generated by landlords and tenants using solar panels has been exempted from taxation.

In order to support renewable heat options such as heat pumps and waste heat utilisation, the tariff for natural gas (up to the use of 170,000 cubic metres) has increased in recent years. For natural gas, the tariff increased by 16% between 2016 and 2019, while the tariff for electricity (up to the use of 10,000 kWh) decreased by 2% in this period.

As part of the Climate Agreement, the government proposed further adjustments in 2019. The tariffs for natural gas will increase further by €0.04 per m3 in 2020 (+16% compared to 2019 levels) and increase further by €0.01 in the six following years. The revenues of this increase will be used to lower the tax on electricity for the first tariff group, enabling lower-income households to participate in the energy transition

4.2.4. Energy Investment Tax Allowance

The Energy Investment Tax Allowance (EIA) is a tax relief programme[20]. It offers a direct financial advantage to companies in the Netherlands that invest in energy-saving equipment and sustainable energy. Companies have been allowed to deduct 55% (45% since 2019) of the investment costs for such equipment from their company's profits for tax over the calendar year in which the equipment was purchased. The list of eligible technologies is published annually. The list focuses on energy-saving technologies instead of renewable energy options; for the latter options, companies are referred to other policies and measures (such as SDE+). More technologies were added to the list in 2019. Similar programmes exist for other environmental measures that may lead to reductions of CO_2 emissions: Environmental Investment Allowances (MIA) and the arbitrary depreciation of environmental investments (Vamil).

4.2.5. Green Deals

The Dutch government set up the Green Deal programme in 2011 to stimulate green growth. More than 200 Green Deals have been signed, of which the majority are in the areas of energy and climate[21]. This instrument supports civil society parties, companies and local authorities that embark on initiatives related to green growth, but face obstacles that may require assistance from the national government to tackle. Exploiting opportunities to save energy and generate sustainable energy locally is not only a matter of access to finance. In practice, there are often other obstacles and difficulties to finding innovative solutions for scaling up green growth options in society, e.g. difficulties regarding regulations or permits, appropriate forms, networks for cooperation, and so on. The government helps to remove such obstacles.

The outputs of Green Deals are not measured in terms of CO_2 reduction or energy saved or generated, but rather in terms of creating better access to financial resources, providing more space for innovative solutions in permits and regulations, reinforcing network cooperation for more innovative projects that require joint action of various sectors in the industrial chain, and so on. Therefore, no figures on CO_2 reduction are reported. This also avoids the double counting of CO_2 reductions through other measures (such as energy taxes and feed-in premiums for renewable energy). The Green Deal approach was evaluated in 2016[22]. Based on this evaluation, it was decided that the Green Deals approach would be continued[23].

4.2.6. Local Climate Agenda

The Local Climate Agenda is a joint initiative bringing together local authorities (provinces, municipalities and regional water authorities) and the central government. They exchange

[20] https://www.rvo.nl/sites/default/files/2018/11/Investments%20in%20the%20industry%202018.pdf

[21] https://www.greendeals.nl/green-deals

[22] https://www.rijksoverheid.nl/documenten/rapporten/2016/06/30/eindrapport-evaluatie-green-deals

[23] https://www.rijksoverheid.nl/documenten/kamerstukken/2016/06/30/kamerbrief-aanbieden-beleidsevaluatie-green-deals

knowledge on best practices and report and address obstacles in legislation with the aim of realising more successful initiatives and facilitating processes such as regional climate agreements. The Agenda has also played a role in national processes, such as the Energy Agreement. Under the Energy Agreement, agreements were concluded for the further intensification of support actions by regional governments. Similar to the Green Deals, the effects are difficult to measure in terms of CO_2 reductions and/or energy savings or generation. The Agenda's progress was evaluated in 2015, with the main conclusion that it is highly valued by local authority participants[24]. After 2020, the local and regional authorities will be explicitly involved in the translation and implementation of the policy measures in the Climate Agreement at the regional and local level.

4.2.7. Energy innovation policy

The government stimulates innovations in energy technologies, products and services through various policy instruments, both generic (non-energy-specific) and specific. The main generic innovation instrument is the Research and Development (Promotion) Act (WBSO; the budget for 2019 was €1.205 billion), which provides fiscal benefits for research and development activities by companies. In addition, public or semi-public knowledge institutes (such as universities) have their research programmes financed. As regards specific instruments, the Top Sector Energy (TSE)[25] has been the main framework since 2012 for governments, knowledge institutes and companies from all sectors to cooperate. The TSE has its own subsidy scheme and several associated subsidy schemes such as the MIT (for small and medium-sized enterprises), DEI (demonstration projects) and HER (reducing the costs of renewable energy technologies). Public spending on energy innovations is monitored by the Netherlands Enterprise Agency[26].

As part of the Climate Agreement adopted by the government in 2019, the policy framework for energy innovations is changing towards mission-oriented innovation programmes. The integral knowledge and innovation agenda (IKIA), published in 2019[27], specifies five missions that contribute to a deep emission reduction of greenhouse gases by 2050. The missions for 2050 are a CO_2 emission-free electricity generation, buildings and transport as well as climate-neutral industry and agriculture/nature. Intermediate targets for 2030 have been formulated for each mission. The knowledge and innovation needs for attaining these targets have been formulated in 13 innovation programmes[28]. These programmes will serve as the basis for energy innovation policy instruments, such as TSE, DEI and HER (see above).

The impact of energy innovation policy on CO_2 reduction is not calculated, as this figure is difficult to determine. Innovation subsidies support innovation projects that are still in development and that are not market-ready. As a consequence, the uncertainties in their market roll-out are significant. This approach also prevents the double counting of the effects of other policy instruments, such as SDE+ and EIA, which aim to stimulate the market roll-out of new low-CO_2 technologies

[24] https://zoek.officielebekendmakingen.nl/blg-540033.pdf

[25] https://topsectorenergie.nl/

[26] https://www.rvo.nl/monitor-publiek-gefinancierd-energieonderzoek

[27] https://www.klimaatakkoord.nl/themas/kennis--en-innovatieagenda/documenten/publicaties/2019/03/12/innoveren-met-een-missie

[28] https://www.topsectorenergie.nl/missies-energietransitie-en-duurzaamheid

4.2.8. Energy Transition Financing Facility (ETFF)

The Energy Transition Financing Facility (ETFF) investment fund has been in operation since 2017. The fund provides attractive loans to companies investing in energy projects with higher financial risks, such as geothermal, energy storage and biomass. The fund, which had an initial budget of €100 million, is operated by Invest-NL, previously known as the Netherlands Investment Agency (NIA).

4.2.9. Reduction Programme for non-CO_2 Greenhouse Gases

This programme (Dutch acronym: ROB) was set up in 1998 and focuses on reducing Dutch emissions of non-CO_2 greenhouse gases. The target is a reduction of 8–10 Mton CO_2-eq. in 2020, working towards the desired level of 25–27 Mton CO_2-eq. This figure would mean a reduction of 50% compared to the reference year (1990). By 2018, a reduction of about 52% (relative to 1990) had already been achieved on the basis of reductions in the nitric acid industry (through admission into the EU ETS), the aluminium industry, HCFC-22 production, the waste disposal sector and agriculture, among other areas.

Over the period 1998–2009, ROB subsidised the development and implementation of innovative reduction technologies (demonstration projects and market introduction) and supported research and communication projects. This support was organised in close cooperation with private companies, research institutes, universities, and provincial and municipal authorities.

Since 2009, the focus of ROB has been on targeting the most significant emission sources (cooling (fluorinated gases), industry (semiconductor industry, caprolactam production), sewage treatment facilities (methane and nitrous oxide), agriculture (methane and nitrous oxide), CHP engines (methane)) and monitoring sources of non-CO_2 greenhouse gases. Subsidies have been stopped, as they are no longer considered effective. Other areas of focus for the reduction policy have been research, communication, and cooperation and deals with the sectors and stakeholders.

The reduction of the emission of fluorinated gases is mainly based on the national implementation of EU legislation concerning ozone and F-gases. Since its implementation in 2015, the European F-gas regulation (517/2014) has been the main driver of the further reduction of the emission of fluorinated gases in the Netherlands.

As for emission reductions in agriculture (the major source of non-CO_2 greenhouse gas emissions in the Netherlands), a voluntary agreement between the government and the sector was agreed in 2008 (the 'Agro covenant'). For more information on the Agro covenant, see section 4.6.1.

Although the programme has been phased down, it is still having an effect on emissions, which is why it is included in the reporting and projections.

4.3. Energy

The Energy Agreement is the main framework for energy saving and renewable energy targets for national policies in the energy sector up until 2020. Several national policies and instruments within this framework are especially important for the energy sector, such as SDE+ subsidies. The new policy measures in the Climate Agreement will form the main framework for national policies after 2020. These policies are not included in the WEM or WAM projection scenarios. Key European instruments are the EU ETS, the Renewable Energy Directive and the Energy Efficiency Directive (which includes smart metering). The most important policy instruments currently in effect that have a major impact on the energy sector are described below.

4.3.1. SDE+: Stimulation of Sustainable Energy Production incentive scheme

General development of SDE+
The production of renewable energy has been encouraged by the government for many years, mostly using feed-in premium schemes which evolved over time. The current scheme is the so-called SDE+ (Stimulation of Sustainable Energy Production) incentive scheme, which has been in place since 2011. The SDE+ scheme is a floating feed-in premium system, financed by a surcharge on the energy tax paid by the end consumers of natural gas and electricity. This surcharge is referred to as the Sustainable Energy Surcharge (ODE). SDE+ takes an innovative tender approach involving a selection of projects proposed by the private sector on the basis of cost-effectiveness with regard to the expected cost of the various available technologies. The premium is to be paid once the facility is in operation on the basis of the power generation for a period of up to 10 or 15 years. Annual budgets for the tenders are set by the government. The budgets have increased substantially in recent years. In 2011, the annual budget was set at €2 billion. This figure increased to €3.5 billion in 2014 and €8 billion in 2016. In 2017 and 2018, the annual budget was €12 billion, in 2019 €19 billion. Payments within the context of the previous feed-in premium schemes MEP and SDE are still ongoing, as the subsidies run for 10 to 15 years. These payments are financed through the government budget.

As part of the Climate Agreement, SDE+ will change to SDE++ from 2020 and onwards. SDE++ will not only subsidise renewable energy production, but also cost-effective CO_2 emission reductions. The list of eligible technologies and projects will be published in early 2020.

SDE+ definition of the feed-in premium
The SDE+ scheme works as an operating grant. Producers receive financial compensation for the unprofitable component of the cost of the renewable energy that they generate. The production of renewable energy is not always profitable because the cost price of renewable energy can be higher than that of energy derived from fossil fuel. The difference in cost price is called the unprofitable component. SDE+ compensates producers for this unprofitable component over a fixed number of years, depending on the technology used. The scheme is available for the production of renewable electricity, renewable gas and renewable heat or a combination of renewable heat and electricity (combined heat and power, CHP).

The cost price for the generation of renewable energy is set off in the base sum for the technology. These prices are defined annually in order to incorporate technological improvements and other developments on the market that affect the cost price (such as installation, construction materials and so on). The yield of fossil energy is established in the correction amount. This method makes the level of the SDE contribution dependent on energy price developments. When the energy price is high, producers receive less from the SDE+ scheme and more from the energy consumer. If the energy price is lower, they receive more from the SDE+ scheme and less from the energy consumer. The correction amount is the average energy price per category during the year of production. The base energy price is the lower limit for the correction amount. When the correction amount is equal to the base energy price, the maximum grant is paid out. The final payments are calculated per year based on the amount of energy produced and the actual energy price.

Primary target groups for SDE+ are companies, institutions and non-profit organisations. The project must be implemented in the Netherlands and the national government is excluded from participation. SDE+ is implemented through the Netherlands Enterprise Agency.

Support for combined heat and power (CHP) under the SDE/SDE+ scheme ceased in 2010 as the government has chosen not to interfere in the market economy process for mature technologies such as CHP.

4.3.2. Offshore wind energy agreements tenders

Offshore wind energy is pivotal for the Netherlands in that it contributes to meeting targets in the Energy Agreement and realising the ambition to reduce greenhouse gas emissions by 49% by 2030. In order to encourage the generation of offshore wind energy, the Regulation on Offshore Wind Energy and the Implementation Regulation on the Offshore Wind Energy Act were published on 3 July 2015. Both have applied since 1 December 2015 and were updated in 2016 and 2017. This legislative framework establishes statutory provisions for the allocation of suitable sites for offshore wind farms as well as the process of issuing permits and awarding subsidies for the construction and operation of offshore wind farms. Roadmaps have been drawn up for the development of offshore winds farms in the North Sea. The first roadmap, which was part of the Energy Agreement, outlines how the generation capacity of offshore wind farms is to be increased from 1,000 MW to 4,500 MW in 2023. Five offshore wind farm zones have been designated for the development of new wind farms and a new scheme has been launched to facilitate the establishment of these farms. The development of two zones was awarded to project developers in 2015 and 2016. The first zone concerns the Borssele Wind Farm Sites I and II, 22 kilometres off the coast of the province of Zeeland. The offshore wind farms built on Borssele Sites I and II will have a capacity of 350 MW per site. The second zone concerns Borssele Wind Farm Sites III (330 MW) and IV (350 MW). In 2017, tenders were opened for the Borssele Wind Farm Innovation Site V (20 MW) and the so-called 'Hollandse Kust' site (Dutch Coast; 700 MW). Permits have now been issued for all these sites. The remaining two zones, both 700 MW, were opened to tender in 2018 and 2019. In 2019, a permit was issued for the 2018 'Hollandse Kust' sites III and IV. It is expected that a permit will also be issued for the 2019 'Hollandse Kust' site V.

The second roadmap was adopted in 2018. It provides an outline of the development of at least 7 GW additional offshore wind energy capacity in the period from 2024 up until 2030[29].

The Climate Agreement foresees a further roll-out of offshore wind farms. The ambition is to generate around 49 TWh by 2030 (corresponding approximately to 11.5 GW). To realise offshore wind farms beyond 2030, a North Sea Strategy will be developed. The national government will take a sufficient number of site decisions in a timely fashion and is de-risking projects by conducting preliminary studies, issuing permits and a sufficient number of tenders, and commissioning TenneT to construct the offshore grid (as long as wind farms are used to generate electricity).

4.3.3. Onshore wind energy agreements (Intergovernmental Wind Energy Agreement (BLOW) and the new Energy Agreement)

The BLOW target of 1,500 MW in onshore wind power capacity by 2010 was reached in 2007. In March 2009, the Government Coordination Rule was introduced for onshore wind projects exceeding 100 MW. This rule means that the Minister of Economic Affairs and Climate Policy is responsible for spatial planning regarding these projects and for coordinating the issue of environmental and other permits. Early in 2013, new agreements were concluded between provincial governments and the national government in order to increase the onshore wind power

[29] https://www.rijksoverheid.nl/documenten/kamerstukken/2018/03/27/kamerbrief-routekaart-windenergie-op-zee-2030

capacity to 6,000 MW in 2020. The Energy Agreement of 2013 integrated these agreements. As per 1 January 2015, all provinces have included the spatial possibilities for their part of the agreement into their spatial planning. They are now focused on integrating these elements into specific regional plans and permit processes. As part of this process, the provinces aim to maximise support for these plans within society. Larger projects are coordinated with the national government, small installations with the municipalities. Since 2010, the amount of wind power capacity installed has increased rapidly. At the end of 2018, nearly 3,500 MW had been installed[30].

The Climate Agreement aims to increase large-scale renewable electricity generation up to at least 35 TWh by 2030 (includes onshore wind farms and solar parks). In 2017, onshore wind farms generated nearly 7 TWh.

4.3.4. Investment Subsidy Renewable Energy (ISDE)

While SDE+ focuses on supporting large-scale renewable energy projects, a subsidy for small-scale investments in renewable heat installations was introduced in 2016. Both consumers and businesses can apply for a one-time investment subsidy to purchase heat pumps, biomass boilers, pellet stoves and solar collectors. Subsidy budgets are set annually by the government. In 2016, the budget was set at €70 million, resulting in 27,000 applications for a subsidy. In 2017, the budget was set at €90 million and it was increased to €100 million in both 2018 and 2019. The number of applications can be found on the Netherlands Enterprise Agency website[31].
ISDE will be continued after 2020 as part of the Climate Agreement. A policy evaluation of ISDE is planned for 2019. The desirability to subsidise pellet stoves will be evaluated due to air quality concerns.

4.3.5. Subsidy scheme for energy savings and renewable energy in sports facilities

The Netherlands has many sports facilities such as swimming pools and enclosed areas that consume a great deal of energy. In order to stimulate the reduction of energy consumption and the generation of renewable energy, the Netherlands introduced a subsidy scheme in 2016. In the period up to 2018, the subsidy was 15–30% of the investment in certain categories of measures, such as LED lighting, heat pumps, insulation and renewable energy generation with solar panels, collectors or biomass boilers. The maximum subsidy per applicant was €125,000 per year. The annual budget was €6 million[32]. In 2019, the subsidy scheme was changed to allow for the subsidy of 20% of the costs (up to €2.5 million per applicant), with a total budget in 2019 of €87 million[33].

4.3.6. Financial insurance for geothermal energy

Geothermal energy projects are often seen as investments with higher financial risks, as the results of drilling – which is often a major part of the investment costs – are relatively uncertain. In order to mitigate the financial risks of geothermal projects, the government has offered financial insurance since 2009 to compensate for the costs of drilling when results are disappointing[34]. The budget for 2019 was €66,6 million.

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[30] http://www.clo.nl/indicatoren/nl0386-windvermogen-in-nederland

[31] https://www.rvo.nl/subsidies-regelingen/investeringssubsidie-duurzame-energie-isde/stand-van-zaken-isde

[32] https://zoek.officielebekendmakingen.nl/stcrt-2015-25937.html

[33] https://www.dus-i.nl/subsidies/stimulering-bouw-en-onderhoud-sportaccommodaties

[34] https://www.rvo.nl/subsidies-regelingen/risicos-dekken-voor-aardwarmte-2019

4.3.7. Smart metering (dissemination of smart meters)

In order to improve the possibilities for consumers to conserve energy, smart meters are being installed in most households in the Netherlands. The smart meter is being rolled out in two stages. Starting in 2012, a small-scale roll-out was used for pilot purposes. During this small-scale roll-out, some 600,000 smart meters for electricity and gas were installed during regular meter replacements (e.g. depreciation), in newly built houses or as part of large-scale renovations, or by customer request. This phase and its effects were subject to monitoring. Based on the outcomes, it was decided to continue with a larger-scale roll-out from 2015 onwards. The aim is to have smart meters installed in at least 80% of households and small businesses by 2020, as mandated by the third Energy Package of the EU. Nearly 3 million households already had a smart meter at the end of 2016[35].

4.3.8. Emission Standards for Medium-Sized Combustion Plants Decree (BEMS)

Gas engines are widely used for the combined generation of heat and electricity (CHP) in the Dutch horticulture sector, and to a lesser extent in the service sector. Part of the natural gas in these engines remains unburnt and is emitted as methane (which is called 'methane slip'). In the Emission Standards for Medium-Sized Combustion Plants Decree (BEMS), the government set maximum emission levels for methane (hydrocarbons) and other air pollutants. These were evaluated in 2013. This Decree, together with a series of other regulations on emissions from installations, was integrated into the Activities Decree and the Activities Regulations in 2013, both part of the Environmental Management Act (see section 4.14.2). This law regulates about 100 activities, such as storage in tanks and packages, medium-sized combustion plants, work on materials (mechanical labour, coating and so on), agricultural activities and some industrial processes (such as large combustion plants). For some of these activities, the regulations are an implementation of EU legislation, such as the Industrial Emissions Directive.

4.3.9. Ban on the use of coal to generate electricity

By 2030, the use of coal to generate electricity will have been banned. This applies to all power plants, including three modern, recently built plants. For older plants, the ban will come into force earlier: RWE's Amer power plant by 2025 and Vattenfall's Hemweg power plant by 2020. Plants may switch to other fuels, such as biomass. This ban is included in the WAM scenario.

4.3.10. National minimum price for CO_2 emissions from power generation

In 2020, the government will also be introducing a minimum carbon price for the generation of electricity, which will be enshrined in law. This was announced in the 2017 coalition agreement and is included in the WAM scenario. The minimum price acts as a safeguard in case prices in the EU ETS are lower than expected. The minimum price starts at €12.30 per tonne CO_2 in 2020 and will gradually increase to €31.90 per tonne CO_2.

[35] https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/gebouwen/hoe-werkt-de-slimme-meter

4.4. Industry

For the industrial sector, both European and national policies are relevant. In addition to the aforementioned Industrial Emissions Directive, the EU ETS is the other key European policy instrument which regulates CO2 emissions (see section 4.2 on cross-sectoral policies). Most national policies are aimed at improving industrial energy efficiency. These policies include the Long-Term Agreements (LTA) with industrial sectors, backed up by environmental permits on the basis of the Environmental Management Act, renewable energy subsidies (SDE+), innovation policy and the Energy Investment Tax Allowance (EIA) scheme, running in parallel with the corporate tax system (see above).

4.4.1. Long-Term Agreements on Energy Efficiency (LTA / LEE)

The first series of Long-Term Agreements (LTA) was concluded in 1992 to improve the energy efficiency of companies. LTAs are voluntary agreements on energy efficiency between the national government, the trade associations and the participating companies. In LTA1 (1992–1998), the focus was on process efficiency. In 1998, most parties continued the covenant through LTA2, while large industrial enterprises adopted the Benchmarking Covenant. Apart from the Ministry of Economic Affairs, the Ministries of Housing, Spatial Planning and the Environment, of Agriculture, Nature and Food Quality and of Transport, Public Works and Water Management were also involved with LTA2. The focus in LTA2 was still on process efficiency, but the scope was expanded to include sustainable energy and chain efficiency, among other things. In 2008, LTA2 changed to LTA3 for the period 2001–2020. The choice was made to intensify, extend and broaden the LTA instrument. Among other things, this intensification means that businesses should aim to attain an improvement in energy efficiency of 30 per cent in the period 2001–2020. Roadmaps for the longer term (2030) have been introduced as well. There is also an increased focus on chain efficiency and cooperation across sectors. For companies that are obliged to participate in the EU ETS, a separate LTA – the Long-Term Agreement on Energy Efficiency for ETS companies (LEE) – was adopted in 2009. Results of LTA/LEE covenants are described annually in the report 'Covenants result brochure: Long-Term Agreements on Energy Efficiency'[36].

Within the scope of the Agreement on Energy for Sustainable Growth, a series of reinforcing measures were agreed in 2013:

- Participating companies are required to obtain an annual declaration of progress, based on their annual monitoring reports, in order to benefit from certain advantages of participating in the LTA (eligibility for lower energy tax, eligibility for participation in the ETS compensation measure and so on). These declarations are only issued after compliance checks by the Netherlands Enterprise Agency, i.e. based on the progress in fulfilling the agreed commitments. If a specific company does not obtain a declaration, this has repercussions for its energy tax relief and ETS compensation.
- Large energy-intensive companies – the ones that are covered by the ETS – joined the government in striving to supplement the Long-Term Voluntary Agreement on Energy Efficiency with a framework of company-specific (i.e. one-on-one) agreements. These agreements focus on improving the energy efficiency and competitiveness of the companies concerned.
- An Energy Performance Assessment (EPA) pilot project (including an evaluation) was set up for other companies. In addition, an independent centre of expertise was set up to assist businesses and funding bodies in identifying the most effective measures for energy efficiency

[36] https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/energie-besparen/mja3-mee/publicaties/resultatenbrochures

in the industry (and agriculture). At the time of writing this report, these pilots are running within the framework of a specific Green Deal.

In 2015, additional measures were adopted in order to meet the target of 100 PJ in energy savings contained in the Agreement on Energy for Sustainable Growth. One of the measures is to intensify the promotion and facilitation of energy savings at LTA companies. This is done by providing more insight into ways to reduce energy consumption and remove obstacles.

Long-Term Agreements are enforced using environmental permits: companies that do not participate are required (in their permits) to implement all energy-saving measures with a payback period of less than five years. Participants in LTA3 or LEE are exempt from the obligation to carry out an energy audit under Article 8 of the EU Energy Efficiency Directive. Instead, participants in LTA draw up an Energy Efficiency Plan (EEP) every four years for the next four-year period. In addition to their results, they have to submit annual monitoring reports on projects that have actually been implemented. In 2016, the companies submitted new four-year plans, which were scrutinised by the Netherlands Enterprise Agency.

In addition to the four-year plans, the LEE companies committed themselves to achieve an additional 9 PJ in energy savings to meet the 2020 targets. The Netherlands Enterprise Agency set an individual efficiency target for each participating company in May 2017. In November 2017, the companies submitted their additional projects, which were assessed by the Netherlands Enterprise Agency in the beginning of 2018. This so-called Addendum to the LEE requires companies to submit a separate annual monitoring report. If monitoring results indicate that realising the 9 PJ as a whole is no longer feasible by the end of 2020, a compensation mechanism obliges companies that do not realise their share of the 9 PJ to pay €12 per GJ efficiency not realised. The efficiency targets of the individual companies in a sector together constitute the sector goal. If a company falls short of its share of the 9 PJ, but the sector target is achieved due to the overperformance of other companies in the sector, the company does not have to pay the compensation.

The Climate Agreement stipulates that the LTA/LEE covenants will not be continued after 2020. In order to stimulate emission reductions within the industry, a national CO_2 tax will be introduced, starting in 2021 at €30 per tonne CO_2 and increasing to €125–150 per tonne by 2030. The national tax includes the EUA price in the EU ETS, so the actual tax depends on the EUA price. At the same time, the possibilities to subsidise emission reductions in the industrial sector will be expanded (through the SDE++). Details of the tax are still being worked out.

Due to the 'Urgenda' court ruling, a subsidy instrument will be introduced to reduce CO_2 emissions with readily available technologies, but with a higher payback time (7–12 years).

4.4.2. Policy for non-CO2 greenhouse gases in the industrial sector

The main policy instrument in this field was the reduction programme for non-CO_2 greenhouse gases (described in section 4.2.9). Around the year 2000, substantial reductions in non-CO_2 greenhouse gases were achieved through 1) environmental permit requirements for the producers of HCFC-22 and aluminium; 2) limitations on emissions of fluoride and other pollutants, resulting in a reduction of HFC emissions achieved through the implementation of an afterburner system; 3) reduced PFC emissions; 4) voluntary agreements with both the oil and gas and the aluminium industries to improve their energy efficiency, resulting in reduced CH_4 and PFC emissions; and 5) adaptations to regulations for reducing the emissions of methane from landfill sites, which were introduced to reduce local safety hazards due to the potential build-up and explosion of methane and to cut down on odours associated with landfill sites.

From 2008, significant N_2O reductions were achieved in nitric acid production. Whereas emissions in 2007 totalled 4.4 Mton CO_2-eq., they had fallen to 0.6 Mton CO_2-eq. in 2008 after the introduction of reduction techniques. The emissions in recent years have been less than 0.4 Mton CO_2-eq. In 2008, the Climate Commission of the European Member States ratified the European Commission proposal to incorporate nitrous oxide (N_2O) emissions into the European Emissions Trading System (ETS) for greenhouse gases. In the Netherlands, two production facilities for nitric acid – DSM and Yara – were affected by this decision. They received a permit for an emissions ceiling of 1.2 Mton CO_2-eq. in 2010, decreasing to 1.0 Mton CO_2-eq. by 2020.

PFC and SF_6 are used to clean processing chambers as well as in the etching process within the semiconductor industry. SF_6 is also used in the power current sector and in the production of double glazing and electron microscopes. The total Dutch emissions of SF_6 (as reported under IPCC sector 2F8) amount to less than 0.5%. There is only one producer of semiconductors in the Netherlands, with a single production location. Thanks to several PFC reduction measures, the producer has realised a significant emission reduction. With a new Voluntary Agreement for the Global Semiconductors Industry (2010–2020), the semiconductor industry aims to achieve a 30% reduction of F-gases in 2020 as compared to 2010.

Though these measures were taken years ago, significant reductions are still included in the projections, which is the reason for a brief mention of these policies and measures in this report as well.

Due to the 'Urgenda' court ruling, a financial stimulus has been announced to reduce N_2O emissions on the Chemelot industrial complex from 2020 and onwards. A sectoral agreement will be concluded with the offshore oil and gas extraction industry in order to reduce emissions from venting and flaring of methane.

4.5. Transport

Mobility and transport is one of the areas within the Energy Agreement and Climate Agreement for which a common target and working programme has been agreed. Ambitious European measures for cleaner fuels and more fuel-efficient cars play a crucial role in this working programme. This programme includes the continuation of fiscal measures to boost the use of cleaner vehicles, pilots for zero-emission distribution into cities and the stimulation of action plans for large companies.

4.5.1. Transition to sustainable mobility

In the 2013 Energy Agreement, an ambitious goal was agreed to limit CO_2 emissions to 25 Mton CO_2 by 2030 and 12.2 Mton by 2050. To realise this ambition, a new government vision on fuels for transport was adopted in 2014. This vision encompasses a wide variety of low-CO_2 fuel combinations for transport, including electricity, hydrogen, advanced biofuels and LNG. In 2015, actions were proposed in order to meet the target. One of the adopted measures was a Green Deal on electric vehicles. Government and business organisations agreed to promote electric vehicles by developing the consumer market and the EV infrastructure as well as initiating innovation projects. The ambition was that by 2025, 50% of newly sold cars would be electric. The Climate Agreement contains new ambitions and measures for the period up to 2030, relating to sustainable fuels, non-emission vehicles (100% of newly sold cars by 2030), switching to more sustainable modalities (i.e. from car to bicycle) and sustainable logistics (i.e. introduction of a kilometre tariff for trucks, zero-emission zones in cities and an aviation tax).

At present, the roll-out of electric vehicles and infrastructure is ongoing, with most of the measures being implemented within the framework of the Green Deals and – in recent years – fiscal policies. Registration of new semi-electric or electric vehicles has increased sharply in recent years[37].

4.5.2. Sustainable fuels

European Directive 2009/28/EC on renewable energy has been implemented into Dutch legislation. This Directive states that Member States should ensure that a minimum of 10% of all energy consumption in transport must come from renewable sources by 2020. In practice, this target is met through biofuels. In 2018, the share of this energy source was 8,9%[38] and it was mainly produced from waste (72%). Dutch policy is aimed at maximising the share of advanced biofuels that are not produced from food/feed crops. In 2018, the share of advanced biofuels was 0.8%. Because blending biofuels is obligatory, there are no additional tax incentives or subsidy programmes. Due to the 'Urgenda' court ruling, the minimum share of renewable energy sources will be extended to include fuel consumption by inland navigation vessels.

In 2006, a total of €60 million was set aside for the production of innovative biofuels in the Netherlands. This programme helped to build biodiesel plants that can produce biodiesel from waste and residues. In addition, several subsidy programmes aimed at filling stations for alternative fuels were implemented in the period 2008–2013[39]. This policy resulted in the construction of around 100 filling stations for biogas and 35 for high-blend bio-ethanol (E85).

4.5.3. Eco-Driving (The New Driving) and Truck of the Future programmes

In order to promote a fuel-efficient driving style among car users, the former Dutch Ministry of Transport and Water launched the Dutch Eco-Driving programme in 1999. The programme 'The New Driving' (*HNR 1.0*) used information campaigns, financed demonstration projects and employed other kinds of dissemination (i.e. cooperation with businesses) to promote the benefits of a fuel-efficient driving style. In 2010, the Ministry provided funding to the Institute for Sustainable Mobility (IVDM) for a four-year period. During this period, the IVDM acquired and supported 19 projects and initiatives which were aimed at reducing fuel consumption by promoting eco-driving (*HNR 2.0*). As part of the 2013 Energy Agreement, parties agreed to continue the eco-driving programme after 2014 without government funding. As from 2015, the programme has been financed by automotive associations RAI, BOVAG and ANWB (*HNR 3.0*). One of the instruments used is a website (launched in 2017) where consumers can find information on the benefits of eco-driving and which provides car owners with information on applying eco-driving for each car and type. Other means of communication are also used, such as informing car owners through car dealers.

A similar programme for the trucks of the future was launched in 2010. In the demonstration programme 'Truck of the Future', various measures were examined that allow companies in the transport sector to save fuel, thereby reducing CO_2 emissions. Through the programme, for which

[37] https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/energie-en-milieu-innovaties/elektrisch-rijden/stand-van-zaken/cijfers

[38] https://www.emissieautoriteit.nl/onderwerpen/rapportages-ev-2018/documenten/publicatie/2019/07/03/rapportage-energie-voor-vervoer-in-nederland-2018

[39] Subsidy programme 'Filling Stations Alternative Fuels" and the experimental programme for sustainable transport.

the government provided subsidies in the period 2010–2014, insight was gained into fuel-saving measures and the extent to which these measures were commercially interesting.

Apart from the Eco-Driving programme, other communication campaigns have been implemented by the former Ministry of Infrastructure and Environment in recent years. These projects include a campaign promoting carpooling, car-sharing and modal shift ('I am a hopper') as well as a campaign about choosing the right energy-efficient tyres and applying the correct tyre pressure 'Choose the best tyre'), in cooperation with stakeholders. Due to the 'Urgenda' court ruling, these campaigns will be intensified.

4.5.4. EU CO_2 emissions performance standards

In 2009, the legislation on CO_2 emissions from passenger cars was officially published in the shape of Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009, setting emission performance standards for new passenger cars as part of the European Community's integrated approach to reducing CO_2 emissions from light-duty vehicles. The fleet average to be achieved by all cars registered in the EU is 130 grams per kilometre (g/km). A so-called 'limit value curve' implies that heavier cars are allowed to produce higher emissions than lighter cars while preserving the overall fleet average. In 2012, 65% of each manufacturer's newly registered cars had to comply (on average) with the limit value curve set by the legislation. This figure rose to 75% in 2013, to 80% in 2014 and to 100% for the period from 2015 onwards. A target of 95 g/km is specified for the year 2021.

The Netherlands had already achieved the 130-grams level by 2011, with the Dutch motor vehicle tax system contributing to this achievement. As a result of fiscal policy, the sales of fuel-efficient, electric and PHEV cars have risen sharply over the past few years. Fiscal policy includes a private motor vehicle and motorcycle tax (BPM) that must be paid when a car, motorcycle or light commercial vehicle is registered in the Netherlands for the first time. The BPM payable on a passenger car is determined by the car's CO_2 emissions. BPM is not charged for electric cars and low-emission cars. CO_2 emission figures for each type of vehicle are listed in the register that is kept by the vehicle registration authority RDW. In addition, beneficial fiscal rules apply to business drivers leasing low-emission cars.

In 2011, European legislation on CO_2 emissions for light commercial vehicles was officially published in the shape of Regulation (EU) No 510/2011 of the European Parliament and of the Council of 11 May 2011 setting emission performance standards for new light commercial vehicles as part of the Union's integrated approach to reduce CO_2 emissions from light-duty vehicles. The fleet average to be achieved by all cars registered in the EU is 175 grams per kilometre (g/km). A so-called 'limit value curve' implies that heavier cars are allowed to produce higher emissions than lighter cars while preserving the overall fleet average. In 2014, 70% of each manufacturer's newly registered light commercial vehicles had to comply (on average) with the limit value curve set by the legislation. This figure rose to 75% in 2015, to 80% in 2016 and to 100% for the period from 2017 onwards. A target of 147 g/km is specified for the year 2021.

In 2019, new emission targets were set for new cars and light commercial vehicles. Compared to the emission limits in 2021, emissions for cars must be reduced by 15% from 2025 on and by 37.5% from 2030 on. For light commercial vehicles, the emission reduction must be 15% and 31% respectively. For heavy-duty vehicles, a new regulation introduced in 2019 set reduction targets of 15% in 2025 and at least 30% in 2030, to be confirmed in the review of EC legislation in 2022.

4.6. Agriculture

For the agricultural sector, including horticulture, the main policy framework is the Agro covenant.

4.6.1. Agro covenant

In 2008, the agriculture and horticulture sectors agreed with the government on ambitious targets and measures in the Agro covenant (also referred to as the Clean and Efficient programme for the agricultural sectors). The main aims of the Agro covenant (Clean and Efficient programme for the agricultural sectors) are:

- a reduction in CO_2 emissions of 3.5 to 4.5 Mton in 2020 as compared to 1990;
- a reduction in non-CO_2 greenhouse gas emissions of 4.0 to 6.0 Mton CO_2-eq. in 2020 as compared to 1990;
- an average annual energy efficiency improvement (energy saving) of 2% over the period 2011–2020;
- a generation of 200 PJ through biomass and 12 PJ through wind energy by 2020.

The covenant also aims to make the agricultural sector more sustainable through a 'green growth strategy'. In addition, the agricultural sector wants to be a producer of sustainable energy and to reduce its dependence on fossil fuels.

The sector is expected to take cost-effective measures that contribute to the reduction of greenhouse gas emissions on a voluntary basis. This covenant distinguishes three separate main areas of concern over policy measures for the reduction of CO_2 emissions in agriculture:

- The agricultural processing industry is mainly subject to 'industrial' policy measures from the Ministry of Economic Affairs and Climate Policy, such as Long-Term Agreements and innovation policy (see above).
- The 2013 Energy Agreement sets a target for energy savings in the horticulture sector of 11 PJ in 2020 (this figure is equivalent to a CO_2 reduction of 0.7 Mton). This target is implemented through energy savings and sustainable production of the energy demand (electricity and heat), as well as through developing energy-efficient greenhouse systems and new growing methods. Policy instruments include LTAs, a specific innovation programme ('The greenhouse as an energy source'[40]) and a sectoral emission trading system[41] in which the total allocation was reduced annually to a level of 6.2 Mton CO_2 in 2020. After an evaluation in 2017, the allocation was lowered to 4.6 Mton CO_2. Two subsidy programmes are available for horticulture in order to stimulate investments in innovative and energy-efficient installations: Energy efficiency and renewable energy horticulture ('EHG') with a budget of nearly €7 million in 2019 and Market introduction energy innovations ('MEI') with a budget of €5 million in 2019. Due to the 'Urgenda' court ruling, these budgets will be raised.
- Other agricultural activities (e.g. primary sectors) focus on energy savings, the sustainable production of energy through fermentation, among other things, and the production of biomass to generate energy. The main policy instruments are LTAs and SDE+.

[40] https://www.kasalsenergiebron.nl/en/

[41] The covenant 'CO_2 emissieruimte binnen het CO_2 sectorsysteem glastuinbouw voor de periode 2013–2020" (Scope for CO2 emissions within the CO2 greenhouse horticulture sector system for the period 2013–2020)

For non-CO_2 emissions, there are three categories of measures that can contribute to reducing emissions:

- Best management practices for reducing nitrogen input on farms, such as precision soil cultivation using GPS. In 2017, the government and businesses started a pilot programme for precision agriculture using innovative technologies such as satellite data and drones[42].
- Measures for cattle feed to reduce CH_4 emissions. The composition of feed can affect the production of methane through the cattle's digestive systems. Generally speaking, the better the digestibility, the lower the methane emissions.
- Measures for manure storage to reduce CH_4 emissions. Manure fermentation is the main option for reducing methane emissions from manure.

A committee in which both the government and sector associations participate was formed for each agricultural sector, describing the specific way in which a sector will contribute to the realisation of the policy target. The Netherlands Enterprise Agency monitors the Agro covenant. The progress in the period 2008–2018 can be found in the 2018 Agro covenant progress report[43]. This report showed that the agricultural sectors play an important role in the generation of renewable energy and that they are able to reduce the use of energy. Some agricultural sectors have set up their own monitoring, such as the flower bulb[44], mushroom[45] and the dairy sectors[46]. The progress in the horticulture sector was evaluated in 2017[47]. It was concluded that the results in the period 2014–2017 already met most of the objectives agreed in the covenant. The parties to the covenant agreed to continue and set new priorities for the remaining years of the covenant (related to the exchange of knowledge, innovation, geothermal heat and regional synergies).

In the Climate Agreement, ambitions were agreed for 2030 and beyond. Total greenhouse gas emissions from agriculture, soils and nature should be reduced by at least 3.5 Mton CO_2-eq. The ambition is to improve the net carbon emission balance by 6 Mton CO_2-eq. (including sequestration of carbon in soils and/or biomass). In the long term (2050), emissions from agriculture and land use, land use change and forestry should be in balance. Carbon and nutrient flows should be circular as much as possible. For horticulture specifically, the aim is to reduce CO_2 emissions to a level of 2.2 Mton in 2030. By 2040, this sector aims to be climate-neutral. The main policy measures to achieve these targets are the sectoral emission trading system, the innovation programme 'The greenhouse as an energy source' and the integration into the regional energy systems. The 'greenhouse as an energy source' innovation programme will focus more on geothermal heat and the utilisation of residual heat. With regard to the emissions from agriculture, policies will focus on technical measures such as low-emission stables and optimising fodder and the processing and storage of manure. Water management, more climate-friendly (soil) cultivation, nature improvement and (re)forestation should lower emissions from LULUCF and improve carbon storage in soils.

Due to the 'Urgenda' court ruling, a subsidy instrument has been announced to induce pig farmers to close down their farms.

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[42] https://www.rijksoverheid.nl/actueel/nieuws/2017/02/13/staatssecretaris-van-dam-kondigt-nationale-proeftuin-precisielandbouw-aan

[43] https://www.rvomagazines.nl/rvopublicaties/2018/01/agroconvenant

[44] https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/groene-economie/schone-en-zuinige-agrosectoren/sectoren/bloembollen-en-bolbloementeelt

[45] https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/groene-economie/schone-en-zuinige-agrosectoren/de-sectoren/agrosectoren-paddenstoelen

[46] https://www.duurzamezuivelketen.nl/resources/uploads/2018/04/DZK-Jaarverslag-2017-1.pdf

[47] https://zoek.officielebekendmakingen.nl/blg-820783.pdf

4.6.2. Legislation on manure management and the EU milk quota

The EU milk quota, which ended in 2015, limited the size of dairy herds held in the Member States. After its abolishment, cattle numbers increased in the Netherlands. Since then, restrictions in manure management and the emissions of minerals such as phosphates have had a strong influence on the limits to dairy herds and consequently on the emissions of methane and nitrous oxide from agriculture. In order to limit phosphate emissions, it was decided to introduce a trading system for phosphate emission allowances starting from 2018[48]. The number of allowances was set as per the situation in July 2015, resulting in a reduction of the dairy herd.

4.7. Forestry (CO_2) and LULUCF

In the Netherlands, emissions and removals of CO2 within the scope of LULUCF occur in forests, grassland and cropland through the conversion of grassland into cropland (or vice versa), the loss of grassland or cropland due to new infrastructure and building, the oxidation of peatland due to water management, and the conversion of forest into grassland (including non-forest nature like heathland), infrastructure, settlements or other land use categories and vice versa. Currently, there are no policies that explicitly aim to reduce GHG emissions from LULUCF by 2020. However, other policies with different objectives have also resulted in restricting carbon emissions or improving removals from LULUCF The 2019 Climate Agreement defines the ambition to reduce emissions from LULUCF by at least 1.5 Mton CO2-eq. by 2030 (in accordance to the EU LULUCF regulation from 2018). Measures will be introduced to lower emissions from peatlands and land use (change), and a strategy will be developed and measures introduced to increase carbon storage in forests.

Forest and nature policy
Over the past decades, forest policy in the Netherlands has been integrated into nature policy, which reflects the change towards multi-purpose forests in which more functions are combined (e.g. nature, recreation). The development of a nature network is a central theme of the nature (and forest) policy. Implementation of nature policy, including the development of the nature network, has been decentralised from the central government to the provincial governments. The nature network is a cohesive network of high-quality nature wetland and terrestrial reserves, including Natura 2000 sites that are foreseen to increase to a total size of 668,000 hectares by 2027. 620,000 hectares of this network were completed by 2017. Depending on the balance between wood production or nature conservation, forest owners within the nature network can apply for lower or higher nature protection subsidies; as a general condition for nature subsidies, forests must be open to the public. The aim is to have converted an additional 40,000 hectares of land to become part of the nature network by 2027. Part of this will be achieved through afforestation and reforestation, which over time will also contribute to increasing removals from LULUCF.

As a result of the 2019 Climate Agreement, national and regional stakeholders will develop a forest strategy that should lead to less deforestation and an increased acreage of woodland and nature.

Cropland and grazing land management
Most provinces with substantial areas of pastures on peat are developing plans to limit subsidence through setting limits to the maximum lowering of ground water tables. Additionally, the Rural Development Plan includes a measure for meadow bird management to raise the groundwater level

[48] https://www.rijksoverheid.nl/actueel/nieuws/2017/07/12/duidelijkheid-over-fosfaatrechten-voor-melkveehouders

in peat pasture areas (during part of the year). Raising the groundwater level will reduce the degradation of soil organic matter in the peat soils.

Some European policies also have a direct impact on cropland and grazing land management in the Netherlands and an indirect impact on the carbon content of soils. The EU Nitrates Directive (1991) limits the application of nitrogen fertilizers on agricultural lands. As part of a derogation, Dutch dairy companies are allowed to apply a higher amount of fertilizer under certain conditions. Some of those conditions have an impact on the carbon content of soils. For example, dairy companies are required to maintain grasslands that amount to at least 80% of their area and croplands are required to use catch crops.

In the Climate Agreement, emissions from LULUCF are explicitly taken into account. Reducing emissions and increasing carbon storage are integrated into the ambitions and policies for agriculture (see section 4.6.1).

Due to the 'Urgenda' court ruling, nature management practices will be considered that have less impact on the climate.

4.8. Waste (CH_4)

The Ministry of Infrastructure and Water Management issues a Waste Management Plan once every six years, in accordance with the Environmental Management Act and EU legislation on waste management. The National Waste Management Plan 2002–2012 was the first such plan. It was replaced in 2009 by a second plan for the period 2009–2021, which was in force up to December 2017. In July 2019, the third plan for the period 2017–2029 was published.

The third plan aims to minimise the production of waste, maximise recycling and other recovery, and minimise the amount of waste that remains for disposal, especially landfill. An important target of the waste policy is a decrease by 50% of the amount of waste sent to incineration plants or landfills between 2012 and 2022. In order to achieve this target, the focus has been on the separation of household and commercial waste for collection (up to 75% in 2020), because almost 50% of this waste flow is still incinerated. Non-recyclable waste is incinerated in energy-efficient incinerators, which are all designated as installations for other recovery in accordance with the EU Waste Framework Directive.

The optimisation of waste management makes an important contribution to the mitigation of the greenhouse effect. Landfill of organic waste, for example, generates substantial methane emissions. This is one of the reasons why waste policy focuses on maximising waste recycling and limiting waste disposal. In 2017, around 16% of waste produced in the Netherlands was sent to landfill . This waste could not be recycled or incinerated.

The third plan also focuses on the contribution to a circular economy. Waste is increasingly considered as a reusable material for new products. This policy will also contribute to lower energy consumption and reduced greenhouse gases.

Due to the 'Urgenda' court ruling, a waste tax will be imposed on the incineration of imported waste. This will also improve the level playing field, as the incineration of domestic waste was already taxed.

4.9. Building sector (households and services)

The building sector is an important sector where significant CO2 emission reductions and energy efficiency improvements can be achieved for both new and existing buildings. The policies developed by the Dutch government for the building sector can be divided into three main categories:

- New buildings
- Existing buildings
- Ecodesign (appliances)

For buildings, a broad package of national policy instruments has been developed over the years, which also implement European policy instruments such as the Energy Performance of Buildings Directive (EPBD) and the Energy Efficiency Directive (EED). The EU Ecodesign Directive is the main policy instrument for appliances.

The main policy framework for the building sector up to 2020 is the 2013 Energy Agreement. In the Energy Agreement, parties set the ambition for the sector to reduce energy consumption by some 110 PJ between 2008 and 2020 (and CO2 by some 22.5 Mton CO2-eq. in 2020). This reduction should mainly be realised by renovating existing residential buildings. The renovation should be such that energy performance is increased by two steps on the energy label scale. In addition, the energy performance of new buildings should be improved so that as from 2020, new buildings will be nearly energy-neutral. The sections below describe the policies and measures to attain this policy goal in more detail.

In recent years, government and stakeholders have developed new policies for the period after 2020. In the Climate Agreement, the parties agreed to reduce emissions by buildings by 3.4 Mton CO2-eq. in 2030 compared to the reference scenario. Measures have been proposed in order to renovate 50,000 dwellings annually by 2021 and up to 200,000 dwellings before 2030. Local governments will lead this with a neighbourhood or 'block-by-block' approach. Financing possibilities will be improved as well, such as the possibility to couple loans to buildings and the creation of a revolving fund for heat measures ('warmtefonds'). On the long term, emissions should fall further to 95% of 1990 levels by 2050.

4.9.1. New buildings

The European Energy Performance of Buildings Directive (EPBD) requires new buildings to be nearly energy-neutral as of 2020 (2018 for central government buildings). This requirement has been implemented in national legislation (the Building Decree). Since 1995, this decision has defined minimum standards for energy performance, which have been slowly increasing over the years. In 2015, the energy efficiency requirements for houses and buildings in the utility/services sector were made more stringent again. As of July 2018, connection to the gas grid is in principle no longer allowed when awarding building permits for new dwellings. New government buildings have been required to be nearly energy-neutral ('BENG' standard) since early 2019. New dwellings and utility buildings need to be nearly energy-neutral from July 2020 (included in the WAM projections only).

4.9.2. Existing buildings

For existing buildings, the national policy framework is more complex, as it distinguishes between private and social housing as well as utility buildings. In the last decade, several agreements between the government and stakeholders have been concluded. This framework builds on earlier

agreements with stakeholders from 2008 ('More with Less') and later (such as the 'Umbrella covenant' in 2012). The 2013 Energy Agreement serves as a framework agreement for the period up to 2020.

For *private-sector housing*, the support actions are focused on awareness, financial support and new arrangements ('unburdening' of homeowners and/or using new business models) to implement energy-saving measures. These instruments include:

- the mandatory energy label system. Five million homeowners have received a notification with their preliminary label. The label is required when the house is newly built, sold or rented. It contributes to raising awareness and stimulates the use of measures to save energy. By 2017, 3.5 million dwellings had a registered energy label. This system is implemented in accordance with the Energy Performance of Buildings Decree[49];
- the National Energy Savings Revolving Fund ('NEF'), founded in 2014 for loans related to energy savings, with a budget of €300 million. This fund makes higher mortgages available in return for investments in energy-saving measures. The NEF is coupled with a support programme by the joint municipalities. This means that regional governments are developing energy programmes (usually in regional clusters), including the so-called local energy 'counters' (for information, among other things) as arranged in the Energy Agreement. Loans increased from €6 million in 2014 to €16 million in 2015, €38 million in 2016, €73 million in 2017 and €114 million in 2018[50];
- the development of new servicing and business models in energy services by energy suppliers, the installation sector and other companies. New arrangements and services are being developed and tested, for example, in various Green Deals and in 'block-by-block' trial projects (a set of some 10 pilot projects with new service arrangements, each for a block of more than 1,500 houses). Successful arrangements are intended to be rolled out further;
- smart metering. Energy distribution companies aim to furnish 80% of dwellings with a smart meter by 2020 (see section 4.3.6);
- subsidies for homeowners (SEEH) who invest in at least two energy-saving measures (such as insulation and high-performance glass). For renovations that lead to very efficient buildings, an additional subsidy is available. The budget for the period 2016–2018 was €61 million[51]. The subsidy budget was already fully used up in 2017. A new subsidy budget of €84 million was made available for the years 2019 and 2020 as a policy measure due to the Urgenda court ruling. However, this was announced too late to be included in the projection scenarios;
- the ISDE subsidy scheme, which can be used by homeowners to invest in renewable heat installations (see section 4.3.3 above);
- lower Value Added Tax on isolation. Since 2009, the VAT rate has been reduced from 21% to 6% of the labour component in the process of installing insulation material and insulating windows;
- in 2016, an information campaign was launched to provide homeowners with insights into ways of saving energy. The campaign, which will run for the coming three years, uses TV and radio commercials as well as a comprehensive website[52] that also links to local energy 'counters'.

For the *social housing sector*, the parties agreed in the Energy Agreement to aim for energy savings of 24 PJ by 2020. This aim is mainly supported by:

[49] http://wetten.overheid.nl/jci1.3:c:BWBR0023734&z=2016-07-01&g=2016-07-01

[50] https://www.rijksoverheid.nl/documenten/rapporten/2019/04/15/jaarverslag-nationaal-energiebespaarfonds-2018

[51] https://www.rvo.nl/subsidies-regelingen/subsidie-energiebesparing-eigen-huis

[52] https://www.energiebesparendoejenu.nl/

- a subsidy scheme (STEP) for improving energy efficiency in social housing. Social housing residents may apply for a subsidy when they invest in improving the energy performance of their home by at least two steps on the energy label scale. The amount of subsidy depends on the level of improvement. The budget was €395 million for the period 2014–2018. By the end of 2018, applications for subsidy amounted to €519 million;
- a fund for improving the energy efficiency of rental housing (FEH). Social housing owners as well as landlords of private sector rental properties may apply for an attractive loan to improve the energy performance of their building stock to nearly energy-neutral[53]. The budget was €75 million for the period 2014–2018. In total €2.6 million in loans were issued in 2018, both to corporations and private owners;
- a programme to realise 11,000 'zero-energy' dwellings by 2016 as a first step (scaling up to 100,000 in 2020) alongside a support programme for parties at the local level;
- since July 2011, the Housing Valuation System has appraised the energy performance of homes (on the basis of the energy label) to promote investments in energy-saving measures. The Housing Valuation System sets the maximum rent on the basis of the characteristics of the home;
- an energy performance surcharge may be imposed by owners of social housing on their tenants since September 2016. Owners who renovate their properties so that they are nearly or entirely zero-energy can charge an energy performance surcharge to their tenants so as to earn back major investments in the rental property. The owner and the tenant must reach an agreement on the sum of the fee;
- further intensification of the measures agreed in the Energy Agreement, which means that housing associations have to realise an average energy label B for social housing by 2021.

Measures that target savings in the utility sector*:*

- The Long-Term Agreements on energy efficiency (LTAs – see under Industry, section 4.4.1) also include some services sectors: universities, buildings for higher professional education and university hospitals. The LTAs will not be continued after 2020.
- The Energy Agreement includes a stricter control of energy requirements under the Environmental Protection Act, with the help of a list of economically viable energy-saving measures, an expert information centre on energy-saving measures and the use of periodical energy performance assessments (EPK) by recognised energy service providers to support parties in their energy-saving actions as well as to check on progress and updates. In 2016, the capacity of regional environmental agencies to enforce the energy requirements was increased. The requirement to conduct a periodical energy audit (according to Directive 2012/27/EU) also facilitates stricter control. By July 2019, companies needed to report on which energy savings measures they had implemented. They must continue to do so every four years in future.
- Utility buildings that are newly built, sold or rented are required to have an energy label. As part of the further intensification of the measures agreed in the Energy Agreement, it was arranged in 2016 that offices are required to have a minimum energy label C by 2023.
- Various subsidy schemes exist, such as for sports facilities, SDE+, ISDE and energy innovation (see above).

In 2017, an agreement between the central government, energy suppliers and distributors, the installation service sector and sector associations was concluded in order to reduce energy consumption in households (both private owners and tenants) and small enterprises by 10 PJ by 2020[54]. This reduction will be realised by improving information on energy consumption by

[53] https://www.rvo.nl/subsidies-regelingen/fonds-energiebesparing-huursector-feh

[54] https://www.rijksoverheid.nl/documenten/convenanten/2017/05/23/convenant-energiebesparing-gebouwde-omgeving

consumers, the energy services offered to consumers and the conditions of existing subsidy schemes for energy savings, as well as increasing the ISDE subsidy budget (see section 4.3.3) by €160 million for the period 2017–2020.

4.9.3. Ecodesign and Energy Labelling

The Ecodesign Directive (2009/125/EC) provides consistent rules for setting product-specific regulations at the EU level and improving the environmental performance of energy-related products. At the moment, 28 product regulations are in force, covering a wide range of products and horizontal aspects such as electric motors, ventilation units, space and water heaters, air conditioners, process chillers, transformers, commercial refrigerators, household appliances, televisions, lamps and network standby. Implementation regulations have established minimum mandatory requirements for energy efficiency and, if relevant, for other environmental aspects such as noise, NOx emissions or durability. Implementation regulations are revised regularly. Recently adopted revisions also focused on resource efficiency parameters, e.g. requiring the availability of certain spare parts and repair information for a minimum number of years and the ability to disassemble the product with commonly available tools.

The Energy Labelling Directive was revised in 2017 and transformed into a Regulation (EU/2017/1369) providing consistent rules for setting product-specific regulations on mandatory energy labels at the EU level. This revision will result in product labels that, after revision, will again have an A–G scale (instead of A+++ to D), because it has been shown that the A–G scale provides more of a motivation for consumers to buy the most efficient products. The first set of five revised regulations was adopted recently and the rescaled labels will come into force as of 1 March 2021. Further revisions are envisioned as soon as the market has transformed in such way that a large number of the products are in the A and/or B class and further technological development is foreseen. The new framework regulation also introduced a mandatory product database to be set up by 1 January 2019 which supports market surveillance and the provision of product data to inform consumers by electronic means, e.g. websites and apps. Energy labels have to be displayed on products for sale in physical shops and online. Currently, 16 energy labelling regulations are in force, covering products such as household appliances, televisions, space and water heaters, air conditioners, residential ventilation units, professional refrigerated storage cabinets and lamps. Discussions are ongoing about including resource efficiency aspects, especially reparability, on the label.
For products that have eco-design requirements as well as an energy label, both instruments are developed in the same policy process.

4.10. Impact of policies and measures on reduction of greenhouse gases

Table 4.2 contains information on the policies and measures (PAMs) described in the sections above, including their impact on the reduction of greenhouse gases. The figures have not been adjusted compared to the third biennial report (BR3), as the changes to policies with an effect in 2020 have been limited since then .

The impact on greenhouse gases is determined by comparing the WAM variant of the National Energy Outlook (NEV) 2017 projections (see BR3, chapter 5) to the situation where no policy changes are assumed after 2012. In this way, the impact of the Energy Agreement of 2013, which is the main policy framework in the Netherlands for the period up to 2020, can be taken into account. For the establishment of this reference, the policy variant 'without the Energy Agreement' in the NEV2017 has been used.

The effects of measures on emissions related to energy consist of three components:

1. Energy efficiency effects as a result of measures preceding the Energy Agreement
2. Energy efficiency effects of measures which are part of the Energy Agreement
3. The effects of renewable energy measures

Ad 1: energy savings as a result of measures preceding the Energy Agreement have been calculated for fuels and electricity for each sector. First, the total savings (autonomous savings and savings as a result of policy measures) were calculated by the modelling system for the NEV2017 scenario 'without the Energy Agreement'. In the second step, dedicated percentages per sector that reflect the savings effects that can be attributed to policy measures were applied to these total savings per sector. Finally, emission factors were applied to the saved fuel and electricity.

Ad 2: the saving effects of the Energy Agreement are based on Table 3.2 in the NEV2017 report. This table contains the saved energy as a result of policies that count towards the Energy Agreement. Savings that are attributable to policies are part of the difference between NEV2017 'without the Energy Agreement' and NEV2017 'with additional measures' (WAM). Emission factors have been applied to the saved fuel and electricity.

Ad 3: all additional renewable energy production after the base year 2013 has been counted towards the emission reduction effects of renewables. This coincides largely with the (expected) production from projects with SDE+ subsidy grants. No reference scenario has been used, but the difference in renewable energy production compared to the situation in 2013.

For non-energy and non-CO2 policies and measures (such as 'ROB' and waste policies), it is assumed that the effects are all policy related. The impact of these policies is equal to the difference between the base year (2013) and the projected emission levels in 2020 according to the NEV2017 WEM and WAM.

Some measures are mentioned more than once in Table 4.1, such as the EIA and LEE/LTA. This is due to the fact that the 2013 Energy Agreement contains changes in policies and measures related to already existing policies. The impacts of those (partial) changes have been attributed to the Energy Agreement. The effects of some PAMs within a sector cannot be distinguished from other measures in that sector. This method has been chosen in order to prevent double counting of policies and measures within a sector. As a result, the effects of those measures are summed in one row for that sector in this table.

Name of mitigation action	**Estimate of mitigation impact in 2020 (not cumulative, in Mton CO_2-eq.)**			**Estimate of cumulative mitigation impact (2013–2020, in Mton CO_2-eq.)**
	Total	*ETS*	*non-ETS*	*Total*
Non-Energy Agreement policies				
Group of industry PAMs: VAMIL/MIA/EIA, Ecodesign, ETS, MEE, Long-Term Agreements (MJA3/MEE)	1.2	0.7	0.4	4.1
Group of transport PAMs: fiscal policy on car efficiency (BPM), Green Deals, fuel tax	3.1	0.0	3.1	10.8
Group of built environment PAMs: VAMIL/MIA/EIA, ETS, EPC	4.9	1.7	3.2	17.0
Group of agriculture PAMs: Agro covenant with various sectors in horticulture and agriculture, incl. effects of fiscal measures, Ecodesign, sectoral emission trading system and ETS in this sector	0.9	0.4	0.5	1.6
Smart metering	0.2	0.1	0.1	0.4
Ecodesign Directive	2.0	2.1	-0.1	7.0
EU CO_2 emission standards for cars and light-duty vehicles	0.9	0.0	0.9	2.7
Actions under the Energy Agreement 2013				
Actions for private housing	0.9	0.3	0.6	2.3
Investment subsidies for small renewable energy systems (ISDE)	0.0	-0.1	0.1	0.1
Actions for social housing	0.3	-0.2	0.4	0.6
Subsidy scheme for energy saving measures and renewable energy in sport accommodations (EDS)	0.0	0.0	0.0	0.0
Minimum energy label C for utility buildings	0.2	0.1	0.1	0.2
Enhanced Energy Investment Allowance (EIA)	0.4	0.2	0.2	1.1
Enhanced Long-Term Agreements (MEE) on energy efficiency with industrial enterprises that have to participate in the EU ETS scheme	0.8	0.8	0.0	1.6
Enhanced Long-Term Agreements on energy efficiency (LTA3/MJA3) (with industrial sectors and some sectors in built environment and transport)	0.1	0.1	0.1	0.3
Ensuring compliance with the Environmental Protection Act in industry and the built environment	0.6	0.4	0.2	1.2
Eco Driving campaign, carpooling, tyre choice and pressure; Truck of the Future	0.5	0.0	0.5	1.3

Name of mitigation action	**Estimate of mitigation impact in 2020 (not cumulative, in Mton CO_2-eq.)**			**Estimate of cumulative mitigation impact (2013–2020, in Mton CO_2-eq.)**
	Total	*ETS*	*non-ETS*	*Total*
Renewable energy policies				
SDE+ subsidy scheme for renewable energy production (Stimulation of Sustainable Energy production)	14.9	11.6	3.3	45.7
EU Fuel Quality Directive (2009/30/EC) [FQD]	3.0	0.0	3.0	9.0
Net metering	1.7	1.7	0.0	6.0
Non-CO_2 policies and measures				
Reduction programme for non-CO_2 greenhouse gases (ROB)	0.4	0.0	0.4	3.6
EU F-gases regulation	0.3	0.0	0.3	1.1
Legislation on manure management	0.1	0.0	0.1	0.7
National waste management plan	1.3	0.0	1.3	4.6
Total	38.8	20.0	18.8	123.0

Table 4.2 - Impact of policies and measures on the reduction of greenhouse gas emissions in 2020 and 2013–2020

4.11. Assessment of the economic and social consequences of response measures

4.11.1. Foreign policy agenda

Dutch support for climate action in developing countries is an integral part of its development cooperation and is financed from its budget for foreign trade and development cooperation. As Dutch support for climate action is part of development cooperation, we have a strong focus on poverty. Poorer people and communities are typically affected the most by climate change, not only because they are often the most exposed but also because they have the fewest resources to cope and adapt. To support mitigation, we focus on providing access to renewable energy and on halting deforestation; to support adaptation, we focus on climate-smart agriculture, integrated water resource management and the provision of climate-resilient WASH (water, sanitation and hygiene) services. Disaster risk reduction is an integral part of our programmes for integrated water resource management, while it also receives support through Partners for Resilience and the Climate Risk and Early Warning Systems Initiative (CREWS). Gender is an important cross-cutting issue, as climate action is the most effective when it builds on the capacities of both genders and addresses the needs as well as the vulnerabilities of both.

4.11.2. International financial support

Committed to scaling up its support for mitigation and adaptation activities in developing countries, the Netherlands has continued to realise an increase in its climate finance after having delivered on its commitment of Fast-Start Finance during 2010–2012. Public climate finance reached €419 million in 2017 and €575 million in 2018. In addition, public finance from the Netherlands mobilised €335 million of private finance for climate-relevant activities in developing countries in 2017 and €411 million in 2018. For more detailed information, we refer to chapter 6.

4.11.3. Collaboration between authorities, businesses, knowledge institutes and civil society

Dutch public climate finance is first and foremost intended to assist the poorest communities and the poorest countries. To address their needs, we work with a multitude of actors, including national, regional and local authorities, multilateral organisations, non-governmental organisations, private-sector organisations, farmers organisations, water boards and so on. These organisations all have their own processes to ensure that their activities meet the needs of their target audiences. The Netherlands only approves finance for activities if it is clear how the needs of target audiences will be met.

Support for technology development and transfer forms an integral part of many activities related to climate change mitigation and/or adaptation, encompassing both hardware (equipment) and software (know-how, methods and practices). Both the private sector and several knowledge institutes are partners in providing this support. A number of examples are presented in chapter 6.

4.11.4. Market mechanisms

The flexible mechanisms under the Kyoto Protocol – International Emissions Trading, Joint Implementation and the Clean Development Mechanism – are all tools incorporated into the Protocol in order to share efforts aimed at reducing greenhouse gases. Their goal is to ensure that investments are made where the money has optimal effects to reduce greenhouse gases with a minimum impact on the world economy. In the first commitment period of the Protocol, the Netherlands made use of each of the flexible mechanisms by acquiring emission credits from CDM and JI projects across the world, mainly through investment programmes of the World Bank and regional development banks (such as CAF). Credits were also acquired through national banks (i.e. the Rabobank) and through a tender carried out by the Netherlands Enterprise Agency. Acquiring activities started in the early 2000s. Since April 2011, the Netherlands has also been supporting the World Bank's 'Partnership for Market Readiness' (PMR) with a total pledge of $7.1 million[55]. The PMR will help countries to make use of the benefits and advantages of the carbon market. It promotes collective innovation and piloting of market-based instruments for GHG emissions reduction. In addition, the PMR provides a platform for technical discussions about instruments to spur innovation and support implementation. During the first commitment period of the Kyoto Protocol, the Netherlands contracted a total of 33.2 Mton in carbon credits from CDM projects, 17.1 Mton from JI projects and 2.2 Mton from participation in Prototype Carbon Funds (PCF). In total, the Netherlands acquired 46.3 million credits using the market-based mechanisms, of which 1.3 million credits were delivered after 2013. Acquired credits are not used to fulfil any national emission reduction target.

[55] https://www.thepmr.org/country/netherlands-0

The institutional arrangements that were set up previously to acquire emission credits are no longer in place, as it is no longer policy to acquire emission credits. The government still facilitates the participation of other legal entities in CDM projects by providing Letters of Approval if certain requirements are met. In this way, the government facilitates the operation of the Kyoto mechanism, but acquires no emission credits.

4.11.5. Biofuel production

All biofuels on the market in Europe and the Netherlands must comply with the sustainability criteria laid down in the Renewable Energy Directive (2009/28/EC) and its revision (2018/2001/EU). Only sustainable biofuels are allowed to be used for fulfilling the blending target. Compliance with these criteria must be demonstrated through one of the adopted certification systems[56]. These certification systems are monitored by an independent audit. All biofuels produced in the Netherlands fulfil these requirements.

The national policy aims to increase the production of biofuels in an effort to achieve the target of renewable energy sources accounting for 10% of the energy used in the transport sector by 2020. In 2018, this share of renewable energy in the transport sector was 8,9%[57]. This was largely due to the blending of biofuels with diesel and gasoline (98%). The other 2% were from the use of biogas (1.5%) and electricity (0.8%). The biofuels used in 2018 were made largely from waste (72%), mostly coming from used frying fat (56%) imported from other western European countries, Asia (China and Taiwan) and North America. 28% of the biofuels were made from crops, mainly wheat and corn originating from Europe. The share of advanced biofuels was 0.8%, which is a sharp rise from 0.1% in 2017.

In the Climate Agreement, parties agreed to promote the sustainable use, production and import of biomass. The domestic production of biomass will be promoted. As the global availability of biomass is limited and competes with other societal needs (i.e. food, material), priorities and safeguards will be developed to ensure that biomass is used were it is of most value.

4.11.6. Sustainability requirements for co-firing and large-scale heat production

The sustainability requirements for co-firing and large-scale heat production have been changed in the SDE+ subsidy programme (see section 4.3.1) as from 1 January 2015 to ensure a high level of sustainability[58]. The use of biomass that competes with food (or food production) for the production of bioenergy is prohibited. In addition, organisations should be in possession of documentary evidence for all forest biomass showing that the forest management unit from which the wood was sourced has been managed with a view to the long-term conservation or expansion of carbon stocks. Overall, these requirements can be considered as very stringent compared with policies in other countries.

[56] http://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/voluntary-schemes

[57] https://www.emissieautoriteit.nl/onderwerpen/rapportages-ev-2018/documenten/publicatie/2019/07/03/rapportage-energie-voor-vervoer-in-nederland-2018

[58] https://english.rvo.nl/file/sde-sustainability-requirements-co-firing-and-large-scale-heat-production

4.12. Policies and measures no longer in place

No major policies or measures that are relevant for the period up to 2020 have been repealed or have been expired since the third biennial report. As part of the Climate Agreement, the LTA/MEE covenants will be discontinued after 2020. Other changes to policies and measures have been explained in the preceding sections.

4.13. Monitoring and evaluation of progress in climate change measures

The overall development of greenhouse gas emissions is being monitored through the emission inventory system (described in section 2.3). Emissions under the EU ETS are being monitored by the Dutch Emissions Authority through annual reporting in accordance with EU ETS. Non-ETS emissions are reported annually to the European Commission, as regulated in Commission Implementing Regulation (EU) No 749/2014. Starting in 2015 and every two years thereafter, all EU Member States have to report to the European Commission all information on national policies and measures related to greenhouse gas reductions by 15 March, in line with Regulation (EU) 525/2013 and the Governance Regulation ((EU)2018/1999).

In 2019, the first annual National Climate and Energy Outlook (KEV) was published. The KEV is the successor of the annual National Energy Outlook (NEV), which was first published in 2014. Compared to the NEV, the KEV is more focused on climate change mitigation. Similar to the NEV, the KEV describes the developments observed from 2000 up to the present, as well as expected developments up to 2030. It covers physical indicators such as energy supply, energy demand and greenhouse gases emissions, in addition to economic indicators such as Economic Value Added and energy-related employment. The KEV aims to provide a factual base for the societal debate on energy in the Netherlands. It is prepared by the Netherlands Environmental Assessment Agency (PBL), Netherlands Statistics (CBS) and the Netherlands Enterprise Agency. PBL is responsible for projections, evaluative analyses and final editing, while CBS and the Netherlands Enterprise Agency provide information on realised progress and ongoing actions, within society at large as well as in policies and measures. Much of the information required by the EU and UNFCCC is provided by this annual KEV, which is why this report – along with the organisation procedures and methods underlying the KEV process – is a cornerstone of the Dutch national system for projections and reporting on policies and measures that was established in 2015 (see section 5.5).

In order to monitor the progress of the SER's 'Agreement on Energy for Sustainable Growth' (see section 4.2.1), it was agreed to appoint a 'Standing Committee' comprising representatives of all parties. Progress reports are compiled annually and are available for the years from 2014 up to 2018. The projections from the annual outlooks are used in these progress reports to track progress on the main targets. Action is undertaken by parties when progress falls behind expectations. In previous years, new actions were added to the Energy Agreement based on these progress reports, in order to attain the energy savings and renewable energy targets for 2020.

In accordance with the Climate Act, the progress of climate policies will be reported annually by the government. This monitor makes use of the KEV.

The Netherlands Environmental Assessment Agency (PBL) publishes 'The assessment of the human environment', a biennial report on the current status and future trends within the Dutch environment in relation to government policies and societal developments. The most recent report was published in 2018 .

Monitoring, reporting and verification of the ESD targets mainly takes place through the submission of the national GHG inventories by Member States. The ESD and the MMR have introduced an annual compliance cycle, requiring a review of Member States' greenhouse gas inventories to

ensure compliance with their obligations under the ESD in the period 2013–2020. The Governance Regulation provides the reporting framework for the period 2021–2030.

4.14. Domestic and regional programmes and/or legislative arrangements , as well as enforcement and administrative procedures

4.14.1. Arrangements and procedures: European policy context

As an EU Member State, the Netherlands is also subject to EU climate policy. It therefore applies the EU Common and Coordinated Policies and Measures (CCPMs) relevant to climate change. These policies include Directive 2003/87/EC, which introduced the European system for CO_2 emissions trading, and the Effort Sharing Decision 406/2009/EC. Also included are the European Council Decision 2002/358/CE on sharing the burden of the EU's emission reduction target for the Kyoto Protocol and Regulation (EU) No 525/2013 on the monitoring mechanism, which ensures that EU progress towards meeting the Kyoto target is assessed annually and that Member States provide sufficient information to the European Commission in order to achieve this aim. Other CCPMs concern the promotion of renewable energy, the introduction of biofuels for transport, the stimulation of energy savings and the reduction of methane (CH_4) emissions from landfill waste sites.

4.14.2. Arrangements and procedures: national policy context

Environmental Management Act
Almost all national legislation on the environment has been incorporated into the Environmental Management Act. This Act sets out an integrated approach to environmental management in the Netherlands and provides a legal framework by defining the roles of national, provincial or regional, and municipal governments[59].

The Act stipulates the tools to be used in environmental management, including:

- environmental plans; for instance, the national waste management plan that regulates municipal waste collection, disposal of discarded equipment such as refrigerators and TVs, and permits for hazardous waste shipment;
- environmental quality criteria for emissions and discharges of harmful substances, such as greenhouse gases and heavy metals, into the air, water and soil;
- environmental impact assessments, a prerequisite for the construction of major infrastructure such as oil refineries, nuclear power plants, chemical plants, roads, railways, and oil and gas pipelines;
- environmental reporting, which is directed at stimulating companies to make their production cleaner and more environmentally friendly. Many companies, such as those involved in metal processing and chemical production, are required to publish an annual environmental report. The Ministry of Infrastructure and Water Management is responsible for ensuring that the reporting requirements of the EU Pollutant Release and Transfer Register (PRTR) are met. Those companies and organisations required to prepare an integrated PRTR report on waste, air emissions (greenhouse gases) and discharges into water sources are listed in Annex II of the PRTR Regulation, which is published in the Official Journal of the European Union;

[59] https://rwsenvironment.eu/subjects/environmental-0/system-environmental/

- the Human Environment and Transport Inspectorate, which is largely responsible for ensuring that the provisions of the Environmental Management Act are enforced. Enforcement is also a task of the municipalities, the police and the justice system.

The Environmental Management Act therefore provides the legal basis for most environmental regulations that affect emissions of greenhouse gases (for example, regarding waste prevention, landfill policy and CO_2 emissions trading). The Act also provides the framework for enforcing commitments undertaken in Long-Term Agreements on energy efficiency (see section 4.4.1)

Chapter 18 of the Environmental Management Act regulates the enforcement of legal measures. It denotes which authorities are responsible for enforcement and requires them to designate officials who are charged with monitoring compliance. In the event of violations, authorities have several sanctions at their disposal. For example, they may order that the situation is brought into compliance at the expense of the offender, impose a pecuniary penalty or withdraw a licence. Another option is a criminal sanction. Public prosecutors may bring cases against offenders in the criminal court, which could result in high financial penalties or even imprisonment (maximum of six years).

Environmental Permitting (General Provisions) Act
The Environmental Permitting (General Provisions) Act lays down the rules for granting an all-in-one permit for physical aspects. This Act enables members of the public and companies to use one transparent procedure in order to apply for permits to one competent authority for activities that have an impact on the physical environment. Large companies, such as chemical plants, are required to obtain environmental permits that stipulate limits for the discharge of substances harmful to the environment.

The Environmental Management Activities Decree ('Activiteitenbesluit Milieubeheer') requires organisations in the Netherlands to save energy (pursuant to the Environmental Management Act). This regulation was changed on 1 July 2019. In addition to the current energy efficiency obligation (all energy efficiency measures with a payback time of five years or less), an energy efficiency notification obligation was introduced for locations that use 50,000 kWh of electricity or 25,.000 m^3 of natural gas (or an equivalent) or more per year. With the notification obligation, the business community and the Dutch government intend to accelerate energy efficiency. As a point of departure, companies use the Recognised Energy Efficiency Measures List (EML) for their business sector. This list contains energy efficiency measures which have a payback period of five years or less. An EML has been drafted for 19 business sectors. Companies had to report before 1 July which energy efficiency measures they had taken. Companies obliged to undertake an audit under the Energy Efficiency Directive have until 5 December 2019. The information is accessible to the competent authority that enforces the energy efficiency obligation.

Housing Act and Buildings Decree
Energy performance requirements for new buildings are laid down in the Buildings Decree pursuant to the Housing Act. The Buildings Decree empowers municipal authorities to grant building permits. In the event of violations of building permits, municipal authorities may have recourse to administrative sanctions based on Section 25 of the Municipalities Act and to criminal sanctions based on Section 108 of the Housing Act. In 2015, the stringency of energy performance requirements in the Building Decree was increased. In 2019–2020, the energy performance requirements will be increased again (see section 4.9).

In March 2015, the Dutch Senate approved new legislation on housing associations. The Housing Act came into effect on 1 July 2015. It defines the core tasks of housing associations, which is to provide affordable housing to people on a low income. The Housing Act makes a strict distinction

between social activities and commercial activities. Housing associations have to focus their future activities on Services of General Economic Interest (SGEI) and have to meet the strict conditions imposed by the national government on activities in the commercial sector (non-SGEI).

4.14.3. Provisions to make arrangements and procedures publicly accessible

After adoption, all laws and underlying legislative arrangements in the Netherlands are published in one of several official government bulletins and/or directly on the National System website, as indicated in section 2.3. The Freedom of Information Act and the Environmental Management Act also provide for public access to information on the enforcement of environmental rules and regulations. As from 22 December 2005, the Freedom of Information Act has been extended with a provision for the reuse of official government information, in accordance with Directive 2003/98/EC of the European Parliament and the European Council of 17 November 2003. Since the first biennial report, there have been no significant changes to the provisions for making arrangements and procedures publicly accessible.

4.15. Use of units from the market-based mechanisms and land use, land-use change and forestry activity

No units from market-based mechanisms and land use, land use change and forestry activities (LULUCF) are used for meeting the target. The government informed parliament in 2011 of its anticipation that the target for greenhouse gas emissions in the non-ETS sector could be achieved domestically and that it would not be necessary to buy units from market-based mechanisms such as CDM and JI[60]. It was further decided that the unused credits would be cancelled[61].

CTF Table 4 contains the annotation Not Applicable (NA), as LULUCF is excluded in the target and so the contribution of LULUCF is irrelevant to the mitigation actions involved. It contains no values, as no Kyoto Protocol units or other units are used for meeting the target.

CTF Table 4(a)I contains no values, as LULUCF is excluded in the target and so the net emissions/removals from activities under Articles 3.3 and 3.4 of the Kyoto Protocol as well as the related accounting quantities for the years since 2008 are irrelevant to mitigation actions involved.

CTF Table 4(b) contains no values, as no Kyoto Protocol units or other units are used for meeting the target.

[60] *Kabinetsaanpak Klimaatbeleid op weg naar 2020 (Government approach to climate policy on the road to 2020)*, Letter to Parliament of 8 June 2011.

[61] https://www.tweedekamer.nl/kamerstukken/brieven_regering/detail?id=2015Z10636&did=2015D21691

5. Projections

5.1. Introduction

The previous (Third) Biennial Report described the projections made in 2017, as published in the National Energy Outlook of October 2017 (Schoots and Hammingh, 2017)[62]. The projections in this Fourth Biennial Report are based on the national Climate and Energy Outlook 2019 (Schoots and Hammingh, 2019)[63]. Unfortunately, this updated projection did not include new projections for air polluting emissions (an update is expected in early 2020). The main differences compared to the previous projections used in the Third Biennial Report are discussed in textbox 5.2 at the end of section 5.3.1.

Section 5.2 describes the main assumptions used in the projections. Section 5.3 presents the main results for greenhouse gases for the years 2020 and 2030. Section 5.4 is dedicated to the aggregate results and the uncertainty and sensitivity analyses. Section 5.5 describes the methodologies and assumptions underlying the projections in more detail.

5.2. Projections

Scenario used and major changes relative to the previous Biennial Report
The projections described in this chapter are based on the National Climate and Energy Outlook (KEV) 2019, which describes the most plausible developments based on the available information on prices, markets, technology and policies. Compared with the National Energy Outlook (NEV) 2017, which was used in the previous Biennial Report, the KEV has incorporated new insights into economic and demographic developments, sectoral developments, fossil fuel prices, and CO_2 prices and policies. New insights into exogenous modelling assumptions were taken into account up to May 2019, using official national statistics, mostly from Statistics Netherlands (CBS)[64], and the Pollutant Release and Transfer Register of RIVM[65] where available. This approach means that the base year for most modelling parameters is 2017 or where possible 2018. Data on greenhouse gas emissions are in line with 2006 IPCC guidelines. New insights after May 2019, such as recent statistics, have been updated in the text where relevant up to August 2019, but have not been incorporated in the modelling. Statistics of greenhouse gas emissions for the year 2018 are still provisional. The projections have been differentiated for sectors as defined in the Climate Agreement, the so-called 'klimaattafels', or the climate sectors (see below).

The KEV 2019 projects the emission levels of greenhouse gases up to 2030 instead of 2035 in the NEV2017 due to significant uncertainties about climate policies after 2030. Emission levels of air pollutants are not included in the KEV 2019. These will be published in a separate report in early 2020. The next Biennial Report will include an updated paragraph on air pollutants.

The KEV includes an uncertainty analysis, which takes into account uncertainties concerning economic development, and energy and CO_2 prices and policies. For some indicators, the KEV gives

[62] https://www.pbl.nl/publicaties/nationale-energieverkenning-2017

[63] https://www.pbl.nl/publicaties/klimaat-en-energieverkenning-2019

[64] https://www.cbs.nl/en-gb

[65] http://emissieregistratie.nl/erpubliek/bumper.en.aspx

an uncertainty bandwidth. Uncertainties with regard to weather influences are not included. Several sensitivity analyses have also been conducted (see section 5.4.2).

The KEV takes assumptions on policies into account up to May 2019, meaning that policies announced in the June 2019 Climate Agreement are not included (see also section 4.1). The effects of the Climate Agreement are discussed in text box 5.1 at the end of this section. The projections distinguish two different policy variants, which are based on both national and European policies (see chapter four). They also contain measures made binding by market participants, public organisations and other government bodies on or before 1 May 2019.

Variant "With Existing Measures" (WEM)
This variant encompasses currently implemented and adopted policies and measures as from 1 May 2019. It includes measures that are sufficiently concrete and have been made binding, such as the European Emissions Trading System (ETS), energy taxation, subsidies for renewable energy, the abolition of the milk quota and the concrete and binding measures of the Energy Agreement. In the sections below, the projections are described according to this policy variant (unless otherwise stated).

Variant "With Additional Measures" (WAM)
In addition to all measures from the WEM variant, this variant also encompasses planned policies and measures that have been published but not yet officially implemented by May 2019. Nevertheless, they were specific enough to incorporate in the calculations; for example, new energy performance standards for new buildings after 2020, a kilometre tariff for trucks and the flight tax. As mentioned above, policies announced in the Climate Agreement from June 2019 are not included

Compared to projections, as reported in the BR3, the difference between the policy variants in the KEV is relatively small, as there have been few changes to the policies up to 2020. A complete list of policies and measures that are included in the projections, either as implemented or as planned, is published separately from the KEV 2019 report itself[66].

A variant "Without Measures" is not included in the projections, because climate and energy policies have already been implemented in the Netherlands from the early 1990s onwards. Since then, policies have been elaborated (such as subsidy schemes for sustainable energy production and energy efficiency policies), discontinued (such as the Benchmarking Covenant) or newly created, both nationally (such as the policies in the Energy Agreement agreed in 2013) or as a result of European policies (such as ETS and Ecodesign) and their revisions. Many policies are cross-sectoral, but each sector also has a specific mix of policies. This situation has resulted in a complex framework of policies and measures, making the construction of a variant "Without Measures" (for instance, no new policies after 2000) very difficult and highly theoretical and unrealistic.

Sectoral definitions
The KEV uses the same sectoral definitions as agreed in the Climate Agreement. The Climate Agreement classifies these 'climate sectors' as follows:

- *Electricity:* Generation and delivery of electricity and heating/residual heat by energy companies.

[66] https://www.pbl.nl/sites/default/files/downloads/pbl-2019-beleidslijst-kev2019-versie-1-0-november-2019_3843.ods

- *Industry:* Industrial activities in the energy sector (refineries, coking plants, extraction and distribution of oil and gas, water companies and waste management) and emissions from the manufacturing industry (processes and combustion).
- *Built environment:* Households and services.
- *Agriculture:* Agriculture, horticulture, CHPs in greenhouse horticulture.
- *Mobility:* Traffic, transport and mobile machinery in the construction, industrial, agricultural and service sectors.

This classification differs from the sectoral structure (CRF) that is customary for international reports, and was also used in the previous BR. One important distinction between the two is that energy-related emissions (combustion emissions or otherwise) are distributed across a variety of climate sector platforms. For example, energy-related emissions from industrial activities are classified as part of the industry climate sector, while emissions from vehicles – including mobile machinery – are part of the mobility climate sector. All emissions from waste management are defined as part of the industry climate sector, while all emissions from agriculture – including greenhouse horticulture – are classified as the agricultural climate sector. Chapter 5 observes the sector definitions for the climate sectors with the exception of table 5.2 and the CTF tables, in which the projections are based on the CRF format.

Text box 5.1 Effects of the Climate Agreement on greenhouse gas emissions

The Climate Plan includes the basic framework of the climate policy established to achieve the goal of a 49% reduction in emissions by 2030. To a large extent, the contents of the Climate Plan are determined by the Climate Agreement, which was published in June 2019. [67] However, the Climate Agreement was published too late to be incorporated into the PBL's Climate and Energy Outlook (KEV) 2019. For this reason, the PBL has made a separate assessment of the published Climate Agreement.[68] The announced policy measures and actions have not been fully incorporated into the KEV, meaning that the findings are indicative and may deviate from the next KEV (2020), in which they will be fully incorporated. The effects have been determined relative to the KEV based on variant with existing and additional measures (WAM).

PBL concluded that the set of policy instruments in the Climate Agreement will result in a 43-48% reduction of greenhouse gases compared to levels in 1990. As the Dutch climate target for 2030 (-49%) is greater than this range, the PBL's assessment indicates that the Climate Agreement will be insufficient to meet the target. In this regard, it must be noted that the current projection concerning the reduction of greenhouse gas emissions (as described in the KEV 2019) are lower than those in the NEV 2017, which served as a point of reference for the draft Climate Agreement.

The Climate Agreement could reduce emission levels to between 116 and 126 Mton of CO_2 equivalents by 2030. The policy package can result in a total reduction in emissions of 18-28 Mton compared with the KEV 2019 (WAM). In addition to the aforementioned reductions, the implementation of the Climate Agreement can also achieve a further reduction in emissions from land use of approximately 2 Mton. These emissions, which do not count towards the achievement of the Dutch target of 49%, could be reduced by 3-4 Mton by 2030. The table below displays the expected effects for each climate sector.

[67] https://www.klimaatakkoord.nl/documenten/publicaties/2019/06/28/national-climate-agreement-the-netherlands

[68] https://www.pbl.nl/publicaties/het-klimaatakkoord-effecten-en-aandachtspunten

Tekst box 5.1 Cont'd:

Sector	**2018[a] [Mton]**	**Forecast for 2030 [Mton CO_2-eq]**		
		Emissions in KEV 2019 (WAM)	Reductions from Climate Agreement	Emissions with Climate Agreement
Built environment	**24.4**	**19**	1.3 – 3.8	15.2 – 17.7
Mobility	**35.6**	**32.9**	1.3 – 3.6	29.3 – 31.7
Industry	**57.2**	**54.2**	14.3[b]	39.9 [b]
Electricity	**45.2**	**13.7**	-0.3 – 2.5	11.2 – 14
Agriculture	**26.9**	**24.5**	1.7 – 4.3	20.2 – 22.8
Land use[c]	**5.6**[d]	**5.6**	1.5 – 2.4	3.2 – 4.1
Total	**189.3**	**144.3**	18 – 28	116 – 126
Total (including land use)	**195**	**149.9**	20 – 31	119 – 130

Table: Greenhouse gas emissions per sector in 2018 and in 2030 based on the KEV 2019 and the expected effects of the Climate Agreement.

[a] Provisional figures

[b] As decisions concerning the design of the set of instruments are yet to be made, these figures serve as a point of reference for the analysis rather than results.

[c] LULUCF, Land Use, Land-Use Change and Forestry

[d] Emission levels for 2017: figures for the emissions from land use in 2018 are not yet available.

5.3. Projection results

5.3.1. National developments

Historical trend of national greenhouse gas emissions

National greenhouse gas emissions have fallen since 1990
Following an initial increase between 1990 and 1996, greenhouse gas emissions in the Netherlands show a decreasing trend with a peak in 2010 (due to a relatively cold winter) and a limited increase in 2015 (see Section 2.2). In 2018, emissions based on preliminary statistics amounted to over 189 Mton of CO_2 equivalents (excluding LULUCF), 15% below the levels of 1990. This decrease can largely be attributed to a decrease in non-CO_2 greenhouse gases in the industrial sector and, to a lesser extent, in the agricultural sector. Between 1990 and 2018, carbon emissions declined by approximately 2 Mton. Although total greenhouse gas emissions rose in 2015 and 2016 in comparison to previous years, they declined again in 2017 and 2018. Compared to 2016, emissions were around 1% lower in 2017 and over 3% lower in 2018. This reduction was largely due to a reduction in carbon emissions from the electricity sector thanks to increasing replacement of coal with more natural gas and greater use of renewable energy.

Emissions of LULUCF decreased slightly between 1990 and 2017, from 6.1 in 1990 to 5.6 Mton of CO_2 equivalents in 2016 (see below for further details). These figures are not included in Figure 5.1.

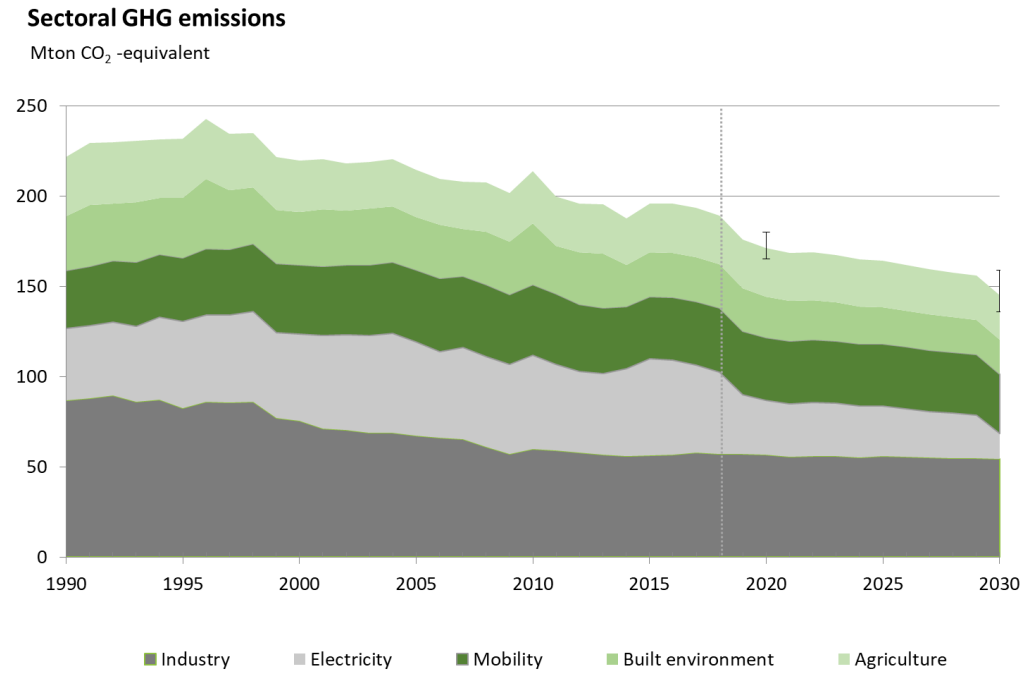

Figure 5.1: Historical and expected greenhouse gas emissions per sector for 1990-2030 (excl. LULUCF) (Sources: Statistics Netherlands (outcomes) and PBL (KEV projections with existing policies).)

Forecast of national emissions of greenhouse gases (excluding LULUCF) by 2030

Projections With Existing Measures
Greenhouse gases to fall up to and including 2020
In the policy variant 'with existing policies', national greenhouse gas emissions drop to 171 [165-180] Mton of CO_2 equivalents by 2020 (see figure 5.1). This means a decline of over 22 Mton of CO_2 equivalents between 2017 and 2020. Nearly 19 Mton CO_2-eq of this projected reduction stems from developments in the electricity sector (see table 5.1). Coal and gas-based generation of electricity in the Netherlands is expected to decrease substantially as a result of four factors:

1. The growth of renewable energy production in the Netherlands.
2. An increase in the use of imported energy via greater interconnection capacity with Germany and Denmark (see Section 4.5.1).
3. Declining generation capacity due to the closure of the coal-fired power plants on the Maasvlakte (mid-2017) and the Hemweg power station (end of 2019).
4. Consequences for coal and/or gas-fired power stations as a result of falling coal/gas prices between 2017-2020 and rising carbon prices during the same period.

Greenhouse gas emissions from the industrial sector are expected to decline by less than 1 Mton of CO_2 equivalents between 2017 and 2020. A number of trends are evident within this sector. Emissions from refineries are expected to increase slightly in the period up to 2020 due to an

increase in the desulphurisation of marine fuel, among other factors. Emissions in the manufacturing industry are expected to decline in the period up to 2020 as a result of energy conservation measures and the use of biomass.

Emissions from the built environment (households and services) are expected to decline by nearly 2 Mton of CO_2 equivalents between 2017 and 2020. It is expected that households will account for the majority of the reduction due mainly to additional conservation policies such as the '10 petajoule mandatory target agreement', the ISDE and measures in the housing sector (both to buy and to let). The services sector will also reduce its emissions through a number of conservation measures.

The reduction of emissions from the mobility sector between 2017 and 2020 is expected to be limited due to a combination of developments. In addition, very little reduction is expected in the agricultural sector (a reduction of <1 Mton is expected for both sectors in this period).

Projections for greenhouse gas emissions between 2020 and 2030
In the period beyond 2020, national greenhouse gas emissions are expected to fall even further as a result of the existing policies. Between 2020 and 2030, the expected emissions are set to fall by nearly 26 Mton of CO_2 equivalents, down to 145 [136-159] Mton, bringing the emissions reduction for 2030 to 35 % compared to 1990. The decline in emissions post-2020 is predominantly ascribed to the expected developments in the electricity sector. Emissions in this sector will fall from 30 to 14 Mton of CO_2 equivalents (see table 5.1) between 2020 and 2030. Until 2029, emissions from the electricity sector will decline relatively little as a result of both increasing generation of renewable energy and greater levels of electricity exports. Subsequently, in 2030, emissions will decline sharply following the closure of the last three remaining coal-fired power stations in the Netherlands.

	Emissions [Mton CO_2 eq]			**Projection [Mton CO_2 eq]**	
Sector	**1990**	**2005**	**2017**	**2020**	**2030**
Electricity	39.6	52.1	48.5	29.8	14.1
Industry	87.0	67.3	57.7	56.9	54.2
Built environment	29.9	29.3	24.6	22.8	19.2
Agriculture (excluding land use)	32.9	26.1	27.4	26.9	24.5
Mobility	32.3	40.0	35.5	34.8	33.1
Total	221.7	214.7	193.7	171.3	145.0
Reduction post-1990		3%	13%	23%	35%
Land use	6.5	5.7	5.6	5.3	5.6
Total (including land use)	228.2	220.4	199.3	176.6	150.6

Table 5.1: Greenhouse gas emissions 1990-2030 based on the Climate Agreement (climate sector) structure (with existing policies).

Greenhouse gas emissions from all of the other sectors are expected to decline in the period between 2020 and 2030 based on existing policies, with the biggest reduction (nearly 4 Mton of CO_2 equivalents) stemming from the built environment. The emissions in industry will fall by nearly 3 Mton of CO_2 equivalents during this period, due to a slight reduction in emissions from refineries and from the extraction of oil and natural gas. Emissions from the manufacturing industry are expected to remain more or less the same, as an increase in emissions from the chemical sector

will be compensated by a decrease in the food, paper and construction sectors. In addition, emissions from agriculture and mobility are both expected to decline by around 2 Mton of CO_2 equivalents between 2020 and 2030. Table 5.2 displays the developments in greenhouse gas emissions in accordance with the CRF structure.

	Emissions [Mton CO_2 eq]			**Projection [Mton CO_2 eq]**	
Sector	**1990**	**2005**	**2017**	**2020**	**2030**
1. Energy	158.6	173.0	160.2	138.9	114.5
2. Industrial Processes	22.9	16.5	11.1	10.9	10.4
3. Agriculture	25.1	18.4	18.9	18.3	17.9
4. Land Use, Land-Use Change and Forestry	6.5	5.7	5.6	5.3	5.6
5. Waste	14.2	6.4	3.1	2.7	1.7
Indirect	0.9	0.4	0.5	0.5	0.5
Total	221.7	214.7	193.7	171.3	145.0
Reduction post-1990		3%	13%	23%	35%
Total (including land use)	228.2	220.4	199.3	176.6	150.6

Table 5.2: Greenhouse gas emissions 1990-2030 based on the sector structure of the National Inventory Report (with existing policies).

The greenhouse gas emissions with additional policies and measures display a slight additional decline for the period up to and including 2020.
The additional policy package (WAM) only differs slightly from existing policies. The main proposals for policy measures included in the KEV 2019 are as follows:

- BENG (Almost Energy-Neutral Buildings) requirements applicable to new buildings after 2020.
- Early implementation of emission requirements for Ecodesign wood-burning stoves: will come into force in 2020 instead of 2022.
- Expansion of the OCAP pipeline: extra provision of industrial CO_2 from 0.1 to 0.2 Mton for cultivation of crops in the greenhouse horticulture sector.
- Kilometre charge for cargo transport as of 2022.
- A flight tax of €7 per departing passenger and €1.93-€3.85 per tonne of cargo for carriers (rate depends on the noise pollution level of the type of aircraft used).

In the period up to and including 2020, emission levels with additional policies will be almost the same as for existing policies. By 2020, emissions with additional policies will be around 11 kilotonnes of CO_2 equivalents lower, mainly as a result of the closure of the Hemweg power station at the end of 2019.

Projections of greenhouse gas emissions with additional policies and measures between 2020-2030 roughly the same
In the period from 2020 up to and including 2030, the two policy variants from the KEV ('With Additional Measures' (WAM) and 'With Existing Measures' (WEM)) both reflect a roughly similar situation: national totals of 144 Mton of CO_2 equivalents with additional measures (excluding emissions from land use) and 145 Mton of CO_2 equivalents with existing measures. Half of this difference stems from the electricity sector (0.4 Mton of CO_2 equivalents), while the other half is due to lower emissions (approx. 0.2 Mton of CO_2 equivalents) from the built environment and from mobility.

With the additional policies and measures, emissions are projected to decline by 35% [28%-39%] by 2030 in comparison to 1990, which is 14 [10-21] percentage points below the target level of 49% as stipulated in the Climate Act. The projection for absolute emissions in 2030 is 31 [22-46] Mton of CO_2 equivalents above the target of 113 Mton of CO_2 equivalents as stipulated in the Climate Act. This does not include the announced policies and measures as stipulated in the Climate Agreement (see text box 5.2).

Text box 5.2 Main differences between he projections in BR3 and BR4

The projections from the Third Biennial Report (2017) were based on the National Energy Outlook 2017 (NEV 2017) (with existing and additional policies). The national emissions projection for 2020 as determined in the KEV 2019 (WAM) only differs slightly (approx. 1 megatonne of CO_2 equivalents) from the projection in the NEV 2017. One important explanation of this is that emissions levels are higher in almost all sectors, with the exception of the energy sector, and a more general explanation is that the KEV assumes greater levels of economic growth. Furthermore, a variety of sector-specific explanations apply in the different sectors. For example, a statistical correction was applied that resulted in emission levels from the industrial sector rising by 2.7 Mton of CO_2 equivalents. In the energy sector, on the other hand, the projected emission levels shrank by 6 Mton of CO_2 equivalents due to higher fuel and CO_2 prices and the closure of the Hemweg power station (at the end of 2019).

The projected 2030 emission level in the KEV (144 Mton of CO_2 equivalents) is 10 Mton lower than the projection of 154 Mton of CO_2 equivalents in the NEV 2017 (see table 5.3). This is mainly due to the fact that the KEV 2019's projected level of emissions from the electricity sector is approximately 16 Mton of CO_2-eq lower than the projection in the NEV 2017. This difference is primarily due to the ban on the use of coal by power stations, which the KEV 2019 takes into account. This ban means there will be no more emissions from Dutch coal-fired power stations by 2030. To replace the electricity generated by coal-fired power stations, the projected levels of electricity from gas-fired power stations and cogeneration in the KEV 2019 are higher than those in the NEV 2017. The KEV 2019 also predicts greater use of cogeneration in the industrial sector and the greenhouse horticulture sector than the projections made in the NEV 2017. As a result, the projected emissions from these two sectors in 2030 are higher than in the NEV 2017. The estimated emissions in the KEV 2019 from the built environment, mobility and agriculture are similar to those in the NEV 2017.

Table 5.3: Projections of greenhouse gas emissions by 2020 and 2030 in the KEV compared with the NEV 2017 (sector definitions in accordance with the Climate Agreement)

	Projections for 2020 [Mton of CO_2-eq.]		**Projections for 2030 [Mton of CO_2-eq.]**	
Sector	**KEV 2019 (WAM)**	**NEV 2017 (WAM)**	**KEV 2019 (WAM)**	**NEV 2017 (WAM)**
Electricity	29.8	36.0	13.7	29.8
Industry	56.9	52.7	54.2	49.5
Built environment	22.8	21.9	19.0	18.5
Mobility	34.7	33.1	32.8	32.4
Agriculture	26.9	25.9	24.5	23.5
Total	171 [164-180]	170 [161-179]	144 [135-159]	154 [136-179]
Reduction compared to 1990	23% [19-26%]	23% [19-27%]	35% [28-39%]	31% [19-38%]

Source: KEV 2019

5.3.2. Developments in ETS and non-ETS (with existing policies))

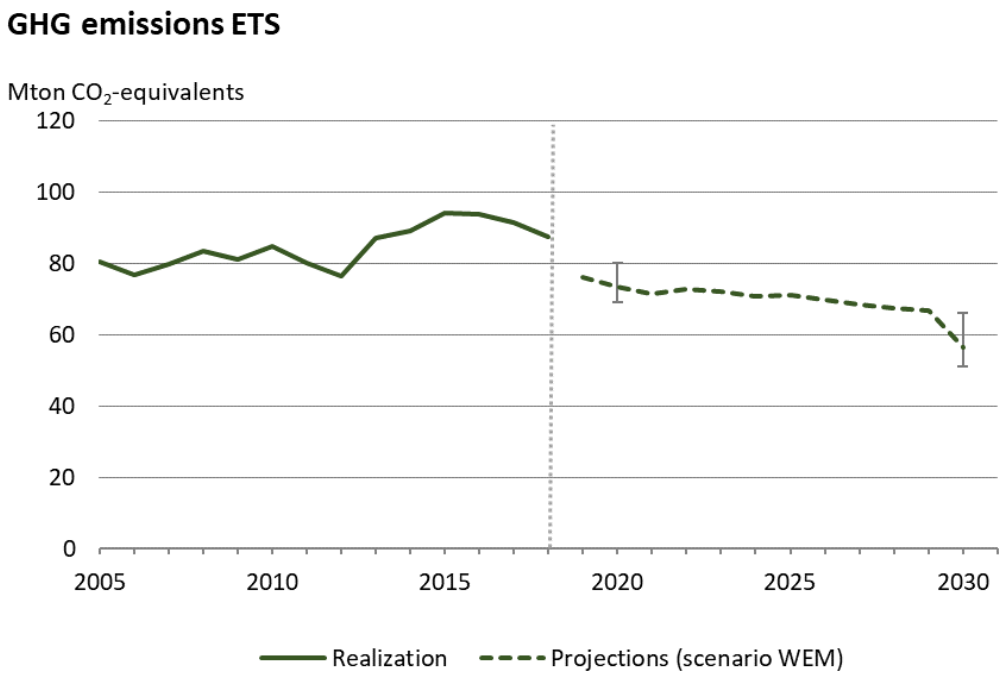

Figure 5.2 Historical and expected greenhouse gas emissions by ETS sectors in the period of 2005-2030 (with existing policies)

ETS emissions trend
Between 2005 and 2012, the emissions of Dutch businesses that took part in the European emissions trading system fluctuated around 80 Mton of carbon dioxide equivalents. In 2013, ETS emissions increased substantially, mainly due to an administrative reallocation of (emission-related) activities from non-ETS to ETS. In 2015 and 2016, the total ETS emissions rose to around 94 Mton of CO_2 equivalents as a result of substantial emissions in the electricity sector. Subsequently, in 2017 and 2018, the total levels of ETS emissions dropped to 91 and 87 Mton of CO_2 equivalents. This reduction was due to lower emission levels in the electricity sector resulting from less electricity being generated in coal-fired power stations and more in gas-fired power stations. Since 2015, ETS emissions from the industrial sector have increased slightly due to favorable economic conditions, among other factors.

ETS emissions expected to be lower by 2020 and 2030
Compared with 2017, ETS emissions are expected to fall by 18 Mton of CO_2 equivalents to 73 [69-80] Mton by 2020 (see figure 5.2). This reduction is due to lower levels of electricity being generated by coal- and gas-fired power stations (see explanatory notes above).

Beyond 2020, ETS are expected to continue declining, to 56 [51-66] Mton of CO_2 equivalents by 2030. This sharp decline is mainly due to a 16-megatonne reduction in emissions from electricity generation in the period between 2020 and 2030 (closure of coal-fired power stations and greater

share of renewable energy). ETS emissions in the industrial sector will fall by 1 megatonne of CO_2 equivalents between 2020 and 2030 (from 43 to 42 Mton).

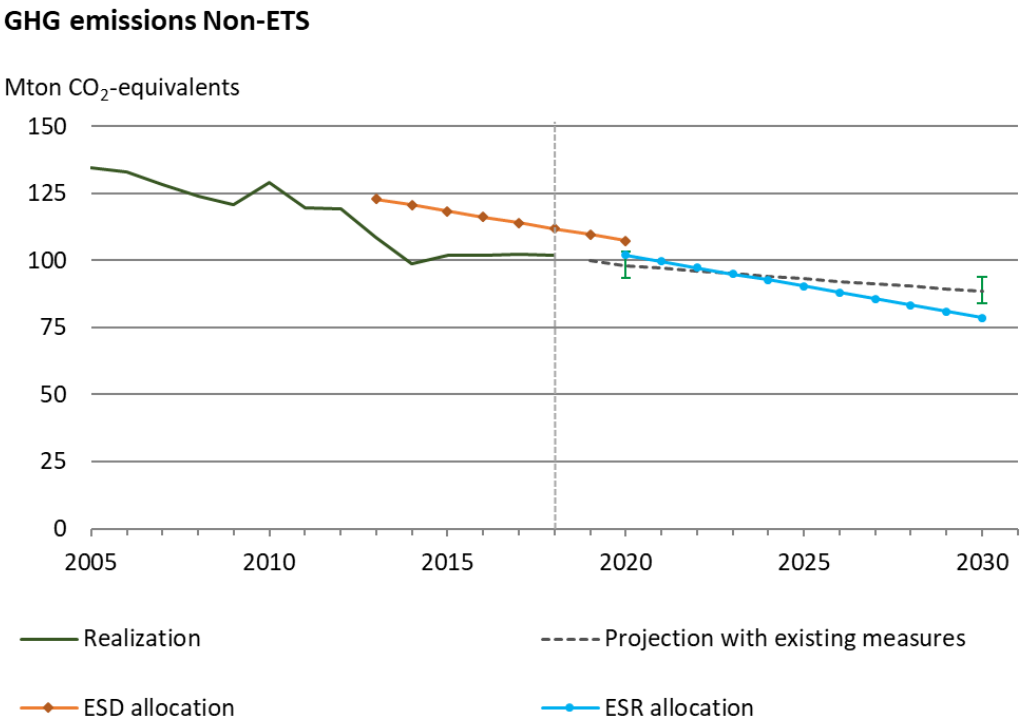

Figure 5.3: Historical and expected greenhouse gas emissions by ETS sectors 2005-2030 (with existing policies)

Cumulative target for non-ETS emissions

In Europe, national targets have been agreed upon for greenhouse gas emissions that do not fall under the European emissions trading system (hereinafter referred to as non-ETS). This includes emissions from mobility, nearly all emissions from the built environment, the majority of emissions from agriculture and a small proportion of emissions from industry (emissions from land use are not included in the non-ETS targets). The non-ETS targets and legislation for the period 2013-2020 are set in the Effort Sharing Decision (ESD), which specifies that the Netherlands must cut its emission levels by 16% of the 2005 levels by 2020. For the period 2021-2030, the Dutch non-ETS targets are specified in the Effort Sharing Regulation (ESR), which specifies that the Netherlands must cut its emission levels by 36% of the 2005 levels by 2030. Based on these two reduction targets, two series of annual caps have been developed (2013-20 and 2021-2030) specifying maximum permitted emission levels. These annual caps will then be added up for each series to produce a cumulative target for each period. The objective in the ESD relates to a series of annual caps of the permitted emissions between 2013 and 2020, which collectively make up the cumulative target for the whole period. The maximum permitted cumulative emissions for the Netherlands under the ESD for the 2013-2020 period amount to 921 Mton in carbon dioxide equivalents. For the 2021-2030 period, new targets have been agreed upon within the framework of the new ESR. For the Netherlands, this is 36%, which is expected to lead to permitted cumulative emissions of 879 Mton. The emission caps will be determined by the European Commission in 2020.

Downward trend of non-ETS emissions

Non-ETS emissions have fallen from 134 Mton in carbon dioxide equivalents in 2005 to 108 Mton in 2013 (see figure 5.3). The reduction in the period from 2005 to 2013 was mainly due to the approx. 20 Mton CO_2-eq reduction in non-ETS emissions from the industrial sector. During the same period, reductions were also achieved in the electricity (3 Mton) and mobility (4 Mton) sectors. In 2013, ETS emissions decreased due to an administrative reallocation of emission-related activities from non-ETS to ETS, among other factors. Between 2015 and 2018, non-ETS emissions stabilised at a level of around 102 Mton of CO_2 equivalents. Emissions of non-carbon dioxide greenhouse gases also significantly decreased during this period, namely by 8 Mton, primarily due to reduction measures in relation to the production of nitric acid.

Sector*	2013	2015	2018**	2020	2025	2030
Electricity	0.2	0.8	0.3	0.5	0.5	0.3
Industry	15.8	15.9	15.5	13.9	13.0	12.2
Mobility	36.3	34.7	35.6	34.8	34.4	33.1
Built environment	29.7	24.1	24.0	22.4	20.0	18.9
Agriculture and horticulture	26.5	26.5	26.5	26.5	25.5	24.1
Totals	108.5	102.0	101.9	98.0	93.3	88.6

* Classification per sector based on the Climate Agreement. In the CRF tables, emissions are presented according to the CRF format.

** Based on preliminary statistics.

Table 5.4: Emissions of non-ETS greenhouse gases from 2005 to 2030 based on existing policy (in Mton of carbon dioxide equivalents, excluding LULUCF, scope according to the third ETS trading period from 2013 to 2020)

EU obligation for non-ETS for the period 2013-2020 more than feasible

In the period 2018-2020, a further reduction to 98 Mton of CO_2 equivalents is expected. This reduction mainly stems from a decline in emissions from the built environment (7 Mton), industry and mobility (both less than 2 Mton) (see table 5.4). The maximum permitted cumulative emissions for the Netherlands for the 2013-2020 period amount to 921 Mton in carbon dioxide equivalents. Based on existing policies, the cumulative emissions for that period are projected to be 814 megatons of CO_2 equivalents. This level is still considerably below the mandatory cumulative emission cap (see figure 5.3).

EU obligation for non-ETS for the period 2021-2030

The maximum permitted cumulative emissions for the Netherlands for the 2021-2030 period are expected to amount to 891 Mton in carbon dioxide equivalents. Based on existing policies, cumulative emissions for 2021-2030 are expected to amount to 931 Mton of CO_2 equivalents, with a deficit of 39 Mton in carbon dioxide equivalents remaining (which poses a policy effort) for the established period. Based on additional policies, the projected cumulative emissions for 2021-2030 amount to 925 Mton of CO_2 equivalents: this is 6 Mton lower than with existing policies. This represents a deficit – and therefore a policy effort– of 34 Mton of CO_2 equivalents for this period. The calculation for the cumulative target above already implicitly accounts for the possibility of compensating for deficits with surpluses between the years (banking and borrowing). The

calculations also do not take into account the opportunity – as stipulated in the European rules – to make use of LULUCF credits.

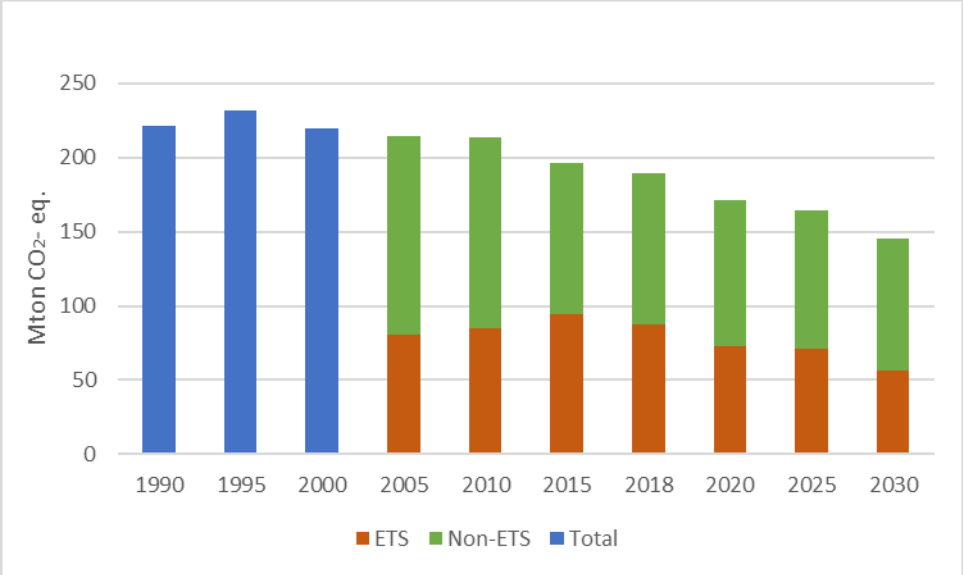

Figure 5.4: Historical emissions and projections (split ETS/non-ETS), 1990–2030, in Mton CO_2 eq. (excl. LULUCF) (with existing policies)

5.3.3. Sectoral developments in non-ETS sectors (with existing policies)

Built environment

Since 1990, emissions in the built environment have gradually fallen from 30 Mton of CO_2 equivalents to 24 Mton in 2018 (without temperature correction; of which 0.5 Mton falls under the ETS), despite an increase in the number of households from 7.1 million to 7.9 million and an expansion of the total floor area of commercial buildings during this period. The number of households is expected to continue to rise to 8 million by 2020 and 8.5 million by 2030. In 2018, the number of residential properties was 7.74 million: this figure is expected to rise to 7.88 million by 2020 and 8.4 million by 2030. Household size declined from 2.3 to 2.2 people per household in the period from 2005 to 2019 and is expected to further decline to 2.1 by 2030. The number of 'degree days' is an indicator of the number of hours in which the heating is on. The long-term trend displays a decline in the number of degree days by 3.5 per decade. Although the number of degree days fluctuates per year, the Royal Dutch Meteorological Institute (KNMI) estimates that this will be over 4% lower than current levels by 2030. Due to all of these structural changes, it is expected that functional demand for heat (for space heating) will decline by 5%.

It is expected that carbon dioxide emissions will fall to 23 Mton by 2020 and to nearly 19 Mton by 2030 (of which 0.3 Mton falls under the ETS). The decrease among households is the result of a reduction in the consumption of natural gas as a result of insulation measures and the use of more efficient boilers in existing buildings, demolition of existing buildings and the construction of energy-efficient new buildings.

The decrease in the services industry is the result of energy savings in existing buildings, demolition, energy-efficient new buildings, reduction in space heating due to global warming, an

increase in the use of electric heat pumps instead of boilers fired by natural gas and less use of cogeneration. The reduction in gas consumption is due to the notification requirement and enforcement of the Environmental Management Act *(Wet milieubeheer)* in combination with a mandatory C label for offices. Furthermore, in the period up to 2030, the BENG requirements for new buildings (WAM) – which will come into force after 2020 – will also come into play.

Industry
A limited percentage of greenhouse gas emissions from industry does not fall under the ETS (over 15 Mton of carbon dioxide equivalents in 2017). The aforementioned developments relevant to the ETS emissions produced by industry are also relevant to the non-ETS emissions. In the period up to 2030, the non-ETS greenhouse gas emissions are expected to gradually decline to approximately 12 Mton of CO_2 equivalents, mainly due to a decline in the emission of other greenhouse gases. Methane emissions from landfill sites have fallen sharply. This decline will continue in the period up to 2030 due to an expected 50% reduction of waste material from 2020 onwards. A 50% reduction is also expected in the amount of degradable carbon per tonne of waste. Between 2000 and 2008, there was a substantial reduction in N_2O emissions, mainly in relation to the production of nitric acid. This sharp reduction was solely due to the fact that, as of the start of the second trading period, the production of nitric acid was classified as ETS. As a result, reduction measures were implemented, which yielded a decrease in emissions of around 5 Mton of CO_2 equivalents in comparison to previous years. The production of acrylonitrile and caprolactam do not fall under the ETS and no further emission-reduction measures for these branches of industry are expected based on existing climate policies.

Coolants used for heat transfer during the process of stationary cooling (e.g. in the industrial sector) contain hydrofluorocarbons (HFCs) such as HFC23 and HFC134a. HFC emissions can occur as a result of leakage during the refill and drainage of systems or leakage during operation of the systems. The EU F-gases Directive that came into force on 1 January 2015 stipulates that the use of HFCs (calculated in CO_2 equivalents) must be reduced by 79% in the period from 2015 to 2030. The projection also takes this factor into account.

Mobility
Between 1990 and 2008, carbon emissions increased by roughly 8 Mton due to an increase in domestic traffic and transport as a result of economic growth. Following the economic crisis of 2008, emissions rapidly fell. Despite the recovery of the economy, emissions have remained more or less stable around 35 Mton of CO_2 equivalents. The relatively substantial increase in cargo volumes in 2018 was compensated by more efficient vehicle fleets and increasing use of biofuels for mobility.

Greenhouse gas emissions from the mobility sector are expected to decrease by 0.8 Mton of CO_2 equivalents in the period 2018-2020, totalling around 34.8 Mton by 2020 [32.8-35.7 Mton]. This decrease is mainly due to the further increase in the use of renewable energy for transport, particularly in the form of biofuels. It is expected that emissions will continue to fall to 33 Mton of carbon dioxide equivalents by 2030. This decline is largely attributable to stricter European source policy concerning emissions from new vehicles, despite increasing volumes of traffic.

Mobile machinery is the biggest source of greenhouse gas emissions from non-road traffic mobility. This category includes excavators, farm tractors, forklift trucks and leaf blowers. Although these types of machinery are not primarily used for transport, their emissions (over 3 Mton of CO_2 equivalents) are classified as belonging to the mobility sector and account for around 10% of total mobility emissions. Inland shipping and fishing are responsible for modest emission levels of

around 2-3%. Rail transport is mainly powered by electricity and therefore accounts for a very low proportion of total greenhouse gas emissions in this sector.

Greenhouse gas emissions from the burning of bunker fuels in the international aviation and shipping industries do not count towards national emission levels. Between 2000 and 2006, these emissions increased from 53 to 67 Mton of CO_2 equivalents. These levels declined in the subsequent period to approximately 50 Mton by 2016 and 2017, and provisional figures for 2018 display a further reduction to 48 Mton. Based on existing policies, this figure is expected to grow to 52 Mton of CO_2 equivalents by 2030. The sale of bunker fuels to the international shipping industry is expected to remain stable in the coming period. The projection for emission levels in 2030 is 34 Mton [27-40 Mton]: the same level as is projected for 2018. A slight increase has been forecast for the sale of bunker fuels to the inland shipping industry: these greenhouse gas emissions are projected to be 2.7 Mton of CO_2 equivalents [2.1-3.2 Mton] by 2030. The total sale of bunker fuels to the aviation industry is estimated to be 215 petajoules [177-231 petajoules] by 2030, accounting for greenhouse gas emission levels of 15 Mton [13-16 Mton] (see figure 5.5).

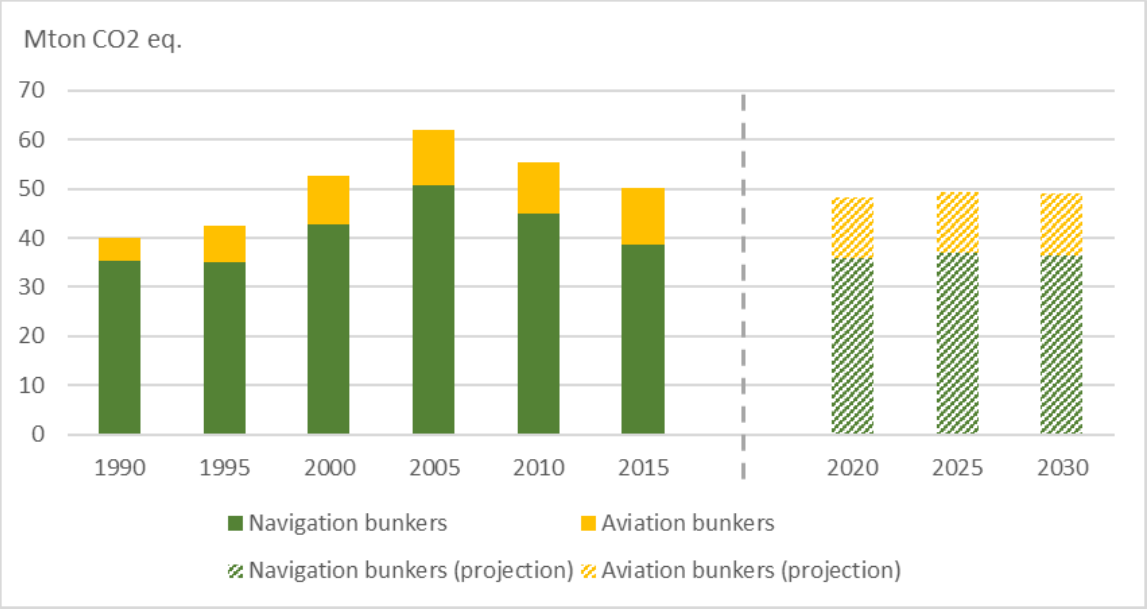

Figure 5.5: Historical emissions and projections for CO_2 from international aviation and navigation, 1990–2030, in Mton-eq. CO_2

Agriculture and horticulture

Most of the carbon emissions from the agricultural sector are produced by the greenhouse horticulture sector, where a large amount of energy is used to heat and light the greenhouses and fertilise them with carbon dioxide. Due to an increase in the total acreage of greenhouses, carbon emissions increased from less than 8 Mton in 1990 to nearly 10 Mton in 2010 (of which 1.8 Mton at the time fell under the ETS). Thereafter, the area of greenhouses decreased by 12%, with carbon emissions currently situated around 7-8 Mton (of which approximately 0.4 Mton falls under the ETS). The carbon emissions in agriculture and horticulture are expected to remain the same in the period up to 2020, after which they will decrease further to 6 Mton in 2030 (of which 0.3 Mton ETS) due to increasingly more efficient and innovative greenhouses. CO_2 emissions in particular will decline (by 1.8 Mton) due to reduced use of fossil energy carriers in gas-fired boilers and gas-fired CHP systems. These fossil fuels are being replaced by renewable energy (biomass boilers and geothermal energy), slightly higher levels of external heat provision to the greenhouse horticulture

sector due to further roll-out of heat networks (particularly in Westland) and a reduction of demand for heat stemming from (limited) new construction and the installation of extra energy screens. All of the aforementioned energy developments take into account a future increase in the demand for heat and electricity due to the trend for further intensification of cultivation (more product per square metre and longer growing seasons). The demand for external CO_2 in the greenhouse horticulture sector will also rise as a result of increasingly sustainable heat generation using CO_2-free sources. Less use of gas-/biogas-fired CHP in the period up to 2030 will also result in a reduction of 0.2 Mton of CO_2 equivalents in methane emissions.

Between 1990 and 2018, emissions of other (non-carbon) greenhouse gases from the agriculture and horticulture sectors decreased by nearly 6 Mton in carbon dioxide equivalents to 19 Mton in CO_2 equivalents. In 2017, other greenhouse gas emissions from the agriculture sector were 0.8 Mton in CO_2 equivalents higher than in 2010. This increase was primarily related to the growth of the dairy herd following the abolition of milk quotas at the beginning of 2015 and, to a lesser extent, due to increased use of fertiliser. This increase is expected to halt once livestock herds shrink as a result of policy from 2017. Preliminary figures for 2018 already show a reduction of 0.6 Mton CO_2-eq compared to 2017.

Other greenhouse gas emissions from agriculture are expected to decline from 18.9 Mton of CO_2 equivalents to 18.2 Mton (17.9-18.5) in the period 2017-2020. In the same period, methane emissions will decrease by approximately 0.5 Mton of CO_2 equivalents and nitrous oxide emissions will decrease by 0.2 Mton of CO_2 equivalents. The reduction in methane emissions is the result of shrinkage of the dairy herd: by 2020, the number of dairy cows and young stock had declined by 6% and 16% respectively in comparison to 2017 (see figure 5.21). It is assumed that dairy farmers will retain less young stock and the number of young cows per dairy cow will decrease from 0.7 to 0.63 in the period 2017-2020. Based on a preliminary estimate, the reduction of 0.5 Mton of CO_2 equivalents in methane emissions as a result of shrinkage of the dairy herd took place almost entirely in the period 2017-2018. This was due to the 2017 phosphate reduction plan and the introduction of the phosphate rights system for dairy cattle as of 2018. The 0.2 Mton CO_2-eq reduction in nitrous oxide emissions between 2017 and 2020 resulted from lower levels of nitrogen transfer into the soil via livestock manure. This transfer mainly takes place during grazing of young stock. The main causes of the reduction are the assumed lower nitrogen content of the rations and the lower numbers of young stock in 2020 compared to 2017.

Other greenhouse gas emissions from the agricultural sector will continue to decrease in the period 2020-2030 to 17.8 [16.7-18.0] Mton of CO_2 equivalents (a reduction of 0.4 Mton). In the same period, methane emissions will decrease by around 0.5 Mton of CO_2 equivalents and nitrous oxide emissions will decrease by around 0.2 Mton of CO_2 equivalents. The reduction in methane emissions is mainly due to the assumed decrease in the number of young cows (by a further 16%) and further reduction of the ratio of young cows per milk cow from 0.63 in 2020 to 0.56 by 2030. In addition, the number of pigs will be reduced by 5% as a result of the agreements stipulated in the Coalition Agreement 2017 (concerning scaling back of pig farming). The number of dairy cows will also decrease by 5% in the period up to 2030, but this will not result in a reduction in methane emissions. The reason for this is that milk production per cow will increase by 1.25% in the period up to 2030, as will the associated extra feed intake. Although feed intake will rise at a slower rate than milk production per cow, this will result in a net increase in methane emissions per cow.
The practice of manure fermentation (in the form of co-fermentation) slowly increased over the period 2006-2014, after which it stabilised. The current SDE+ subsidy programme focuses solely on energy production (i.e. avoidance of CO_2 emissions), and therefore does not pay any attention to methane emissions stemming from manure storage. In 2017, methane emissions from manure fermentation decreased by 0.13 Mton of CO_2 equivalents. It has been assumed that without additional policies, both manure fermentation and reduction of methane emissions stemming from

manure storage will remain limited in scale. However, a transition from co-fermentation to mono-fermentation is expected (due in part to the SDE+ scheme).

5.3.4. Developments LULUCF

LULUCF emissions stable
In the Netherlands, grasslands, agricultural land and developed land are the principal sources of the so-called Land Use, Land Use Change and Forestry (LULUCF) emissions. Forests capture net CO_2. The combined net emissions from all land use categories decreased from 6.1 to 5.6 Mton of CO_2 equivalents per year (see figure 5.6) in the period from 2000 to 2017. Besides low levels of nitrous oxide (0.06 Mton of CO_2 equivalents in 2000, rising to 0.1 Mton by 2017), these emissions almost entirely consisted of CO_2. Between 2000 and 2010, emission levels gradually declined, with the figure stabilising after 2010 at a level of around 5.6 Mton of CO_2. The reduction of net emissions from 2000 to 2017 was achieved via changes in the use of agrarian land, which offset increased emission levels resulting from the expansion of built-up areas and lower net levels of carbon absorption by forests. Carbon absorption by forests declined gradually from 2.0 Mton of CO_2 equivalents to 1.8 Mton over the period 2000-2017. This decline correlates with increased deforestation and the gradual ageing of Dutch forests, which results in less carbon being captured by existing forests. Emissions from agrarian land use (arable land and grasslands) declined from 6.7 Mton of CO_2 equivalents to 5.5 Mton in the period 2000-2017. This trend is a result of reduced agricultural acreage and peat-soil acreage. Emissions from the expansion of built-up areas (construction) increased from 1.2 to 1.5 Mton of CO_2 equivalents in the same period.

Projected LULUCF emissions
Total LULUCF emissions are expected to decrease from 5.6 Mton of CO_2 in 2017 to 5.3 Mton by 2020 due to a multitude of minor changes. The reduction is mainly due to slightly lower emissions from construction, higher levels of carbon absorption as a result of afforestation, and reduced emissions from arable land.

After 2020, total net emissions from land use are expected to increase to 5.6 Mton of CO_2 equivalents by 2030 as a result of various developments. The KEV projects that emissions from construction will gradually increase between 2020 and 2030 from 1.5 to 1.7 Mton of CO_2 equivalents. This trend stems from a gradual decrease in arable acreage, a shift from arable land to grasslands, and the expansion of urban ('built-up') areas. In the same period, forests are expected to absorb less greenhouse gases (net reduction of 0.1 Mton of CO_2 equivalents). Emissions from arable land are projected to increase slightly between 2020 and 2030 from 1.7 to 1.8 Mton of CO_2 equivalents. Emissions from grasslands during the same period are expected to decline by nearly 0.2 Mton of CO_2 equivalents, reaching a level of 3.5 Mton by 2030. Total net emissions from agrarian land use (arable land, grasslands and harvested forest products) will decrease between 2020 and 2030 from 5.5 to 5.4 Mton of CO_2 equivalents.

The analysis of emissions ('debits') and reductions ('credits') for the current projections for the period up to 2030 projects annual net debits by the end of both commitment periods specified in the LULUCF Regulation (2025 and 2030), with an average of 0.3 megatons of CO_2 equivalents in 2025 and 0.25 megatons of CO_2 equivalents in 2030. This equates to a net debit of 1.5 Mton of CO_2 equivalents during the first commitment period (2021-2025) and 1.2 Mton of CO_2 equivalents during the second commitment period (2026-2030). The category 'deforested land' is the main source of emissions due to the loss of carbon from biomass and litter. Credits are earned for the categories 'forested land', 'arable land' and 'grasslands'.

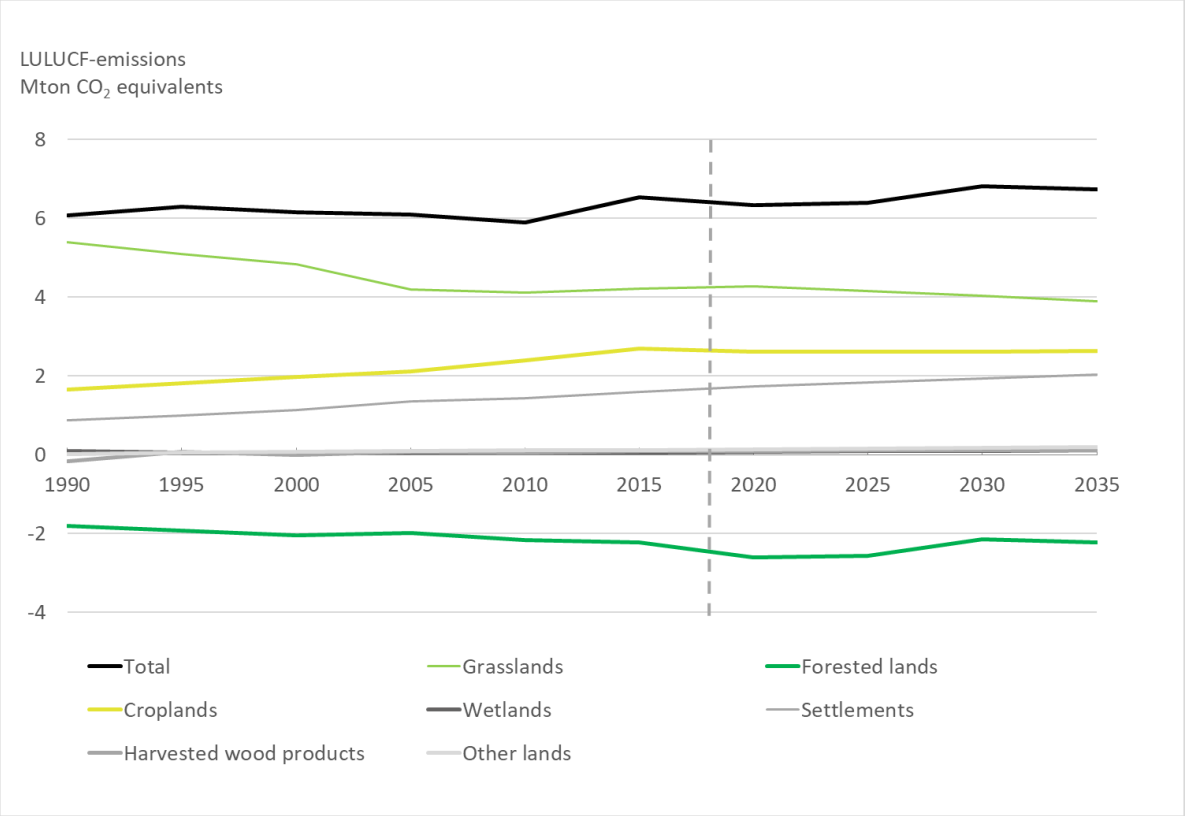

Figure 5.6: Historical emissions and projections from LULUCF, 1990–2030, in MtonCO_2-eq.

5.4. Assessment of the aggregate effects of policies and measures and uncertainty analysis

5.4.1. Effects on emissions of greenhouse gases

All measures taken together will bring about a reduction of the total greenhouse gas emissions in the period 2018–2020 of 18 Mton CO_2-eq. (13%) for both policy variants (WEM and WAM) (see Table 5.5). This reduction will be achieved mainly in CO_2 emissions.

Additional emissions reductions of 26 Mton-CO_2 eq. with the existing policies (WEM) or 27 Mton-CO_2 eq. with the additional policies (WAM) are projected for the period 2020–2030. CO_2 emissions will fall by 24 Mton- and 25 Mton-CO_2 eq. respectively. Under both policy variants, non-CO_2 emissions will fall by 2.3 Mton-CO_2 eq.

Around 45% of the Dutch emissions (excluding LULUCF and international aviation and navigation) are covered by EU ETS. The emissions under EU ETS are projected to fall by 7.3 Mton-CO_2 eq. in both policy variants (WEM and WAM) in the period 2013–2020. Non-ETS emissions are projected to fall by 9.8 Mton-CO_2 eq. in both policy variants in the same period. The emissions under ETS will decrease by a further 17 Mton-CO_2 eq. (WEM and WAM) in the period 2020–2030, while non-ETS emissions will decrease by an additional 9 Mton-CO_2 eq. (WEM and WAM).

(Mton CO_2 eq.)	Historical emissions							Projections			
	1990	1995	2000	2005	2010	2015	2018*	2020 WEM	2020 WAM	2030 WEM	2030 WAM
Total emissions	221.7	231.7	219.8	214.7	213.8	196.0	189.3	171.3	171.3	145.0	144.3
Breakdown by gas											
Carbon dioxide	163.3	173.7	172.5	178.0	182.6	166.9	161.2	143.2	143.2	119.3	118.6
Methane	31.8	29.7	24.3	19.9	19.4	18.2	17,3	17.3	17.3	15.7	15.7
Nitrous oxide	18.0	18.2	16.2	14.6	8.6	8.8	8.5	8.6	8.6	8.5	8.5
Fluorinated	8.5	10.1	6.9	2.3	3.1	2.1	2.2	2.1	2.1	1.5	1.5
Breakdown ETS/non-ETS											
ETS				80.4	84.7	94.1	87.4	73.2	73.2	56.4	56.0
Non-ETS				134.4	129.1	101.9	101.9	98.0	98.0	88.6	88.3

* provisional data

Table 5.5: Projections by gas and split into ETS/non-ETS, 1990–2030, in Mton CO_2 eq (excluding emission from LULUCF and including indirect emissions).

5.4.2. Uncertainty analysis

The Netherlands uses the National Climate and Energy Outlook (KEV) 2019 for the projections. Although developments in factors that are largely exogenous, such as the economy, demography, fuel prices, technology and human behaviour, can only be predicted to a limited extent, they do have a major influence on the trends in emissions. The effects of policy measures can also be uncertain, because it is usually difficult to predict how the market will behave. As a consequence, there is inevitably a large degree of uncertainty in the projections. Based on the most up-to-date information on these factors, the KEV 2019 presents a picture of the most plausible scenario for the future. The projections present one estimation of future trends in these factors. One scenario is produced that constitutes the conditional point of departure for the projections; if the trends proceed as expected, the consequences for the emissions will be as described. The varying degrees of uncertainty surrounding the exogenous and other factors are shown by means of uncertainty ranges for 2020 and 2030 with a 90% reliability interval, which means that an outcome outside the given ranges is very improbable but still conceivable.

The uncertainty calculations produce ranges in the total emissions of 9% for 2020 and 16-17% for 2030 (see Table 5.6).

(Mton CO_2 eq.)	**2020 (WEM)**	**2020 (WAM)**	**2030 (WEM)**	**2030 (WAM)**
Total emissions	171	171	145	144
Uncertainty range	165-180 (-4%/ +5%)	165-180 (-4%/ +5%)	136-159 (-6% / +9%)	135-159 (-6%/ +10%)

Table 5.6: Projected national emissions with uncertainty ranges, 2020 and 2030, in Mton CO_2 eq (excluding emission from LULUCF and including indirect emissions).

Sensitivity analysis
Developments for which short-term or medium-term uncertainty has a relatively significant effect on the projections can be assessed via a sensitivity analysis. In creating the KEV 2019, a sensitivity analysis for 2020 was conducted to assess the impact that the following scenarios could have on the electricity market: reduced access to nuclear power stations in Belgium and France, a year with low wind levels in Northern Europe and stronger than usual fluctuations in energy and CO_2 prices. For 2030, a sensitivity analysis has been elaborated with more ambitious climate and energy policy in the United Kingdom, France and Germany, which will boost availability of renewable electricity and reduce the availability of coal and nuclear power. The results of these sensitivity analyses are summarised in text box 5.3.

Text box 5.3: Sensitivity analysis and alternative scenario for developments in the European electricity market.

Sensitivity analysis for 2020
The background scenario of the KEV is based on an average picture of the European electricity market. For example, average standard technical availability of nuclear power stations is assumed. With regard to the issue of solar, wind and hydroelectric power, a year with an average climate is assumed, while a single average price is maintained throughout the year for both fuel and CO_2. In contrast, the sensitivity analysis assumes lower availability of nuclear power stations based on outcomes from 2018, less wind power and precipitation and more sun in Northern Europe (based on the weather in 2010) and a monthly price pattern for fuel and CO_2 prices based on the data from 2018.

It also assumed a drop in net imports from 15.3 to 12.3 caused by lower electricity generation abroad as a result of less renewable and nuclear electricity. In addition, there are months in which the gas-fired power stations in the Netherlands have a stronger position in the North-West European market due to the prices of fuel and CO_2. During these periods, coal- and gas-fired generation of electricity is considerably higher due to the lower levels of imports, less electricity from wind and lower production from the nuclear power station in Borssele. This results in nearly 6 terawatt hours of extra gas-based electricity and over 3 terawatt hours of extra coal-based electricity. As a result, CO_2 emissions will rise by 4 Mton in 2020 compared to the emission of approximately 30 Mton as projected in the main forecast of the KEV. The price of electricity will be approximately 2 euros per megawatt hour higher due to the reduced production of renewable and nuclear-based electricity in both the Netherlands and abroad.

Alternative scenario for 2030
In the long-term, other uncertainties concerning policy developments in other European countries come into play. We based the alternative scenario for 2030 on more extensive climate policy in the United Kingdom, France and Germany than has been assumed for the main forecast in the KEV (the main forecast is identical to the ENTSO-E Sustainable Transition scenario). With regard to thermal and renewable established capacity in Germany, the alternative scenario is based on the C2030 scenario[69]. The C2030 scenario assumes significantly lower levels of lignite and coal-fired electricity (in line with the recommendations of the Coal Committee) in comparison to the assumptions on which the main forecast of the KEV is based, although the C2030 assumes more renewable capacity. Our situation for France is based on the Ampère scenario, which was recently published by RTE in 2018 together with a

69 https://www.bundesnetzagentur.de/SharedDocs/Downloads/EN/BNetzA/PressSection/ReportsPublications/2019/AnnualReport2018.pdf%3F__blob%3DpublicationFile%26v%3D3

series of other scenarios. In this scenario, the assumptions for the established gas capacity are more or less equal to those on which the main forecast of the KEV is based, the nuclear capacity for 2030 is nearly 11 gigawatts lower, and wind and solar capacity is approximately 13 gigawatts higher than in the main forecast. The established capacity scenario for the United Kingdom is based on the 2018 National Grid's 2 degrees scenario, which assumes greater wind and nuclear capacity than the main forecast of the KEV, but less gas capacity. In all three countries, demand for electricity is rising due to electrification.

Due to increased generation of renewable electricity in North-West Europe, the Netherlands is expected to export slightly less power compared to the basic scenario in the KEV (approximately 2.5 terawatt hours). This is partly reflected in the reduced production of gas-based electricity (-1 terawatt hour) and partly in greater curtailment of wind power (2 terawatt hours compared with 0.6 in the main forecast). The higher proportion of renewable energy generated in North-West Europe will increase the frequency of situations in which supply levels elsewhere are so high that exports from the Netherlands are not possible. The other assumptions concerning developments abroad have little effect on CO_2 levels. The lack of coal in the electricity mix means changes to imports and exports will have little effect on CO_2 emissions as fluctuations in the electricity market can be accommodated by increasing or decreasing generation at gas-fired power stations and natural-gas-fired cogeneration stations, which cause substantially lower emission levels per unit than coal-fired power stations.

5.5. Description of methodology

5.5.1. Models and methods used

The KEV 2019 uses a combination of models to construct an energy balance sheet of energy consumption in the Netherlands that reflects the past and projects the future. This outlook analyses the developments in different socioeconomic sectors with regard to energy demands and energy production. An overview of energy flows is provided on the basis of these analyses. The quantitative developments in the activities themselves form the basis for this outlook, and include, amongst others, the production of electricity and goods, the use of devices, the heating of buildings and the number of kilometres travelled. Statistics Netherlands (CBS) collects information from questionnaires completed by businesses as well as information registered by network companies and government institutions to construct a historical overview. For projections of the future, the expected changes to these activities are calculated on the basis of assumptions about developments in the economy, demographics and the energy market. These particular projections are calculated using confirmed and announced projects and policy measures of government institutions and actions by other stakeholders. The expected levels of activity are converted into the relevant energy usage and the necessary energy production. Expected developments in technology are an important aspect of these calculations, especially those relating to improved energy efficiency and those leading to a change in the fuels needed for the production of power and heat . Finally, the energy usage is converted into CO_2 emissions. The emissions created by non-CO_2 greenhouse gases are determined on the basis of the levels of relevant activities that produce these emissions. A brief description of the models is included in Annex 1.

5.5.2. Key variables and assumptions

General approach
During the calculation of the projections, developments concerning the volume and price energy products and economic developments in other relevant sectors were taken into account. For this purpose, the long-term (2030) insights from the scenario study *Welvaart en Leefomgeving* ('Welfare, Prosperity and the Human Environment')[70] and the prices of energy commodities into account (see below). Assumptions concerning wage costs, work productivity and development of fixed costs are based on trends representative of the sectors in question. With regard to future investment in energy generation capacity, the KEV's assumptions are based on demand projections, existing and additional policies and the expected lifespan of installations.

Demographical and macro-economical developments

Population growth on the decrease
At the end of 2018, the population consisted of 17.2 million people. This figure is expected to increase to 18 million by 2030. Due to the ageing population, the potential workforce has stabilised in recent years. The increase of the retirement age will see the potential workforce increase in the years to come, but gradually decrease beyond 2025.

Increase in the number of small households
In terms of the energy consumption of consumers, the number of households is more important than the size of the population. Larger households have economies of scale in comparison to smaller households, so they consume less energy per person. The average size of households has been decreasing in the past decades, and this trend is set to continue in the future. The growth of the number of households is therefore greater than the growth of the population.

Economic activity recovered from crisis
In the period from 2000 to 2018, the Dutch economy (expressed in gross domestic product at 2015 prices) grew by an average of 1.6% a year. The economic recession beginning in autumn 2008 had a visible impact: From 2008 up to and including 2013, GDP shrunk by 2.0%. During the crisis, production and investments decreased sharply. The economy recovered afterwards. In 2014, the economy grew by 1.4%, after which growth rose each year, to 2.6 % in 2018.

At the beginning of the recession in 2008, exports showed a sharp decrease, but they recovered as early as 2010 and have not experienced a second dip, as was the case for domestic consumption and investments. For that reason, the economic recovery was initially chiefly borne by exports. However, from the end of 2014, the recovery of the housing market also had a positive impact on economic growth (expressed in the investments made by households), and from 2015, private consumption and commercial investment contributed to the economic recovery as well.

Despite the continued economic recovery, the average economic growth is not expected to reach the level of the 2000-2008 period until 2030 – during that period, growth averaged 2.3% a year. Average growth for the period 2015-2030 is expected to be 1.8 % a year chiefly due to low workforce growth.

[70] https://www.wlo2015.nl/rapporten-wlo/klimaat-en-energie

It is expected that exports will continue to make a significant contribution to economic growth until 2030. Between 2015 and 2030, the growth of exports will remain roughly two percentage points above economic growth. During the same period, export growth is expected to be slightly lower than the growth of imports. From 2024 onwards, the growth of consumption (both private and public) is expected to be lower than economic growth.

Assumptions on energy and CO_2 prices
The global and regional price of fossil fuels (oil, natural gas and coal) rose again from 2016 onwards following a decline in prices prior to that. This rise resulted from increased economic growth. The short-term outlook (up to and including 2021) is based on the futures markets, while the outlook concerning long-term price developments is based on the expectations of the International Energy Agency (IEA) as published in de World Energy Outlook (WEO: IEA, 2018). Just like the NEV 2017, the KEV 2019 is also based on the New Policies Scenario from the WEO. The WEO 2018 also specifies this scenario as its central variant. The projections for energy prices remain volatile due to the many uncertainties involved in the energy market, and therefore broad ranges apply. Uncertainty bandwidths will be indicated around the main forecast for use in the sensitivity analyses for the KEV. As was also the case during the National Energy Outlook (NEV), the KEV adheres to the WLO climate scenarios for the bandwidths.

The key variables and assumptions used in the projections are presented in CTF Table 5.

6. Provision of financial, technological and capacity-building support to developing countries

6.1. Summary information on financial support

Dutch support for climate action in developing countries is an integral part of its development cooperation, financed from the Netherlands' budget for foreign trade and development cooperation. Committed to scaling up its support for mitigation and adaptation activities in developing countries, the Netherlands has continued to realise an increase in its climate finance after delivering on its Fast-Start Finance commitment in the 2010–2012 period. Public climate finance reached €419 million in 2017 and €575 million in 2018. CTF Table 7 provides an overview of Dutch public financial support for those years. In addition, public finance from the Netherlands mobilised €335 million in private finance for climate-relevant activities in developing countries in 2017 and €411 million in 2018 (for detailed information, see section 6.1.3). Increases in climate finance can be credited to a better integration of climate action into bilateral and multilateral development activities, the allocation of additional budget for climate-specific activities and strengthened efforts to mobilise private finance for climate-relevant activities.

Adaptation expenditure amounted to €165 million (39% of total) in 2017, rising to €186 million (32% of total) in 2018, while mitigation expenditure amounted to €44 million (11% of total) in 2017 and increased to €71 million (12% of total) in 2018. Most public climate finance supported crosscutting activities, thanks to substantial contributions received through multilateral and other channels to support both adaptation and mitigation activities. Crosscutting support amounted to €210 million (50% of total) in 2017 and €319 million (55% of total) in 2018.

As Dutch support for climate action is part of development cooperation, we have a strong focus on poverty. Poorer people and communities are typically affected the most by climate change, not only because they are often the most exposed but also because they have the least resources to cope and adapt[71]. To support mitigation, we focus on providing access to renewable energy and on halting deforestation; to support adaptation, we focus on climate-smart agriculture, integrated water resource management and the provision of climate-resilient water, sanitation and hygiene services (WASH). Disaster risk reduction is an integral part of our programmes for integrated water resource management, while it also receives support through Partners for Resilience[72] and the Climate Risk and Early Warning Systems Initiative (CREWS)[73]. Gender is an important crosscutting issue, as climate action is most effective when it builds on the capacities and addresses the needs as well as the vulnerabilities of both genders.

[71] IPCC, Climate Change 2014 Synthesis Report, Summary for Policymakers, 2014; Hallegatte, Stephane, Mook Bangalore, Laura Bonzanigo, Marianne Fay, Tamaro Kane, Ulf Narloch, Julie Rozenberg, David Treguer and Adrien Vogt-Schilb, 2016. *Shock Waves: Managing the Impacts of Climate Change on Poverty*. Climate Change and Development Series. Washington, DC: World Bank.

[72] https://partnersforresilience.nl/en/

[73] https://www.crews-initiative.org/en

The results of the Dutch development cooperation, including our support for climate action, are reported to Parliament and published online[74]. Some quantitative results of Dutch climate finance reported in 2018 were:

- an additional 2.6 million people gained access to clean energy, bringing the total to 7.2 million people since 2015;
- more than 1.1 million hectares of land and forest were brought under improved sustainable management;
- almost 2.4 million people became more resilient by living in better managed river basins;
- 754,000 farming businesses became more resilient to climate change.

6.1.1. Meeting the needs of developing countries

Dutch public climate finance is first and foremost intended to assist the poorest communities and the poorest countries. To address their needs, we work with a multitude of actors, including national, regional and local authorities, multilateral organisations, non-governmental organisations, private-sector organisations, farmers organisations, water boards, and so on. These organisations all have their own processes to ensure that their activities meet the needs of their target populations. The Netherlands only approves finance for activities if it is clear how they will meet the needs of target populations.

For the countries and regions on which the Netherlands focuses its development cooperation, climate change profiles have been drafted and regularly updated[75]. These profiles contain an overview of country-specific climate change impacts as well as relevant policies and strategies of each national government. They are used to guide the integration of climate action in our development cooperation programmes in these countries.

6.1.2. New and additional financial support

As reported in the previous Biennial Report, the Netherlands delivered on its Fast-Start Finance commitment in the 2010–2012 period. Since then, following the growing understanding that development and climate action are best pursued in an integrated manner, we have chosen a more flexible approach in line with our pledge to contribute a fair share to cover the costs of climate action in developing countries. Over the years, we have also actively engaged with the private sector to raise additional funding for climate action, as presented in the next section.

The financial resources disbursed over 2017 and 2018 as reported in this Biennial Report are considered new and additional to the financial disbursements reported over the years 2011–2016 in the previous national communications or biennial reports. Dutch support for climate action in developing countries is financed from the budget for foreign trade and development cooperation[76]. This budget is approved by Parliament annually, providing new and additional resources to the

[74] https://www.dutchdevelopmentresults.nl/

[75] Bangladesh, Benin, Burundi, DRC, Egypt, Ethiopia, Ghana, Great Lakes region, Greater Horn of Africa, Indonesia, Iraq, Kenya, Lebanon, Mali, Mozambique, Palestinian Territories, Rwanda, South Sudan, Tunisia, Uganda, West African Sahel and Yemen. See https://www.government.nl/documents/publications/2019/02/05/climate-change-profiles.

[76] The core contributions to IDA and AIIB are exceptions financed from the Ministry of Finance's budget.

budgets approved in previous years, so all the financial support to developing countries for climate action provided from this budget in a given year (as reported in CTF Tables 7a and 7b) is considered new and additional.

6.1.3. Private climate finance

Climate change cannot be addressed by governments alone. The private sector must take part in the transformative change that is needed for low-carbon, climate-resilient development. The knowledge and the financial resources from private sector sources are indispensable.

The Netherlands has set up a number of bilateral instruments to collaborate with the private sector. The Sustainable Water Fund, the SDG Partnership Facility and FMO's Access to Energy Fund are examples of support to public-private partnerships in the water, food and energy sectors that help to address climate challenges in developing countries, including via the mobilisation of private finance. The Netherlands started setting up Climate Investor One in 2017, a multi-donor blended finance facility aimed at improving the mobilisation of private finance for renewable energy infrastructure projects in developing countries by contributing to the projects' entire lifecycles.[77] In addition, the Netherlands supports a number of multi-donor trust funds, multilateral climate funds and development banks that mobilise private finance for climate action. Apart from these activities focusing on direct mobilisation, the Netherlands focuses on activities that indirectly promote the mobilisation of private climate finance. One example is our support to funds promoting readiness for climate-relevant investments, such as the Energy Sector Management Assistance Program (ESMAP), the Public-Private Infrastructure Advisory Facility and the IFC Sustainable Business Advisory. Another example is our support to the Global Innovation Lab for Climate Finance, which identifies and pilots cutting-edge climate finance instruments to attract private investment aimed at climate change mitigation and adaptation in developing countries. The Dutch government is also actively supporting a new programme called Mobilising More For Climate (MoMo4C)[78], which brings together entrepreneurs, policymakers and investors to formulate bankable business propositions tackling climate change challenges in developing countries.

Following years of work in the Research Collaborative on Tracking Private Climate Finance — which the Netherlands also supported — major donors adopted the Joint Statement on Tracking Progress Towards the $100 Billion Goal in September 2015, agreeing on a common understanding of mobilised private climate finance and a common methodology. Since then, the Research Collaborative further refined methodologies in collaboration with the OECD DAC. Using these methodologies, the Netherlands can now report that it mobilised €335 million in private climate finance in 2017 and another €411 million in 2018[79]. Tables 6.1 and 6.2 present detailed information. Data limitations presented still serious constraints in some cases, so the reported amounts should be considered as best estimates.

[77] https://www.climateinvestorone.com/nl/

[78] https://www.momo4climate.org/

[79] HGIS- Jaarverslag 2017; HGIS-Jaarverslag 2018

Mobilised private climate finance	**€ million**
Through bilateral programmes:	
Facility for sustainable entrepreneurship and food security	0
Sustainable Water Fund	4.19
Ghana WASH Window	0
Solidaridad Partners for Change	5.15
Dutch Good Growth Fund	9.20
Through Climate Investor One:	105.03
Through multi-donor funds:	
The Sustainable Trade Initiative (IDH)	7.01
Global Agriculture and Food Security Programme (GAFSP)	0.51
Private Infrastructure Development Group (PIDG)	7.33
Scaling Up Renewable Energy Program (SREP)	0.21
Through multilateral climate funds:	
Global Environment Fund	1.13
Green Climate Fund	0
Through FMO:	41.18
Through Multilateral Development Banks (excluding EIB):	153.86
Total	**334.80**

Table 6.1: Private climate finance, 2017, in € million

Mobilised private climate finance	**€ million**
Through bilateral programmes:	
Sustainable Water Fund	2.66
Geodata for Water	6.19
Aqua for All	0.91
Solidaridad Partners for Change	1.05
Dutch Good Growth Fund	0.00
Dutch Agro-Water Climate Alliance	0.11
Bilateral projects financed by NL embassies in Ghana, Bangladesh, Kenya, Mozambique	1.09
Through Climate Investor One:	19.66
Through multi-donor funds:	
The Sustainable Trade Initiative (IDH)	10.98
Global Agriculture and Food Security Programme (GAFSP)	2.43
Global SME Finance Facility	2.35
Through multilateral climate funds:	
Global Environment Fund	0.38
Green Climate Fund	6.29
Through FMO:	164.93
Through Multilateral Development Banks (excluding EIB):	192.28
Total	**411.31**

Table 6.2: Private climate finance, 2018, in € million

6.2. Public financial support: contribution through multilateral channels

Multilateral climate change funds to which the Netherlands contributed include the Green Climate Fund (GCF), the Global Environment Facility (GEF) and the Least Developed Countries Fund (LDCF).

The Netherlands continued to play an active role in the GCF through its commitment of € 100 million at the end of 2014 (for the IRM), its disbursements of € 27.9 million in the period 2017–2018, and as an (alternate) Board member and a member of its Risk Management Committee. In the GCF board, our priorities focussed on: establishing essential policies on gender and private-sector engagement, creating a mechanism for decision making in between meetings and in the absence of consensus, finalising the results framework and other policies, such as the integrity policies. We continued to support the GCF's work via the Risk Management Committee on its Risk Management Framework. The Netherlands also continued to provide active support for the work of the GEF and the Climate Investment Funds (CIFs) as a donor member of the GEF's Council and the Trust Fund Committees of the CIFs.

The Netherlands is also a major donor of core funding to multilateral development banks, United Nations' agencies and funds that provide significant support to climate action in developing countries. The Netherlands reports on the climate-specific part of these core contributions in CTF Table 7(a). Under our thematic priorities, key multilateral organisation programmes that we supported include the World Bank's CGIAR (originally known as the Consultative Group for International Agricultural Research), the World Bank's Energy Sector Management Assistance Program (ESMAP) and the World Bank's Cooperation in International Waters in Africa (CIWA).

As reported in CTF Table 7, the total contributions through multilateral channels amounted to €137 million in 2017 and €210.4 million in 2018. CTF Table 7(a) gives an overview of Dutch multilateral climate finance disbursed in 2017 and 2018.

6.3. Provision of public financial support: contribution through bilateral, regional and other channels

In addition to our core contributions through multilateral channels, the Netherlands also worked with the private sector, knowledge institutes and NGOs to support climate action in developing countries. In countries with which we maintain a bilateral aid relationship, we continued to focus mainly on climate-smart agriculture, integrated water resource management and climate resilient WASH services. Centrally managed programmes emphasised providing access to renewable energy, halting deforestation, promoting climate-smart agriculture, using integrated water resources management and offering climate-resilient WASH services. In many cases, these programmes also targeted countries or regions beyond the focus of the Netherlands' development cooperation.

As reported in CTF Table 7, the total contributions through bilateral, regional and other channels amounted to €281.7 million in 2017 and €365.3 million in 2018.

CTF Table 7(b) provides a detailed overview of Dutch climate finance through bilateral, regional and other channels disbursed in 2017 and 2018.

6.4. Methodology used for reporting on financial support

6.4.1. General remarks

The Netherlands reports on disbursed climate-specific ODA. All ODA consists of grants.

In CTF Table 7a and the first five rows of CTF Table 7, the Netherlands reports on multilateral climate finance comprising:

- the contributions to multilateral climate change funds;
- the climate-specific share of our core contributions to GEF;
- the climate-specific share of our core contributions to multilateral financial institutions, including regional development banks;
- the climate-specific share of our core contributions to specialised UN agencies;
- the climate-specific share of our non-core contributions to multilateral organisations for worldwide programmes.

The climate-specific share of our non-core contributions to multilateral organisations for country-specific or region-specific programmes are reported under CTF Table 7b for contributions through bilateral, regional and other channels, in line with the OECD DAC definition of bilateral ODA. In CTF Table 7b, the additional information provided in the last column is the contracting party. In many cases, the contracting party is also the main implementing agency.

The Netherlands uses an annually established corporate currency exchange rate. This rate was €0.90 per US$ for 2017 and €0.88 per US$ for 2018.

6.4.2. Bilateral public climate finance

The Netherlands uses the OECD DAC Rio marker definitions for climate change adaptation and climate change mitigation.

For most activities (projects/programmes), the OECD/DAC Rio Markers are used to provide an approximate quantification of Dutch climate finance:

- If an activity is marked as 'principal' for mitigation or adaptation, 100% of the support is considered and reported as climate finance.
- If an activity is marked as 'significant' for mitigation or adaptation, 40% of the support is considered and reported as climate finance. Together with other donors, we consider this percentage to be a reasonable estimate of the average climate contribution by projects that have climate change adaptation or mitigation as a significant objective.

6.4.3. Multilateral public climate finance

To determine the climate-specific share of our core contributions to multilateral organisations, the Netherlands applies weighted averages from the OECD DAC imputed climate-related shares to our relevant core contributions to multilateral organisations. In this report, we have used the latest figures available at the moment of writing, which are the weighted averages for 2016–2017 as published in December 2018.

For a number of multilateral organisations carrying out climate-relevant work, such as the UNDP, UNEP, UNICEF, FAO, WFP and UNCCD, the OECD DAC has not yet determined imputed climate-related shares. In consultation with the organisations concerned, we have ourselves determined

climate-specific shares for these organisations and applied them to our core or general contributions. These figures range between 1% and 30%.

6.4.4. Private climate finance

To measure the volume of private finance mobilised by the Netherlands, we have followed the OECD DAC methods developed over the past years or still under development. For the private finance mobilised by the Netherlands through its share in MDBs, we have calculated the best possible estimate based on the data available.

6.5. Provisions of support for technology development and transfer

Support for technology development and transfer makes an integral part of many activities related to climate change mitigation or adaptation, encompassing both hardware (equipment) and software (know-how, methods, practices). The private sector and several knowledge institutes partner in providing this support. The combined innovative and financial strengths of these parties are essential to meet the challenges of climate change together with the government.

The Netherlands identifies activities with technology development and transfer aspects based on the description of the activity in its appraisal memorandum and a further check with the responsible project officer.

CTF Table 8 shows the activities at the implementation phase in 2017-2018 that included support for technology development and transfer. We considered it appropriate to also include activities that were included in previous Biennial Reports, if these activities were still ongoing in 2017-2018. Additional information on the activities is provided below.

Recipient country and/or region	Targeted area	Measures and activities related to technological transfer
Worldwide	Adaptation	Sustainable Water Fund I and II
Worldwide	Adaptation	Disaster Risk Reduction Programme
Worldwide	Mitigation	Energising Development Partnership Programme (EnDev)
Worldwide	Mitigation	Energy Sector Management Assistance Program (ESMAP)
Ethiopia	Adaptation	Integrated Seed Sector Development Programme in Ethiopia
Ethiopia	Adaptation	Capacity building for scaling-up of evidence-based best practices in agricultural production in Ethiopia (CASCAPE)
Uganda	Adaptation	Integrated Seed Sector Development Programme (ISSD) and ISSD Plus Programme in Uganda
Uganda	Mitigation and Adaptation	Solar for Farms in Uganda/Milking the Sun
Burundi	Adaptation	Supporting Agricultural Productivity

Recipient country and/or region	Targeted area	Measures and activities related to technological transfer
		in Burundi (PAPAB)
Worldwide	Adaptation	Water Grand Challenge: Securing Water for Food
Bangladesh	Adaptation	Urban Dredging Demonstration Project
Ghana	Mitigation and Adaptation	Ghana Climate Innovation Centre
worldwide	Mitigation and Adaptation	Netherlands-CGIAR Partnership 2017–2020
Indonesia	Mitigation and Adaptation	Horticulture Indonesia Next Level
Bangladesh	Adaptation	Water Management Knowledge and Innovation Programme
Kenya, Tanzania, Uganda	Mitigation and Adaptation	Climate Smart Agriculture, East Africa
Worldwide	Adaptation	Blue Deal 2018-2030
Bangladesh	Adaptation	Joint Cooperation Program Bangladesh

Source: CTF Table 8

Table 6.3: Examples of activities providing support for technology development and transfer 2017–2018

Sustainable Water Fund I and II – act. nos. 23710 and 24011
This fund is a public-private partnership facility in the field of water and sanitation. It aims to contribute to water safety and water reliability in developing countries, including through innovative technological solutions. Themes include climate-relevant topics, such as efficient water usage, safe deltas and improved basin management.

Disaster Risk Reduction Programme – act. no. 4000000768
Climate change will increase water-related risks. The Netherlands is renowned for its expertise in water management and risk prevention, and we aim to make this knowledge available to other countries. This is why the Dutch government together with the Dutch water sector founded our Disaster Risk Reduction Team (DRR team). The DRR team is able to cover the entire disaster management cycle from mitigation and preparedness to response and recovery. For example, when a country is struck by severe flooding and first emergency relief workers have completed their work, the need for advice on how to build a sustainable and safer water future arises. To meet these needs with a swift response, the DRR team of experts advises governments on how to resolve urgent water issues related to flood risks, water pollution and water supply, to prevent disasters or to rebuild after water-related disasters.

Energising Development Partnership Programme (EnDev) – act. no. 18315
EnDev contributes to making local, renewable energy accessible in 26 developing countries, mainly for the benefit of rural and peri-urban populations, social institutions, and small and medium-sized enterprises in Africa, Asia and Latin America. This is accomplished by establishing economically

sustainable energy solutions and distribution schemes, mainly for rural communities. More detailed information on EnDev's technology cooperation projects is available on their website[80].

Energy Sector Management Assistance Program (ESMAP) – act. no. 29278
ESMAP supports, among other things, reform of fossil fuels subsidies through south-south cooperation (support for targeted research, design and preparation, capacity development, political economy strategies and communication). South-South exchange demonstrates that many countries struggle with the challenge of reducing the fiscal burden of fossil fuel subsidies and are keen to learn from experiences of front runner countries in their region, like Egypt in the MENA region.

Integrated Seed Sector Development Programme in Ethiopia – act. no. 23448
The overall objective of this programme is to increase agricultural productivity through the production and marketing of improved seeds that are drought or flood resilient. This programme is managed by Wageningen University and largely implemented by four Ethiopian universities, the Oromia Seed Enterprise and the Ethiopian Seed Growers and Processors Association. The programme provides capacity building for private entrepreneurs and farmer organisations in terms of organisational, managerial, financial and technical skills. It also strengthens the capacity of regional and district or *woreda* governments and non-government organisations, such as universities and research centres, to support the seed sector.

Capacity building for scaling up of evidence-based best practices in Ethiopia (CASCAPE) – act. no. 22482
The CASCAPE project aims to validate climate-smart farming practices to be taken up by the agricultural extension service in the Agricultural Growth Programme 2 of the government of Ethiopia. The project is implemented by Wageningen University, five Ethiopian universities and two regional research institutes on agriculture. It also intends to strengthen the capacity of stakeholders, such as research institutes, universities and extension services, to scale up best practices.

Integrated Seed Sector Development Programme (ISSD) and ISSD Plus Programme in Uganda – act. nos. 23617 and 29417
These projects aim to build capacity of local seed groups for becoming businesses that can produce improved drought or flood-resilient seeds through collaboration with national research centres. The project also focuses on strengthening the relevant public institutions, such as the national seed certification service and the Uganda National Agro-Input and Dealers' Association.

Solar for Farms in Uganda/Milking the Sun – act. no. 26961
This project makes high-quality and affordable solar lamps and solar home systems available to dairy cooperative members through the provision of financing, thereby increasing farm production, lowering household emissions by substituting kerosene for solar, as well as providing improved lighting for dairy and household activities.

Supporting Agricultural Productivity in Burundi (PAPAB) – act. no. 27741
The PAPAB project aims to increase food production in Burundi sustainably by promoting market-oriented, climate-resilient and sustainable agricultural techniques, supported by targeted fertiliser subsidies. This project uses a participatory approach centred on integrated crop, soil and farm management and cooperation among stakeholders. The project consortium includes five partners: IFDC, Alterra, Wageningen University, Oxfam Novib and ZOA. Another 10 local organisations are

[80] www.endev.info

involved, including Adisco, OAP, Consedi and Réseau Burundi 2000+, plus a few Dutch organisations, such as HealthNetTPO, Soil Cares and Trimpact.

Water Grand Challenge: Securing Water for Food – act. no. 26393
Water scarcity is one of the main challenges developing countries face, a challenge that will be further exacerbated by climate change. To help developing countries meet this challenge, the objective of the Securing Water for Food programme is to source and accelerate innovations that enable the production of more food using less water and facilitate water access for food production, processing and distribution in developing countries. These innovations involve water efficiency and reuse, water capture and storage, and salinity and water intrusion. The activity will catalyse new investments from businesses, governments, NGOs and others to address water scarcity in the food value chain by providing financial and technical support as well as innovation acceleration support.

Urban Dredging Demonstration Project – act. no. 26397
This project aims to increase the knowledge and capacities, including training staff, improving resources and instruments of the Dhaka Water Supply and Sewage Authority for remedial and maintenance dredging operations through the demonstration of new, internationally proven dredging technologies and the dissemination of dredging expertise. The goal is to help reduce the risk of increased floods as a result of climate change.

Ghana Climate Innovation Centre (GCIC) – act. no 26945
The GCIC, supported by the World Bank Group's infoDev, helps local small and medium-sized enterprises (SMEs) in clean technology as well as climate innovators to commercialise and scale the most innovative private-sector solutions to climate change. It provides entrepreneurs in clean technology with the knowledge, capital and market access required to launch and grow their businesses. The success of these enterprises leads to emission reductions and improved climate resilience, while also enabling developing countries to realise greater value in the innovation value chain, build competitive sectors and create jobs.

Netherlands-CGIAR Partnership 2017–2021 – act. no. 4000000183
CGIAR works to advance agricultural science and innovation for the development and uptake in developing countries of new agricultural knowledge and practices for the sake of ensuring food security facing the effects of climate change and other challenges.

Horticulture Indonesia Next Level - act. no. 4000000978
The objective of this programme by Wageningen University & Research in collaboration with other Dutch private sector partners is to stimulate and facilitate innovation in the horticulture sector in Indonesia with a view to achieving sustainable, responsible, climate-smart and profitable vegetable production in Indonesia. The programme provides farmers with better access to current knowledge and new technologies, as well as support for vocational education in this field in Indonesia.

Water Management Knowledge and Innovation Programme - act. no. 4000000785
The southern coastal region of Bangladesh is subject to major changes in its water and land resources and systems because of climate change and environmental mismanagement in the upstream river system. Through this programme, the Netherlands and Bangladesh cooperate to enhance their joint capacity and knowledge on these changes and possible solutions, including technological solutions. The activity is implemented by Deltares of the Netherlands and the Institute of Water Modelling of Bangladesh in collaboration with Wageningen University & Research in the Netherlands and Centre for Environmental Impact Assessment and GIS in Bangladesh.

Climate Smart Agriculture, East Africa – act. no. 400000819
SNV's Climate Smart Agriculture in East Africa programme aims to contribute to achieving food security in Kenya, Tanzania and Uganda by promoting ecologically sustainable food systems. The programme promotes inclusive business development for climate-smart sustainable intensification in arable farming and supports smallholder farmers that produce nutritionally relevant food crops in becoming more resilient and productive. Involving the Dutch government, East African governments, as well as other international partners and knowledge institutes, including from the civil and private sectors, the aim of the programme is to promote joint learning, knowledge sharing and scaling of business cases and climate-smart technologies and practices tried and tested within the programme.

Blue Deal 2018-2030 – act. no. 4000001624
The Blue Deal programme aims to ensure that 20 million people in 40 watershed areas are provided with access to clean and sufficient water and better protection against floods, taking into account the current and long-term risks of climate change. Through this programme, Dutch water authorities and the Dutch Ministries of Infrastructure and Water and of Foreign Affairs support local and national water authorities through capacity building and institutional strengthening with a focus on technical knowledge and capacities, as well as institutional, organisational and social aspects required for improving water management. Partnerships under the Blue Deal programme are being developed in Argentina, Benin, Burkina Faso, Colombia, Eswatini, Ethiopia, Ghana, Kenya, Mali, Mozambique, Palestinian Territories, Peru, Romania, South Africa and Vietnam.

Joint Cooperation Programme Bangladesh – act. no. 4000001952
To operationalise the Bangladesh Delta Plan (BDP2100) a knowledge agenda has been established to address its knowledge needs, including those linked to climate change adaptation. The Joint Cooperation Programme Bangladesh aims to contribute to the knowledge agenda in a cooperation between two knowledge institutes in the Netherlands, Deltares and Wageningen University & Research, and two in Bangladesh, the Institute for Water Management and the Centre for Environmental Impact Assessment. The programme focuses on developing databases, instruments for decision making and analysis and user applications, among other initiatives.

Good examples of support for the development and enhancement of endogenous capacities and technologies include the Energising Development Partnership Programme (EnDev), the Integrated Seed Sector Development Programme (ISSD) in Ethiopia, the ISSD and the ISSD Plus programmes in Uganda and the Ghana Climate Innovation Centre (GCIC). More information on these programmes can be obtained on their websites[81] or from their main implementing agencies, respectively GiZ, the Netherlands Enterprise Agency, Wageningen Research Centre for Development Innovation and infoDEV.

Technological development and transfer require a complex and long-term process, whose successes and failures can often only be established properly in retrospect. For instance, to promote the use of renewable energy technologies that contribute to universal energy access, we started to invest in various long-term innovation processes years or even decades ago. Nowadays, we consider our support of household solar systems a success, while our support of Jatropha was less successful. The main indicator of success is uptake of new technological solutions by target groups.

[81] www.endev.info, https://issdethiopia.org/, https://issduganda.org/,http://www.infodev.org/articles/climate-technology-program-ghana

The Netherlands has supported the promotion of household solar systems as an alternative to communal power projects since the first pilot in the early 1990s. Development funds were used to subsidise pilot projects, develop financing mechanisms, shape policies and the enabling environment for the commercial dissemination of home solar systems. Around 2010, breakthroughs in the field of LED lighting and lithium batteries brought forward a new range of pico solar products, mostly solar lanterns and small plug-and-play solar home systems. A further innovation was the integration with mobile banking in pay-as-you-go systems. The Netherlands invested in fast-start climate finance to fund further pilots on the ground in a large number of developing countries through public-private partnerships and the EnDev programme, as well as via systematic efforts to strengthen the enabling environment through the Lighting Africa and Lighting Global programmes of the World Bank Group. This combination of approaches has strongly contributed to a self-propelling commercial sector that has served more than 150 million people worldwide with off-grid lighting and rural electrification products, which grows by about 35% annually.

To develop Jatropha as a sustainable biofuel crop in sub-Saharan Africa and Indonesia, the Netherlands supported twelve different projects between 2005 and 2014. There was substantial interest and co-investment from a wide variety of businesses, NGOs and governments. Projects ranged from pilot farms to policy development and from the direct use of Jatropha oil at villages to the production of biodiesel. In practice, however, all but one of the projects performed poorly and did not deliver on the promise of a potential breakthrough technology. The Netherlands ended targeted funding. Nowadays, the original interest from the broad range of stakeholders has largely disappeared and is looked back on as the Jatropha hype.

6.6. Provisions of capacity-building support

Capacity building of local partners in developing countries forms an integral part of many activities that support climate change mitigation or adaptation. The Netherlands identifies activities with capacity building aspects based on the description of the activity in its appraisal memorandum and a further check with the responsible project officer.

CTF Table 9 includes activities with capacity building aspects that were at the implementation phase in 2017-2018. We considered it appropriate to also include activities that were included in previous Biennial Reports, if these activities were still ongoing during 2017-2018. Additional information on these activities is provided below.

Recipient country/region	Targeted area	Programme or project title
Latin America and the Caribbean, Asia Pacific, Africa	Mitigation	Climate and Development Knowledge Network (CDKN)
Ethiopia, Guatemala, Haiti, India, Indonesia, Kenya, Mali, Philippines, South-Sudan, Uganda	Adaptation	Partners for Resilience (PfR)
Mozambique	Adaptation	Zambezi Valley Agency (ADVZ)
Bangladesh	Adaptation	Sustainable Agriculture, Food Security and Linkages in Bangladesh (SaFaL)
Bangladesh, Vietnam, Indonesia, Ghana, Mozambique	Adaptation	Urbanising Deltas of the World (UDW)

Recipient country/region	Targeted area	Programme or project title
Africa	Adaptation	Cooperation in International Waters in Africa (CIWA)
Ghana, Africa, Middle East and North Africa, Asia Pacific, Latin America and the Caribbean, LDCs, SIDS	Adaptation	World Resources Institute (WRI)
Africa	Mitigation	Africa Biogas Partnership Programme (ABPP)
Mali	Adaptation	Integrated Water Resource Management Programme in the Niger Basin (GIRE) in Mali
LDCs	Multiple Areas	Women Delegates Fund (WDF)
Ethiopia	Adaptation	Small-Scale and Micro Irrigation Support Project (SSMISP)
Africa, Middle East and north Africa, SIDS, Bangladesh, Indonesia	Adaptation	IGG-IHE Delft Institute for Water Education Programmatic Cooperation
Mali, Central African Republic, Lebanon, Zambia	Adaptation	Netherlands Red Cross Response Preparedness
Ethiopia	Adaptation	Support to ATA
Mozambique	Adaptation	Institutional Support to FIPAG
Benin	Adaptation	OmiDelta
Palestinian Territories	Adaptation	Palestinian-Dutch Academic Water Cooperation
Myanmar	Adaptation	Integrated Seed Sector Development Myanmar
Mozambique	Adaptation	Support to inclusive and sustainable agricultural development in the Zambezi Valley (ISA-II)
Worldwide	Multiple Areas	Netherlands-CGIAR Partnership 2017–2021
Myanmar, Philippines	Multiple Areas	VNG DEALS
West Africa	Multiple Areas	Organic Markets for Development (OM4D)
Myanmar	Adaptation	Farming Systems for Sustainability
Indonesia	Multiple Areas	Horticulture Indonesia Next Level
Bangladesh	Adaptation	Water Management Knowledge and Innovation programme
Worldwide	Adaptation	Blue Deal 2018-2030
LDCs	Adaptation	Least Developed Countries Fund (LDCF)
Indonesia	Adaptation	Joint Cooperation Program III
Bangladesh	Adaptation	Support to the implementation of Bangladesh Delta Plan

Recipient country/region	Targeted area	Programme or project title
Ethiopia	Multiple Areas	Building Rural Incomes through inclusive Dairy business Growth in Ethiopia (BRIDGE)
Worldwide, focus sub-Sahara Africa	Mitigation	Global Energy Transformation Programme – promoting investments in Renewable Energy (Get.invest)
Bangladesh	Adaptation	Joint Cooperation Program Bangladesh
Bolivia, Cameroon, Ghana, Indonesia, Liberia and Vietnam.	Multiple Areas	Working Landscapes

Source: CTF Table 9

Table 6.4: Examples of activities providing capacity-building support

Climate and Development Knowledge Network (CDKN) – act. nos. 21868 and 4000001091
CDKN helps to turn global and local research and information on climate change into policies and programmes, supporting developing countries to move to a climate-resilient future. This programme should result in relevant policy and strengthened capacity by emphasising knowledge management, research, partnership, technical assistance and services.

Partners for Resilience (PfR) – act. no. 27551
Partners for Resilience (PfR) is a partnership of the Netherlands Red Cross, CARE Netherlands, Cordaid, the Red Cross Climate Centre and Wetlands International. PfR contributes to the resilience of communities by integrating climate change adaptation, ecosystem management and restoration into disaster risk reduction. This approach helps communities strengthen their capacities to reduce the effects of natural disasters.

Zambezi Valley Agency in Mozambique – act. no. 24658
This programme aims to build the capacity of the Zambezi Valley Agency (ADVZ) and the strategic partners of ADVZ to promote inclusive and sustainable agricultural development in the Lower Zambezi Valley.

Sustainable Agriculture, Food Security and Linkages in Bangladesh (SaFaL) – act. no. 24552
This project aims to enhance food security by promoting sustainable, climate-smart agricultural practices and linking farmers to markets. It includes training sessions for farmers to adopt innovative, climate-smart farming practices.

Africa Biogas Partnership Programme (ABPP) – act. no. 26010
The Africa Biogas Partnership Programme (ABPP) builds capacity in the biogas sector of five African countries: Ethiopia, Uganda, Burkina Faso, Kenya and Tanzania. The programme assists these countries in applying domestic biogas as a climate-friendly solution for energy, organic fertiliser and livestock keeping.

Urbanising Deltas of the World (UDW) – act. no. 24709
The Urbanising Deltas of the World is a research programme with the goal of supporting water safety, water and food security, and sustainable economic development in delta areas worldwide. Climate change is one of the challenges that the programme aims to address. The programme combines the generation of practical and applicable knowledge with capacity building to use this new knowledge, for example, in the design of interventions and in the formulation of new policies.

In the Mekong Delta, for instance, one of the research consortia is developing an integrated package of tools to understand the interrelations between increased land subsidence, sea level rise, reduced river flows, increased flood risks and salinisation of the delta's freshwater system better. The package will help decision makers assess the pros and cons of different interventions in land use, water management and infrastructure through an integrated approach.

Cooperation in International Waters in Africa (CIWA) – act. no. 25925
The World Bank's Cooperation in International Waters in Sub-Saharan Africa (CIWA) programme aims to strengthen cooperative management and development of international waters across sub-Saharan Africa in order to aid sustainable, climate-resilient growth. It supports transboundary cooperation in rivers, lakes and groundwater bodies, focusing on capacity building in transboundary institutions, such as river basin authorities or on the nucleus of such organisations, among others.

World Resources Institute (WRI) – act. no. 18813
The Dutch government supports WRI's work on international climate change issues. Part of WRI's work is to support developing countries in integrating climate risks into laws, policies and plans, leading to climate-resilient development outcomes.

Integrated Water Resource Management Programme in the Niger Basin (GIRE) in Mali – act. no. 26989
One of the aims of this programme is improving knowledge on available water resources as well as to promote sustainable water allocation and monitoring for various sectors (energy, drinking water, fisheries, livestock, irrigation, among others), taking into account the expected consequences of climate change. The programme includes a capacity-building component for relevant public and private-sector personnel, research institutes and user groups.

Women Delegates Fund (WDF) – act. no. 29215
The Women Delegates Fund aims to increase the effective participation of women from developing countries, mostly LDCs, in the UNFCCC climate negotiations. This fund combines the payment of travel costs with a capacity-building programme.

Small-Scale and Micro Irrigation Support Project (SSMISP) in Ethiopia – act. no. 26389
The objective of SSMISP is to build the capacity of relevant public and private institutions in four Ethiopian states for establishing and managing small-scale irrigation systems and micro-irrigation schemes.

IGG-IHE Delft Institute for Water Education Programmatic Cooperation – act. nos. 17133 and 28325
IHE Delft Institute for Water Education supports capacity building in the water sector of developing countries through education, research and partnership programmes. Climate change is an integral part of the programmes. The geographical focus is on partner countries in Dutch development cooperation and river basins in Africa and the Middle East.
The Netherlands also supports a scholarship programme for Small Island Developing States (SIDS) to strengthen their capacity in the water sector and to cope with the effects of climate change. The IHE Delft Institute for Water Education is one of the world's foremost education and research institutes in water-related fields. This programme offers 25 scholarships for an 18-month master's of science, as well as 70 short courses for water professionals and policymakers.

Netherlands Red Cross Response Preparedness II – act. no. 28677
This programme focuses on building response preparedness capacity of national Red Cross and Red Crescent societies in Mali, Central African Republic, Lebanon and Zambia, so these countries can

better respond to disasters, including climate-related disasters, for example, by translating early warning information into proactive action.

Support to ATA in Ethiopia – act. no. 28735
The Agricultural Transformation Agency (ATA) is responsible for addressing issues that limit farmers' productivity and market issues, while also tackling underlying systemic issues. Climate change adaptation and mitigation are crosscutting concerns. Part of ATA's mandate also includes building the capacity of the Ministry of Agriculture and Natural Resources, the Ministry of Livestock and Fisheries, as well as other key players.

Institutional support to FIPAG in Mozambique – act. no. 29748
The Netherlands provides capacity-building support to the Fundo de Investimento e Património do Abastecimento de Água (FIPAG), the asset manager of water supply infrastructure in Mozambique's 21 major cities and the operator of the water supply systems. Part of the support focuses on ensuring that FIPAG's investments are more resilient to the effects of climate change.

OmiDelta programme in Benin – act. no. 29296
This activity focuses on the Ouémé River delta, more specifically on the urban and surrounding areas. Disaster risk reduction is addressed through the introduction of the Dutch Delta approach, while support to the National Water Institute in Benin reinforces national and regional capacity to cope with the uncertain effects of climate change. The National Water Institute aims to develop the capacity for data collection, hydraulic modelling and advisory services. The OmiDelta programme consists of three funding instruments: (1) a fund for the development of government projects, (2) a fund for civil-society and private-sector projects, and (3) a technical assistance instrument.

Palestinian-Dutch Academic Water Cooperation – act. no. 29135
This cooperation programme between 10 Dutch and Palestinian universities aims to tackle key challenges facing the Palestinian water sector in policy and practice, while enhancing the capacity of the Palestinian academic institutions. Key challenges include increasing water productivity in the agricultural sector, as well as improving river basin management and safe deltas, both of which promote resilience to climate change.

ISSD Myanmar – act. no. 4000000070
The objective of the project is to contribute to food and nutritional security, and climate resilience of smallholder farmers in the Dry Zone of Myanmar, by improving smallholder farmer access and uptake of quality seed of improved and well-adapted varieties. The project will, among others, build the professional capacities of 180 local seed business (LSBs) and six domestic and international seed companies to produce significant volumes of quality seed from seven different crops: rice, pigeon pea, chickpea, mung bean, sunflower, sesame and groundnuts. It will also build the capacity of agricultural policy makers and extension services to develop a good policy framework for the seeds sector.

Support to inclusive and sustainable agricultural development in the Zambezi Valley (ISA-II) – act. no. 4000000267
ISA-II will continue to support the Zambezi Agency to help achieve inclusive and sustainable agricultural development in the Zambezi Valley. The agency's Water Productivity pilot aiming at obtaining more crop per drop is an important intervention for climate change adaptation and resilience. Capacity building focuses on the Zambezi Agency and is directed to educational centres and business development service providers.

Netherlands-CGIAR Partnership 2017–2021 – act. no. 4000000183
CGIAR works to advance agricultural science and innovation for the development and uptake in developing countries of new agricultural knowledge and practices to ensure food security facing the effects of climate change and other challenges. Capacity building of national agricultural research systems in crosscutting issues through collaborative research.

VNG DEALS – act. no. 4000000441
VNG DEALS aims to improve the quality of life of the urban poor — those living on less than US$1.25 a day — by enhancing inclusivity, safety, resilience and sustainability based on plans developed by local authorities. The programme includes support for capacity building of local authorities in cities where climate change is already creating water management challenges, such as in Pathein, Myanmar, and Manilla, Philippines.

Organic Markets for Development (OM4D) – act. no. 4000000806
This programme aims to promote the adoption of organic agricultural principles through enhancing know-how, raising consumer awareness and influencing policy in four countries in West Africa with a view to creating opportunities for small holder farmers through their inclusion in domestic and international organic markets. Empowerment and capacity building of smallholder farmers and other value chain actors is an important element of the programme. Organic agriculture has positive effects on soils, ecosystems, water quality and agro-biodiversity in the region, enhancing resilience in the region.

Farming Systems for Sustainability – act. no. 4000000861
The Farming Systems for Sustainability project in Myanmar aims to contribute to food and nutrition security of smallholder farmers in Shan state and the Dry Zone of Myanmar, by identifying, testing and developing sustainable farming strategies for farming systems in Myanmar that can meet the demands of the future, being robust and resilient to climate change, yielding increased productivity as a basis for profitability. The project is implemented by a joint effort of Wageningen University & Research in collaboration with the Ministry of Agriculture, Livestock and Irrigation of Myanmar (MOALI) and a consultancy company based in Myanmar.

Horticulture Indonesia Next Level – act. no. 4000000978
The objective of this programme is to stimulate and facilitate innovation in the horticulture sector in Indonesia with a view to achieving sustainable, responsible, climate-smart and profitable vegetable production in Indonesia. Undertaken by Wageningen University & Research in collaboration with other Dutch private sector parties, this programme provides farmers with better access to current knowledge and new technologies and support for vocational education in this field in Indonesia.

Water Management Knowledge and Innovation Programme – act. no. 4000000785
The southern coastal region of Bangladesh is subject to major changes in its water and land resources and systems because of climate change and environmental mismanagement in the upstream river system. Through this programme, the Netherlands and Bangladesh cooperate to enhance their joint capacity and knowledge on these changes and possible solutions.
The programme is implemented by Deltares of the Netherlands and the Institute of Water Modelling of Bangladesh in collaboration with selected organisations and knowledge institutes from the Netherlands and Bangladesh: Wageningen University & Research and the Brabantse Delta District Water Board in the Netherlands, and the Centre for Environmental Impact Assessment and GIS in Bangladesh.

Blue Deal 2018-2030 – act. no. 4000001624
The Blue Deal programme aims to ensure that 20 million people in 40 watershed areas are provided with access to clean and sufficient water and better protection against floods, taking into account the current and long-term risks of climate change. Through this programme, Dutch water authorities and the Dutch Ministries of Infrastructure and Water and of Foreign Affairs support local and national water authorities through capacity building and institutional strengthening with a focus on technical knowledge and capacities, as well as institutional, organisational and social aspects required for improving water management. Partnerships under the Blue Deal programme are being developed in Argentina, Benin, Burkina Faso, Colombia, Eswatini, Ethiopia, Ghana, Kenya, Mali, Mozambique, Palestinian Territories, Peru, Romania, South Africa and Vietnam.

Least Developed Countries Fund (LDCF) – act.no. 4000002111
The LDCF of the Global Environment Facility, set up in 2001 as a financial mechanism under UNFCCC, supports the world's most vulnerable countries in their efforts to adapt to the effects of climate change. It focuses on technology transfer, risk management, mainstreaming of climate change adaptation in other GEF activities and supports national authorities in the preparation and implementation of national adaptation plans.

Joint Cooperation Program III – act. no. 4000001352
This cooperation programme between Dutch and Indonesian knowledge institutes seeks to enhance the resilience of urban deltas in Indonesia to climate change through development of climate datasets and capacity building for improved river basin management and operational activities, such as urban flood forecasting, drought early warning, supporting climate field schools for farmers and development of a hydro informatics centre.

Support to the implementation of the Bangladesh Delta Plan – act. no. 4000001489
With the support of the Netherlands and others, the government of Bangladesh has been engaged in the development of a long-term delta plan (BDP2100) to address future development challenges, including the effects of climate change. The objective of this activity is to support Bangladesh in the operationalisation of the Bangladesh Delta Plan by strengthening the capacity of the General Economics Division of the Bangladeshis Ministry of Planning with a view to establishing a competent delta wing to coordinate implementation of the BDP2100, as well as a delta fund and the broader institutional structure required. The activity also focuses on strengthening the capacity of other key implementing organisations.

BRIDGE – act.no. 4000001768
The programme Building Rural Income through Inclusive Dairy Growth in Ethiopia (BRIDGE), implemented by SNV and Wageningen University & Research, aims to build rural income through inclusive climate-smart dairy business growth in Ethiopia, while at the same time contributing to climate change adaptation and mitigation. To this end, BRIDGE is strengthening the capacities of farmers, agro-input providers, cooperatives, processors and extension services.

Global Energy Transformation Programme – promoting investments in Renewable Energy (Get.invest) – act. no. 4000001666
GET.invest is the private sector module of the Global Energy Transformation Programme (GET.pro), a European multi-donor platform delivering on energy and climate targets.
The objective of GET.invest is to stimulate investments in renewable energy in developing countries by pipeline development and private sector mobilisation. It does so by providing demand-driven coaching and advisory services for project development, including in-depth technical assistance, and generating and making available market information on business opportunities. The programme works across different market segments of decentralised renewables, such as small on-

grid independent power producers (IPPs), mini grids, solar home systems and clean cooking solutions. GET.invest has a focus on sub-Sahara Africa but can also be deployed in other regions.

Joint Cooperation Program Bangladesh – act. no. 4000001952
To operationalise the Bangladesh Delta Plan (BDP2100) a knowledge agenda has been established to address its knowledge needs, including those linked to climate change adaptation. The Joint Cooperation Programme Bangladesh aims to contribute to the knowledge agenda in a cooperation between two knowledge institutes in the Netherlands, Deltares and Wageningen University & Research, and two in Bangladesh, the Institute for Water Management and the Centre for Environmental Impact Assessment. The programme focuses on strengthening knowledge institutes in Bangladesh in the field of adaptive water management in view of the uncertainties that climate change poses, among other initiatives.

Working Landscapes – act. no. 4000002173
This programme aims at strengthening national processes to improve and implement NDCs with an emphasis on the role of forests and trees in achieving climate change adaptation and mitigation. Implemented by Tropenbos International, the programme focuses on Bolivia, Cameroon, Ghana, Indonesia, Liberia and Vietnam.

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Glossary

CHEMICAL COMPOUNDS

C	Carbon
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2-eq.	Carbon dioxide equivalent (in this report using a GWP-100)
F-gases	Fluorinated gases
HFCs	Hydrofluorocarbons
HCFCs	Hydrochlorofluorocarbons
NMVOC	Non-Methane Volatile Organic Compounds
NF_3	Nitrogentrifluorides.
N_2O	Nitrous oxide
NO_x	Nitrogen oxides (NO and NO_2), expressed as NO_2
PFCs	Perfluorocarbons
SF_6	Sulphur hexafluoride
SO_2	Sulphur dioxide

UNITS

Gg	Giga gramme (10^9 gramme = kton)
GJ	Giga Joule (10^9 Joule)
g/km	gram per kilometer
ha	hectare
kton	kilo ton (= 1,000 metric ton = 1 Kton)
km/h	kilometre per hour
kW	kilo Watt (1000 Watt)
kWh	kilo Watt hour
mg/km	milligrams per kilometer
mld	1,000 million
mln	million
Mton	Mega ton (= 1,000,000 metric ton = 1 Tg)
MW	MegaWatt
Nm^3	Normal cubic metre (volume of gas at 10^5 Pa and 20°C)
Pg	Peta gramme (10^{15} gramme)
PJ	Peta Joule (10^{15} Joule)
TJ	Tera Joule (10^{12} Joule)
TWh	Tera Watt hour (10^{12} Watt hour)
Tg	Tera gramme (10^{12} gramme= Mton-eq)
US$	US Dollar
USD	US Dollar
€	Euro
EUR	Euro

ABBREVIATIONS

A

AAU	Assigned Amount Unit
ABPP	African Biogas Partnership Program
ADB	Asian Development Bank
ADVZ	Zambezi Valley Agency
AEA	Annual Emission Allocation
AER	Annual Environmental Reports
ANWB	Algemene Nederlandse Wielrijders Bond (The Royal Dutch Touring Club ANWB)
ASAP	Adaptation for Smallholder Agricultural Programme
ATA	Agricultural Transformation Agency
AR2	2nd IPCC Assessment Report
AR4	4th IPCC Assessment Report

B

BEMS	Emission Requirements Combustion Installation Decree
BENG	Bijna Energieneutrale Gebouwen (Nearly Energy-Neutral Buildings)
BLOW	Bestuursovereenkomst Landelijke Ontwikkeling Windenergie (Intergovernmental Wind Energy Agreement)
BOVAG	Bond Van Automobielhandelaren en Garagehouders (Alliance of car traders and garage holders)
BPM	Belasting personenauto's en motorrijwielen (motor vehicle and motorcycle tax)
BR	Biennial Report

C

CASCAPE	Capacity-Building for Scaling-up evidence-based best Practices in Ethiopia
CAF	Corporación Andina de Fomento (Development Bank of Latin America)
CBS	Centraal Bureau voor de Statistiek (Netherlands Statistics)
CCPM	Common and Coordinated Policies and Measures (of EU)
CDKN	Climate and Development Knowledge Network
CDM	Clean Development Mechanism
CER	Certified Emission Reductions Unit
CGIAR	Consultative Group on International Agricultural Research\
CIE	European Commission
CIF	Climate Investment Funds
CITL	Community Independent Transition Log
CIWA	Cooperation in International Waters in Africa
CHP	Combined Heat and Power (= WKK)
CMP	Conference of Membership (parties) of the (Kyoto) Protocol
COP	Conference of Parties
CRF	Common Reporting Format
CTF	Common Tabular Format

D

DAC	Development Assistance Committee
DEI	Demonstratie Regeling Energie Innovatie (Demonstration subsidy on Energy Innovation)
DES	Data Exchange Standards
DRR	Disaster Risk Reduction

E

EC	European Commission/European Community
ECN	Energieonderzoek Centrum Nederland (Netherlands Energy Research Centre)
EED	Energy Efficiency Directive
EHG	Energy efficiency and renewable energy horticulture
EIA	Energie Investerings Aftrek (Energy Investment Allowance)
EnDev	Energising Development Partnership
ENINA	Task Force on Energy, Industry and Waste Management
EPA	Energie Prestatie Advies (Energy Performance Assessment)
EPBD	Energy Performance of Buildings Directive
EPK	Energie Prestatie Keurmerk (Periodical Energy Performance Assessment)
ER	Emissie Registratie (Emissions Registration)
ERU	Emission Reduction Unit
ESD	Effort Sharing Decision
ESR	Effort Sharing Regulation
ESMAP	Energy Sector Management Assistance Programme
ETFF	Energy Transition Financing Facility
ETS	Emission Trading Scheme
EU	European Union
EZK	Ministerie van Economische Zaken en Klimaat (Ministry of Economic Affairs and Climate Policy)

F

FAO	Food and Agriculture Organisation of the United Nations
FEH	Fund for improving the energy efficiency of rental housing
F-gases	Fluorinated greenhouse gases (HFCs, PFCs, SF_6)
FIBANI	Professional Education in the Niger Basin
FIPAG	Fundo de Investimento e Património do Abastecimento de Água
FMO	Financierings Maatschappij voor ontwikkelingslanden (Entrepreneurial development bank)

G

GAFS	Global Agriculture and Food Security Program
GCF	Green Climate Fund
GCIC	Ghana Climate Innovation Centre
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Green House Gas

GIRE	Integrated Water Resource Management Programme in the Niger Basin
GWP	Global Warming Potential

H

HER	Hernieuwbare Energie Regeling (Stimulation of Sustainable Energy)
HNR	Het Nieuwe Rijden (Ecodriving)
HNT	Het Nieuwe Telen (The Next Generation Cultivation)

I

IEA	International Energy Agency
IFC	International Finance Corporation
IGG	Inclusive Green Growth Department, Ministry of Foreign Affairs of the Netherlands
I&M	Ministerie van Infrastructuur en Milieu (Ministry of Infrastructure and the Environment); no longer in place
IMO	International Maritime Organisation
IPCC	Intergovernmental Panel on Climate Change
ISDE	Investerings Subsidie Duurzame Energie (Investment Subsidy Renewable Energy)
ISSD	Integrated Seed Sector Development
ITL	Independent Transition Log
IVDM	Institute for Sustainable Mobility

J

JI	Joint Implementation

K

KEV	Klimaat en Energie Verkenning (National Climate and Energy Outlook)
KP	Kyoto Protocol

L

LDC	Least Developed Countries
LEE	Long-Term Agreement on Energy Efficiency for ETS companies (= MEE)
LED	Light Emitting Diode
LEI	Landbouw Economisch Instituut (Agricultural Economics Institute)
LNG	Liquefied Natural Gas
LNV	Ministerie van Landbouw, Natuur en Voedselkwaliteit (Ministry of Agriculture, Nature and Food quality)
LTA	Long-Term Agreement (= MJA)
LULUCF	Land-use, Land-Use Change and Forestry

M

MEI	Market Introduction Energy Innovations
MEP	Milieukwaliteit Elektriciteits Productie (Environmentally Friendly Electricity Production Programme)
MEWAT	Taakgroep Water (Taskforce on Water)
MIA	Milieu Investeringsaftrek (Environmental Investment Allowances)
MIT	MKB-innovatiestimulering Regio en Topsectoren (Medium Sized Enterprise in Topsectors)
MMR	Monitoring Mechanism Regulation
MS	Member State(s)

N

NEa	Nederlandse Emissie Autoriteit (Dutch Emissions Authority)
NEF	Nationaal Energiebespaarfonds (National Energy Savings Revolving Fund)
NEV	Nationale Energie Verkenning (National Energy Outlook)
NGO	Non-Governmental Organisation
NIA	Netherlands Investment Agency
NIE	National Inventory Entity (Single National Entity under the Kyoto Protocol)
NIR	National Inventory Report

O

OCAP	organic CO_2 for assimilation by plants
ODA	Official Development Assistance
ODE	Opslag Duurzame Energie (Sustainable Energy Surcharge)
OECD	Organisation for Economic Co-operation and Development
OOF	Other Official Flows

P

PAMs	Policies and measures
PAPAB	Supporting Agricultural Productivity in Burundi
PBL	Planbureau voor de Leefomgeving (Netherlands Environmental Assessment Agency)
PCF	Protocol Carbon Funds
PFR	Partners for Resilience
PHEV	Plug-In Hybrid Electric Vehicle
PIDG	Private Infrastructure Development Group
PMR	Partnership for Market Readiness
PROFOR	Program on Forests
PRTR	Pollutant Release and Transfer Register

Q

QA	Quality Assurance

QC	Quality Control

R

RAI	Amsterdam Convention Centre
RDW	Rijksdienst voor Wegverkeer (Netherlands Vehicle Authority)
REB	Regulerende Energie Heffing (Regulatory Energy Tax)
RED	Renewable Energy Directive
RIVM	Rijksinstituut voor volksgezondheid en Milieu (National Institute of Public Health and the Environment)
RMU	ReMoval Unit on the basis of land use, land-use change and forestry
ROB	Reductieprogramma Overige Broeikasgassen (Reduction Programme for non-CO_2 greenhouse gases)
RVO.nl	Rijksdienst voor Ondernemend Nederland (Netherlands Enterprise Agency)

S

SAFAL	Sustainable Agriculture, Food Security and Linkages in Bangladesh
SCF	Strategic Climate Fund
SDE+	Stimulering Duurzame Energieproductie (Stimulation of Sustainable Energy Production)
SEEH	Subsidie Energiebesparing eigen huis (Subsidy energy savings home-owners)
SER	Sociaal Economische Raad (Social Economic Counsel)
SGEI	Services of General Economic Interest
SIDS	Small Island Developing States
SME	Small and Medium-sized Enterprises
SREP	Scaling up Renewable Energy Program
SSMISP	Small-Scale and Micro Irrigation Support Project
STEP	Subsidy scheme for improving energy efficiency in social housing

T

TERT	Technical Expert Review Team
TNO	Netherlands Organisation for Applied Scientific Research
TSE	Top Sector Energy

U

UDW	Urbanising Deltas of the World
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar

V

VAMIL	Willekeurige afschrijving milieu-investeringen (Arbitrary Depreciation of Environmental Investments)
VAT	Value Added Tax
VWS	Ministerie van Volksgezondheid, Welzijn en Sport (Ministry of Health, Welfare and Sport)
V&W	Ministerie van Infrastructuur en Waterstaat (Ministry of Infrastructure and Water management)

W

WAM	With Additional Measures
WASH	Water, Sanitation and Hygiene
WBSO	Wet Bevordering Speur en Ontwikkelingswerk (Research and Development Promotion Act)
WDF	Women Delegates Fund
WEM	With Existing Measures
WEO	World Energy Outlook
WESP	Werkgroep Emissies Servicebedrijven en Produktgebruik (Task force on Consumers and other sources of emissions)
WFP	World Food Programme
WKK	Warmte Kracht Koppeling (Combined Heat and Power, CHP)
WLO	Welvaart en Leefomgeving scenario's (Wealth and Environmental scenario's)
WRI	World Resources Institute

Z

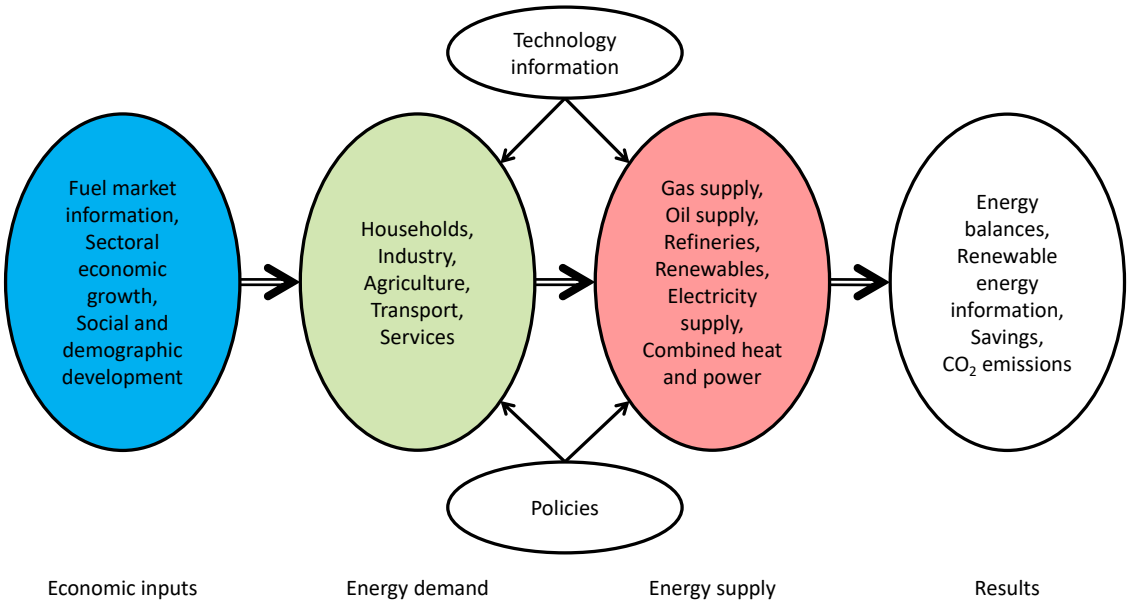
ZOA	International relief and recovery organisation

Annex 1 Modelling systems for projections

This annex briefly describes the modelling system for projections. In the Netherlands, a combination of modelling tools is used. The National Energy Outlook Modelling System (NEOMS) is the primary modelling suite, developed for over 20 years by Energy Research Centre of the Netherlands (ECN) and the Environmental Assessment Agency (PBL) for projections and policy evaluations. In 2018, the NEOMS has been transferred to PBL.

National Energy Outlook Modelling System

NEOMS is a suite of models to simulate the various parts and sectors of the Dutch Energy System[82]. Some constituent models have been developed in spreadsheets (Excel), some are optimization models developed in AIMMS or GAMS. Although each models is unique, the general starting point is a detailed inventory of the existing portfolio of all energy consuming technologies in all sectors, calibrated to national statistics on energy demand and supply, investments, added value and data available from other sources (e.g. world market prices for oil, gas and coal from IEA and futures markets, monitoring of government programmes). Building on the drivers for developments in the energy system, such as economic growth, population growth and technological change - some as endogenous effort, some defined exogenously - the models simulate the development of the system, activity levels and the uptake of alternative technologies therein, taking into account consumer preferences and market behaviours and the impact of policies thereupon. Combining expected technology deployment and the demand for various products and energy services result in the final and primary energy consumption and CO_2-emission projections.



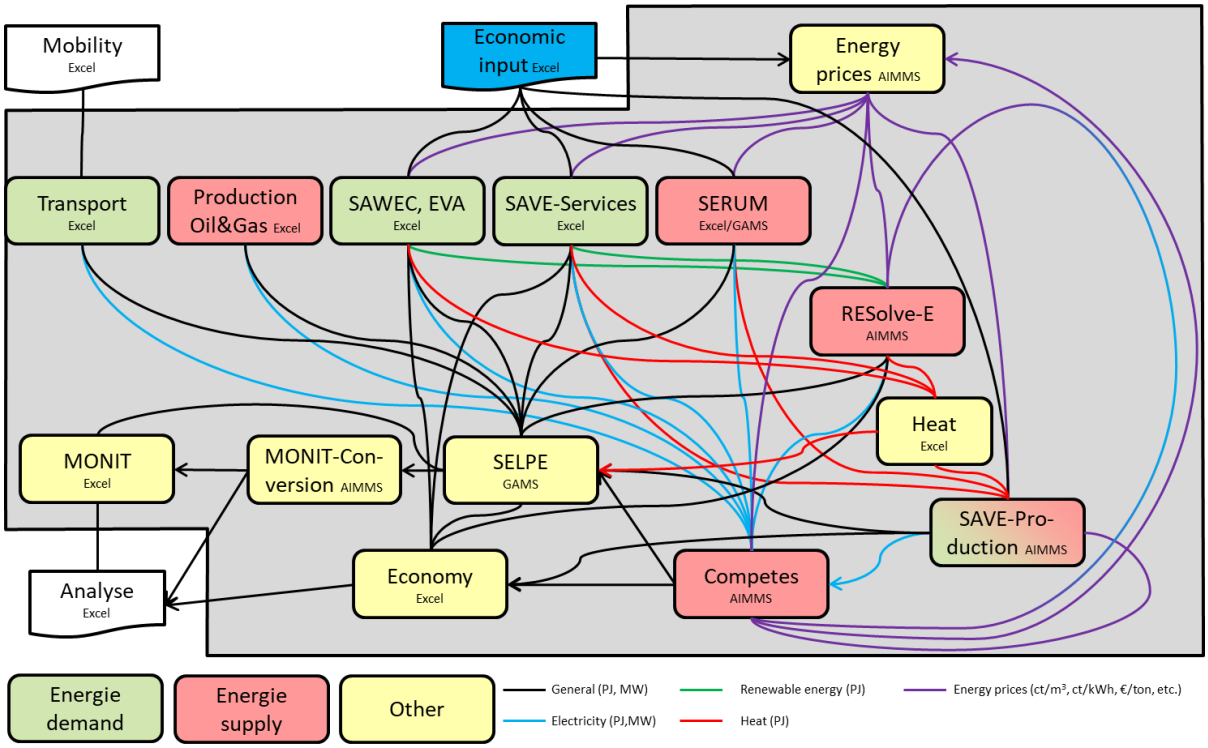
The NEOMS enables the exchange of data between 12 energy models, producing consistent and detailed results. Detailed results include energy demand, supply, emissions, technology uptake, investments, costs, prices, policy impacts. The total system includes about 22 sub-sectors with all relevant technologies and fuels per sub-sector. Their CO_2 emissions are also calculated

[82] https://www.pbl.nl/modellen/kev-rekensysteem

The NEOMS models currently cover the following sectors and their corresponding models:

- **Energy demand**
  - Industry and agriculture (SAVE-Production),
  - Service sector (SAVE-Services),
  - Households (SAWEC and EVA),
  - Transport (various models).
- **Energy supply**
  - Combined heat and power (SAVE-Production),
  - Electricity supply (Competes),
  - Refineries (SERUM),
  - Renewables (RESolve-E),
  - Gas and oil supply (Gas/oil production).

The outputs of all the separate models are combined in a model of the total energy sector (SELPE) in which the validity and consistency of the energy system as a whole is verified. Ultimately, all the results feed into MONIT-Conversion, a tool which calculates the energy savings per sector and produces aggregated results for all kinds of analyses, for example for the presentation tool MONIT.



Energy demand

SAVE-Production (industry, agriculture and CHP)
SAVE-Production is a simulation model that calculates the energy demand of industry and agricultural sectors and the sectoral implementation of combined heat and power generation. The future energy demand is calculated based on the economic growth per subsector and measures taken.

SAVE-Services (services sector)
SAVE-Services is a simulation model for the services sector. Based on the economic growth per subsector and the measures taken, the model calculates the future gas and electricity demand.

SAWEC (households)
SAWEC is a simulation model for households that calculates the building-related energy use of houses, for example natural gas, electricity, district heating and oil products. Based on a stock database, SAWEC calculates the effects of all kinds of measures. The model can accurately simulate historic energy-related trends dating back to 1985 and uses the same algorithm to project future developments towards 2040.

EVA (households)
EVA uses a detailed stock database to calculate the national electricity use of household appliances. EVA offers a detailed view on the impact of changes in the penetration of appliances and autonomous or policy driven changes in energy consumption.

Transport
The transport model is a tool to incorporate the results of the calculations of all kind of models specific for the transport sector used at PBL into the databases of NEOMS. This enables the other models to use these data for their calculations.

Energy Supply

COMPETES (electricity supply)
COMPETES is used to calculate decisions in investments and operations for centralised electricity production in the EU. Based on the Dutch sectoral electricity demand, hourly electricity production from intermittent renewables and sectoral implementation of combined heat and power, the remaining demand is covered by COMPETES, taking into account the merit order of the supply curve of centralised electricity generators and electricity trade with the neighbouring countries. COMPETES also provides the commodity prices for electricity.

SERUM (refineries and oil supply)
SERUM is an optimization model for the Dutch oil refining sector. Based on expectations about the demand for oil products, environmental measures and crude properties, SERUM calculates the required crude intake, the required refining configuration and the energy use for the whole process. Based on energy use and energy carriers, emission developments are calculated.

RESolve-E (renewables)
The aim of the RESolve-E model is to provide data about the total renewable energy production (excluding biofuels). For the renewable energy production that is eligible to receive a subsidy via the SDE subsidy scheme, the SDE budget constitutes a ceiling for the total production. Because renewable energy can contribute to realising the energy performance coefficient standards for new buildings, the renewable energy production of SAWEC and SAVE-Services serve as input for RESolve-E.

Gas/oil production (gas and oil supply)
In this model, the supply of natural gas and crude oil is calculated based on the availability of natural gas in the 'Groningen' gas field, and the other onshore as well as the offshore fields for gas and oil. Exogenous assumptions are made about the volume for gas storage, gas-export and oil-export. If demand exceeds this production, natural gas and oil will be imported. The model

calculates the amount of energy needed for production, storage and transport as well as losses in the grid

Other models and tools in NEOMS

Energy prices
The energy prices tool provides electricity and gas prices for the different sectors as defined in NEOMS. These data can be used by the NEOMS models.

SELPE (validity and consistency check)
SELPE is an optimisation model that is used to model the entire Dutch energy sector. Most of the constraints are set by the above-mentioned models. The aim of this model is to check the feasibility and consistency of the outcomes of the other models, for example verifying that the total electricity demand does not exceed the electricity supply.

MONIT
The output of the SELPE model is very detailed. MONIT-Conversion can aggregate its results into any format needed by the user. The output is made available to MONIT, and can also be made available to external parties. Another function of this tool is to calculate the energy efficiency indicators. The tool is used to present the combined results of the models in such a way that they can be used in all kinds of reports, together with historic data.

ECONOMY
All the energy demand and energy supply models provide data on investment costs and costs for operation and maintenance. In the Economy tool these costs are combined together with the energy prices to make an overall cost picture for the Netherlands.

Non-energy models
The results from NEOMS are used and/or complemented with the modelling of non-CO_2 emissions and non-energy related CO_2-emissions (LULUCF). This is done using sectoral models (agriculture and LULUCF) and spreadsheet tools (industry and other sectors).

Agriculture
For the calculation of the agricultural emission projections the National Emission Model for Agriculture (NEMA) is used (Vonk et al., 2018)[83]. NEMA models CH_4, NH_3, N_2O, NO_x, PM_{10}, $PM_{2.5}$ and CO_2 emissions from agriculture using a methodology in compliance with the IPCC and EMEP Guidelines. Usually the model runs with historical input data calculating the emissions for the National inventory report and the Informative inventory report. Input data for projections is based on estimated effect of existing policies and expert judgement using other models, research and historical trends. Institutes involved in estimating input data are Wageningen Economic Research, Wageningen Environmental research, Wageningen Livestock Research and PBL.

[83] https://english.rvo.nl/sites/default/files/2018/04/Vonk-et-al-2018-Methodology-report-agriculture-2018.pdf

LULUCF
The forestry projection is based on calculations with the EFISCEN (European Forest Information Scenario) model[84]. The projections of the other categories are expert based projections. The historic trends are used as input for these projections. A modelling tool is only applied at the LULUCF category forestry and only for carbon dioxide. Forestry inventories, updated every four years, are used for the LULUCF category forestry. The inventory supplies up-to-date forest data, as input for the modelling.

Waste
Methane from waste disposal is calculated using a spreadsheet model. The annually varying factors in this calculation are:
- the annual quantity of deposited waste;
- the carbon content;
- the amount of landfill gas extracted.

The projections in the KEV2019 takes into account:
- A halving of the material to be deposited from 2020;
- Almost a halving of the potentially degradable carbon per tonne of landfilled waste from 2020;
- Reduced extraction, because less landfill gas is formed.

IPPU
CO_2 emissions from non-energy processes have been projected by a separate methodology that uses activity levels of industrial subsectors and other sectors (as they appear in the NEOMS). The activity levels for companies are expressed as added value, for transport as the transport volume and for households as the number of dwellings or inhabitants. Historic process and product use emissions are scaled using the change in activity level of these (sub)sectors. Relevant NEOMS sectors for industrial processes are Building materials, Organic chemistry, Iron and steel and Non-ferro metals. For solvent use the relevant NEOMS sectors are Transport and Organic chemistry. For liming it is Agriculture, and for indirect emissions (often oxidation of NMVOCs) Water and Waste, Construction, Organic chemistry, Households, Energy companies, Services, Agriculture, Refineries and Transport.

Nitrous oxide emissions from the industry: Nitric acid and Caprolactam production
The emissions for the future years have been calculated via a calculation sheet.
The input variables, in both the production of Nitric acid and Caprolactam, in this calculation sheet are the realized emission (in CO_2-eq.) from the Dutch PRTR in 2017 (the base year) a starting point;
- the growth series(economic developments) according to the KEV;
  For nitric acid, the growth series "chemical industry - fertilizer" is used and for caprolactam the series "chemical industry";
- if measures will be taken in future years:
  * the introduction year(s) of the measure(s);
  * the reduction percentage(s)of the measure(s).

In the calculations for the KEV2019, no further reduction measures are expected until 2030

HFC emissions from Stationary cooling
Also for this source a calculation sheet has been used to calculate the emissions for the future years. As a result of the new EU regulation on F-gases that came into force on 1 January 2015, the use of HFCs (calculated in CO_2 equivalents) should drop by 79% between 2015 and 2030.

[84] https://www.efi.int/publications-bank/manual-european-forest-information-scenario-model-efiscen-41

Based on the usage figure determined for 2017 and the intermediate reduction percentages as input, the usage figures for the years between 2015 and 2030 have been determined as a first step. Subsequently, with the help of these usage figures and the quantity of inventory to be replaced, the emissions were determined using an average leak rate of 5%.

HFC emissions from Air conditioning Mobile
For this source the emissions for the future years also have been calculated via a calculation sheet. The European Directive 2006/40 / EC (MAC Directive (EC, 2006)) prohibits the use of refrigerants with a GWP> 150 in new cars from 2017. Taking this ban into account, the emissions for future years are calculated using an emission factor per year of construction and the size of the car park as input variables .The data on the development of the car fleet are from the KEV. The emission factors per construction year are determined using the leakage percentages from a number of surveys.

Colophon / credits

This is a publication of the Ministry of Economic Affairs and Climate Policy (EZK)
Directorate General for Climate Change and Energy

Address for visitors:
Bezuidenhoutseweg 73
2594 AC Den Haag
Telefoonnummer: 0031-703798911

Postal Address:
PO Box 20401
2500 EK The Hague
The Netherlands

www.rijksoverheid.nl/ezk

Preparation:

Ministry of Economic Affairs and Climate Policy	(EZK)
Ministry of Infrastructure and Water Management	(I&W)
Ministry of Foreign Affairs	(BuZa)
Netherlands Enterprise Agency	(RVO.nl)