The Netherlands Third Biennial Report under the United Nations Framework Convention on Climate Change

Ministry of Economic Affairs and Climate Policy

CONTENTS

1. SUMMARY

Introduction

This report presents the third 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 2015, the total GHG emissions (including indirect CO_2 emissions, but excluding emissions from land use, land-use change and forestry (LULUCF)) in the Netherlands amounted to 195.2 Tg CO_2 eq. This figure is approximately 12.5% below the emissions in the base year of 1990 (223.1 Tg CO_2 eq.).

Figure 1.1 shows the trends and contributions of the different gases in relation to the aggregated national emissions of greenhouse gases. In the period 1990–2015, emissions of carbon dioxide (CO_2) increased by 1.5% (excluding LULUCF). Emissions of non-CO_2 GHGs, i.e. methane (CH_4), nitrous oxide (N_2O) and fluorinated gases (F-gases), decreased by 41%, 53% and 74% respectively. Emissions of LULUCF-related sources increased by about 10% in the period 1990–2015. The total amount of GHG emissions in the Netherlands for the year 2015 (including LULUCF) was 202.0 Tg CO_2 eq.

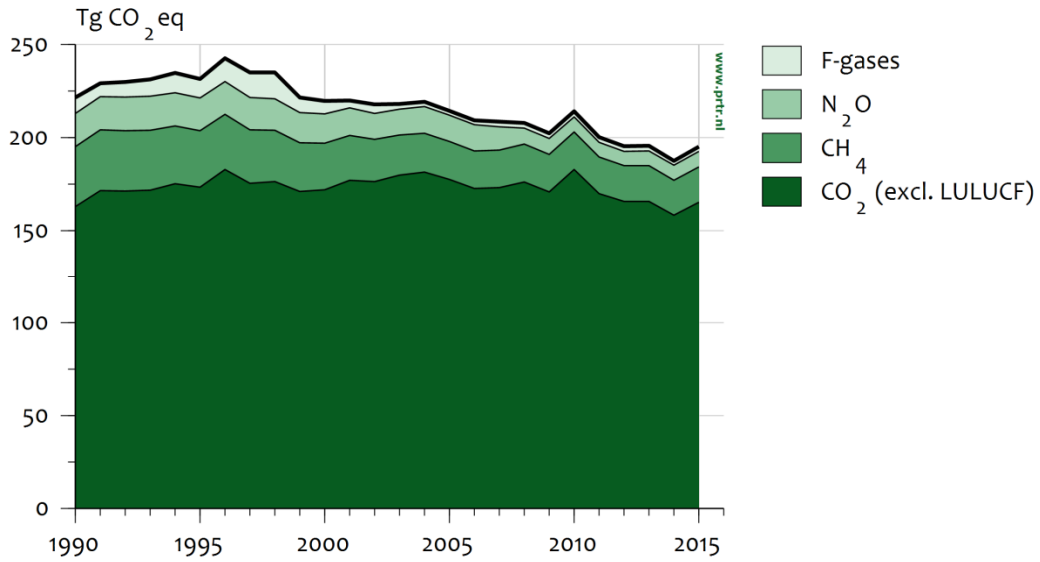

Figure 1.1 Greenhouse gases: trends and emission levels (excl. LULUCF), 1990–2015.

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).

The Netherlands maintains its National Registry in a consolidated manner in the Central European Emissions Trading Registry (EU Registry) with all the Parties that are also members of the European Union. The Registry is maintained by the Dutch Emissions Authority (NEa).

Quantified economy-wide emission reduction targets

In 2010, the European Union (EU) submitted a pledge to reduce its GHG emissions by 2020 by 20% compared to 1990 levels (UNFCCC, 2014a). As this target under the Convention has been submitted by the EU-28 as a group, and not by each individual Member State, there are no specified convention targets for individual Member States under the Convention. Instead, the Netherlands – as part of the EU-28 – is pursuing this quantified economy-wide emission reduction target jointly with all other Member States.

In 2009, the EU established internal rules under its 2020 climate and energy package that underpin the EU implementation of the target under the Convention. The package introduced a clear approach to achieving the 20% reduction in total GHG emissions compared to 1990 levels, which is equivalent to a 14% reduction compared to 2005 levels. This 14% reduction objective is divided between the sectors that fall under the scope of the EU emissions trading system (ETS) and the non-ETS sectors, which are governed by the EU Effort Sharing Decision (ESD). 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 the ESD sectors, shared between the 28 Member States through individual national GHG reduction targets.

The Netherlands is committed to reducing its emissions in the sectors covered under the Effort Sharing Decision (ESD, non-ETS) by 16% compared to 2005 emissions. The Dutch quantified annual reduction targets set by EU Decisions and Annual Emission Allocations (AEA) in tons CO_2 eq. are 122.9 million AEA 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.

Progress in achievement of quantified economy-wide emission reduction target

The Dutch emissions under the ESD amounted to 108 Mton CO_2 eq., 97.9 Mton CO_2-eq and 101.1 Mton CO2_eq. in the years 2013, 2014 and 2015 respectively. The provisional figure for the year 2016 is 102.7 Mton CO_2 eq., while the allocated AEAs for these years were 123, 121, 118 and 116 Mton respectively. For the period 2013-2020 the projected emissions are calculated to be 798 Mton CO_2-eq. It is therefore anticipated that the emissions in 2020 as well as the cumulative emissions will be lower than the target and the cumulative AEAs over the period (see figure 1.2). The Netherlands has decided to cancel any surplus of AEAs for the period up to 2020, presently estimated to amount to about 123 Mton CO_2 eq. cumulatively.

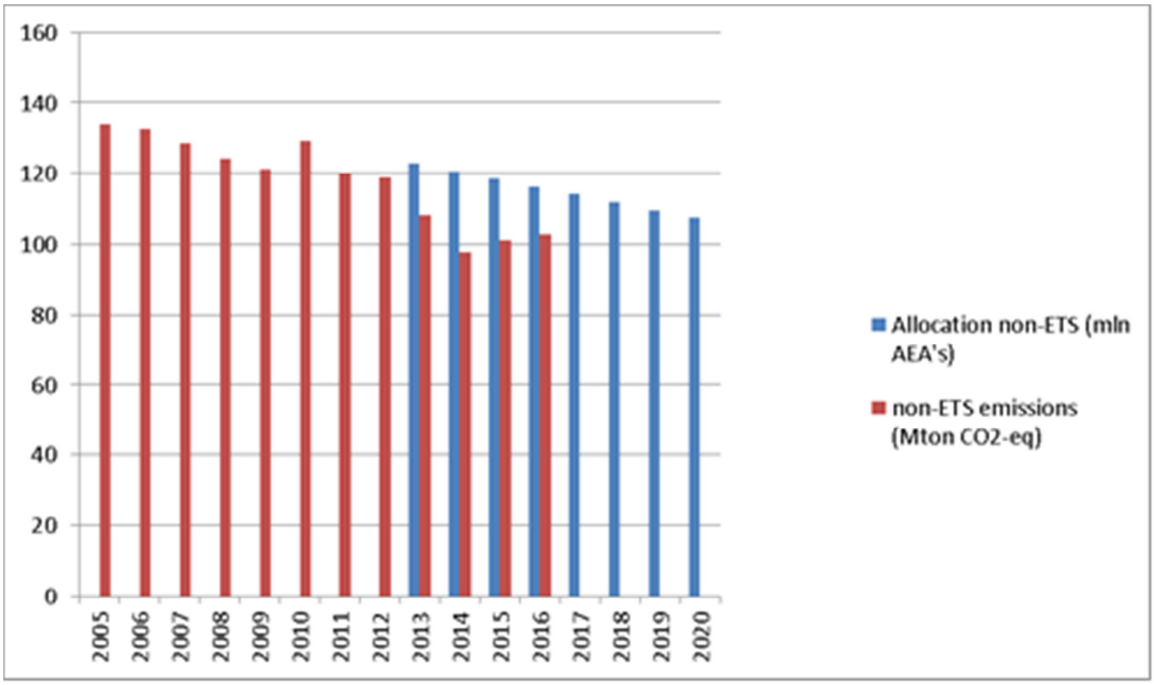

Figure 1.2 Greenhouse gas emissions 2005–2016 for non-ETS sectors and AEA allocation for 2013–2020 (Mton CO_2 eq.). Emissions in 2016 are based on provisional data.

The scope of the policies and measures (PAMs) is limited to domestic and EU policies and measures implemented since 1990 or planned in the Netherlands and includes PAMs that have had, or are expected to have, a significant impact on greenhouse gas emissions in the Netherlands, even if the primary objective of the policy is (or was) not directly related to climate change. The policies and measures are described by sector and by greenhouse gas, in addition to cross-sectoral policies and measures. The most important PAMs are mentioned below:

Agreement on Energy for Sustainable Growth (Energy agreement)

In 2013, the Dutch national government concluded a cross-sectoral agreement with more than 40 stakeholders, including energy companies, NGOs and regional and local 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 responsibility and commitment to achieve the following overarching objectives:

- An average energy efficiency improvement of 1.5% per year (adding up to a reduction of 100 PJ by 2020)
- A 14% share of renewable energy in the Netherlands' total consumption of energy by 2020 and 16% by 2023
- Creation of at least 15,000 additional jobs by 2020.

This agreement includes some 160 economy-wide actions for the participating parties to implement this commitment, including actions by the national government. During its implementation, additional actions were agreed in 2015 and 2016 in order to attain the 2020 targets for energy efficiency and renewable energy.

SDE+ (Stimulation of Sustainable Energy Production incentive scheme)

Renewable energy production is stimulated with the SDE+ incentive scheme. Producers receive financial compensation for the renewable energy they generate. Production of renewable energy is not always profitable because the cost price of renewable energy is in most cases still higher than that of energy derived from fossil fuels. SDE+ compensates producers for the unprofitable part of the cost price for a fixed number of years. Separate regulations and subsidy programmes have been implemented to develop large-scale offshore windfarms.

Long-Term Agreements on Energy Efficiency (LTA3 and LEE)
The Long-Term Agreements LTA3 and LEE are voluntary agreements that incentivise energy savings in industry. They are concluded between the national government, the trade associations and the participating companies. These Long-Term Agreements are enforced using environmental permits: companies which do not participate are required (in their permits) to implement all energy-saving measures with a pay-back period of less than five years. Participants in the LTA are required to draw up an Energy Efficiency Plan (EEP) every four years for the next four years. They also have to submit annual monitoring reports on projects that have actually been implemented and their results.

Agro covenant
The Agro covenant is a Public-Private Partnership signed in 2008 dealing with greenhouse gas emissions, biomass and wind power. With respect to the first, the aim is to reduce CO_2 emissions in 2020 by at least 3.5 Mton and those of non-CO_2 greenhouse gases like methane and nitrous oxide by 4.0 to 6.0 Mton (in CO_2-equivalents) compared to 1990. The targets for the year 2020 are production of 200 PJ per year of renewable energy from biomass and a total amount of wind energy on land of 3.5 billion kWh per year, equivalent to approximately 12 PJ.

EU Emissions Trading System (ETS)
As prescribed by Directive 2003/87/EC, a trading system for CO_2 emissions started in the EU on 1 January 2005, focusing on CO_2 emissions from large industrial emitters. It is a cap-and-trade system, where participants are assigned a set amount of allowances up front and are required to surrender annual allowances equal to their actual emissions. In 2013, the EU ETS entered its third phase, running up to 2020. The ETS now also includes more sectors (i.e. domestic and intra-EU aviation) and gases (nitrous oxide, PFCs). Its allowances will be reduced by 21% between 2005 and 2020 in order to reduce the total emissions.

European directives related to energy efficiency
Several EU directives are important to improve energy efficiency: the Energy Performance of Buildings Directive (EPBD), which sets minimum energy performance standards for new buildings; the Energy Efficiency Directive (EED), which sets, among other things, binding targets for final energy consumption and improves market conditions for energy efficiency; the CO_2 emission performance standards, which improves the fuel efficiency of passenger cars and light-duty vehicles; and finally, the Ecodesign Directive. The Ecodesign Directive provides consistent EU-wide rules for improving the environmental performance of energy-using or energy-related products, such as household appliances. The Directive sets out minimum mandatory requirements for the energy efficiency of these products.

Biofuels
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 in 2020. In practice, this target is mainly fulfilled with biofuels.

Developments in long-term policy planning
In January 2016, the Ministry of Economic Affairs and Climate Policy published its Energy Report, which sets out the long-term ambition of the Dutch government to make the transition towards a low-carbon energy system by 2050. The incumbent government, which took office in October 2017, intends to continue this transition and has set an ambitious target to reduce the Netherlands' domestic greenhouse gas emissions by 49 per cent by 2030. In order to realise that ambition, a new Climate and Energy Agreement will be concluded, as a follow-up of the 2013 Energy Agreement that will end in 2020 (2023 for renewable energy).

Projections and the total effects of policies and measures

The projections are based on the National Energy Outlook 2017 (NEV 2017), which describes the most likely developments based on the available information about energy prices, markets, technology and policies. Compared with the National Energy Outlook 2015, which was used in the previous Biennial Report, the NEV 2017 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 up to May 2017 have been taken into account, using official national statistics from Statistics Netherlands (CBS) and the Pollutant Release and Transfer Register of the National Institute for Public Health and the Environment (RIVM) where available. This approach means that the base year for most modelling parameters is 2015 or 2016 where possible.

The modelling distinguishes two different policy variants, which are based on the underlying principles of Dutch and European policy: the variant 'With Existing Measures' (WEM) and the variant 'With Additional Measures' (WAM). Both variants contain measures made binding by market participants, public organisations and other government bodies on or before that date. A variant 'Without Measures' is not included in the modelling.

Although CO_2 emissions increased between 2015 and 2016, the structural trend for the future is expected to be a decrease of CO_2 emissions. This is the result of increasing efforts towards the decarbonisation of the energy system. In the policy variants with existing measures and with additional measures, greenhouse gas emissions are expected to fall to 171 and 170 Mton of CO_2 equivalents by 2020, respectively. This figure represents a decrease of almost 23% compared to 1990 levels.

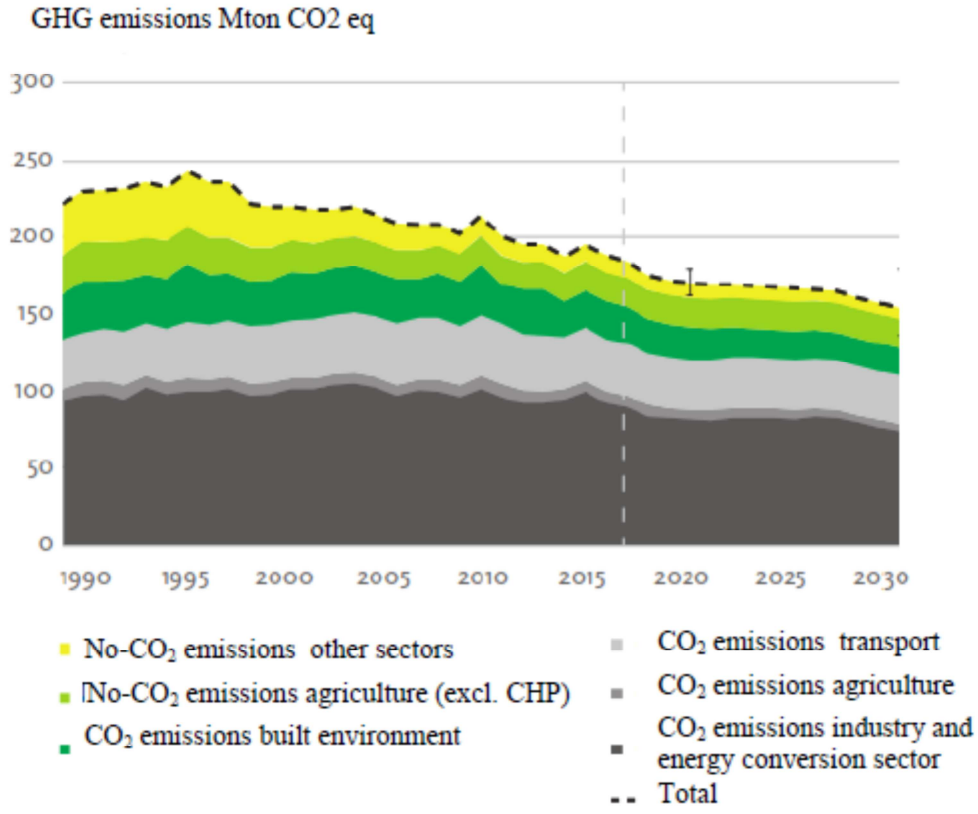

Figure 1.3 Historic and projected emissions of greenhouse gases by sector, 1990–2030.

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 and is financed from its budget for foreign trade and development cooperation. The Netherlands is committed to scaling up its support for mitigation and adaptation activities in developing countries and has continued to realise a year-on-year increase in its climate finance after having delivered on its commitment of Fast-Start Finance during 2010–2012. While public climate finance amounted to €286 million in 2013 and €395 million in 2014, it increased to €420 million in 2015 and €472 million in 2016. In addition, public finance from the Netherlands in 2015 mobilised €73 million of private finance for climate-relevant activities in developing countries. In 2016, the mobilised private finance amounted to €171 million.

Adaptation expenditure amounted to €116 million in 2015 and represented 28% of Dutch public climate finance. In 2016, adaptation expenditure rose to €156 million, which amounted to 33% of the total sum. This increase was due to a better integration of climate change adaptation in development activities. The share of mitigation expenditure was stable in absolute terms at €31 million, which amounted to 7% of the total amount in 2015 and 2016. Most public climate finance supported cross-cutting activities (65% in 2015, 60% in 2016), due to substantial contributions to activities through multilateral and other channels that support both adaptation and mitigation.

As Dutch support for climate action is part of its development cooperation, both our bilateral and our multilateral climate finance are characterised by 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 water, sanitation and hygiene (WASH) services. Disaster risk reduction is an integral part of our programmes for integrated water resource management, while it also receives support through the Partners for Resilience alliance. Gender is an important cross-cutting issue, as climate action is most effective when it builds on the capacities of both genders and addresses the needs as well as the vulnerabilities of both.

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 1990–2015) to the UNFCCC in April 2017. 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 greenhouse gas emissions by greenhouse gas (GHG) and by sector over the period 1990–2015, as described in the National Inventory Report (NIR) 2017. More detailed explanations are provided in the NIR 2017[1].

Emission trends for aggregated greenhouse gas emissions
In 2015, the total GHG emissions (including indirect CO_2 emissions, but excluding emissions from land use, land-use change and forestry (LULUCF)) in the Netherlands amounted to 195.2 Tg CO_2-eq. This figure is approximately 12.5% below the emissions in the base year of 1990 (223.1 Tg CO_2-eq).

Figure 2.1 shows the trends and contributions of the different gases in relation to the aggregated national emissions of greenhouse gases. In the period 1990–2015, emissions of carbon dioxide (CO_2) increased by 1.5% (excluding LULUCF). Emissions of non-CO_2 GHGs, i.e. methane (CH_4), nitrous oxide (N_2O) and F-gases, decreased by 41%, 53% and 74% respectively.
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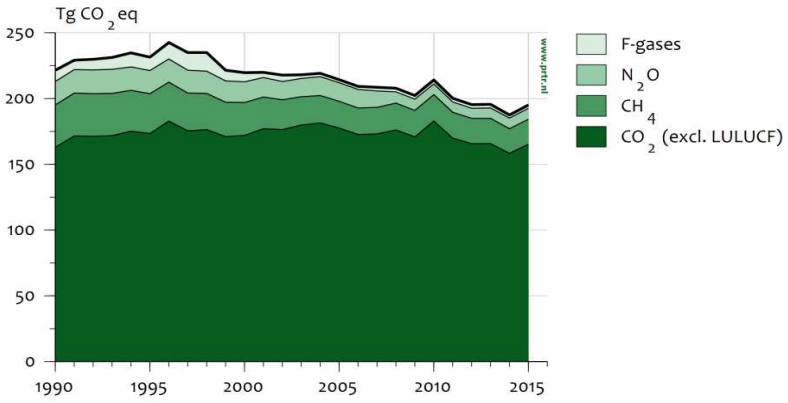


Figure 2.1: Trends and emission levels for greenhouse gases, 1990–2015, in Tg CO_2-eq.

Emission trends by gas

Carbon dioxide

[1] Coenen et al., 2017
http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/nld-2017-nir-14apr17.zip

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 1990–2015, national CO_2 emissions increased by 1.5% (from 162.9 to 165.3 Tg). The Energy sector is by far the largest contributor to CO_2 emissions in the Netherlands (97%), with the Subcategories 1A1 Energy industries (40%), 1A4 Other sectors (20%) and 1A3 Transport (19%) being the largest contributors in 2015.

Relatively high levels of CO_2 emissions in – for instance – 2010 is mainly explained by the relatively 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 (0.2 Tg in 2015).

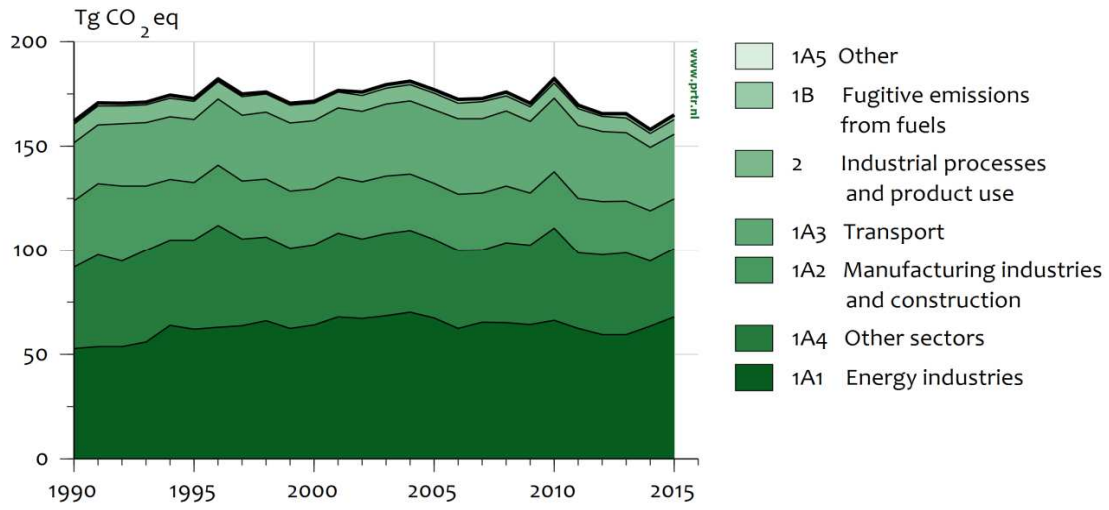


Figure 2.2: Trends and emission levels for CO_2 by sector, 1990–2015, in Tg CO_2 eq.

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 41%, from 32.3 Tg in 1990 to 19.0 Tg CO_2-eq in 2015. The Agriculture and Waste sectors (67% and 18%, respectively) were the largest contributors in 2015.

Compared with 2014, national CH_4 emissions increased by about 1.2% in 2015 (0.2 Tg CO_2-eq). CH_4 emissions decreased in Category 5A (Solid waste disposal on land), but they were balanced by an increase in emissions from Agriculture.

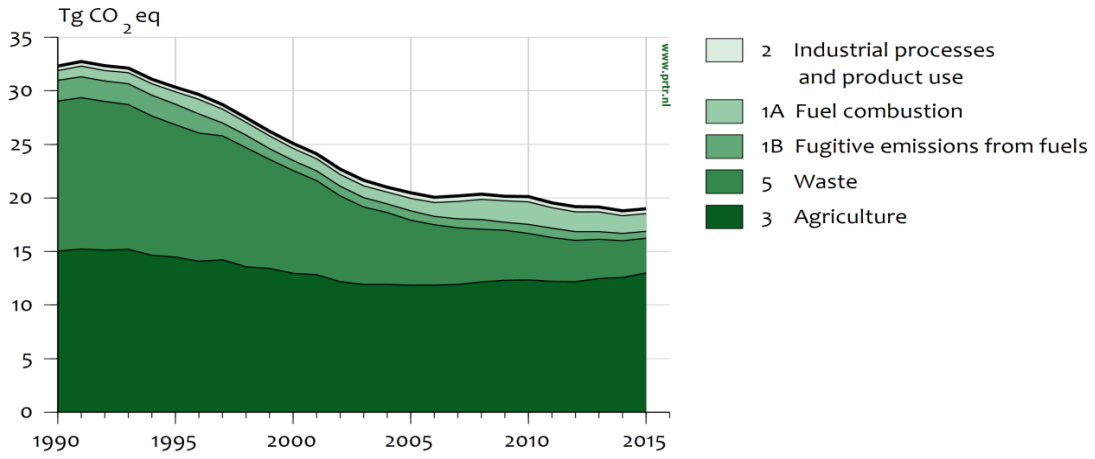


Figure 2.3: Trends and emission levels for CH_4 by sector, 1990–2015, in Tg CO_2 eq.

Nitrous oxide

Figure 2.4 shows the contribution of the most relevant sectors to the trend in national N_2O emissions. In total, the national inventory of N_2O emissions decreased by about 53%, from 17.7 Tg CO_2-eq in 1990 to 8.3 Tg CO_2- eq. in 2015. The Industrial processes sector contributed the most to this decrease in N_2O emissions (emissions were almost 81% lower than in the base year). Compared with 2014, the total N_2O emissions increased by 3.3% in 2015, mainly due to a rise of emissions in agriculture.

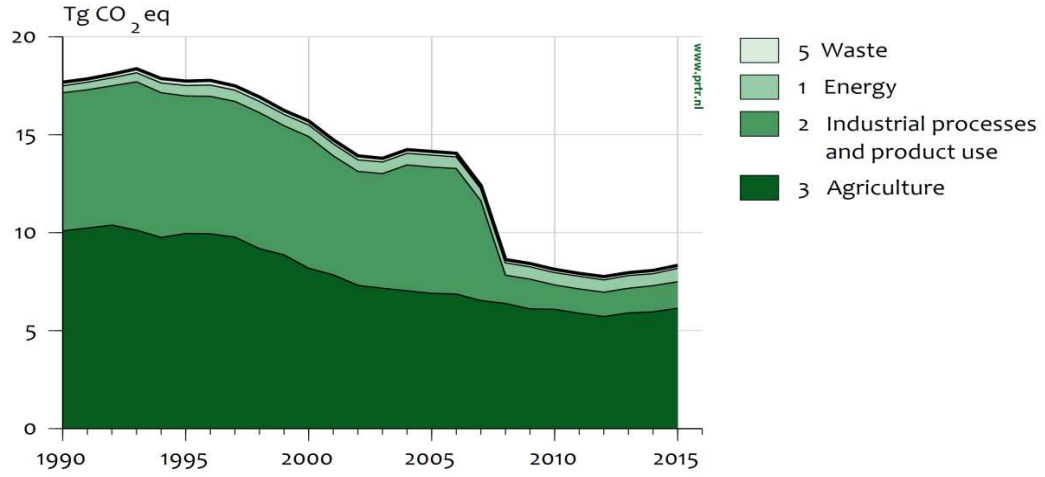


Figure 2.4: Trends and emission levels for N_2O by sector, 1990–2015, in Tg CO_2-eq.

Fluorinated gases

Figure 2.5 shows the trend in fluorinated or F-gas emissions included in the national GHG inventory. The total emissions of F-gases decreased by 74% from 10.1 Tg CO_2-eq in 1995 (base year for F-gases) to 2.6 Tg CO_2- eq. in 2015. Emissions of hydrofluorocarbons (HFCs) and perfluorocarbons

(PFCs) decreased by approximately 69% and 95% respectively during the same period, while sulphur hexafluoride (SF_6) emissions decreased by 47%. It should be noted that due to national circumstances, the emissions of NF_3 cannot be reported separately and are included in the PFC emissions. Between 2014 and 2015, HFCs emissions increased by 3.6%, PFCs emissions increased by 10.6% and SF_6 emissions increased by 3.1%. The aggregated emissions of F-gases decreased by 1%.

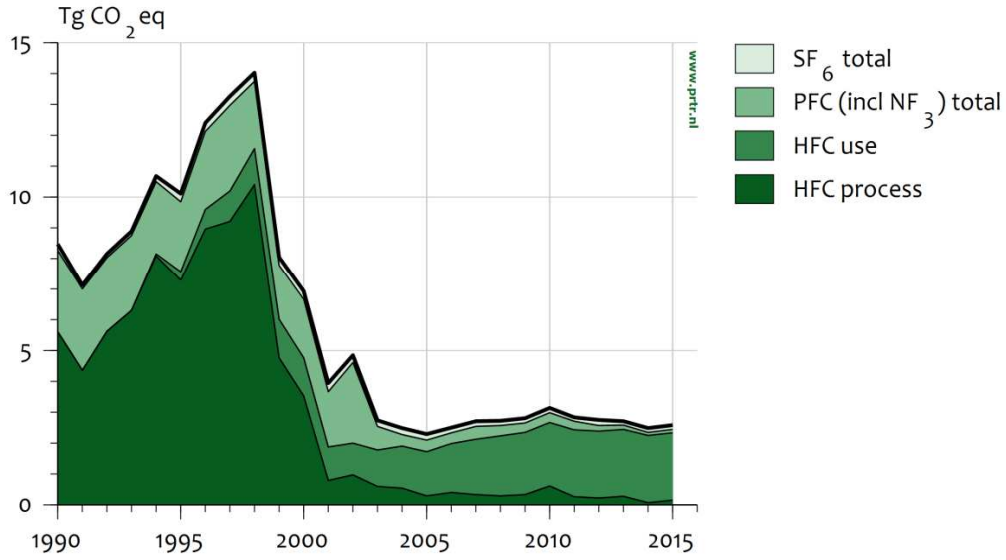


Figure 2.5: Trends and emission levels for individual fluorinated gases (F-gases), 1990–2015, in Tg CO_2-eq.

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 the total GHG emissions in the national inventory (contributing 68% in the base year and 78% in 2015). Emission levels of the Energy sector increased by approximately 3% in the period 1990–2015. The total GHG emissions from the Waste, Industrial processes and Agriculture sectors in 2015 decreased by 77%, 57% and 24% respectively compared with the base year, while LULUCF emissions increased by 11% in the same period.

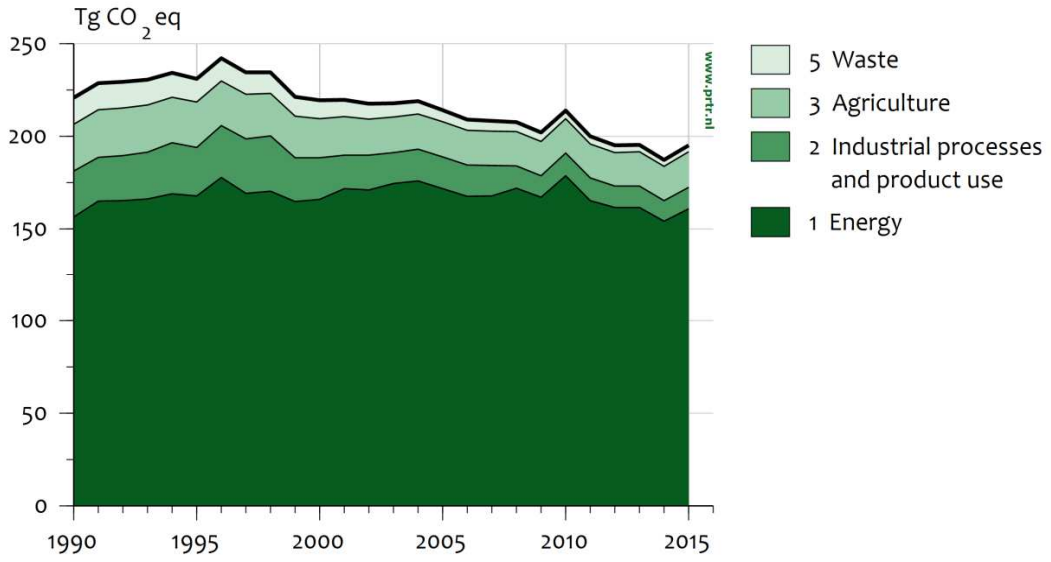


Figure 2.6: Trends and emission levels for aggregated greenhouse gases by sector, 1990–2015, in Tg CO_2-eq

Emission trends for indirect greenhouse gases and SO_2
Figure 2.7 shows the trends in total emissions of carbon monoxide (CO), nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOC) and sulphur dioxide (SO_2). Compared with 1990, CO and NMVOC emissions in 2015 had decreased by 52% and 71%, respectively. For SO_2, the reduction was 84%; for NOx, the 2015 emissions were 64% lower than the 1990 level. With the exception of NMVOC, most of the emissions stem from fuel combustion.

Because of problems (incomplete reporting) identified with annual environmental reports, emissions of indirect greenhouse gases and SO_2 from industrial sources have not been verified. As a result, the emissions data for the years 1991–1994 and 1996–1998 are of a lesser 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 they are directly related to transport statistics on a vehicle-kilometre basis. To some extent, this process is different from the IPCC approach, because the IPCC approach uses the amounts of sold fuels as activity data in the emission calculation.

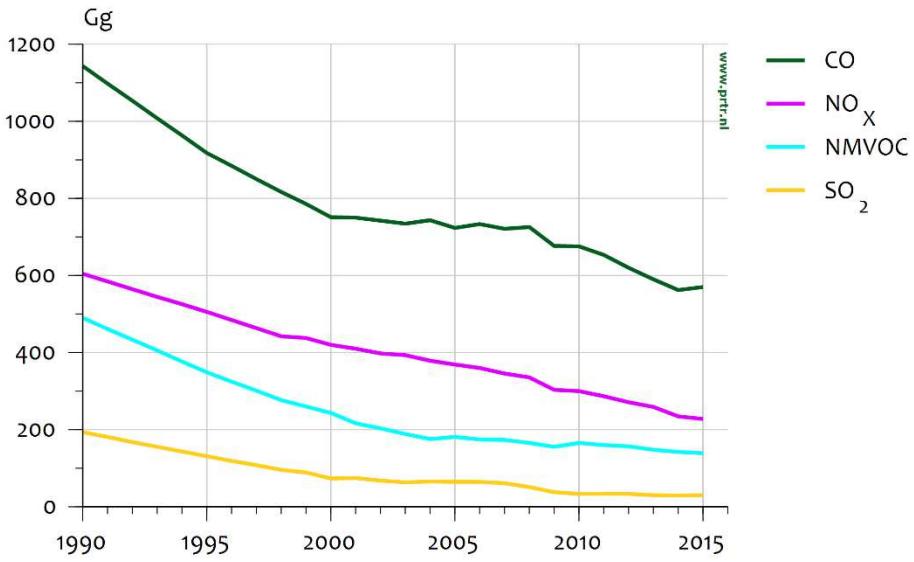


Figure 2.7: Trends and emission levels for NO_x, CO, NMVOC and SO_2, 1990-2015, in Gg.

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) by 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 checked by the National Inventory Entity (NIE) and approved by the chairperson of the PRTR Task Force concerned. As part of the National System, the methodology reports are available at the National System website[2].
- 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

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

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 2017, 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.

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:
(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 organisational aspects

Name and contact information for the national entity

a) 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 UN 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, checked by the National Inventory Entity and approved by the chairperson of the PRTR Task Force concerned.

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

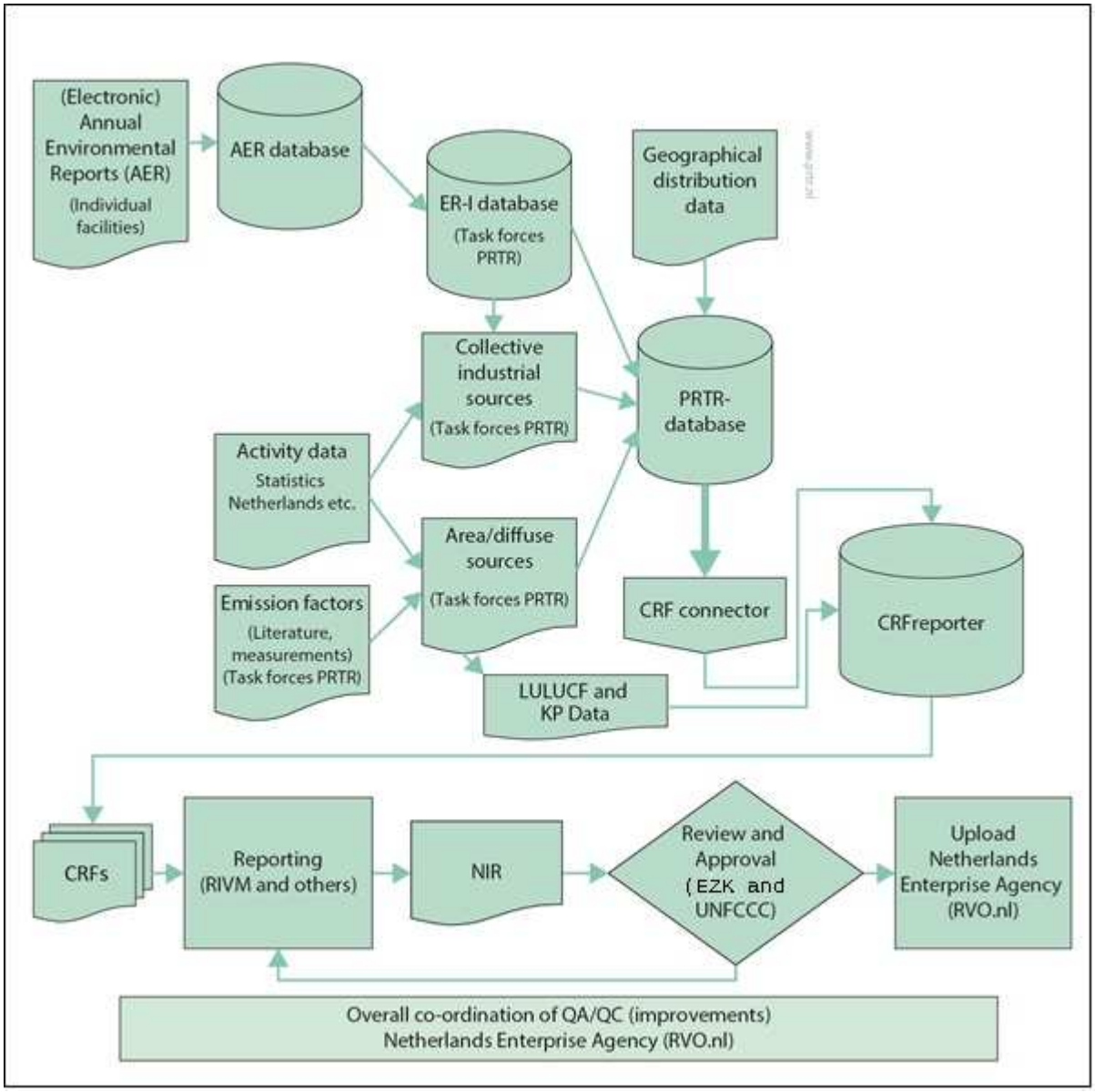


Figure 2.8: Schematic overview of main steps in the primary process; in practice, various feedback loops exist

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.

The data in the AERs and EU ETS reports are used to verify the CO_2 emissions figures derived from energy statistics for the industry, the energy sector and refineries. Whenever reports from major industries contain plant-specific activity data as well as EFs of sufficient quality and transparency, these reports are used in the calculation of CO_2 emissions estimates for specific sectors. Plant-specific data is mainly used for the calculation of CO_2 emissions from derived gases (chemical waste gas, blast furnace gas, coke oven gas). Since derived gases can have a highly variable emission factor, the use of plant-specific data will improve the CO_2 calculations. The AERs from individual companies also provide essential information for calculating the emissions of substances other than CO_2. 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, NO_x, NMVOC and SO_2). Only those AERs with high-quality and transparent data are used as a basis for calculating the total source emissions in the Netherlands.

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) 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), Deltares 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 Assessment Agency (PBL), Statistics Netherlands (CBS), Rijkswaterstaat, Deltares and TNO.

Task Force on Agriculture
Covers the calculation of emissions to soil and air. Participating organisations include RIVM, Netherlands Environmental Assessment Agency (PBL), LEI, Alterra, Statistics Netherlands (CBS) and Deltares.

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, TNO and Statistics Netherlands (CBS).

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[3]).
The Act also specifies that the National Inventory must be based on methodologies and processes as laid down in the methodology reports.

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

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.

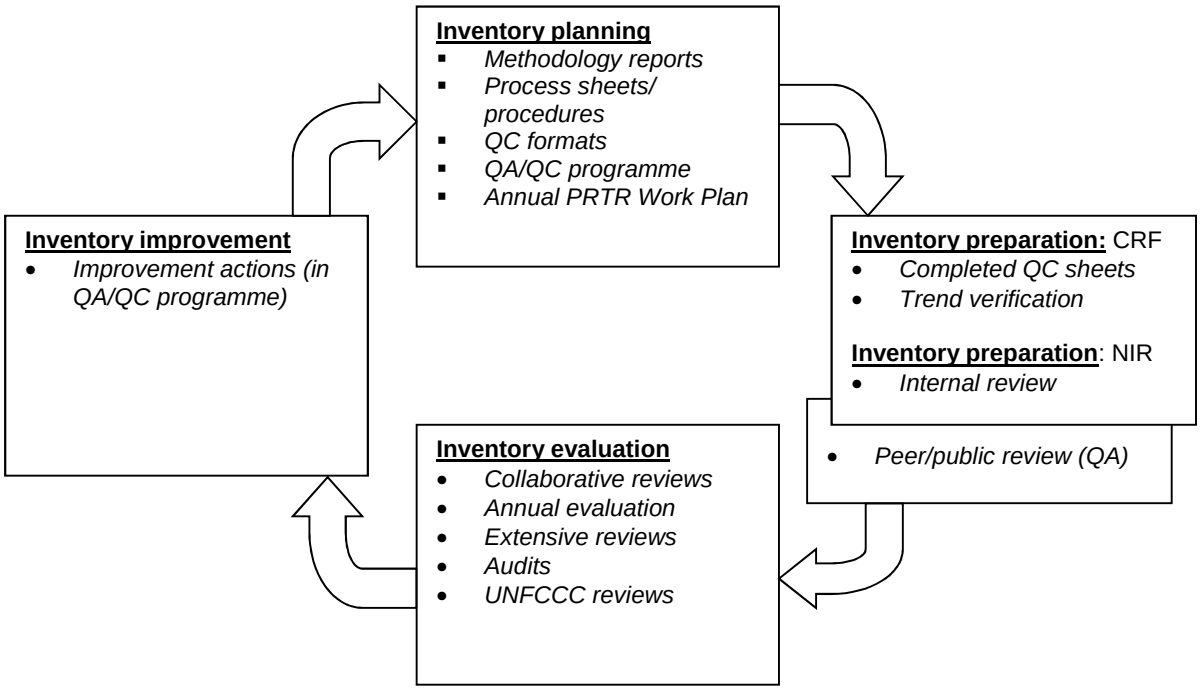


Figure 2.9: Annual cycle

(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 guideline 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) by five methodology reports. These methodology reports are also part of the National System.

The annual QA/QC cycle (see below) 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.

In the past years, the five-year extensive review activities were aimed at the changes deriving from the introduction of the 2006 IPCC Guidelines (IPCC, 2006).
For the longer term, RVO.nl will consider how the improvement programme can be continued, albeit with a different scope. RVO.nl aims at a monitoring system which provides more useful feedback to sectors/policymakers/other stakeholders and which is more cost-effective (avoiding duplication in data gathering, adjusting the frequency of data gathering according to relevance and trends, and so on).

More detailed information on how these processes have been implemented is provided by a description (in the section below) of the implementation in the National System of various functions 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 will be checked by the National Inventory Entity and approved by the chairperson of the PRTR Task Force. They are also made accessible on the national system website (http://english.rvo.nl/nie) and listed in Annual Work Plans (ER, 2017);
- *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, 2017) 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[4]. 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[5] 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.

(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 achieved by using 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.

[4] 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).

[5] For the PRTR Work Plan, approval is given by the Steering Committee ER
.

Changes can be initiated by all parties involved; they can be based on recommendations by the UN 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. The latter is performed using the National System website, together with the notification of experts and organisations with a potential interest;
- 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 UN 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 text 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 UN 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 UN 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 have been 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 UN reviews. The QA/QC programme includes a timetable, tasks and responsibilities. This programme is essentially an internal document that is available for UN 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 Tier 1 uncertainty analysis (annually) and Tier 2 uncertainty analysis (every five years).

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;
- extensive review process – coordinating improvements for the longer term process (see section 2.3.3);
- 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;
- 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; the 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.

2.4 National Registry

This section describes the Dutch National Registry. It follows the outline for presenting information taken from the guidelines on the reporting of information under Article 7.2 of the Kyoto Protocol.

(a) The name and contact information of the registry administrator designated by the Party to maintain the National Registry

Registry administrator	
Name	Harm van de Wetering
Address	Koningskade 4 – PO Box 91503
City	The Hague
Postcode	2509 EC
Country	The Netherlands
Telephone number	+31 6 52595182
Fax number	+31 70 4568247
Email	harm.vande.wetering@emissieautoriteit.nl

(b) The names of the other Parties with which the Party cooperates by maintaining their National Registries in a consolidated system

The Netherlands maintains its National Registry in a consolidated manner within the central European Emissions Trading Registry (EU Registry) with all the Parties that are also members of the European Union. This European Emissions Trading Registry is hosted and facilitated by the European Commission.

(c) A description of the database structure and capacity of the National Registry

A description of the database structure and capacity can be found in the readiness documentation, available on the UNFCCC website[6].

(d) A description of how the National Registry conforms to the technical standards for data exchange Between Registry Systems for the purpose of ensuring the accurate, transparent and efficient exchange of data between National Registries, the Clean Development Mechanism Registry and the transaction log (decision 19/CP.7, paragraph 1)[7]

The EU Registry software has been developed to implement the EU Emissions Trading Scheme and the Kyoto Emissions Trading Scheme. Both schemes require Registries to be compliant with the UN Data Exchange Standards (DES) referred to in the Kyoto Protocol. Through ongoing development, the Commission's registry software is continuously kept up to date with the current version of the DES specifications.

The EU Registry software implements functionalities to perform issuance, conversion, external transfer, voluntary cancellation, retirement and reconciliation processes by using XML messages and web services as specified in the DES.

In addition, the CIE registry software implements functionalities for 24-Hour Clean-up, Transaction Status Enquiry, Time Synchronisation, Data Logging requirements (including Transaction Log, Reconciliation Log, Internal Audit Log and Message Archive), Replacement of tCERs and lCERs,

[6] https://extranet.unfccc.int/registry-systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx
[7] See decision 24/CP.8.

Carry-Over, Expiry Date Change (for tCER and lCER), ITL Notices (and the Notification Log) and the various identifier formats as specified in the DES.

(e) A description of the procedures employed in the National Registry to minimise discrepancies in the issuance, transfer, acquisition, cancellation and retirement of ERUs, CERs, tCERs, lCERs, AAUs and/or RMUs, and replacement of tCERs and lCERs, and of the steps taken to terminate transactions where a discrepancy is notified and to correct problems in the event of a failure to terminate the transactions

In order to minimise discrepancies between the EU Registry and the Transaction Log, the following approach has been adopted for the development of the registry software.

Communication between the EU Registry and the ITL is achieved via web services using XML messages, as specified in the DES. These web services, XML message formats and the processing sequence are as specified in the DES. As far as possible, the Registry validates data entries against the list of checks performed by the ITL – as documented in Annex E of the UN DES Annexes document – before forwarding the request to the ITL for processing. This procedure minimises the submission of incorrect information to the ITL for approval.

All units that are involved in a transaction are earmarked internally within the Registry, thereby preventing the units from being involved in another transaction until a response has been received from the ITL and the current transaction has been completed.

The web service that receives the transaction proposal messages logs and confirms the receipt of these messages if they are technically valid. Next, the content validation and processing is performed sequentially. This separation allows for swift communication with the ITL while still performing extensive business checks. It also significantly improves the transaction handling capacity of the Registry System.
Where a 24-hour clean-up message is received from the ITL regarding a transaction, the web service will roll back the units that were involved in this transaction, thus ensuring that the unit holdings in the Registry reflect the unit holdings as recorded in the ITL.

If an unforeseen failure were to occur, any data discrepancies between the EU Registry and the ITL can be corrected via a manual intervention function within the Registry which is initiated by the Service Desk of the EU. Following this procedure, reconciliation will be performed to confirm that the data are again in sync between the EU Registry and the ITL.

(f) An overview of security measures employed in the National Registry to prevent unauthorised manipulations and to prevent operator errors, and a description of how these measures are kept up to date

The security measures of the EU Registry are described in the EU Registry Security Plan, which can be found in the EU Readiness Security Plan that is part of the readiness documentation, available on the UNFCCC website[8].

(g) A list of the information publicly accessible by means of the user interface to the National Registry

The Registry consists of a public area and a restricted area. While the public area is accessible to everyone and can be used to find publicly available information[9], the restricted area is only accessible to authorised users[8].

[8] https://extranet.unfccc.int/registry-systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx
[8] https://ets-registry.webgate.ec.europa.eu/euregistry/NL/public/reports/publicReports.xhtml

Users wanting to access the restricted area are redirected to the restricted area through the public area. Although the public and restricted areas are technically distinct, referral links between these areas ensure that combined users perceive them as one area. The homepage of our website is linked to the CITL, which contains all information required by the European Regulation on Registries (2216/2004).

All publicly available information as described in 13/CMP.1, Annex II.E, Paragraphs 44–48, is also available via the website of the Dutch Emissions Authority[10].

The user terms and conditions are also available through the website of the Dutch Emissions Authority[11].

(h)	A description of measures taken to safeguard, maintain and recover data in order to ensure the integrity of data storage and the recovery of Registry services in the event of a disaster

The European Emissions Trading Registry is hosted and facilitated by the European Commission. A description of measures taken to safeguard, maintain and recover data can be found in the readiness documentation, available on the UNFCCC website[12].

Physical security

The European Emissions Trading Registry is hosted and facilitated by the European Commission. A description of the physical security can be found in the readiness documentation, available on the UNFCCC website[13].

(i)	The results of any test procedures that might be available or developed with the aim of testing the performance, procedures and security measures of the National Registry undertaken pursuant to the provisions of decision 19/CP.7 relating to the technical standards for data exchange between Registry systems

Testing of the Registry related to the technical standards for data exchange between Registry systems is carried out under the supervision of the European Commission. A description of the test procedure can be found in the readiness documentation (CSEUR - Readiness Questionnaire v1.1.doc), available on the UNFCCC website[14].

[10] https://www.emissionsauthority.nl/topics/public-information-kyoto
[11] https://www.emissionsauthority.nl/documents/publications/2016/10/26/user-terms-and-conditions-pha-ta-ka .
[12] https://extranet.unfccc.int/registry- systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx
[13] https://extranet.unfccc.int/registry-systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx
[14] https://extranet.unfccc.int/registry-systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx

3. QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET

3.1 The EU target under the Convention

In 2010, the European Union (EU) pledged to reduce its GHG emissions with 20% by 2020 compared to the 1990 levels[15] (UNFCCC, 2014a). As this target under the Convention has been submitted by the EU-28 as a group and not by each of its Member States (MS), there are no specified targets for individual Member States under the Convention. Due to that fact, the Netherlands – as part of the EU-28 – is pursuing this quantified economy-wide emission reduction target jointly with all other Member States.

The following assumptions and conditions apply to the EU's 20% target under the UNFCCC:

- Although the EU Convention pledge does not include emissions/removals from land use, land-use change and forestry (LULUCF), this category is estimated to be a net sink over the relevant period. EU inventories do also 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. The target refers to 1990 as a single base year for all gases and all Member States.
- Emissions from international aviation, to the extent that it is included in the EU Emission Trading Scheme (EU ETS), are included in the target[16].
- A limited number of CERs, ERUs and units from new market-based mechanisms may be used to achieve the target. Under EU ETS, the use of international credits is capped (to no more than 50% of the reduction required from EU ETS sectors by 2020). Quality standards also apply to the use of international credits in the EU ETS, including a ban on credits from LULUCF projects and certain industrial gas projects. In the ESD sectors (non-ETS), the annual use of international credits is limited to no more than 3% of each Member State's ESD emissions in 2005. A limited number of Member States are permitted to use an additional 1% from projects in Least Developed Countries (LDCs) or Small Island Developing States (SIDS), subject to conditions.
- The Global Warming Potentials (GWPs) which are used to aggregate GHG emissions up to 2020 under EU legislation were those based on the Second Assessment Report (AR2) of the IPCC when the target was submitted. In its submission to clarify the 2020 target dated 20 March 2012, the EU announced that the implications of the CMP Decision to revise the GWPs in conformity with those from the IPCC Fourth Assessment Report (AR4) were under review. This review has been completed and the revised GWPs from AR4 have been adopted for the EU ETS. In the revision of ESD targets, the revised GWPs were taken into account. For the implementation until 2020, GWPs from AR4 will be used consistently with the UNFCCC reporting guidelines on GHG inventories.
- The target covers the gases CO_2, CH_4, N_2O, HFCs, PFCs and SF_6.

The above information is summarised in Table 3.1.

[15] http://unfccc.int/resource/docs/2014/sbsta/eng/inf06.pdf
http://unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/europeanunioncphaccord_app1.pdf

[16] In the EU, the total emissions covered by the "international aviation" category would go beyond the scope of the EU target, as emissions from international aviation are included in the EU Climate and Energy Package and the EU target under the UNFCCC to the extent to which aviation is part of the EU ETS. As such emissions cannot be separated in the EU inventory nor in the projections for the entire time series, emissions from international aviation have been considered in their entirety throughout the report. Over the period, the total emissions from international aviation were between 1.2 and 2.9% of the total annual GHG emissions in the EU.

Parameter	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, as measured by the full annual inventory, partly including international aviation
Land Use, Land-Use Change and Forestry (LULUCF)	Excluded
Use of international credits (JI and CDM)	Possible to certain extent under the EU ETS and the ESD
Other	Conditional offer to move towards a 30% reduction by 2020 in comparison with 1990 levels as part of a global, comprehensive agreement for the period beyond 2012, provided that other developed countries commit themselves to comparable emission reductions and that developing countries contribute adequately according to their responsibilities and respective capabilities

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 and energy package

In 2009, the EU established internal rules under its "2020 climate and energy package"[17] 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 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. Allowances allocated in the EU ETS from 2013 to 2020 decrease by 1.74% annually, starting from the average level of allowances issued by Member States for the second trading period (2008–2012).

Within the EU, the vast majority of emissions which fall outside the scope of the EU ETS are addressed by the Effort Sharing Decision (ESD; Decision No 406/2009/EC). The ESD covers emissions from all sources outside the EU ETS, except for emissions from domestic and international aviation (which were included in the EU ETS from 1 January 2012), international maritime emissions, and emissions and removals from land use, land-use change and forestry (LULUCF). As a result, it includes a diverse range of small-scale emitters in a wide range of sectors: transportation (cars, vans), buildings (in particular heating), services, small industrial installations, fugitive emissions from the energy sector, emissions of fluorinated gases from appliances and other sources, agriculture and waste. Such sources accounted for 55% of the total GHG emissions in the EU over 2013[18].

[17] http://ec.europa.eu/clima/policies/package/index_en.htm

[18] 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):

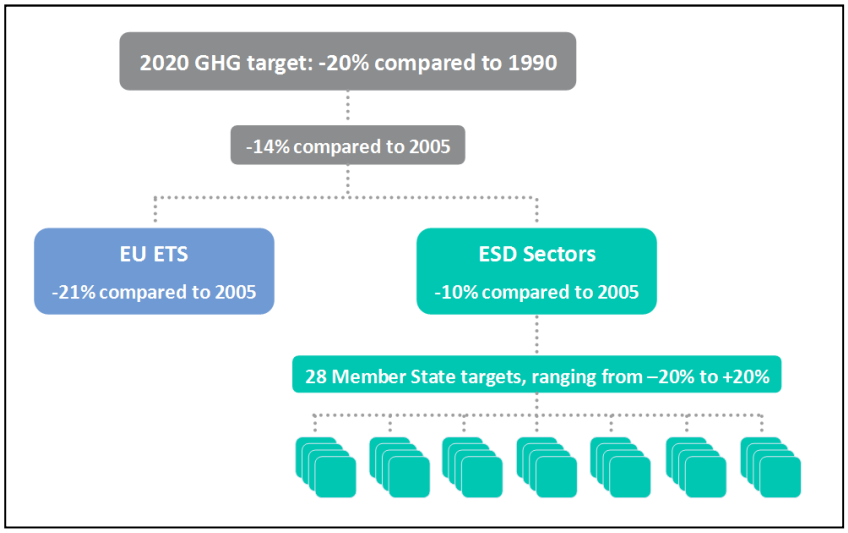


Figure 3.1: GHG targets under the 2020 climate and energy package

While the EU ETS target is to be achieved by the EU as a whole, the ESD target was 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, measured 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), expressed in Annual Emission Allocations (AEAs)[19,20,21]. At the country level, the 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. In addition, different levels of development in the EU-28 are taken into account by the provision of several flexibility options. Up to certain limitations, the ESD allows Member States to make use of flexibility provisions for meeting their annual targets: carry-over of overachievements 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). MSs exceeding their annual AEA, even after taking into account the flexibility provisions and the use of JI/CDM credits, will face a penalty – a deduction from their emission allocation for the following year (excess emissions multiplied by 1.08).

3.2.2. Monitoring on progress to 2020 ESD targets

Monitoring, reporting and verification of the ESD targets mainly takes place through the submission of the national GHG inventories by Member States. Chapter III of Commission Implementing Regulation 749/2014 sets out strict criteria on which the national GHG inventories and GHG emissions of MSs are reviewed annually at the EU level. Based on this review, the European

https://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/10102-2016-251-EN-F1-1-ANNEX-1.PDF.

[19] 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).

[20] 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).

[21] 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).

Commission issues an implementing decision on MS ESD emissions in the given year, which might lead to MSs 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 the use of flexibilities and the application of corrective action, where necessary, at the end of each relevant year. The following progress has been made on the reviews:

- In 2016, a comprehensive review was completed, establishing 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.

3.3 The Dutch reduction target under the ESD

The Netherlands is committed to reducing its emissions in sectors covered by the Effort Sharing Decision (ESD, non-ETS) with 16% compared to 2005 emissions. Dutch quantified annual reduction targets set by EU Decisions[22] and Annual Emission Allocations (AEA) in tonnes CO_2-eq are 122.9 million AEA in 2013, decreasing to 107.4 million in 2020 (according to AR4 GWPs); see Table 3.2 and Figure 3.2. The cumulative amount of AEAs for the period 2013–2020 is set at 921 Mton CO_2-eq.

Year	Annual Emission Allocations (ton CO_2-eq)	Year	Annual Emission Allocations (ton 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 Dutch annual ESD emission allocations using GWPs according to AR4, 2013–2020, in ton CO_2-eq

Compared to the previous Biennial Report, the numbers for the years 2017-2010 in Table 3.2 are slightly higher. The reason for this fact is as follows. 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 exceeds 1% for most Member States. In the light of this examination, all Member States' annual emission allocations for the years 2017 to 2020 as contained in Annex II to Decision 2013/162/EU should be

[22] 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 Commision Decision (EU) 2017/1471 of 10 August 2017 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L:2017:209:TOC.

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 3.3 presents the AEAs as reported for the years 2017–2020 in the Biennial Report with the revised values.

Year	Annual Emission Allocations (ton CO_2 eq.) As reported in BR2	Year	Annual Emission Allocations (ton CO_2 eq.) Revised
2017	113,859,321	2017	114,050,540
2018	111,587,118	2018	111,821,315
2019	109,314,916	2019	109,592,091
2020	107,042,714	2020	107,362,866

Table 3.3 Dutch annual ESD emission allocations, previous AEAs and revised AEAs using GWPs according to AR4, 2017–2020, in ton CO_2 eq.

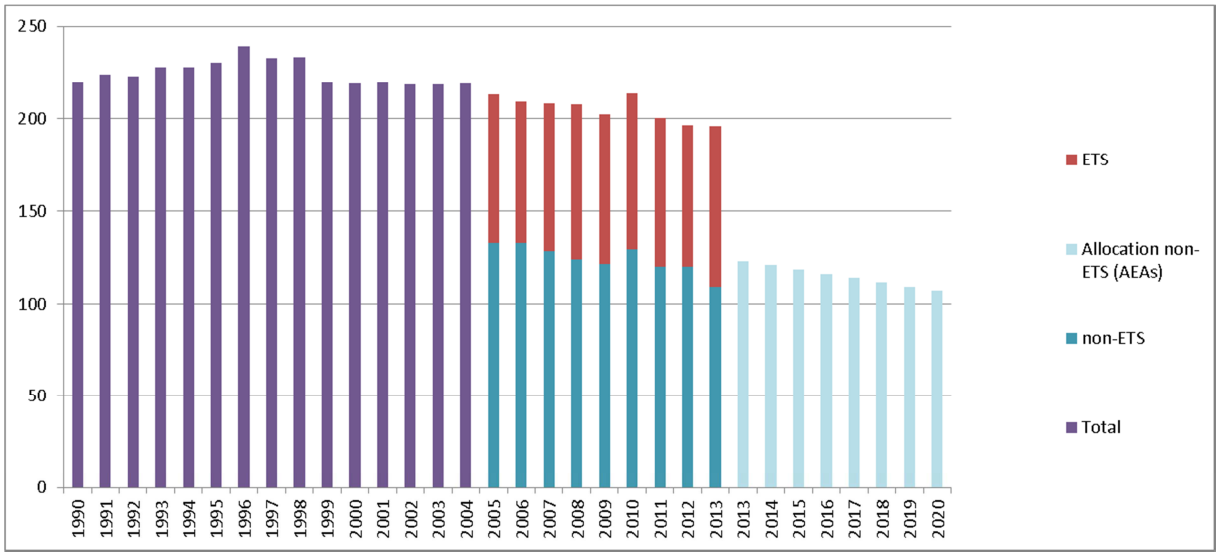


Figure 3.2: Dutch total greenhouse gas emissions, 1990–2013 (including a breakdown of the 2008–2013 figures in emissions under ETS, emissions under ESD (non-ETS) and the ESD target for 2012–2020), in Mton CO_2-eq

In 2011, the Dutch government agreed on a translation of the Dutch non-ETS goal for 2020 into sectoral 2020 goals, along with agreements about which ministry is responsible for achieving each goal[23]. These goals are presented in Table 3.4. The responsible ministries are updated due to the new Cabinet and the changes of ministries by the end of 2017.

Sectoral goals were set using GWPs from AR2. There is no current schedule to recalculate these targets for non-CO_2 greenhouse gases using the GWPs from AR4.

[23] Kabinetsaanpak Klimaatbeleid op weg naar 2020 (Cabinet Approach to Climate Policy on the road to 2020), 2011.

Sector	Sectoral Goal (2020, in Mton) GWPs as in AR2	Responsible Ministry
CO_2 Industry & Energy	*10.7*	Ministry of Economic Affairs and Climate Policy
CO_2 Transportation	*35.5*	Ministry of Infrastructure and Water Management
CO_2 Built environment	*22.5*	Ministry of the Interior and Kingdom Relations
CO_2 Agriculture	*5.75*	Ministry of Agriculture, Nature and Food Quality
Non-CO_2 GHG Agriculture	*16.0*	Ministry of Agriculture, Nature and Food Quality
Non-CO_2 GHG Other sectors	*8.8*	Ministry of Economic Affairs and Climate Policy
Total	**99.25**	

Table 3.4 Sectoral goals for 2020

When these sectoral goals were determined in 2011, the process of Annual Emission Allocations was still ongoing. As reported above, the Dutch emissions reduction target of 16% and the resulting cap on Annual Emission Allocations are key for the Dutch contribution to the EU target for 2020 under the Convention. As the table shows, however, the Netherlands is likely to contribute more to meeting the EU target than required. The Dutch government has decided to cancel any surplus of AEAs for the period up to 2020.

In June 2015, the Dutch government faced a court decision 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 reduce national greenhouse gas emissions by 25% compared to the 1990 levels. Although the government has appealed against this decision, it is obliged to start executing the ruling. An evaluation of the effectiveness of the GHG reduction measures, which is ongoing, will therefore be used to decide on additional steps for GHG reductions.

4. PROGRESS IN ACHIEVEMENT OF QUANTIFIED ECONMY-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 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 have been implemented up to the autumn of 2017. The WAM scenario is similar to the WEM scenario but also includes policies that are formally planned by the government. Unless specified otherwise, the report describes the scenario with additional measures (WAM).
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 ETS and non-ETS sectors.

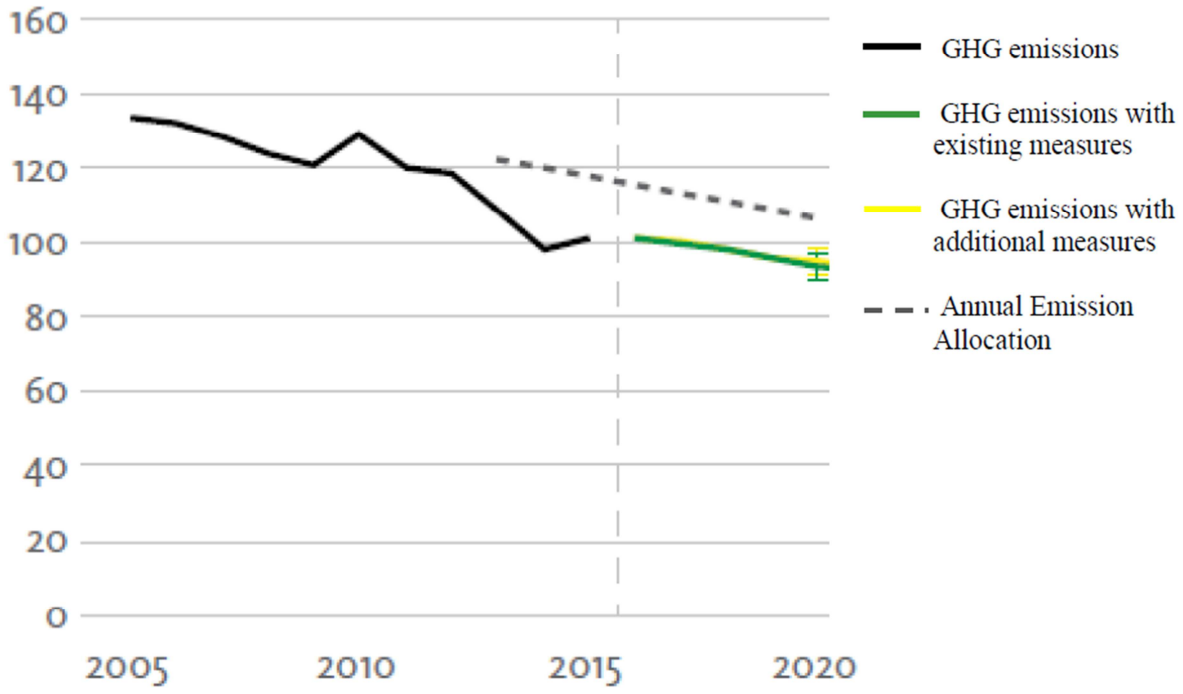


Figure 4.1 Greenhouse gas emissions for the non-ETS sectors, 2005–2016, and AEA allocation, 2013–2020, in Mton

As elaborated in section 3.3, the Dutch quantified annual reduction targets up to 2020 are set by EU Decisions and amounted to 122.9 Mton CO_2 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 2013–2016 were nearly 411 Mton CO_2 eq.[24] (see table 4.1). In 2013 and 2014, emissions fell due to mild winters resulting in less energy use for space heating and emission reductions for transport. In 2015, emissions increased again mainly due to a colder winter.

[24] http://www.emissieregistratie.nl/erpubliek/erpub/international/ets.aspx; 2016 is based on preliminary data

Emissions in 2016 increased again, partly due to another relatively cold winter but also as the result of increased industrial activities, more transport and a larger dairy herd.

Year	Non-ETS Emissions (Mton CO_2 eq.)	Annual Emission Allocations (tons CO_2 eq.)
2013	108.3	122,948,129
2014	97.9	120,675,928
2015	101.1	118,403,725
2016	102.7*	116,131,523

* 2016 preliminary data

Table 4.1 Non-ETS emissions and Assigned Emission Allocations (in ton CO_2-eq)

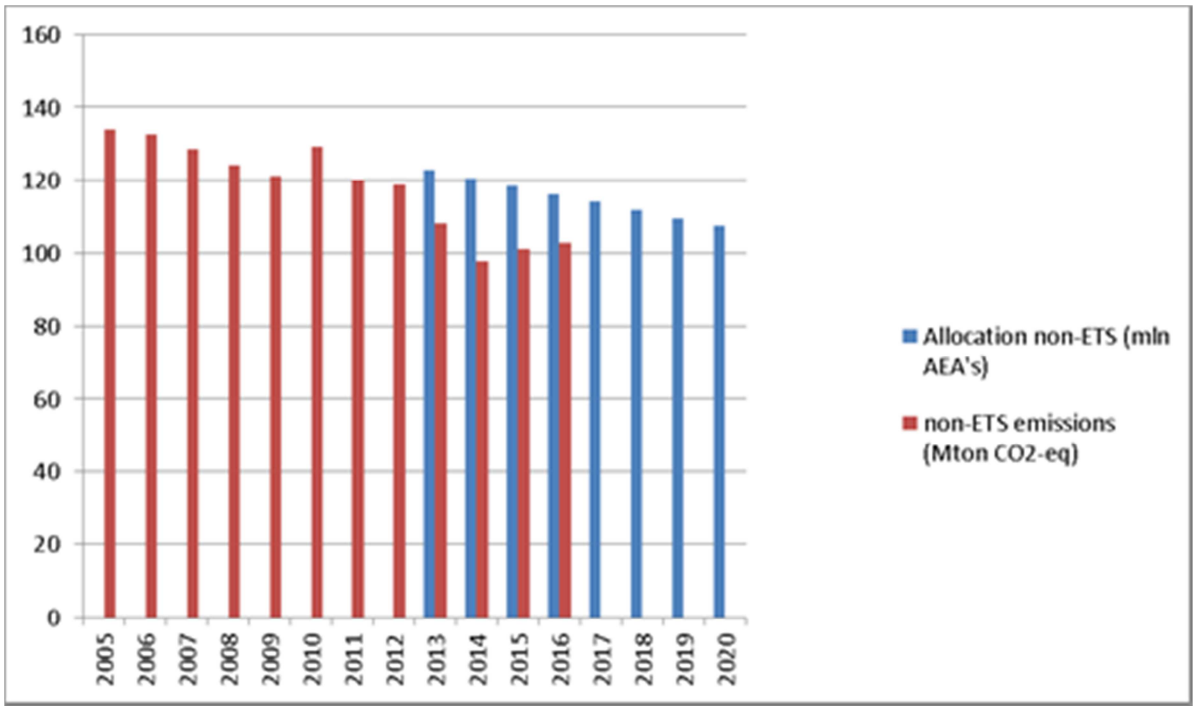


Figure 4.2 Greenhouse gas emissions 2005–2016 for non-ETS sectors and AEA allocation for 2013–2020 (Mton CO_2 eq.). Emissions in 2016 are based on provisional data.

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 fuel in transport and lower non-CO_2 emissions. By 2020, the non-ETS emissions are expected to have dropped to 94 Mton CO_2 eq. (WAM), with an uncertainty range of 90–97 Mton CO_2 eq.[25]. The cumulative non-ETS emissions in the entire budget period (2013–2020) are projected at 798 Mton CO_2 eq., excluding weather influences. As a result, it is expected that the Netherlands will meet its reduction targets up to 2020 (see Figure 4.1).

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 Energy Outlook 2017.

[25] See The National Energy Outlook 2017 (p. 81-107) assuming the implementation of WEM and WAM.

Estimated impacts of the packages of the main policies and measures on GHG emissions reduction 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. Some degree of double counting cannot be avoided, as policies and measures are implemented simultaneously. 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.

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 CO_2 Emissions Trading System, the Reduction Programme for Non-CO_2 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 Production (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 that are implemented in the Netherlands. 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 to be created in the next few years.

The 2013 agreement includes some 160 actions for the participating parties to implement this commitment, including actions by the central government. While some of the actions were new, others imply 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

As prescribed by Directive 2003/87/EC, a trading system for CO_2 emissions started in the EU on 1 January 2005, focusing on CO_2 emissions from large industrial emitters. It is a “cap and trade” system, where participants are assigned a set amount of allowances up front and are required to submit annual allowances that are equal to their actual emissions. 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 are included in the ETS, responsible for around 45% of the total emission of greenhouse gases in the Netherlands[26].

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 still free, 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 up until now. According to analysts, this fact was mainly due to a growing surplus of allowances, largely because of the economic crisis which limited emissions more than anticipated. Increasing renewable energy production 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[27]. In 2014, the "back loading" amendment was implemented, resulting in the postponed auctioning of 900 million allowances. Moreover, a market stability reserve will start operating in 2019. The postponed allowances and any other unallocated allowances will be transferred to the reserve. These measures have so far had limited impact on the CO_2 price, as the total allowances in the third phase remain unchanged.

In 2015, the European Commission proposed further changes to the ETS, including a sharper rate for the reduction of allowances in the period after 2020. This proposal is still under debate in the EU as part of a broader package of climate and energy proposals for the period up to 2030 (not 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 enables organisations to sell certificates that prove emission reductions and allows other parties to offset their emissions by buying these certificates, creating a market value for CO_2 emissions. The pilot started in 2017 and is expected to be operational by 2018. 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 direct consumers towards 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 energy saving (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 Energy 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 2016. 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 a Long-Term Agreement with the government (see Section 4.4.1) are eligible for a tax refund in so far as the overall tax tariff for electricity exceeds the minimum tariff

[26] https://www.emissieautoriteit.nl/documenten/publicatie/2016/09/05/rapport-voortgang-emissiehandel-2016 Voortgang Emissiehandel 2016
[27] https://ec.europa.eu/clima/sites/clima/files/ets/reform/docs/com_2012_652_en.pdf

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 the horticulture sector.

Several changes have been made in recent years to promote the production of renewable energy for cooperatives or associations of private homeowners. Since 2004, private homeowners are allowed to settle the amount of electricity returned to the grid with their consumption (since 2012 up to their annual consumption taken from the grid). This is referred to as net metering, which stimulates the installation of PV-panels on roofs of homeowners. Since 2014, a lower tariff has been introduced for cooperatives and associations of private homeowners that produce their own renewable energy. Since 2015, the electricity produced by lessors 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 by 32% since 2016 while the tariff for electricity (up to the use of 10,000 kWh) has decreased by 16%.

4.2.4 Energy Investment Tax Allowance

The Energy Investment Tax Allowance (EIA) is a tax relief programme. It offers a direct financial advantage to companies in the Netherlands that invest in energy-saving equipment and sustainable energy. Entrepreneurs may deduct 55% 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. As part of the Energy Agreement for Sustainable Growth, this list now focuses more on energy-saving technologies instead of renewable energy options; for the latter options, companies are referred to other policies and measures (such as SDE+). A similar programme (MIA Vamil) exists for other environmental measures.

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 in the areas of energy and climate[28]. This instrument supports civil society parties, companies and local authorities which embark on initiatives related to green growth, but which face obstacles that may require assistance from the national government to tackle. Exploiting opportunities for saving energy and generating local sustainable energy is not only a matter of access to finance. In practice, there are often other obstacles and difficulties to finding innovative solutions in society for scaling up green growth options; e.g. difficulties regarding regulations or permits, appropriate forms, networks for cooperation, and so on. The government helps to lower such obstacles.

The outputs of green deals are not measured in terms of CO_2 reduction of energy saved or produced, 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. This fact explains why no figures on CO_2 reduction are reported. In addition, this procedure avoids double counting of CO_2 reductions through other measures (such as energy taxes and feed-in premiums for renewable energy). Annual progress reports to Parliament give examples of Green Deal achievements[29].

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 knowledge on best practices, and report and address obstacles in legislation, with the aim of realising more

[28] http://www.greendeals.nl/green-deals/overzicht-green-deals/
[29] http://www.greendeals.nl/wp-content/uploads/2015/06/Progress_reoprt_2011_2015_Green_Deals_ENG.pdf

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, actions 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 production. Its progress was evaluated in 2015, with the main conclusion that it is highly valued by participants from local authorities[30]. As a result, the government has decided to continue the agreement through a follow-up (until 2020). One of the main ambitions in this follow-up is to support municipalities in developing robust plans to reach climate neutrality by 2050[31].

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; budget in 2017 is € 1.2 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. In the case of specific instruments, the Top Sector Energy (TSE)[32] has been the main framework since 2012 where governments, knowledge institutes and companies from all sectors cooperate. 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 RVO.nl[33].

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 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.

4.2.8 Energy Transition Financing Facility (ETFF)

Since 2017, the investment fund Energy Transition Financing Facility (ETFF) has been operative. The fund provides attractive loans to other banks that finance innovative energy projects with higher financial risks, such as geothermal, energy storage and biomass. The fund, which starts with a budget of € 100 million, is operated by 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% in these gases compared to the reference year (1990). By 2016, a reduction of about 50% (relative to 1990) had already been achieved on the basis of reductions in the nitric acid industry (through admission into the EU Emissions Trading System, 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) as well as supporting research and communication projects. This support was organised in close cooperation with private companies, research institutes, universities, and provincial and municipal authorities.

[30] https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/rapporten/2015/06/29/evaluatie-lokale-klimaatagenda-2011-2014/evaluatie-lokale-klimaatagenda-2011-2014.pdf
[31] https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/kamerstukken/2015/06/29/lokaal-klimaatbeleid/lokaal-klimaatbeleid.pdf

[32] https://topsectorenergie.nl/
[33] https://www.rvo.nl/monitor-publiek-gefinancierd-energieonderzoek

Since 2009, the focus of ROB has been on targeting the most significant sources: cooling (fluorinated gases), the 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 stopped, as they are not considered to be as effective any more. Other areas of focus for the reduction policy were research, communication, and cooperation and deals with the sectors and stakeholders. The reduction 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 fluorinated gases in the Netherlands.

Where emission reductions in agriculture (the major source of non-CO_2 greenhouse gas emissions in the Netherlands) are concerned, a voluntary agreement between the government and the sector was agreed in 2008 (the "Agrocovenant"). For more information on the Agrocovenant, see 4.6.1.

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

4.2.10 Developments in long-term policy planning

The Energy Agreement is considered as the first major step in achieving international long-term climate objectives laid down in the Paris Agreement of 2015. For this reason, the Ministry of Economic Affairs (now Ministry EZK) published its Energy Report in January 2016 through which the long-term ambition of a low-carbon energy system by 2050 was set[34]. In the Energy Report, three main principles of future policies were identified for energy transition: 1) focus on CO_2 reduction, 2) make the most of the economic opportunities that the energy transition offers and 3) integrate energy in spatial planning policy.

The Energy Report further distinguished four main energy functionalities in order to concentrate the efforts required for the transition: energy for space heating, energy for industrial process heat, energy for transport, and energy for power and light. An extensive public consultation was performed in the spring of 2016 to raise awareness, collect views on the future energy system and contribute to the design of the future policy agenda.

The Energy Agenda was adopted in early 2017[35] and draws several preliminary conclusions on future climate and energy policies. First, the reduction of greenhouse gas emissions is seen as the primary goal in order to attain the climate ambition of the Paris Agreement in the most cost-effective way. The best and most cost-effective mix of energy conservation, renewable energy and other low-carbon options will arise on the market by targeting CO_2 reduction. For this purpose, the EU ETS is considered as an appropriate tool, although the Netherlands supports an ambitious strengthening of the ETS. Second, the Netherlands is in favour of a gradual and timely transition both in ETS sectors such as energy and the industry and in non-ETS sectors such as housing, agriculture and transport in order to control national costs. More specific conclusions are also drawn for the four energy functionalities.

It is up to the new government, following the elections in the spring of 2017, to design and implement new policies in order to continue the transition towards a low-carbon economy. The new government is also ambitious with regard to climate and energy. It aims to reduce greenhouse gases with 49 per cent by 2030, which is more ambitious than the 40 per cent agreed with the EU[36]. In order to realise that ambition, a new Climate and Energy Agreement will be concluded, as a follow-up of the 2013 Energy Agreement that will end in 2020 (2023 for renewable energy). One of the measures the new government has announced is to close all coal fired power plants by 2030. In line with this measure,

[34] https://www.government.nl/binaries/government/documents/reports/2017/03/01/energy-agenda-towards-a-low-carbon-energy-supply/Energy+agenda.pdf
[35] https://www.government.nl/binaries/government/documents/reports/2017/03/01/energy-agenda-towards-a-low-carbon-energy-supply/Energy+agenda.pdf
[36] https://www.kabinetsformatie2017.nl/documenten/verslagen/2017/10/10/coalition-agreement-confidence-in-the-future

the Netherlands is member of the coalition to phase out coal which was launched at the COP23. The ambitions of the new government and new policies that will follow are not part of the policies and measures included in the projections described within this report.

4.3 Energy

For the energy sector, the Energy Agreement is a major overarching framework for energy saving and renewable energy targets in the Netherlands. Several national policies and instruments within that framework are especially important for the energy sector, such as SDE+ subsidies. 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 already 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+ (Encouraging 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 based on a selection of projects that are proposed by the private sector along the lines 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 production for a period of up to 10 or 15 years. Annual budgets for the tenders are set by the government. The budgets have been increasing substantially in recent years. In 2011, the annual budget was set at € 2 billion. This figure increased to € 3.5 billion in 2014. In 2016, this amount was increased again to € 8 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.

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 production 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 which affect the cost price (such as installation, construction materials, and so on). The yield of fossil energy is established in the correction sum. This method makes the level of the SDE contribution dependent on energy price developments. When the energy price is high, producers receive less SDE+ and more from the energy consumer. If the energy price is lower, they get more SDE+ and less from the energy consumer. This 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 reached. The final payments are calculated per year according to 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 Netherlands Enterprise Agency (RVO.nl).

The impending decrease in combined heat and power (CHP) will not help energy efficiency. However, apart from the generic measures mentioned here, the government has chosen not to interfere in the market economy process for mature technologies such as CHP. Support for CHP under the SDE/SDE+ scheme ceased in 2010.

SDE+ Offshore Wind Energy
Increasing the production of offshore wind energy is pivotal to attaining renewable energy target in the Energy Agreement. In order to encourage the production of offshore wind energy, new regulations were issued in 2015. The Regulation on Offshore Wind Energy 2015 and the Implementation Regulation on the Offshore Wind Energy Act were published on 3 July 2015. Both regulations have applied since 1 December 2015. 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.

In addition, the Wind Energy Roadmap was adopted as part of the Energy Agreement. This roadmap outlines how the generation capacity of offshore wind energy 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" (Dutch Coast; 700 MW). The remaining two zones, both 700 MW, will be opened to tender in 2018 and 2019.

4.3.2 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 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, in these projects, the Minister of Economic Affairs is responsible for spatial planning and for coordinating the attribution of environmental and other permits. Early in 2013, new agreements were concluded between provincial governments and national government in order to increase the onshore wind capacity to 6,000 MW in 2020. The Energy Agreement of 2013 has 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 and are now focused on integrating these elements into specific regional plans and permit processes. In this process, the provinces aim to maximise the support for these plans within society. Larger projects are coordinated with the national government, small installations with the municipalities. After 2010, the amount of wind power capacity installed has increased rapidly. At the end of 2016, more than 4,200 MW was installed[37] and some 700 MW was under construction.

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

4.3.3 Investment Subsidy Renewable Energy (ISDE)

While SDE+ focuses on supporting large-scale projects in renewable energy, 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. It is expected that this scheme leads to investments in around 24,000 installations[38]. In 2017, the budget was set at € 90 million. The number of applications in the first half of 2017 increased, especially for heat pumps and solar collectors[39].

4.3.4 Subsidy scheme for energy savings and renewable energy in sports facilities

In the Netherlands, there are many sports facilities such as swimming pools and enclosed accommodations that consume a great deal of energy. In order to stimulate the reduction of energy consumption and the production of renewable energy, the Netherlands introduced a subsidy scheme in 2016. The subsidy can be 15–30% of the investment in certain categories of measures, such as LED lighting, heat pumps, insulation and renewable energy production with solar panels, collectors or biomass boilers. The maximum subsidy per applicant is € 125,000 per year. The annual budget is € 6 million over the period 2016–2020[40.]

4.3.5 Financial insurance for geothermal energy

Projects in geothermal energy 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 offers a financial insurance which compensates the costs of drilling when results are disappointing[41.]

4.3.6 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 within the Netherlands. The smart meter is being rolled out in two stages. A small-scale roll-out was used for pilot purposes starting 2012. During this small-scale rollout, some 600,000 smart meters for electricity and gas were installed during regular meter replacements (e.g. depreciation), in newly built houses, with large-scale renovations and by customer request. This phase and its effects were monitored; based on these experiences, it was decided to continue with a larger-scale roll-out from 2015 onwards. The aim is to have smart meters fitted in at least 80% of households and small businesses by 2020, as mandated by the third Energy Package of the EU.

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

Gas engines are widely used for the combined production of heat and electricity (CHP) in the horticulture sector within the Netherlands and in the service sector to a lesser extent. Part of the natural gas in these engines remains unburnt and is emitted as methane. This process is called “methane slip”. Through the Emission Standards for Medium-Sized Combustion Plants Decree (BEMS), the government has set maximum emission levels for methane (hydrocarbons) and other air pollutants, which were evaluated in 2013. This regulation, 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). These laws regulate 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

[38] NEV (2017), p. 150.
[39] https://www.rvo.nl/subsidies-regelingen/investeringssubsidie-duurzame-energie-isde
[40] https://zoek.officielebekendmakingen.nl/stcrt-2015-25937.html
[41] https://www.rvo.nl/subsidies-regelingen/risicos-dekken-voor-aardwarmte-2017

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.

4.4 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 CO_2 emissions (see 4.2 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, included in parallel with the corporate tax system (see above).

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

In order to improve the energy efficiency of companies, the first series of Long-Term Agreements (LTA) started in 1992. 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 the 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 broadened to include sustainable energy and chain efficiency, among other things. In 2008, LTA2 was continued into 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 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 a report "Covenants result brochure Long-Term Agreements on energy efficiency"[42]

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

- Participating companies are required to produce 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 RVO.nl, i.e. based on the progress in fulfilling their agreed commitments. If the declarations are not issued for a specific company, this situation has repercussions for the energy tax relief and ETS compensation.
- Large energy-intensive companies – the ones that are covered by the ETS – join the government in striving to supplement the Long-Term Voluntary Agreement on Energy Efficiency Covenant) with a framework of company-specific (i.e. one-to-one) agreements. These agreements focus on improving the energy efficiency and competitiveness of the companies concerned.
- There is an EPA (Energy Performance Assessment) pilot project (including an evaluation) for other companies. An independent centre of expertise is set up to assist businesses and funding bodies in identifying the most effective measures for energy efficiency in the industry (and agriculture). At the time of writing this report, the pilots are running within the framework of a specific Green Deal.

[42] https://www.rvo.nl/sites/default/files/2015/11/Resultatenbrochure%20Meerjarenafspraken%20energie-effici%C3%ABntie%202014%20English_0.pdf

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

Long-Term Agreements are enforced using environmental permits: companies not participating are required (in their permits) to implement all energy-saving measures with a payback period of less than five years. Participants of LTA3 or LEE are exempted 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. They have to submit annual monitoring reports on projects that have actually been implemented in addition to their results. In 2016, new four-year plans were submitted by the companies, which are scrutinised by RVO.nl.

4.4.2 Policy for non-CO_2 greenhouse gases in the industry

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) reductions in PFC emissions; 4) voluntary agreements with both the oil and gas and the aluminium industries to improve their energy efficiency, resulting in reductions of 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, as well as cutting down on odours associated with landfill sites.

From 2008, significant N_2O reductions were achieved in nitric acid production. Whereas emissions in 2007 were 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 are 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 the nitrous oxide emissions (N_2O) 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 and given 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 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.

4.5 Transport

Mobility and Transport is one of the areas within the Energy 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 production of cleaner vehicles, pilots for zero-emission distribution into cities and stimulating action plans for large companies in order to achieve a 20% reduction of CO_2 emissions in the area of mobility.

4.5.1 Transition to a sustainable fuel mix

In the 2013 Energy Agreement, an ambitious goal was agreed to limit the CO_2 emissions to 25 Mton CO_2 by 2030 and 12.2 Mton by 2050. For such an ambition, a new government vision on fuels for transport was adopted in 2014[43]. This vision encompasses a wide variety of CO_2-low fuel combinations for transport, including electricity, hydrogen, advanced biofuels and LNG. In 2015, actions were proposed in order to meet these ambitions[44]. One of the adopted measures is 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 is that by 2025, 50% of the new cars sold are electric. 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 been increasing sharply in recent years[45].

4.5.2 Biofuels

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 fulfilled with biofuels. In 2016, the share of this energy source was 7%[46]. More than 66% of the energy content is from advanced biofuels. Dutch policy is aimed at maximising the share of advanced biofuels that are not produced from food/feed crops. Because blending biofuels is obligatory, there are no additional tax incentives or subsidy programmes.

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[47]. In addition, several subsidy programmes aimed at filling stations for alternative fuels were implemented in the period 2008–2013[48]. 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 Dutch Eco-Driving programme was initiated in 1999 by the former Dutch Ministry of Transport and Water. 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 four-year funding to the Institute for Sustainable Mobility (IVDM). During this period, the IVDM acquired and supported 19 projects and initiatives which were aimed at reducing fuel use by promoting eco-driving (*HNR 2.0*). In 2013, as part of the 2013 Energy Agreement, parties agreed to continue the eco-driving programme after 2014 without

[43] http://www.energieakkoordser.nl/~/media/files/energieakkoord/nieuwsberichten/2014/brandstofvisie/duurzame-brandstofvisie-met-lef-2e-druk.ashx
[44] http://www.energieakkoordser.nl/~/media/files/energieakkoord/nieuwsberichten/2015/20150710-ministerraad-duurzame-brandstofvisie/actie-agenda-duurzame-brandstoffen.ashx
[45] https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/energie-en-milieu-innovaties/elektrisch-rijden/stand-van-zaken/cijfers
[46] https://www.emissieautoriteit.nl/onderwerpen/rapportages-en-cijfers-ev/documenten/publicatie/2017/06/30/totaalrapportage-2016
[47] https://zoek.officielebekendmakingen.nl/stcrt-2006-247-p24-SC78346.pdf

[48] Subsidy programme “Filling Stations Alternative Fuels” and the experimental programme for sustainable transport.

government funding. As from 2015, the programme is 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 shows car owners information on applying eco-driving specified 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 are examined that allow companies from the transport sector to save fuel, thereby reducing CO_2 emissions. Through the programme, for which the government provided subsidies in the period 2010–2014, insight is gained into fuel-saving measures and the extent to which these measures are 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.

4.5.4 EU CO_2 emission 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 Community'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 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% from 2015 onwards. A target of 95 g/km is specified for the year 2021.

The Netherlands had already achieved the 130 gram level by 2011, with the Dutch car tax system contributing to this achievement. Due to fiscal policy, the sales of fuel-efficient, electric and especially PHEV cars have risen sharply over the past years. Fiscal policy includes a purchase tax (BPM) that must be paid when a car, motorcycle or light-goods 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, the 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% from 2017 onwards. A target of 147 g/km is specified for the year 2021.

In November 2017, the Commission published a proposal for new fuel efficiency targets for the time after 2021. The outcome of the negotiations with the Council and Parliament is not known yet.

4.6 Agriculture

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

4.6.1 Agro covenant

In 2008, the sectors in agriculture and horticulture 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 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 gases of 4.0 to 6.0 Mton CO_2 equivalents in 2020 as compared to 1990;
- an average annual energy efficiency improvement (energy saving) of 2% over the period 2011–2020;
- a production of 200 PJ in biomass and 12 PJ in 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 emission reductions of greenhouse gases 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 issued with "industrial" policy measures from the Ministry of Economic Affairs 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, specific innovation programme ("The greenhouse as an energy source"[49]) and a sectoral emission trading system[50] in which the total allocation declines 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[51]. 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 € 6 million in 2017 and Market introduction energy innovations ("MEI") with a budget of € 5 million in 2017.
- 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+.

Reduction measures for methane (CH_4) and nitrous oxide (N_2O)
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[52];

[49] https://www.kasalsenergiebron.nl/en/
[50] 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)
[51] https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/kamerstukken/2017/07/06/kamerbrief-over-evaluatie-co2-sturing-in-de-glastuinbouw/kamerbrief-over-evaluatie-co2-sturing-in-de-glastuinbouw.pdf
[52] https://www.rijksoverheid.nl/actueel/nieuws/2017/02/13/staatssecretaris-van-dam-kondigt-nationale-proeftuin-precisielandbouw-aan

- 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 was formed for each agricultural sector, in which both the government and sector associations participate, describing the specific way in which a sector will contribute to the realisation of the policy target. RVO.nl performs the monitoring of the Agrocovenant. The latest monitoring report was published in 2014[53]. This report showed that the agricultural sectors play an important role in the production 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 Flower bulbs[54], Mushrooms[55] and the Dairy sector[56]. The progress in the horticulture sector was evaluated in 2017[57].
The covenant was evaluated in 2015, including a re-assessment of its objectives. A new document is expected to be published in the beginning of 2018. Partners are currently also making plans for the period up to 2030 and 2050.

4.6.2 Legislation on manure management and the EU milk quota

The EU milk quota, which ended in 2015, limited the number of dairy herds held in the Member States including the Netherlands. After its abolishment, the number of cattle increased. 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[58]. The number of allowances is set at 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 CO_2 within the scope of LULUCF occur in forests, grass- and cropland, the conversion of grassland into cropland (or vice versa), the loss of grass- or cropland due to new infrastructure and building, and 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, no direct policies for implementing measures explicitly dedicated to reducing GHG emissions from LULUCF exist in the Netherlands. However, other policies with different objectives result also in restricting carbon emissions or improve removals from LULUCF.

Forest and Nature policy
Over the past decades, forest policy in the Netherlands has been integrated into the 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

[53] https://www.rvo.nl/sites/default/files/2014/05/energie-en-klimaat-in-de-agrosectoren.pdf
[54] https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/groene-economie/schone-en-zuinige-agrosectoren/sectoren/bloembollen-en-bolbloementeelt
[55] https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/groene-economie/schone-en-zuinige-agrosectoren/de-sectoren/agrosectoren-paddenstoelen
[56] https://www.duurzamezuivelketen.nl/files/DZK%20jaarverslag%202015.pdf
[57] https://www.kasalsenergiebron.nl/content/user_upload/Tussentijdse_evaluatie_meerjarenafspraak_energietransitie_glastuinbouw_2014-2020.pdf

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

cohesive network of high-quality nature wetland and terrestrial reserves, including Natura 2000 sites that are foreseen to get a total size of 668,000 ha in 2027. 620,000 ha of this network were completed by 2017[59]. 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 subsidy forests must be open to the public. The aim is to have converted an additional 40,000 ha 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. The scale of such afforestation is, however, not known yet. Provinces are having the lead in making policy for this. Initiatives from the private sector, such as the Action plan for Forest and Wood sector[60], where an additional 100,000 ha of new forests and improved forest management is targeted, will have additional influence.

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. Additional the Rural Development Plan includes a measure for meadow bird management to raise the groundwater level in peat pasture areas (during part of the year). Implementation of such higher groundwater level will reduce degradation of soil organic matter in the peat soils.

Some European policies also have impact on cropland and grazing land management in the Netherlands and have – indirectly- impact 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 impact on the carbon content of soils. For example, dairy companies are required to have grassland that amounts at least 80% of their area and croplands are required to use catch crops.

Relevant European regulation, such as the LULUCF regulation (EU 479/2016) and the revision of the Renewable Energy Directive are under negotiation. Implementation of these regulations will most probably incentivize further policy action in the Netherlands to optimise the capacity for carbon sequestration in the land use sector and will influence the use of biomass both from agricultural as from forest sources as well.

4.8 Waste (CH_4)

According to the Environmental Management Act, the former Ministry of Infrastructure and the Environment (I&M) was tasked with issuing a Waste Management Plan once every six years. 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 is in force up to December 2017. The third plan, for the period 2017–2029, is currently being prepared.

The policy of the current – second – 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 for the period until 2025 is a decrease by 50% of the amount of waste sent to incineration plants or landfills. In order to achieve this target, the focus has been on the separation of household and commercial waste for collection, 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.

[59] http://www.ipo.nl/publicaties/provincies-op-koers-met-realisatie-natuurnetwerk-nederland
[60] https://www.staatsbosbeheer.nl/Over-Staatsbosbeheer/Nieuws/2016/10/plan-bos-en-houtsector-levert-bijdrage-aan-klimaatdoelen

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 fact is one of the reasons why waste policy focuses on maximising waste recycling and limiting waste disposal. In 2014, around 2% of waste produced in the Netherlands was sent to landfill. This waste could not be recycled or incinerated.

The draft third plan builds on the second plan, but now also focuses on the contribution to a circular economy. Waste will be considered more as a reusable material for new products. This policy will also contribute to lower energy consumption and reduced greenhouse gases.

4.9 Building sector (households and services)

The building stock is an important sector where significant CO_2 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.

For the building sector, the 2013 Energy Agreement is the main policy framework up to 2020. In the Energy Agreement, parties set the ambition for the sector to reduce energy consumption by some 110 PJ between 2008 and 2020 (and CO_2 by some 22.5 Mton CO_2 eq. in 2020). This reduction should mainly be realised by renovating 300,000 existing residential buildings annually up to 2020. The renovation is such that energy performance is increased by two steps on the energy label. In addition, the energy performance of new buildings is improving such that from 2020, new buildings are nearly energy neutral. The sections below describe the policies and measures for this policy horizon in more detail.

In recent years, government and stakeholders are developing new policies for the period after 2020. As already arranged in the Energy Agreement, the entire building sector should be energy neutral by 2050. This ambition is also reflected in the Energy Report 2016 (see above), in which the government set its vision on a low-carbon energy system. In the Energy Agenda (2016), it was decided that this ambition should be realised by a steep reduction of both energy and natural gas consumption in buildings and by an increase in renewable power and heat production[61]. The supporting policy instruments are being developed and are expected to be set by the new government.

4.9.1 New buildings

The European Energy Performance of Buildings Directive (EPBD) requires that new buildings are almost energy neutral by 2020 (2018 for buildings from the central government). This requirement is 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. The next steps are the requirements for nearly energy-neutral government

[61] https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/rapporten/2016/12/07/ea/Energieagenda-2016.pdf

buildings by the end of 2018 and for other buildings in the utility/services sector by the end of 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 were 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. It was again agreed that the energy efficiency of some 300,000 dwellings should be improved every year until 2020 by two steps on the energy label.

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 application of measures for energy saving. This system is implemented with the Energy Performance of Buildings Decree[62];
- 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 for investments in energy-saving measures. The NEF is flanked with a support programme by the joint municipalities 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 and € 27 million by September 2016[63];
- 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 the dwellings with a smart meter by 2020 (see Section 4.3.6);
- subsidies for homeowners 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 is € 61 million[64];
- the ISDE subsidy scheme, which can be used by homeowners to invest in renewable heat installations (see Section 4.3.3 above);
- a 2016 information campaign to provide homeowners with insight 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[65] 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 the following instruments:

- a subsidy scheme (STEP) for improving energy efficiency in social housing. Owners of social housing 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. The amount of subsidy depends on the level of improvement. The budget is € 395 million for the period 2014–2018;

[62] http://wetten.overheid.nl/jci1.3:c:BWBR0023734&z=2016-07-01&g=2016-07-01
[63] https://www.vvebelang.nl/media/kamerbrief-over-energiebesparing-gebouwde-omgeving.pdf

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

- a fund for improving the energy efficiency of rental housing (FEH). Owners of social housing as well as tenants of rental housing may apply for an attractive loan when the energy performance is improved to nearly energy neutral[66]. The budget is € 75 million for the period 2014–2019;
- a programme to realise as a first step 11,000 "zero-energy" dwellings by 2016 (scaling up to 100,000 in 2020) alongside a support programme with parties at the local level;
- 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 dwellings by 2021 (WAM scenario only).

Measures that influence 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 Energy Agreement includes a stricter control of energy requirements under the Environmental Protection Act with the help of a list with 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.
- 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 (WAM scenario only).
- 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 with 10 PJ by 2020[67]. This reduction will be realised by improving the information on energy consumption by 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 (included in the WAM scenario only).

4.9.3 Ecodesign

The Ecodesign Directive (2009/125/EC) and its earlier 2005 version provide 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, process chillers, household appliances, televisions, lamps and network standby. Implementing regulations establish minimum mandatory requirements for energy efficiency and, if relevant, for other environmental aspects such as noise, NOx emissions or durability. Implementing regulations are revised regularly.

The Energy Labelling Directive has recently been revised 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. Further revisions are envisioned when the market has transformed in such way that a large number of the products are in

[66] https://www.rvo.nl/subsidies-regelingen/fonds-energiebesparing-huursector-feh
[67] https://www.rijksoverheid.nl/documenten/convenanten/2017/05/23/convenant-energiebesparing-gebouwde-omgeving

the A class. The new Framework Regulation will also introduce a mandatory product database 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, and lamps. 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 impact on greenhouse gases is determined by comparing the With Additional Measures variant of the NEV2017 projections (see Chapter 5 for more details) 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, can be taken into account. For the establishment of this reference, the policy variant "Without the Energy Agreement" in the NEV2017 has been used.

In order to determine the impact of European regulations and other national policies and measures adopted before 2013, the projections from 2012 were used as a reference[68]. For these European and national policies and measures, the impact of changes after 2012 was determined by comparing the policy variant "With Existing Measures" from the 2012 projections to the policy variant "Without the Energy Agreement" in the NEV2017.

The calculation of CO_2 emission reductions of the renewable energy production incentive scheme (SDE+), the most important renewable energy policy in the Netherlands, is based on the (expected) production of renewable energy after 2013 from projects that were granted with a subsidy .

Some measures are mentioned more than once in table 4.1, such as the EIA, LEE / LTA. This is due to the fact that the Energy Agreement from 2013 contains changes in policies and measures of 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 singled out 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.

[68] http://www.pbl.nl/sites/default/files/cms/publicaties/PBL_2012_Referentieraming-energie-en-emissies-2012_500278001.pdf

Name of mitigation action	**Estimate of mitigation impact in 2020 (not cumulative, in Mton CO_2 eq.)**			**Estimate of cumulative mitigation impact (period 2013-2020, in Mton CO_2 eq.)**
	Total	*ETS*	*non-ETS*	*Total*
Non Energy Agreement policies				
Group of PAM's industry: VAMIL/MIA/EIA, Ecodesign, ETS, MEE, Long Term Agreements (MJA3/MEE)	1.2	0.7	0.4	4.1
Group of PAM's transport: Fiscal policy on car efficiency (BPM), green deals, fuel tax	3.1	0.0	3.1	10.8
Group PAM's built environment: VAMIL/MIA/EIA, ETS, EPC	4.9	1.7	3.2	17.0
Groups PAM's agriculture: Agrocovenant, with various sectors in horticulture and agricultures, 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 CO2 emission standards for cars and light duty vehicles	0.9	0.0	0.9	2.7
Actions under the Energy Agreement 2013				
Additional actions for private dwellings	0.9	0.3	0.6	2.3
Investment subsidies small renewable energy systems (ISDE)	0.0	-0.1	0.1	0.1
Additional 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
Maintaining the Environmental Protection Act in industry and the built environment	0.6	0.4	0.2	1.2
Eco Driving Campaign, carpooling, tire 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 (period 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
Decision Biofuels as renewable energy for transport	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 Program 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
Legislation on landfill and waste	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 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

As Dutch support for climate action is part of development cooperation, both our bilateral and our multilateral climate finance are characterised by 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 WASH 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. 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 a year-on-year increase in its climate finance after having delivered on its commitment of Fast-Start Finance during 2010–2012. Public climate finance amounted to € 420 million in 2015 and € 472 million in 2016. In addition, public finance from the Netherlands in 2015 mobilised € 73 million of private finance for climate-relevant activities in developing countries. In 2016, mobilised private finance amounted to € 171 million. 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 populations.

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)[69]. Credits were also acquired through national banks (i.e. the Rabobank) and through a tender carried out by RVO.nl. 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 $ 7.2 million[70]. 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 Carbon Funds (PCF).

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). 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[71]. These certification systems are controlled 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 use in the transport sector by 2020. In 2016, this share of renewable energy was 7%[72]. More than 66% of the energy content is from advanced biofuels. The raw materials for advanced biofuels are waste and residual materials such as used frying fat. Most of the frying fat is imported from other western European countries, Asia (China and Taiwan) and North America. The raw materials of non-advanced biofuels are mainly maize and wheat originating from Europe. The share of renewable electricity, which also contributes to the 10% target, is still small (0.1% in 2016).

[69] https://www.rijksoverheid.nl/documenten/rapporten/2014/06/17/beleidsevaluatie-clean-development-mechanism-cdm
[70] https://www.thepmr.org/pmrimplements/1
[71] http://ec.europa.eu/energy/en/topics/renewable-energy/biofuels/voluntary-schemes
[72] https://www.emissieautoriteit.nl/onderwerpen/rapportages-en-cijfers-ev/documenten/publicatie/2017/06/30/totaalrapportage-2016

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

The sustainability requirements for co-firing and large-scale heat production were changed in the SDE+ subsidy programme (see Section 4.3.1) as from 1 January 2015 to ensure a high level of sustainability[73].
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 is 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.

4.12 Policies and measures no longer in place

The following policies have been repealed or have expired since the Second Biennial Report and the Sixth Netherlands National Communication:

- The MEP and earlier SDE schemes have been replaced by the more cost-effective SDE+ scheme. There are still payments taking place for projects with an MEP or earlier SDE grant, as subsidies in the SDE typically run for 12 to 15 years. Support for CHP under the SDE/SDE+ scheme was repealed in 2010, as the government prefers generic measures over the financial or fiscal favouring of specific – mature – technologies such as CHP.
- The Benchmarking Covenant has been replaced by a new Long-Term Agreement on energy efficiency for ETS companies (LEE Covenant, see Section 4.4.1).

All these changes have been further explained in the previous 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 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.

Since 2014, an annual National Energy Outlook (*NEV*) has been published. The NEV describes the development observed from 2000 up to the present, as well as expected developments up to 2030 (since 2016, up to 2035; see Chapter 5). 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 NEV aims to provide a fact base for the societal debate on energy in the Netherlands and is prepared by a consortium consisting of the Energy Research Centre of the Netherlands (ECN), the Netherlands Environmental Assessment Agency (PBL), Netherlands Statistics (CBS) and Netherlands Enterprise Agency (RVO.nl). The former two agencies are responsible for projections, evaluative analyses and final editing, while the latter two 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 NEV, which is why this report – along with the organisation procedures and methods underlying the NEV 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).

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

In order to monitor the progress of the SER "Agreement on Energy for Sustainable Growth" (see Section 4.2.1), it was agreed to appoint a "Standing Committee" comprising representatives of the parties. Progress reports are made annually and are available for the years 2014, 2015 and 2016. The projections from the annual National Energy Outlooks are used in these progress reports to track the progress on the main targets. Action is undertaken by parties when progress is falling behind expectations. Based on the progress up to 2015 and 2016, new actions have been added to the Energy Agreement in order to attain the energy savings and renewable energy targets for 2020[74].

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 publication is "Providing direction – Creating space 2016"[75].

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 (see also section 3.2.2).

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 and so it 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 is incorporated in 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[76].

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;

[74] http://www.energieakkoordser.nl/~/media/files/energieakkoord/publiciteit/voortgangsrapportage-2015.ashx, page 60 and https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/ip2020
[75] http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2016-balans-van-de-leefomgeving-2016-1838.pdf
[76] https://www.government.nl/topics/environment/contents/roles-and-responsibilities-of-central-government/environmental-management-act

- environmental quality criteria for emissions and discharges of harmful substances, such as greenhouse gases and heavy metals, to air, water and soil;
- environmental impact assessment, 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 I&W 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;
- The Human Environment and Transport Inspectorate 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 violator, 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.[77]

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 (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).

[77] http://rwsenvironment.eu/subjects/all-one-permit/

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 activities

No units from market-based mechanisms and land use, land-use change and forest activities (LULUCF) are used for meeting the target. The Cabinet informed the 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[78]. It was further decided that the unused credits would be cancelled[79].

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

[78] *Kabinetsaanpak Klimaatbeleid op weg naar 2020 (Cabinet Approach to Climate Policy on the road to 2020)*, Letter to Parliament of 8 June 2011.
[79] https://www.tweedekamer.nl/kamerstukken/brieven_regering/detail?id=2015Z10636&did=2015D21691

5. PROJECTIONS

5.1 Introduction

The previous Biennial Report[80] described the projections made in 2015, as published in the National Energy Outlook of October 2015 (Schoots and Hammingh, 2015)[81]. The projections in this Third Biennial Report are based on the report "National Energy Outlook 2017" (Schoots and Hammingh, 2017)[82].

Section 5.3 presents the main results for greenhouse gases for the years 2020 and 2030. Emission projections for air pollutants are described in Section 5.3, while Section 5.4 is dedicated to the aggregate results and the uncertainty and sensitivity analyses. The methodologies and assumptions underlying the projections are described in more detail within Section 5.5.

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 Energy Outlook 2017 (NEV 2017), which describes the most plausible developments based on the available information about prices, markets, technology and policies. Compared with the National Energy Outlook 2015, which was used in the previous Biennial Report, the NEV 2017 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 2017, using official national statistics mostly from Statistics Netherlands (CBS)[83] and the Pollutant Release and Transfer Register of RIVM[84] where available. This approach means that the base year for most modelling parameters is 2015 or where possible 2016. Data on greenhouse gas emissions are in line with 2006 IPCC guidelines. Assumptions on policies are also taken into account up to May 2017. New insights after May 2017, such as recent policy developments and statistics, have been updated where relevant up to August 2017 but have not been incorporated in the modelling. Statistics of greenhouse gas emissions for the year 2016 are still provisional. The National Energy Outlook now also projects the emission levels of greenhouse gases up to 2035 (instead of 2030). Emission levels of air pollutants were an integral part of the National Energy Outlook 2015. In the NEV 2017, however, air pollutants were not included. An update to the emission levels of air pollutants in the NEV 2015 scenarios has been published in a separate report by the Netherlands Environmental Assessment Agency (PBL)[85]. Where relevant, the results of this update are included in the present BR3.
In the NEV, an uncertainty analysis is included that takes into account uncertainties concerning economic development as well as energy and CO_2 prices and policies. Uncertainties with regard to weather influences are not included.

The projections distinguish two different policy variants which are based on the underlying principles of Dutch and European policy, including the measures from the Energy Agreement (see section 4.2.1). They also contain measures made binding by market participants, public organisations and other government bodies on or before 1 May 2015.

Variant "With Existing Measures" (WEM)
This variant encompasses currently implemented and adopted policies and measures as from 1 May 2017. It includes measures that are sufficiently concrete and have been made binding, such as the

[80] BR2.
[81] https://www.rijksoverheid.nl/documenten/rapporten/2015/10/09/nationale-energieverkenning-2015
[82] http://www.pbl.nl/publicaties/nationale-energieverkenning-2017
[83] https://www.cbs.nl/en-gb
[84] http://emissieregistratie.nl/erpubliek/bumper.en.aspx
[85] http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2017-emissieramingen-luchtverontreinigende-stoffen-nederland-rapportage-2017-2946.pdf

European Emissions Trading System (ETS), subsidies for renewable energy, the abolition of the milk quota and the concrete and binding measures of the Energy Agreement.

Variant "With Additional Measures" (WAM)
In addition to all measures from the WEM variant, this variant also encompasses planned policies and measures which have been published but not yet officially implemented by May 2017. Nevertheless, they were specific enough to incorporate in the calculations; for example, the European CO_2 norms for cars as from 2025, stringent energy performance requirements for existing offices and the intensification of several measures in the Energy Agreement. A complete list of policies and measures that are included in the projections, either as implemented or as planned, is published separately from the NEV 2017 report itself[86].

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 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 its specific 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 as well as a highly theoretical and unrealistic.

The impact of (groups of) PAM's on the reduction of greenhouse gases are established using a reference scenario that assumes no policy changes after 2012 (see section 4.10 for more details). This section presents the integrated projection results for the variants "With Existing Measures" and "With Additional Measures".

5.3 Projection results

5.3.1 General trends

National greenhouse gas emissions have fallen since 1990
The total greenhouse gas emissions fell by 11% between 1990 and 2016, from 219 to 197 Mton of CO_2 equivalents (see Figure 5.1). This decrease has been achieved mainly through a sharp fall in non-CO_2 greenhouse gas emissions after 1995 due to reduction measures taken (the "ROB" programme, see Chapter 4). CO_2 emissions increased after 1990 but peaked in 2010 at 183 Mton. In the years after 2010, CO_2 emissions decreased mainly due to lower emissions from the industry and from buildings, although they tend to fluctuate from year to year (partly due to colder and milder winters as well as varying economic activities). In 2016, CO_2 emissions were 3% higher than in 1990 and 1 Mton higher than in 2015. It is expected, however, that the structural trend of future CO_2 emissions will fall as a result of the trend towards decarbonisation of the energy system.

National greenhouse gas emissions will continue to fall until 2020
Based on existing policy (the "With Existing Measures" or WEM variant), greenhouse gas emissions are expected to fall to 171 Mton of CO_2 equivalents by 2020, with an uncertainty range of 163–181 Mton CO_2 eq. This figure is a decrease of almost 23% from 1990 levels (see Figure 5.1).

[86] http://www.pbl.nl/sites/default/files/cms/data/pbl-2017-nationale-energieverkenning-2017-overzicht%20beleidsvarianten.ods

When the intended policy is taken into account (the "With Additional Measures" or WAM variant), emissions will fall to 170 Mton of CO_2 equivalents by 2020. This figure is a decrease of more than 23% from 1990 levels. There is a higher proportion of renewable energy in this policy variant and more energy savings in buildings.

Nevertheless, with the projected emissions for 2020 in both the WEM and the WAM variant, the Netherlands would comfortably meet its 2020 European target for reducing greenhouse gases.
In the European context, the Netherlands only has a national emissions target for greenhouse gases that are not regulated by the European Emissions Trading System (ETS; see Chapter 3). This target relates to cumulative (non-ETS) emissions in the period 2013–2020 and is set at 921 Mton CO_2 equivalents. Annual non-ETS emissions will decrease in the variant "With Existing Measures" (WEM) as well as in the variant "With Additional Measures" (WAM) from 109 Mton CO_2 equivalents in 2013 to 100 Mton in 2020 (see Figure 5.2). Compared to the target of 9210 Mton CO_2 equivalents allowed for cumulative emissions, it is expected that actual emissions will amount to 798 Mton CO_2 eq. (with existing and additional measures) or 801 Mton CO_2 eq. (with existing measures only). These levels are decreasing due to lower emissions from buildings and horticulture (less use of gas), lower fuel consumption by transport and further decreases in non-CO_2 emissions (such as from landfills). As a result, the Netherlands will meet this target by a comfortable margin. In June 2015, the government announced that any surpluses of AEA's will be cancelled and will consequently not be carried over to the period after 2020.

In the same period (2013–2020), the emissions under EU ETS will decrease from 87 Mton in 2013 to 76 Mton by 2020 (both the WEM and the WAM variant) due to the falling consumption of coal and gas in the energy sector and the industry.

Emissions of greenhouse gases are projected to decrease further after 2020
If the WEM variant is followed, the emissions of greenhouse gases will further decrease to 156 Mton of CO_2 equivalents by 2030. This figure is almost 30% lower than in 1990. Emissions in both ETS and non-ETS sectors will decline. In ETS sectors, this decrease is mainly due to the falling consumption of coal and gas as well as the increasing production of power and heat using renewable energy. In non-ETS sectors, the decrease in emissions between 2020 and 2030 will mainly be due to the decline of energy consumption in buildings and greenhouse horticulture. Non-ETS emissions from vehicles and industrial sectors are expected to remain more or less stable, whereas emissions of non-CO_2 greenhouse gases will also decrease further.

The WAM variant will lead to slightly lower energy consumption in the built environment and in transport. As a result of this scenario, greenhouse gas emissions will fall by an additional 2.5 Mton to 154 Mton CO_2 equivalents. This figure is almost 31% lower than in 1990.

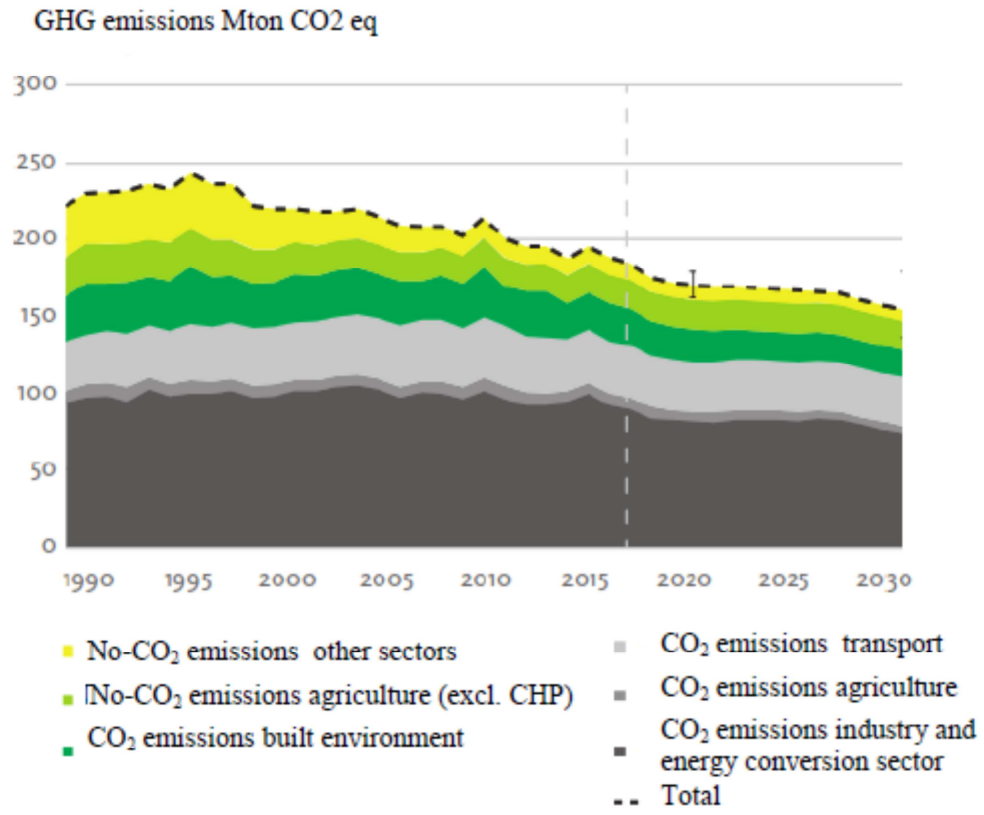


Figure 5.1: Historical emissions and projections for greenhouse gases per gas, 1990–2030, in Mton CO_2 eq.

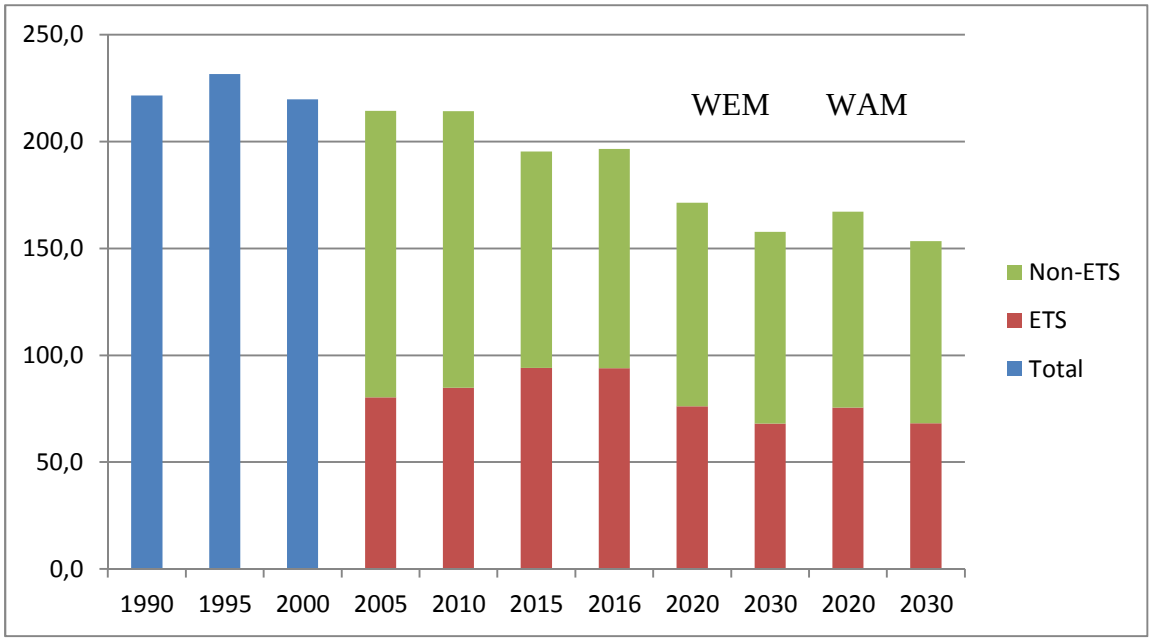


Figure 5.2: Historical emissions and projections (split ETS/non-ETS), 1990–2030, in Mton CO_2 eq.

5.3.2 Energy and industry (CO_2)

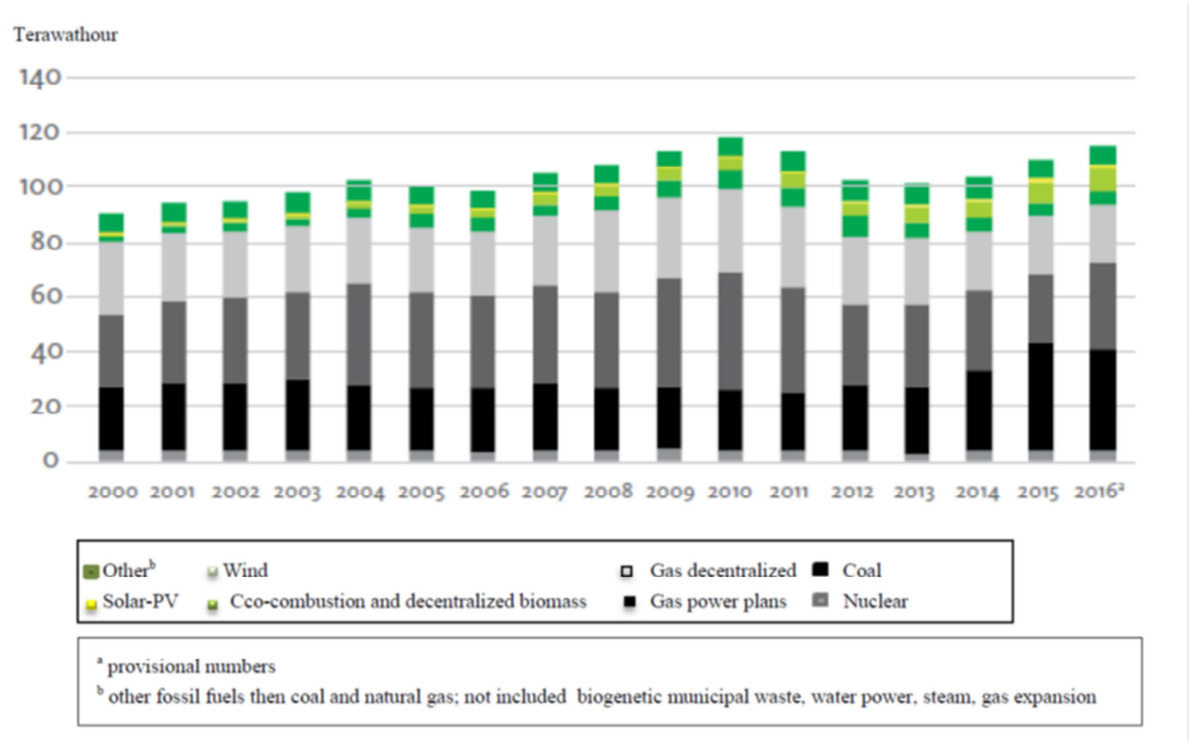
CO_2 emissions from energy and the industry encompass emissions from power and heat production by the utility and industrial sectors as well as from industrial non-energy processes. By contrast, CO_2

emissions from buildings and horticulture are excluded and described in the sections below. The emissions from this energy and industry sector are largely covered by the European Emission Trading System (for more than 90%). Important measures for these sectors are the Sustainable Energy Production Subsidy Scheme, the 2013 Energy Agreement (which included the closure of coal-fired power plants), Long-Term Agreements on Energy Efficiency (LTA and /LEE) and the Energy Investment Allowance scheme (EIA).

Emissions from energy and the industry increased from 98 Mton in 2000 to 101 Mton in 2016[87]. This growth is mainly due to developments in the energy sector, where the use of coal for power production has been increasing. However, this figure is expected to fall again due to the closure of coal-fired power plants in the coming years and the increase of power production from renewable sources (see figure 5.3a and figure 5.3b). In addition, the capacity to interconnect with neighbouring countries (such as Germany) is increasing, which improves the exchange of renewable power between countries. This development also contributes to a reduced need for conventional power production. After 2023, the Netherlands is expected to become a net exporter of electricity. By 2025, more than half of the power production is expected to come from renewable sources. This figure may increase to two thirds by 2030, even though it is assumed that no new SDE+ subsidies will be granted in future for the co-combustion of biomass in power plants. CO_2 emissions from power production are expected to fall from 69 Mton CO_2 in 2016 to 51 Mton CO_2 (both WEM and WAM) by 2020. Due to the increasing production of renewable energy, most notably from wind and solar, emissions are expected to decline further to 43 Mton CO_2 (both WEM and WAM) by 2030.
The energy demand from industrial sectors decreased sharply after 2008 due to the economic crisis and never returned to that level. It is expected that the demand will increase slightly from 1,088 PJ in 2016 to 1,098 PJ (WEM) or 1,091 PJ (WAM) by 2020[88]. This slight increase is the result of economic growth balanced by improvements in energy efficiency. In the WAM scenario, additional energy savings are expected as the result of the intensification of the Energy Agreement. On the one hand, the production of power and heat by industrial CHP has been declining since 2010 and is expected to decline further due to unprofitable market circumstances. On the other hand, the use of biomass for heat and steam production is increasing. As a consequence of these developments, CO_2 emissions from the industry are expected to remain stable at around 31 Mton CO_2 (both WEM and WAM) in the coming decade.

Combined CO_2 emissions from the energy and industry sectors are expected to decline to 82 Mton (WEM) or 81 Mton (WAM) by 2020 (see Figure 5.4), decreasing further to 74 Mton CO_2 by 2030.

[87] Please note that CTF table 6 uses a different sectoral definition as used in this section. In that table emissions from industrial processes are noted separated from energy-related emissions and are included in the industry sector to ensure consistency with the sectoral definition in the CRF. This is in the WEM scenario 7.2 Mton CO_2 for the year 2020.
[88] These figures include the final energy demand for power, heat and raw materials.



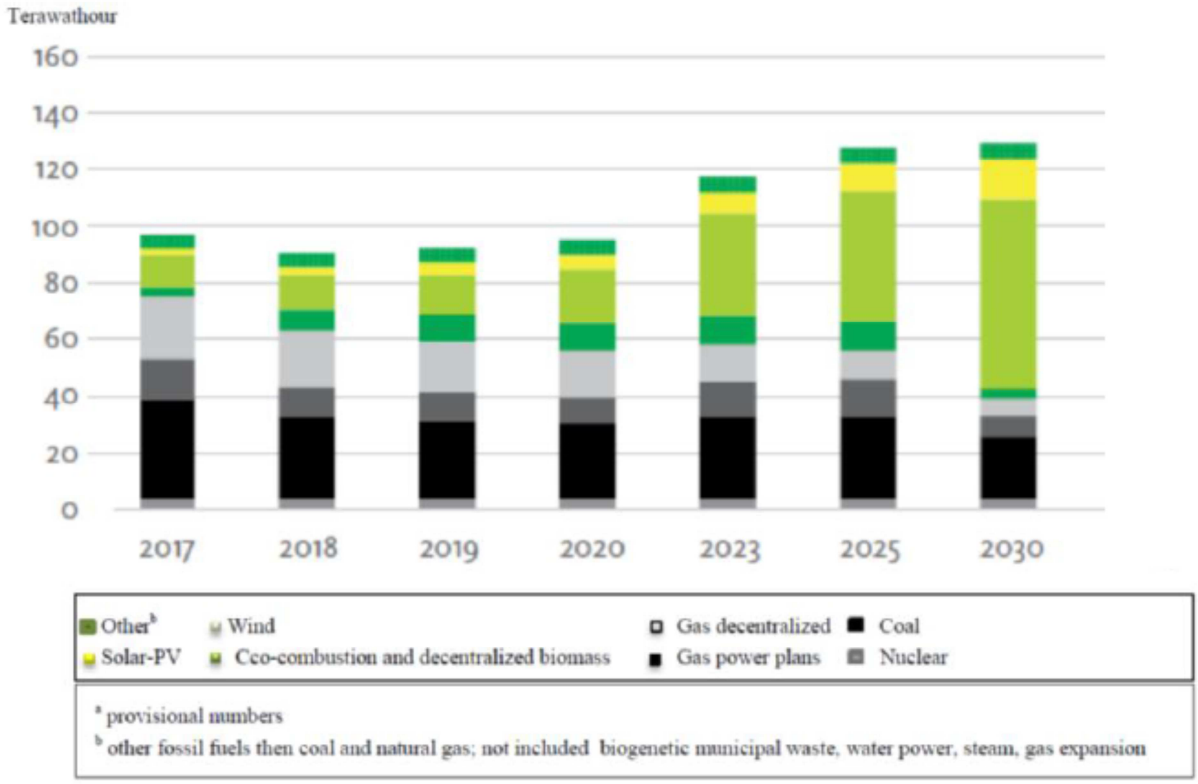


Figure 5.3a and figure 5.3b: Historical and projected power production by energy source (NEV 2017), 2000–2030, in TWh

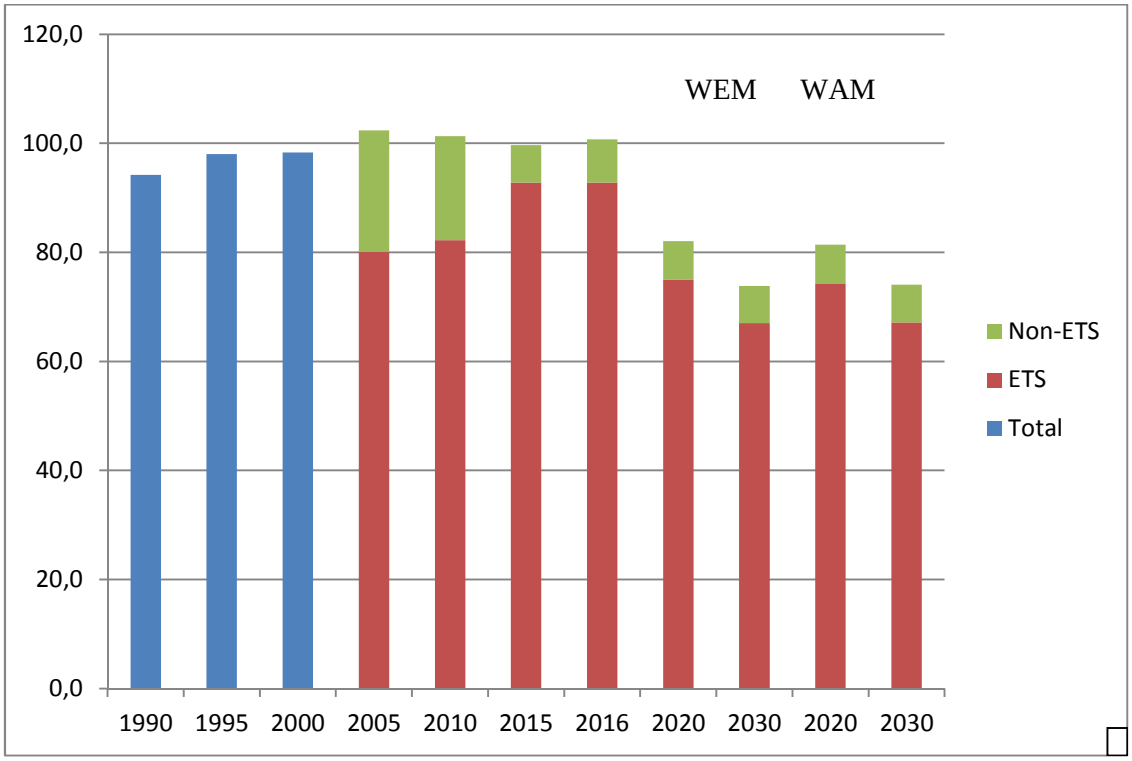


Figure 5.4: Historical emissions and projections for CO_2 from energy and industry, 1990–2030, in Mton

5.3.3 Built environment (CO_2)

The CO_2 emissions from the built environment encompass the emissions from dwellings and utility buildings in the services sector (such as offices, schools, and so on) but exclude emissions from buildings in industrial and agricultural sectors (which are accounted for in those sectors). CO_2 emissions arise from the use of natural gas for spatial heating, cooking and tap water. The CO_2 emissions in the built environment decreased from 29 Mton CO_2 in 1990 to 24.5 Mton CO_2 in 2016, despite a 13% increase in the number of households during the period 2000–2016 and a 25% increase in the floor area of utility buildings. This development is the result of increased insulating measures and the growing use of highly efficient boilers. It is expected that CO_2 emissions will decrease further as a result of declining gas use in the coming decade. With existing measures, the CO_2 emissions are projected to be around 22 Mton CO_2 in 2020 and 19 Mton CO_2 in 2030 (see Figure 5.5). With additional measures, the projected emissions are roughly 1 Mton CO_2 lower. The developments for dwellings and utility buildings are described below.

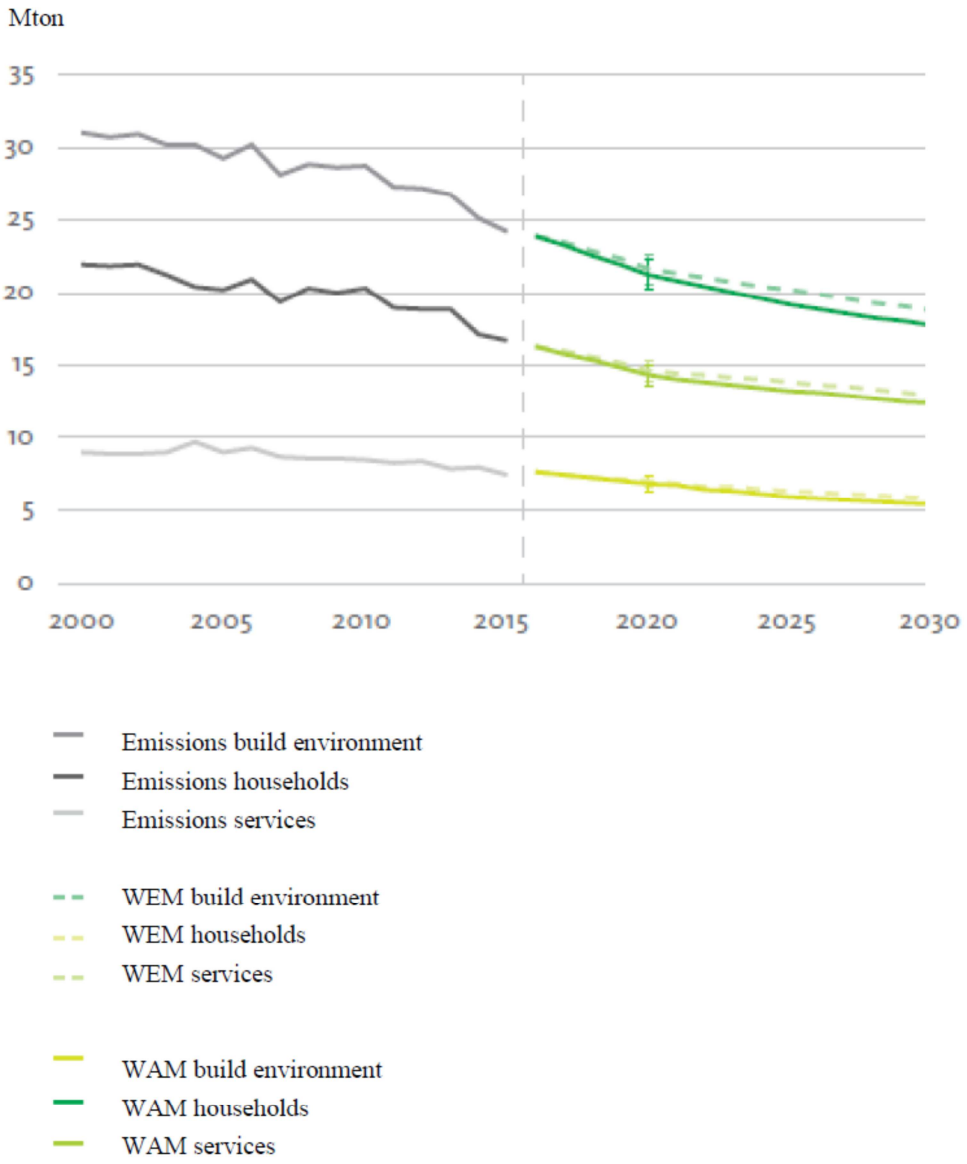


Figure 5.5: Historical emissions and projections for CO_2 from buildings, 2000–2030, in Mton CO_2

Homes

The average gas consumption per house fitted with gas central heating fell from approximately 2,150 Nm^3 in 1995 to approximately 1,300 Nm^3 in 2015 due to energy-saving measures in existing and new homes. It is expected that this figure will fall to 1,150 Nm^3 by 2020 and to 1,050 Nm^3 by 2030, even though the number of households will be growing by 8% between 2016 and 2030. The current requirements for an energy performance certificate (EPC) for new homes and the current requirements for energy efficiency in domestic appliances and lighting under the EU Ecodesign Directive are included in the WEM variant. This situation results in new homes that are nearly energy neutral from 2020 onwards. Such houses use virtually no natural gas. Account has also been taken of measures from the Energy Agreement, such as the arrangements aimed at domestic consumers and the renovation of social dwellings. This development will reduce emissions in homes from 17 Mton in 2015 to a projected 15 Mton in 2020 and to 13 Mton in 2030.

In addition, the intended policy (WAM variant) also takes account of the new covenant to stimulate energy savings by households and of the additional agreements with the social housing sector to

realise an average energy label B for social dwellings. These measures will reduce emissions by an additional 1 Mton CO_2.

Services
While the building stock in the services sector almost doubled between 1980 and 2010, there has been a marked decrease in new building after 2010 as a result of the economic recession creating a surplus of office and retail premises. That situation has been a temporary slowdown, as floor area is increasing again, albeit at a lower pace. This development is related to expected demographic trends: an ageing population, a smaller population of professionals and fewer students in education. Trends such as online shopping, new working methods ("Het Nieuwe Werken") and senior citizens staying in their own homes for longer are also playing a role in the decreasing need for space. Vacancy levels remain relatively high despite the economic recovery. At the beginning of 2015, over 17% of office space and over 9% of retail space was empty. A part of this surplus comprises readily marketable offices. Another part consists of buildings that have fallen into disuse due to obsolescence or that are situated in areas with poor prospects (contracting regions).

Since 2010, emissions in the services sector have stabilised at around 8 Mton (2015 level). In the services sector, the current requirements for energy performance in new buildings, the current requirements for energy consumption under the EU Ecodesign Directive, the subsidies for renewable energy (ISDE, sports facilities) and a stricter control of energy requirements under the Environmental Protection Act are included in the WEM variant. This set of requirements will reduce emissions to a projected 7 Mton in 2020 and to 6 Mton in 2030.

The WAM scenario includes a stricter control of the energy-saving requirements from the Environmental Management Act for all branches and a minimum energy label C for existing offices by 2023. In addition, the energy performance of new buildings is required to be almost energy neutral (for normal buildings by the end of 2020, for the central government by the end of 2018). This development will reduce emissions to a projected 7 Mton in 2020 and to 5 Mton in 2030.

5.3.4 Transport (CO_2)

Between 2000 and 2010, emissions from traffic and transport in the Netherlands rose from 37 Mton to 39 Mton CO_2[89]. This increase was mainly due to the growth in traffic on the roads. Goods transport and its associated emissions decreased in 2009 and 2010 due to the economic recession. Following an increase in 2011, emissions fell again in 2012, 2013 and 2014, partly due to weaker growth in traffic, a more economical vehicle fleet under the influence of the European standards for CO_2 and tax incentives to boost fuel economy in vehicles. In recent years, emissions have remained more or less stable due to economic growth.

In 2012, the maximum speed limit on motorways was raised from 100 km/h or 120 km/h to 130 km/h on those stretches where this increase was deemed acceptable in terms of safety, noise, nature and air quality. If 130 km/h is not possible the whole day, a dynamic speed limit applies to part of the day. Based on an ex-ante assessment, it is expected that this action leads to an annual increase in CO_2 emissions of about 0.4 Mton[90].

It is expected that the demand for transport (of both goods and persons) continues to increase as a result of further economic growth. In the WEM variant, although energy consumption in the sector would be stable until 2020, emissions are projected to fall further to 33 Mton in 2020 due to a growing share of biofuels and an increase of electric or semi-electric vehicles. By 2030, the emissions

[89] Please note that CTF table 6 uses a different sectoral definition as used in this section. In that table emissions from non-road mobile machinery, military and fisheries are included in the energy sector to ensure consistency with the sectoral definition in the CRF. This is in the WEM scenario 3.5 Mton CO_2 for the year 2020.
[90] https://zoek.officielebekendmakingen.nl/blg-142118.pdf

are projected to have increased slightly to 35 Mton as a result of the increasing demand for transport (of both goods and persons).

In the WAM scenario, the decrease in CO_2 emissions is relative to energy consumption, also after 2020. This fact is mainly due to a higher share of electric passenger vehicles that is driven by European CO_2 standards and fiscal policies. In public transport, the share of electric buses is also expected to increase from 2025 due to the ambition of governments to deploy new buses in public transport that have zero emissions. In the WAM variant, emissions are projected to fall to 32 Mton in 2020 and remain stable afterwards.

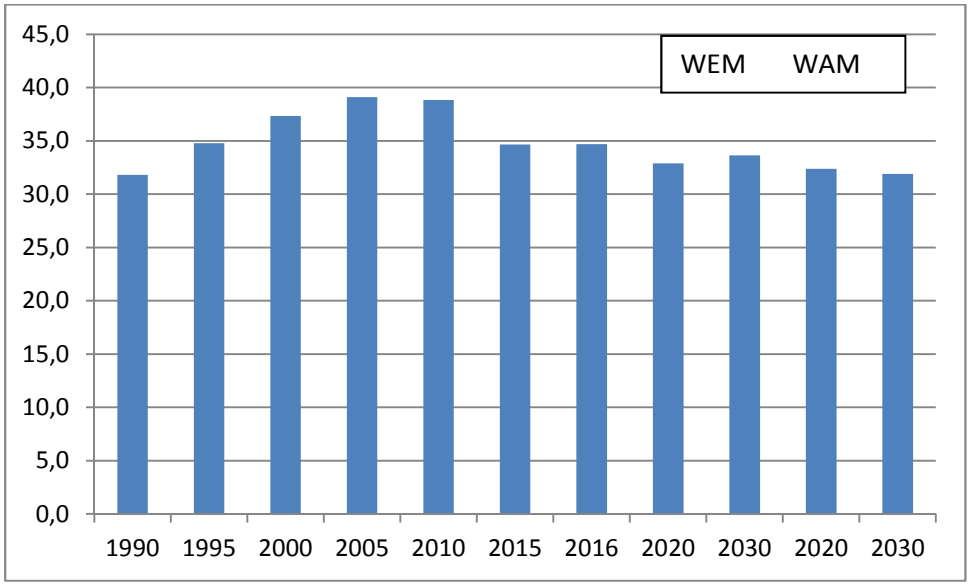


Figure 5.6: Historical emissions and projections for CO2 from transport, 1990–2030, in Mton

5.3.5 Agriculture (CO_2)

In terms of energy consumption, the agricultural sector can be divided into two parts: greenhouse horticulture and other agriculture, with the latter covering arable farming and intensive livestock farming. The majority of energy consumption in agriculture is caused by greenhouse horticulture, mainly for heating greenhouses and for lighting, to grow and develop plants[91].

Since 2010, the area being cultivated under glass has been decreasing. In 2016, the area was 12% less than in 2000. The number of companies involved fell by 65% in that period due to an increase in scale and clustering. Given the improved economic circumstances, it is expected that the decline in the area being cultivated under glass has ended. The uncertainties about this development are substantial, however. It is assumed that the area will remain stable after 2020 at around 9,390 ha (1% above 2016). Despite the recent decrease in the area being cultivated under glass, the total production in greenhouse horticulture continues to increase due to intensification and optimisation of cultivation. The shift over the last few years from the cultivation of cut flowers and flowering plants in greenhouses to vegetables is also expected to continue in future.

In line with the area, the total energy consumption has been falling since 2010. In 2015, the energy consumption level was 17% below 2010 levels. For the coming years, a small increase in consumption is expected as a result of a small increase in area. However, as the area will remain

[91]Please note that CTF table 6 uses a different sectoral definition as used in this section. In that table CO_2 emissions from agriculture are included in the energy sector to ensure consistency with the sectoral definition in the CRF. CO_2 emissions from agriculture are in the WEM scenario 6.6 Mton CO_2 for the year 2020.

stable after 2020, energy consumption is expected to fall further due to improved energy efficiency and innovative greenhouses. By 2020, consumption will be about 27% below 2010 levels and continue to fall to more than 50% by 2030.

Combined heat and power systems (CHP) and boilers currently provide the largest part of the necessary heat; the CO_2 released by burning natural gas can then be used for CO_2 supplementation in greenhouses. However, the use of CHP is declining due to unfavourable market conditions (high gas prices relative to electricity prices), which are not expected to change in the near future. The installed capacity in 2015 was 3,000 MW, which is expected to decline to 1,000 MW by 2030. In recent years, the production of renewable energy using biomass boilers and geothermal sources has increased to 8% in 2015. It is expected that this share will increase further to 12% by 2020 and to more than 25% by 2030.

CO_2 emissions in agriculture have been falling from almost 9 Mton in 2010 to 7.3 Mton in 2015, following the trends of declining cultivation area and energy consumption. After a short increase to around 8 Mton in 2016 and 2017, emissions in both policy variants (WEM and WAM) are expected to fall to 6.6 Mton by 2020 and to 4.5 Mton by 2030.

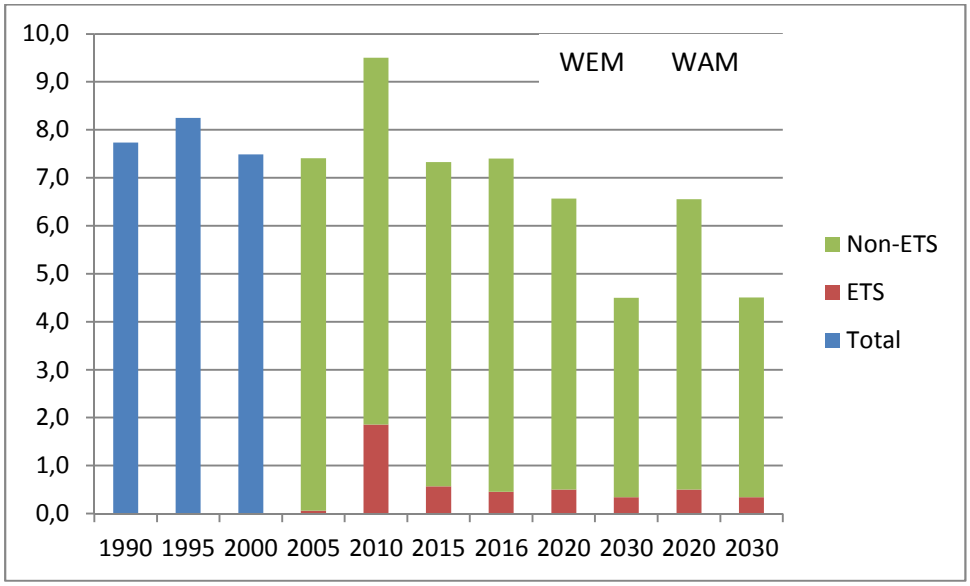


Figure 5.7: Historical emissions and projections for CO_2 from agriculture, 1990–2030, in Mton

5.3.6 Agriculture (non-CO_2)

Non-CO_2 emissions from agriculture come from the following sources:

- methane (CH_4) emissions from enteric fermentation and manure management;
- nitrous oxide (N_2O) emissions from manure management as well as direct and indirect emissions from agricultural soils.

The developments and expected trends for methane and nitrous oxide are set out below.

Methane emissions

Methane emissions from agriculture fell by approximately 21% between 1990 and 2005, from 15 Mton to 12 Mton of CO_2 equivalents. After 2005, these emissions rose again to 13 Mton of CO_2 equivalents in 2016. This increase was due to a growth in milk production of around 25% compared to 2015 as a consequence of the abolition of milk quotas. Though most of this increase was achieved by increasing the milk production per cow, the number of dairy cows also increased by almost 5%.

The number of dairy cows will fall to 2015 levels again due to new policies introduced in 2017, which were established after European phosphate production levels were exceeded. As a result, measures were implemented in 2017 to reduce phosphate production, encompassing the stimulation of low-phosphate fodder and the reduction in the number of dairy cows. From 2018 onwards, a quota system for phosphate production will be introduced.

The fermentation of manure (with or without co-substrates such as maize) for biogas production reduces emissions from manure storage, as the manure is stored for a short period and produces biogas which can be used to generate heat and/or electricity. Current levels of fermented manure are around 2.5%. Under the SDE+ Sustainable Energy Production Subsidy Scheme, it is expected that this figure will increase to around 8% by 2025. However, recent insights into methane leakage have led to higher methane emissions, especially for co-fermentation installations.

Methane emissions from agriculture are expected to remain at the 2016 levels after 2020. The emissions for 2030 are estimated at 13 Mton in both policy variants (WEM and WAM).

Nitrous oxide emissions
In 1990, agricultural emissions amounted to 10.1 Mton of CO_2 equivalents in the form of nitrous oxide. By 2015, that figure had fallen to 6.1 Mton of CO_2 eq. This decrease was mainly achieved through the reduced use of artificial fertiliser under the influence of the manure policy and because fewer dairy cattle were grazing outdoors. Emissions will stabilise at 5.7 Mton of CO_2 equivalents by 2020. After that time, a small reduction to 5.6 Mton of CO_2 equivalents in 2030 is expected as a result of a further decrease in outdoor grazing. These figures apply to both variants.

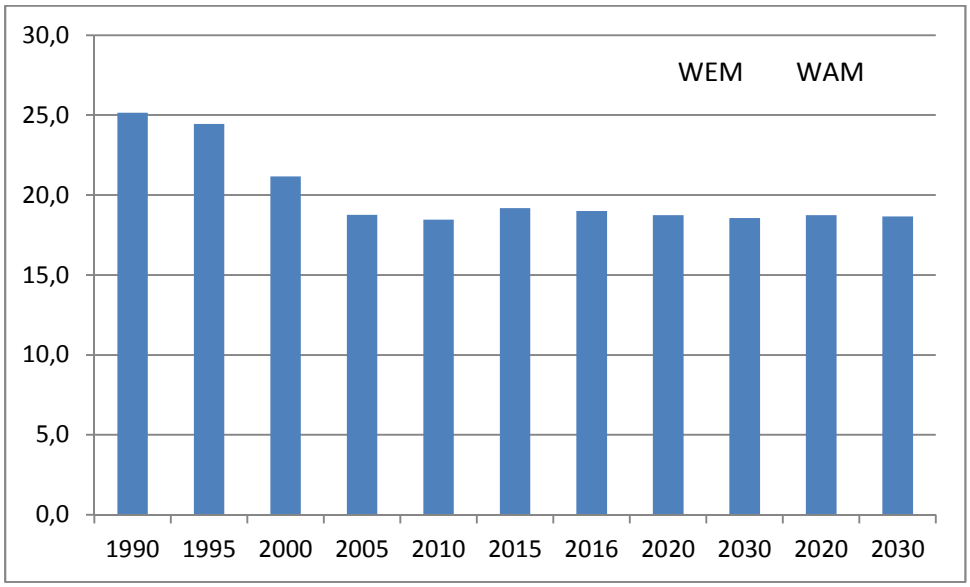


Figure 5.8 Historical emissions and projections for CH_4 and N_2O from agriculture, 1990–2030, in Mton CO_2 eq.

5.3.7 Non-CO_2 (other sectors

General matters
Since 1990, there has been a substantial decrease in emissions of non-CO_2 greenhouse gases within the other sectors, from 33.3 Mton-CO_2 eq. in 1990 to 26.6 Mton-CO_2 eq. in 2000 and to 10.8 Mton-CO_2 eq. in 2015. These emissions will decrease further between 2013 and 2030, but the rate will be lower, as the potential to reduce emissions quickly is declining. The projected emissions in 2020 and 2030 amount to 9.4 Mton-CO_2 eq. and 6.9 Mton-CO_2 eq. respectively under the existing policy

(WEM), or to 9.4 Mton-CO_2 eq. and 6.8 Mton-eq. Mton-CO_2 eq. under the intended policy (WAM). The difference between the WEM and the WAM variant is the methane emissions from combined heat and power plants (CHPs) in horticulture, which are slightly higher in WEM. There is no difference between the two policies with respect to the other sources. The historical developments and estimated future trends for the most important sources are set out below.

Methane from waste disposal
Methane emissions from waste disposal (such as landfill sites) fell substantially in the past, from 13.7 Mton-CO_2 eq. in 1990 to 2.9 Mton-CO_2 eq. in 2015. The expectation is that these emissions will continue to fall to 1.1 Mton-CO_2 eq. in 2030. This decrease is due to reducing emissions from landfills, less waste being landfilled and a decline in the biogenic fraction of landfilled waste.

Methane emissions from combined heat and power plants (CHPs)
A marked increase in the use of CHPs in greenhouse horticulture since 2005 has caused a rise in methane emissions from 0.4 Mton-CO_2 eq. in 2005 to 1.3 Mton-CO_2 eq. in 2010. Since then, emissions have been declining due to the lower utilisation of CHPs in greenhouse horticulture. It is expected that emissions decline to 0.8 Mton-CO_2 eq. by 2020 and to 0.5 Mton-CO_2 eq. by 2030 (WEM). In the WAM variant, methane emissions from CHP are expected to be slightly lower by 2030 (less than 0.1 Mton-CO_2 eq.)

Nitrous oxide emissions from the industry
Nitrous oxide emissions from the industry are caused by the production of caprolactam (0.9 Mton-CO_2 eq. in 2015) and nitric acid (0.4 Mton-CO_2 eq. in 2015). The latter emissions have been falling since 2008 under the EU Emissions Trading System (EU ETS). Measures to reduce emissions were taken at nitric acid factories in 2007. This policy achieved a reduction of 5 Mton-CO_2 eq. over 2008 as compared with 2006. Since the production of caprolactam and nitric acid is expected to increase slightly in the period 2013–2030 and no further reduction measures are anticipated, there will be a small growth in nitrous oxide emissions from the industry to 1.4 Mton-CO_2 eq. in 2030.

Emissions of F-gases
F-gases are produced as a by-product of a number of industrial production processes, especially the production of HCFC-22 (emission of HFC-23) and primary aluminium production (emission of PFCs).
These gases are also released during the use of these substances. Their main uses include HFCs as refrigerants, PFCs in the semiconductor industry and SF_6 in the power current industry.

Emissions of F-gases increased between 1990 and 1998 (from 8.5 Mton-CO_2 eq. to 14.0 Mton-CO_2 eq.), but have sharply decreased to levels below 3 Mton-CO_2 eq. since 2003 (except in 2010, when emissions were 3.1 Mton-CO_2 eq. This development was mainly due to measures taken under the Reduction Programme for non-CO_2 Greenhouse Gases (ROB), which resulted in significant emission reductions from production processes. Emissions from the use of F-gases, however, increased between 1990 and 2015 from 0.2 to 2.4 Mton-CO_2 eq. This increase is mainly due to a large growth in the use of HFCs due to the phasing out of ozone-depleting substances (especially HCFCs) since 1995.

The total emissions (from use and processing) of F-gases are expected to fall to 2.2 Mton-CO_2 eq. in 2020 and to 1.0 Mton-CO_2 eq. in 2030. This decrease is mainly due to lower emissions from the use of HFCs. Following the new EU Regulation that came into effect on 1 January 2015, the use of HFCs (calculated Mton-CO_2 eq.) must be reduced by 79% between 2015 and 2030. The effect of this regulation will be to cut emissions due to the use of HFCs from 2.2 Mton-CO_2 eq. in 2015 to 1.6 Mton-CO_2 eq. by 2020 and to 0.5 Mton-CO_2 eq. by 2030.
Total F-gas emissions from the use of F-gases will decrease from 2.4 Mton-CO_2 eq. in 2015 to 1.9 Mton-CO_2 eq. by 2020 and 0.7 Mton-CO_2 eq. of CO_2-equivalents by 2030.

Total F-gas emissions from production processes in 2020 and 2030 are expected to remain at around the level of 0.3 Mton-CO_2 eq.

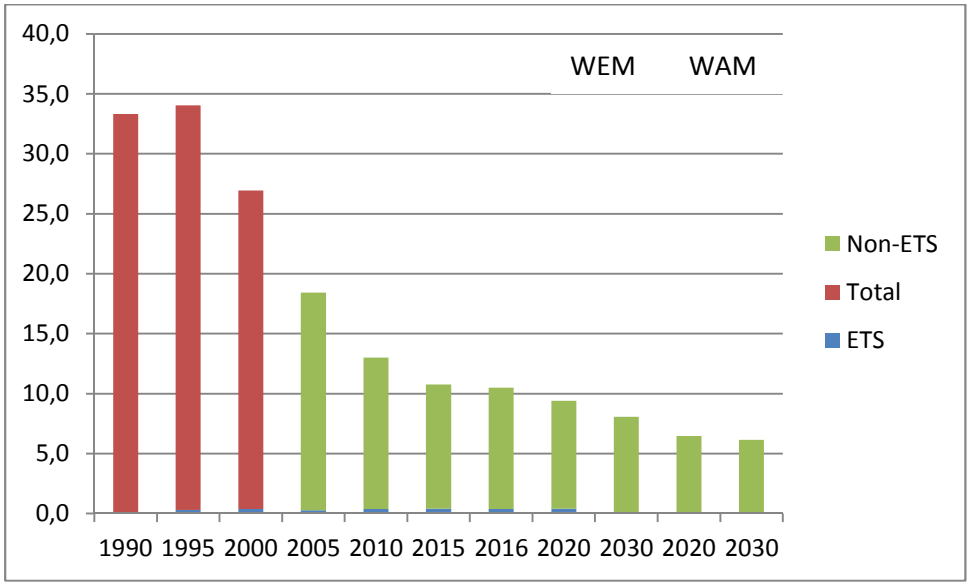


Figure 5.9: Historical emissions and projections for non-CO_2 from other sectors, 1990–2030, in Mton CO_2 eq.

5.3.8 LULUCF

In the Netherlands, the historical net CO_2 emissions from LULUCF are around 6 Mton-eq. The main emission sources are grasslands (on peatland), croplands and soils in the built environment. Forests are a net sink of CO_2. The emissions from grassland are declining as a result of its conversion into cropland as well as the establishment of new infrastructure and buildings, which both result in a net release of CO_2 from the soil. Since 2005, more CO_2 is captured by forests due to the growth of existing forests and the creation of new forests.

It is projected that net CO_2 emissions from LULUCF will increase to nearly 6.8 Mton-eq. in 2030, assuming no new policies. The expectation is that the rate of converting grassland into buildings will slow as new buildings are increasingly built within the existing built environment. Management practices of grass- and cropland are assumed to remain unchanged, which results in more or less stable emissions. Forests, however, are expected to take up less CO_2 as they grow older, resulting in slightly increased LULUCF emissions over the coming decade.

The historical emissions and projections from LULUCF have been incorporated into the National Energy Outlook for the first time in 2017. For the collection and establishment of the historical emissions, the underlying methodology complies with 2006 IPCC guidelines and is described in the methodology report of the National System[92].

[92] https://english.rvo.nl/file/lulucf-methodology-report-2017

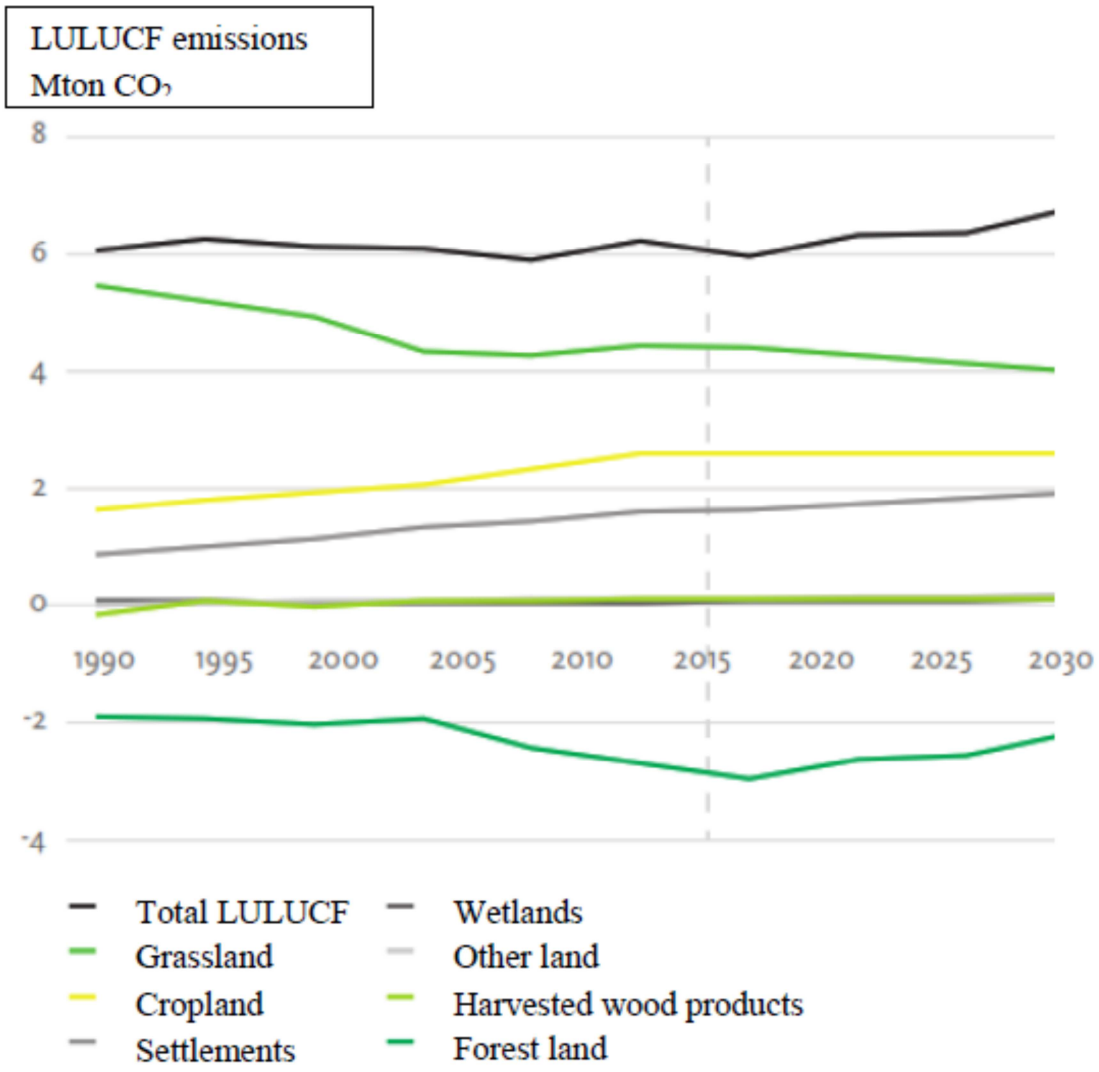


Figure 5.10: Historical emissions and projections from LULUCF, 1990–2030, in Mton CO_2eq.

5.3.9 International bunkers

Although energy consumption (and the related CO_2 emissions) from international transport over water does not count as domestic consumption, it is treated as a form of export not attributed to the Netherlands for policy purposes regarding energy and CO_2. The CO_2 emissions from international aircraft are not attributed to the Netherlands either, but they do count towards the target for the total gross end consumption of renewable energy from the Renewable Energy Directive (RED). A great deal of bunker fuel is sold for international shipping and aviation in the Netherlands and Europe.

In 2015, the CO_2 emissions from international bunkers amounted to 52 Mton in total, of which around 40 Mton-eq. for navigation and 11 Mton-eq. for aviation. As a result, the bunker emissions exceeded the emissions from domestic transport. In both the WEM and the WAM variant, the total emissions from international bunkers are expected to grow to 55 Mton-eq. in 2020 and 58 Mton-eq. in 2030 as a consequence of the estimated growth in transport volumes.

Figure 5.11: Historical emissions and projections for CO_2 from international aviation and navigation, 1990–2030, in Mton-eq. CO_2

5.3 Emissions of NOx, NMVOCs and SO_2

A significant proportion of the emissions of air-polluting substances are related to energy consumption. Burning fossil fuels and biomass produces both greenhouse gases and air-polluting substances. Combustion processes are the main cause of the release of nitrogen oxides and sulphur dioxide. Non-combustion processes are also major contributors to the emission of non-methane volatile organic compounds (NMVOCs). In addition, NMVOCs are released through the use of paint and cosmetics, among other things. Emissions of air-polluting substances have decreased substantially since 1990 due to the implementation of national and European legislation and regulations. These large decreases have mainly been achieved through policies which have led to the application of scrubbing methods and cleaner processes as well as the use of cleaner fuels, such as gas instead of coal or oil. Since 2000, however, emissions have not been falling as rapidly as in the 1990s.

The projections for air pollutants below are from a 2017 update of projections in the National Energy Outlook 2015[93]. Some inconsistencies with the projections for greenhouse gases may therefore occur.

Sulphur dioxide (SO_2)
Emissions of sulphur dioxide fell by 84% from 193 kton SO_2 in 1990 to 30 kton SO_2 in 2015. Over the coming years, the emissions of sulphur dioxide are expected to remain stable at around 30 kton under both the existing (WEM) and the intended (WAM) policies (see Figure 5.12). Various developments in several sectors are behind this stable situation. On the one hand, the closure of five old coal-fired power stations in 2016 and 2017 as agreed in the Energy Agreement (Energieakkoord) will reduce emissions from coal-fired electricity generation. By 2030, emissions from refineries will be reduced as compared to their average levels over recent years through two developments. First, there will be fewer emissions due to the estimated lower production (oil throughput) in the long term. Second, the expected intensification of the desulphurisation of ships' fuel due to international IMO requirements will decrease emissions. On the other hand, emissions from the industry (including base metals, building materials and chemicals) will increase slightly because of the projected economic growth while the current emissions standards remain in force.

[93] http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2017-emissieramingen-luchtverontreinigende-stoffen-nederland-rapportage-2017-2946.pdf

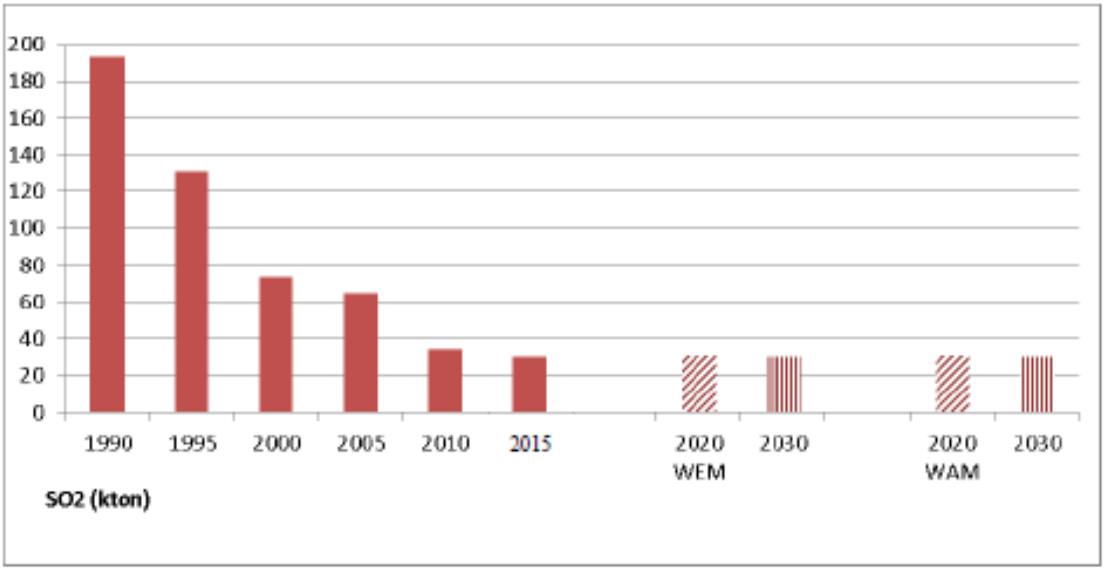


Figure 5.12: Historical emissions and projections for sulphur dioxide (SO_2), 1990–2030, in kton SO_2

Nitrogen oxides (NO_x)

Emissions of nitrogen oxides (NO_x) fell by 62% from 604 kton NO_x in 1990 to 228 kton in 2015. It is expected that emissions will continue to fall through to 2030.

The expected decrease in the national emissions of nitrogen oxides in the WAM variant (see Figure 5.13) can be traced back to reductions in most sectors except the industry, where they remain roughly the same. In absolute terms, the greatest decrease will be in transport. This decrease will be achieved through the existing European standards for road transport, other transport and mobile machinery. Emissions are projected to fall gradually by more than 80 kton between 2015 and 2030 due to the existing standards, despite slightly increasing energy consumption. Compared to the BR2, the projections now include the effect of the intended toughening of procedures to test emissions from private cars and delivery vans. Tightened emissions standards for mobile machinery and inland waterways vessels are now also included.

In order to improve air quality, the use of catalytic converters was made compulsory for petrol-driven vehicles in the early 1990s. This measure resulted in a substantial decrease of NO_x emissions. However, the use of catalytic converters does result in higher N_2O emissions per kilometre. The average N_2O emission factor also rose during the period 1990–1999 (from 9 mg/km to 15 mg/km), slightly dropping to 12 mg/km in 2003. In the last decade, the emission factor remained stable[94].

Emissions from electricity generation will decrease up to 2030 as old coal-fired power stations are decommissioned (agreed in the Energy Agreement) and because of incentives for renewable energy generation (wind and solar). The emissions from small combustion installations in greenhouse horticulture, utility buildings and homes will be reduced largely due to lower energy consumption and national emissions regulations. In greenhouse horticulture, one of the reasons for this trend is a reduction in the use of CHP in favour of gas boilers. A rise in emissions from the industry is anticipated as a consequence of the assumed economic growth and the continuation of the present emission standards. The projections for air-polluting substances take into account the incentives under the SDE+ scheme for the use of biomass in medium-sized combustion plants (larger than 500 kilowatt, especially in the industry, agriculture and utility buildings). Biomass plants are mostly

94

http://www.emissieregistratie.nl/erpubliek/documenten/Lucht%20(Air)/Verkeer%20en%20Vervoer%20(Transport)/Wegverkeer/TNO%20(2012)%20N2O%20emissies%20van%20wegverkeer.pdf

replacing plants fired by natural gas. Although this measure reduces CO_2 emissions, it does increase emissions of nitrogen oxides, NMVOCs and Particulate Matter (PM2.5). The use of biomass in medium-sized combustion plants will increase by a factor of more than two between 2015 and 2020. After 2020, the combustion of biomass is expected to decline sharply, as it is assumed that no new subsidies will be granted after 2020[95]. The nitrogen oxide emissions per Peta Joule of biomass fuel used are more than a factor of two higher than for natural gas plants.

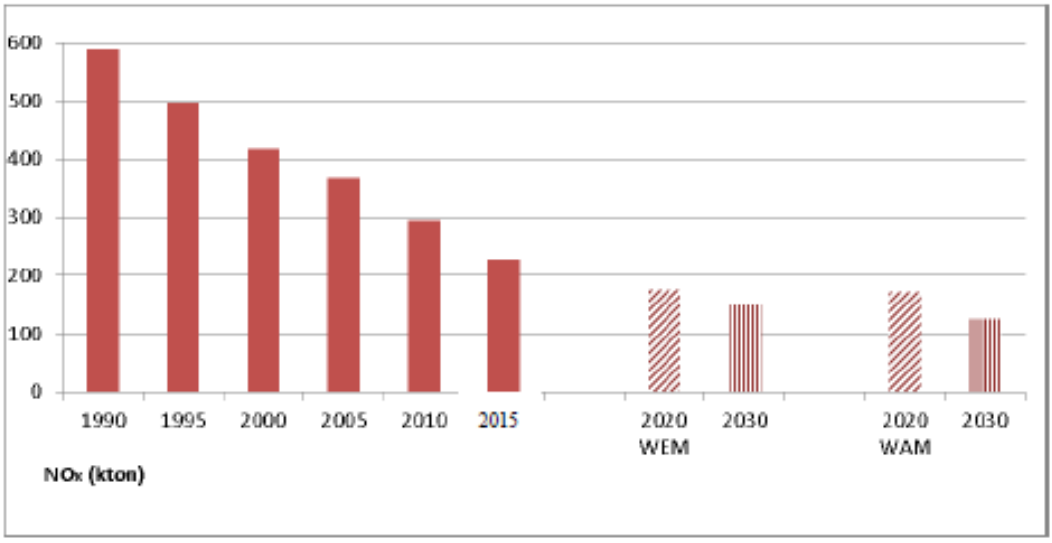


Figure 5.13: Historical emissions and projections for nitrogen oxides (NO_x), 1990–2030, in kton NO_x

NMVOCs

Emissions of non-methane volatile organic compounds (NMVOCs) decreased by 69% from 489 kton in 1990 to 139 kton in 2015. It is expected that emissions will remain stable in the period up to 2030. Though the total NMVOC emissions seem to have been stabilising since 2013, a number of relevant developments are projected in the underlying sectors. Both the WEM and the WAM anticipate a decrease of emissions in road transport up to 2030 as a consequence of the European emissions standards for road vehicles and mobile machinery (see Figure 5.14). Emissions from onshore and offshore gas and oil production will also fall in the short term due to reduced production on Dutch territory. A small reduction in emissions from wood-burning stoves is expected, partly due to a small increase in certified – and therefore cleaner – stoves, on the assumption that the amount of wood used by households will not change from now to 2030.

By contrast, the emissions from the industry, the storage and the trans-shipment of chemical products and fuels, as well as from consumer products such as cosmetics (deodorant sprays and hairsprays), car products and cleaning products, will increase. These increases are associated with the expected growth in these activities as well as a continuation of the current product and emission standards.

[95] This policy assumption was not taken into account in the projections for air pollutants.

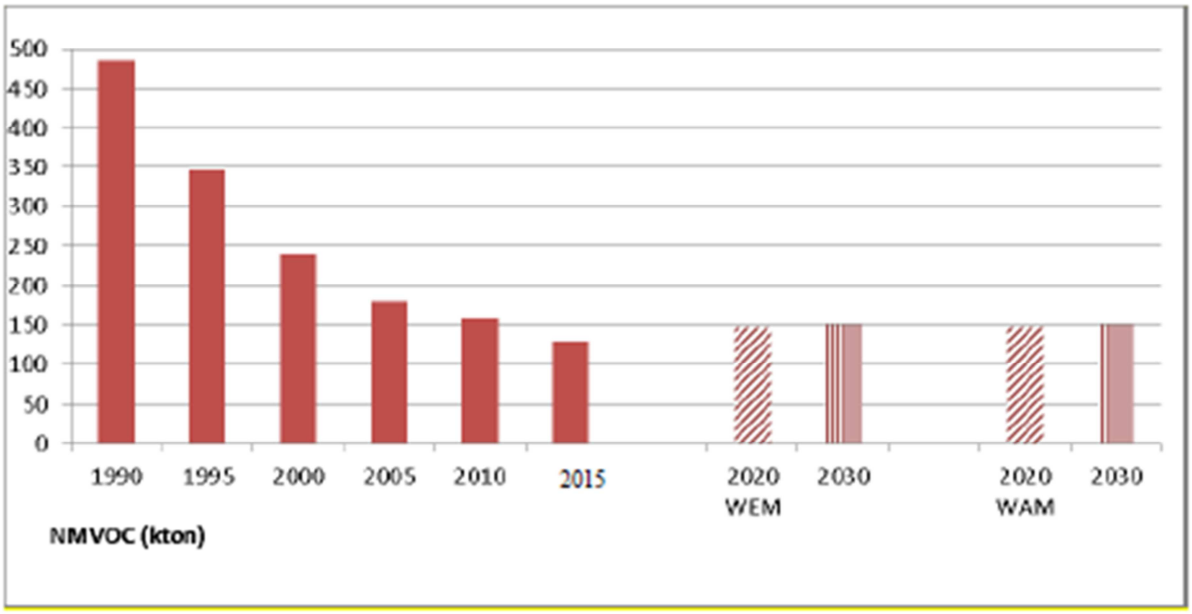


Figure 5.14: Historical emissions and projections for non-methane volatile organic compounds (NMVOC), 1990–2030, in kton of CO_2 eq

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 2016–2020 of 25 Mton-eq. (13%) under the existing policy (WEM variant) or 26.9 Mton-eq. (14%) under the intended policy (WAM variant; see Figures 5.1 and 5.2 as well as Table 5.1). The greatest reduction will be achieved in CO_2 (24 or 25.7 Mton-eq. respectively). Under both policy variants, reductions of 0.5 Mton-CO_2 eq. for methane, 0.3 Mton-CO_2 eq. for nitrous oxide and 0.4 Mton-CO_2 eq.
for fluorinated or F-gases are projected.

Additional emissions reductions of 15 Mton-CO_2 eq. under the existing policy (WEM) or 16 Mton-CO_2 eq. under the intended policy (WAM) are projected for the period 2020–2030. CO_2 emissions will fall by 12.4 Mton-CO_2 eq. or 13.4 Mton-CO_2 eq. respectively. Under both policy variants, methane emissions will fall by 1.4 Mton-CO_2 eq., nitrous oxide emissions by 0.1 Mton-CO_2 eq. and F-gases by 1.2 Mton-eq. 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 17.8 Mton-CO_2 eq. (WEM) or 18.4 Mton-CO_2 eq. (WAM) in the period 2013–2020. Non-ETS emissions are projected to fall by 7.5 Mton-CO_2 eq. (WEM) or 8.5 Mton-CO_2 eq. (WAM) in the same period. The emissions under ETS will decrease by a further 7 Mton-CO_2 eq. (WEM) or 8 Mton-CO_2 eq. (WAM) in the period 2020–2030, while non-ETS emissions will decrease by an additional 7 Mton-CO_2 eq. (WEM) or 8.6 Mton-CO_2 eq. (WAM).

(Mton CO_2 eq.)	Historical emissions							Projections			
	1990	1995	2000	2005	2010	2015	2016*	2020 WEM	2020 WAM	2030 WEM	2030 WAM
Total emissions	221.4	231.5	219.7	214.4	214.2	195.2	196.6	171.3	169.7	156.2	153.7
Breakdown by gas											
Carbon dioxide	162.9	173.3	172.0	177.4	182.8	165.3	167.2	143.1	141.5	130.7	128.2
Methane	32.3	30.3	25.1	20.5	20.1	19.0	18.6	18.1	18.1	16.7	16.7
Nitrous oxide	17.7	17.7	15.7	14.2	8.1	8.3	8.2	7.9	7.9	7.8	7.8
Fluorinated	8.5	10.1	6.9	2.3	3.1	2.6	2.6	2.2	2.2	1.0	1.0
Breakdown ETS/non-ETS											
ETS				80.4	84.7	94.1	93.9	76.1	75.5	68.0	68.1
Non-ETS				134.0	129.,4	101.2	102.7	95.1	94.2	88.2	85.5

* provisional data

Table 5.1 Projections by gas and broken down into ETS/non-ETS, 1990–2030, in Mton CO_2 eq.

5.4.2 Uncertainty analysis

The Netherlands uses the National Energy Outlook (NEV) 2017 for the projections. Although developments in factors which 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 about these factors, NEV 2017 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 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 10% for 2020 and 28% for 2030 (see Table 5.2).

(Mton CO_2 eq.)	2020 (WEM)	2020 (WAM)	2030 (WEM)	2030 (WAM)
Total emissions	171	170	156	154
Uncertainty range	163–181 (±5%)	161–179 (±5%)	140–182 (±14%)	136–179 (±14%)

Table 5.2 Projected national emissions with uncertainty ranges, 2020–2030, in Mton CO_2 eq.

5.5 Description of methodology

Much of the information below is based on the Dutch National System for projections and reporting on policies and measures, which was established in 2015 (RVO.nl, 2015).

5.5.1 Models and methods used

The NEV 2017 uses a combination of models to construct an energy balance sheet of energy consumption in the Netherlands that reflects on the past and projects the future (for results, see annex 2). 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 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 future projections, 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 as well as the intended policy measures of government institutions and other social players. 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 electricity. Finally, the energy usage is converted into CO_2 emissions. The emissions created by non-CO_2 greenhouse gases and air pollutants are determined on the basis of the levels of relevant activities that produce these emissions. A brief description of the models used to create the overview is included in Annex 1.

5.5.2 Key variables and assumptions

The key variables used in the projections are listed in Table 5.3 below.

Summary of key variables and assumptions used in the projections analysis								
Key underlying assumptions						Projected		
Assumption	*Unit*	2000	2005	2010	2015	2020	2025	2030
GDP growth rate		100.00	106.00	114.00	117.00	128.00		152.00
Population	millions	15.8	16.3	16.6	16.9	17.2	17.5	17.7
Population growth	%	0.80	0.20	0.50	0.40	0.40	0.30	0.20
Number of households	millions	6.8.1	7.1	7.4	7.7	8.0	8.3	8.4
International oil price	US$ per barrel	39.00	66.00	87.00	55.00	89.00	114.00	140.00
Exchange rate	US$/Euro	0.90	1.24	1,33	1,11	1,16	1,11	1,11
International coal price	€ per ton	52.00	75.00	89.00	70.00	81.00	85.00	88.00
International gas price	€ per m3	0.16	0.18	0.20	0.24	0.28	0.31	0.33
Electricity (commodity baseload price) (WEM)	€ per MWh	58.38	51.50	52.96	40.81	32.28	47.62	44.41
Electricity (commodity baseload price) (WAM)	€ per MWh	58.38	51.50	52.96	40.81	32.38	47.42	43.51
European Emission Allowance (EU ETS)	€ per ton	N.A.	12.12	15.40	7.70	6.60	10.90	16.40
habited dwellings	millions	6.45	6.71	7.00	7.30	7.48	7.73	7.91
floor area utility building (services sector)	millions of m2	370.27	405.11	440.76	463.08	485.46	502.18	519.59
mobility passengers (WEM)	billions of km's	186.60	194.00	193.60	192.50	207.16	219.16	230.33
mobility passengers (WAM)	billions of km's	186.60	194.00	193.60	192.50	207.33	217.90	227.56
transport (WEM)	billions of tons freight * km's	Not available	122.3	118.50	126.70	144.72	150.60	156.47
transport (WAM)	billions of tons freight * km's	Not available	122.3	118.50	126.70	144.72	150.60	156.47
Livestock								
- Dairy young stock	millions of animals	1.34	1.15	1.25	1.34	1.25	1.14	1.03
- Dairy cows	millions of animals	1.50	1.43	1.48	1.62	1.62	1.62	1.62
- Cattle for meat production	millions of animals	1.23	1.21	1.25	1.17	1.18	1.16	1.14
- Breeding swine (incl. piglets)	millions of animals	6.61	5.81	6.35	6.80	6.58	6.58	6.58
- Fattening pigs	millions of animals	6.50	5.50	5.90	5.80	5.78	5.78	5.78
- Laying hens including broiler parents	millions of animals	53.08	48.42	56.50	57.66	54.08	52.67	51.26
- Broilers including ducks and turkeys	millions of animals	53.44	46.77	46.87	50.90	47.14	46.08	45.01
- Sheep	millions of animals	1.31	1.36	1.13	0.95	1.03	1.03	1.03

Table 5.3 Key variables used in the projections, 2000–2030

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 and is financed from its 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 a year-on-year increase in its climate finance after having delivered on its commitment of Fast-Start Finance during 2010–2012. While public climate finance amounted to € 286 million in 2013 and to € 395 million in 2014 (as reported in the Second Biennial Report), it reached € 416 million in 2015 and € 472 million in 2016. An overview of Dutch public financial support (2015 and 2016) is provided in CTF Table 7. In addition, public finance from the Netherlands in 2015 mobilised € 73 million of private finance for climate-relevant activities in developing countries. In 2016, mobilised private finance amounted to € 171 million.

Adaptation expenditure amounted to € 116 million in 2015 and represented 28% of Dutch public climate finance. In 2016, adaptation expenditure rose to € 156 million, which amounted to 33% of the total sum. This increase was due to a better integration of climate change adaptation in development activities. The share of mitigation expenditure was stable in absolute terms at € 31 million, which amounted to 7% of the total amount in 2015 and 2016. Most public climate finance supported cross-cutting activities (65% in 2015, 60% in 2016), due to substantial contributions to activities through multilateral and other channels which support both adaptation and mitigation.

As Dutch support for climate action is part of development cooperation, both our bilateral and our multilateral climate finance are characterised by 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[96]. 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 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. Gender is an important cross-cutting issue, as cclimate 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.

The results of the Dutch development cooperation, including our support for climate action, are reported to Parliament and published online. The online results report for 2015 (Development Results in Perspective 2016) can be found on the website of the Dutch government[97], while the English version of the report for 2016 is also available online[98].

Some quantitative results of Dutch climate finance in 2016 were:

[96] 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.
[97] https://www.rijksoverheid.nl/onderwerpen/ontwikkelingssamenwerking/documenten/kamerstukken/2016/09/15/kamerbrief-inzake-ontwikkelingsresulaten-in-beeld-editie-2016
[98] http://www.dutchdevelopmentresults.nl/intro

- an additional 2.2 million people gained access to clean energy, bringing the total to 4.1 million people since 2015;
- more than 760,000 hectares of land and forest were brought under improved sustainable management;
- almost 10 million people became more resilient to climate change due to improved water management;
- 1.3 million Smallholder farmers 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.

For the countries with which the Netherlands maintains a bilateral aid relationship, climate country profiles were drafted in 2014 and have since been regularly updated[99]. These country profiles contain an overview of country-specific climate change impacts as well as relevant policies and strategies of the 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 commitment of Fast-Start Finance during 2010–2012. In the period since Fast-Start Finance, we have chosen a more flexible approach in line with our pledge of contributing a fair share to the costs of mitigation and adaptation to climate change in developing countries. Over the years, we have also actively engaged with private funds, as presented in the next section.

The financial resources over 2015 and 2016 as reported in this Biennial Report are considered to be "new and additional" to the financial resources reported over the years 2011–2014 in the previous national communication or biennial report. As the Dutch Government's budgets are approved by Parliament on an annual basis, all annual disbursements represent new and additional resources.

6.1.3 Private climate finance

Climate change cannot be addressed by public interventions only. The private sector must be part of the transformative change that is needed for low-carbon, climate-resilient development. Their knowledge and financial resources are indispensable to succeed.

The Netherlands has set up a number of bilateral instruments to collaborate with the private sector. For example, the Sustainable Water Fund, the Facility for Sustainable Entrepreneurship and Food Security, the Ghana WASH Window and FMO's Access to Energy Fund support public-private partnerships in the water, food and energy sector that help to address climate challenges in developing countries, including via the mobilisation of private finance. In addition, the Netherlands supports a number of multidonor trust funds, multilateral climate funds and development banks that mobilise private finance for climate action. Apart from this approach, the Netherlands focuses on activities that indirectly assist the mobilisation of private climate finance by preparing the ground. One example is

[99] Bangladesh, Benin, Burundi, Ethiopia, Ghana, Indonesia, Kenya, Mali, Mozambique, the Palestinian Territories, Rwanda, South Sudan, Uganda and Yemen; see http://dsu.eia.nl/publications/advisory-reports/7152. For our partner country Afghanistan, no climate profile was drafted as our cooperation with Afghanistan has other priorities.

that we support funds which promote 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 that we support the Global Innovation Lab for Climate Finance, which identifies and pilots cutting-edge climate finance instruments that can attract private investment aimed at climate change mitigation and adaptation in developing countries. Also in the Netherlands, a process has been set up with the active support of the government which brings together entrepreneurs, policymakers and investors to formulate bankable business propositions that tackle climate change challenges in developing countries.

Mobilised private climate finance	**€ million**
Through bilateral programmes:	
Facility for Sustainable Entrepreneurship and Food Security	3
Sustainable Water Fund	4
Ghana WASH Window	1
Through multidonor funds:	
The Sustainable Trade Initiative	9
Energising Development (EnDev)	16
Global Agriculture and Food Security Programme (GAFSP)	10
Private Infrastructure Development Group (PIDG)	1
Through multilateral climate funds:	
Global Environment Fund	2
Green Climate Fund and Climate Investment Funds	pm
Through FMO:	27
Through Multilateral Development Banks:	pm
Total	**73**

Table 6.1: Private climate finance, 2015, in € million

Mobilised private climate finance	**€ million**
Through bilateral programmes:	
Facility for Sustainable Entrepreneurship and Food Security	7.44
Sustainable Water Fund	1.61
Ghana WASH Window	1.10
Solidaridad Partners for Change	0.26
Through multidonor funds:	
The Sustainable Trade Initiative (IDH)	6.96
Initiative for Sustainable Landscapes (IDH-ISLA)	0.40
Energising Development (EnDev)	14.47
Global Agriculture and Food Security Programme (GAFSP)	0.99
Private Infrastructure Development Group (PIDG)	0.72
Through multilateral climate funds:	
Global Environment Fund	3.38
Green Climate Fund and Climate Investment Funds	pm
Through FMO:	16.00
Through Multilateral Development Banks (Excluding EIB)	117.89
Total	**171.22**

Table 6.2: Private climate finance, 2016, in € million

Following years of work in the Research Collaborative on Tracking Private Climate Finance, 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 its scope as well as a common methodology. Based on this Joint Statement, the Netherlands can now report that it mobilised in total € 73 million of private climate finance in 2015 and € 171 million in

2016[100]. Detailed information is presented in Tables 6.1 and 6.2. As data and methodological limitations are still a serious constraint, the reported amounts should be considered as best estimates.

6.2 Public financial support: contribution through multilateral channels

Multilateral climate change funds to which the Netherlands contributed were the Green Climate Fund (GCF), the Global Environment Facility (GEF) and the Scaling up Renewable Energy Program (SREP) of the Strategic Climate Fund (SCF), one of the Climate Investment Funds (CIF).
The Netherlands played an active role in the operationalisation of the GCF through its commitment of € 100 million at the end of 2014, its disbursements of € 18.4 million in the period 2015–2016, and as a Board member and a co-chair of its Risk Management Committee. In the Board, our priorities have been the GCF's focus on poverty, gender responsiveness and private-sector contributions. The Netherlands also continued to provide active support for the work of the GEF and the CIFs through its financial contribution, also as a member of the GEF's Council and the Joint Trust Fund Committee of the CIFs.

In addition, the Netherlands is a major donor of core funding to Multilateral Development Banks as well as United Nations organisations and funds that play an important role to support developing countries in their climate action. The Netherlands reports on the climate-specific part of these core contributions in CTF Table 7(a).

In line with our thematic priorities, key programmes of multilateral organisations that we supported are IFAD's Adaptation for Smallholder Agricultural Programme (ASAP), the World Bank's Consultative Group on International Agricultural Research (CGIAR), the World Bank's Energy Sector Management Assistance Program (ESMAP), the World Bank's Cooperation in International Waters in Africa (CIWA), UNDP's Environment and Energy Thematic Trust Fund (SIDS programme), the ADB's Water Financing Partnership Facility, the World Bank's Water Partnership Program and the World Bank's Program on Forests (PROFOR).

As reported in CTF Table 7, the total contributions through multilateral channels were € 180.1 million in 2015 and € 235.6 million in 2016.
CTF Table 7(a) gives a detailed overview of Dutch multilateral climate finance that has been disbursed in 2015 and 2016.

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

Further to our support through multilateral channels, the Netherlands worked mostly through alliances 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 or offering climate-resilient WASH services. In most cases, these programmes were not limited to the countries with which the Netherlands maintains a bilateral aid relationship, but they were targeted at a broader group of countries and/or regions.

As reported in CTF Table 7, the total contributions through bilateral, regional and other channels were € 239.9 million in 2015 and € 236.2 million in 2016.

[100] HGIS- Jaarverslag 2015; HGIS-Jaarverslag 2016

CTF Table 7(b) gives a detailed overview of Dutch climate finance through bilateral, regional and other channels that has been disbursed in 2015 and 2016.

6.4 Methodology used for reporting on financial support

6.4.1 General remarks

The Netherlands reports on climate-specific ODA that has been disbursed. 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 bodies;
- 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 OECD/DAC's definition of bilateral ODA.

In its Second Biennial Report, the Netherlands reported its general/core contributions to climate change funds, multilateral financial institutions and specialised UN bodies in addition to the climate-specific share of our core contributions to these organisations. In this Third Biennial Report, we have discontinued such practice in line with the Annex to Decision 9/CP.21, where it is clarified in the footnotes to Table 7 that the general/core contribution should only be reported in the event that it cannot be specified as being climate-specific. This situation is not the case for the Netherlands, as we can provide the specification.

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 € 0.74 per US$ for 2015 and € 0.92 per US$ for 2016.

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.

If more than one climate Rio Marker is assigned to an activity, double counting is avoided as follows:

- If an activity has 2 "principal" markers, both are counted for 50%.
- If an activity has 2 "significant" markers, both are counted for 20%.
- If an activity has 1 "principal" and 1 "significant" marker, the "principal" marker is counted for 60% and the "significant" marker for 40%.

For the sizeable contributions through and to NGOs in the framework of MSF-2 and the "Dialogue and Dissent" policy framework (the Dutch policy framework for grants when working with NGOs), the Netherlands uses a mixed approach. The aforementioned system of quantification through Rio Markers is used when climate change adaptation and/or mitigation is a principal or significant policy objective of the entire activity. When climate change adaptation and/or mitigation is only a principal or significant policy objective of parts of the programme, the Netherlands determines the climate-specific share of the NGO's programme. These percentages range between 4 and 38 %.

6.4.3 Multilateral climate finance

To determine the climate-specific share of our core contributions to multilateral organisations, the Netherlands applies the OECD/DAC "Imputed climate-related shares" (weighted averages) to our relevant core contributions to multilateral organisations. In this report, we have used the weighted averages for 2014–2015.

For a number of multilateral/UN agencies carrying out climate-relevant work (UNDP, UNEP, FAO, WFP, UNCCD), 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/general contributions. These figures range between 5 and 30 %.

6.4.4 Private climate finance

The Netherlands reports on private climate finance according to the "Joint Statement on Tracking Progress Towards the $100 Billion Goal", which major donor countries adopted in Paris on 6 September 2015. In this Joint Statement, private climate finance is defined as follows: "Private finance for climate-relevant activities that has been mobilised by public finance or by a public policy intervention, including technical assistance to enable policy and regulatory reform".
Key underlying principles that were agreed for tracking private climate finance are the following:

- Only finance mobilised by governments of developed countries is counted.
- Where multiple actors are involved, the resulting finance is only counted once in tracking.
- The reporting framework encourages and incentivises the most effective use of climate finance.

In view of methodological and data limitations, the private climate finance that the Dutch reports is a best estimate of the private finance that was mobilised by public finance from the Netherlands (bilateral and attributable multilateral finance) to support developing countries in their climate action.

Key methodological choices made are the following.
Definition of public and private finance:

- An entity was considered public if more than 50% was owned by public shareholders. In this case, 100% of finance deployed by these institutions was considered public finance (no apportioning if ownership was mixed).
- An entity was considered private if more than 50% was owned by private shareholders. In this case, 100% of finance deployed by these institutions was considered private finance (no apportioning if ownership was mixed).

Direct versus indirect mobilisation:

- Only climate-relevant activities that directly mobilise private finance were included.
- Climate-relevant activities that only indirectly mobilise private finance were not included.

Types of public finance instruments:

- Grants, loans and equity were included. Guarantees and insurances (e.g. export credit insurance) were not included in the calculations. All instruments were calculated at face value.

Collection of data:

- Preferably, data were collected at the project level. If project data were not available, aggregated figures were used.

Attribution:

- Attribution of private co-finance was based on a pro rata calculation (according to the share of Dutch public finance in the total amount of public finance for the project, including public finance from developing countries).[101]

Attribution:

- Attribution of private co-finance was based on a pro rata calculation (according to the share of Dutch public finance in the total amount of public finance for the project, including public finance from developing countries).

Causality:

- All private co-finance in the same project was assumed to have been mobilised by public finance.

Point of measurement for public and mobilised private finance:

- Preferably, public and mobilised private finance were measured at the moment of disbursements.
- If disbursement data were not available, public and mobilised private finance were measured at the moment of commitment (Board approval).

Classification of developing countries:

- Developing countries were classified on the basis of the OECD/DAC list of ODA recipients.

6.5 Provision of support for technology development and transfer

[101] Exception is FMO. For FMO 100% of mobilized private finance has been attributed to FMO when they are the lead arranger while 0% has been attributed when they are not the lead arranger.

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, practices). Both the private sector and several knowledge institutes are partners 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.

Recipient country and/or region	Targeted area	Measures and activities related to technological transfer
worldwide	Adaptation	Sustainable Water Fund I and II
worldwide	Adaptation	Dutch Risk Reduction Team
worldwide	Mitigation	Energising Development Partnership Programme (EnDev)
worldwide	Mitigation	Energy Sector Management Assistance Program (ESMAP)
Ethiopia	Adaptation	Integrated Seed Sector Programme in Ethiopia
Ethiopia	Adaptation	Capacity-building for Scaling-up evidence-based best Practices in Ethiopia (CASCAPE)
Uganda	Adaptation	Integrated Seed Sector Development (ISSD) and ISSD Plus Programme in Uganda
Uganda	Mitigation and Adaptation	Solar for Farms in Uganda/Milking the Sun
Burundi	Adaptation	Supporting Agricultural Productivity in Burundi (PAPAB)
worldwide	Adaptation	Water Grand Challenge: Securing Water for Food
worldwide	Adaptation	IFAD's Adaptation for Smallholder Agricultural Programme (ASAP)
Bangladesh	Adaptation	Urban Dredging Demonstration Project
Ghana	Mitigation and Adaptation	Ghana Climate Innovation Centre

Source: CTF Table 8

Table 6.3: Examples of activities providing support for technology development and transfer, 2015–2016

As we do not track technology development and transfer in our climate action, we provide an illustrative list of activities that were at the implementation phase in 2015–2016 (see also CTF Table 8).

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.

Dutch Disaster Risk Reduction Team – act. no. 25588
Climate change will increase water-related risks. As the Netherlands is renowned for its expertise in water management and risk prevention, we aim to make this knowledge available to other countries. This reason 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, preparedness and response to recovery. For instance, when a country has been struck by severe flooding and the first emergency relief workers have gone, 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, how to prevent disasters or how 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 fact is done by establishing economically sustainable energy solutions and distribution schemes, mainly for rural communities. More detailed information on the technological cooperation projects within EnDev is available on their website[102].

Energy Sector Management Assistance Program (ESMAP) – act. no. 29278
ESMAP supports, among other things, geothermal energy capacity and resource risk mitigation through south-south cooperation (support for targeted research, design and preparation, capacity development and knowledge dissemination). The Netherlands has specific expertise on how to improve the success rate of geothermal test drilling and how to mitigate geothermal resource risks. Through a trilateral approach, it will also build on the experience of countries which have a track record in geothermal development (Indonesia, Kenya, the Philippines and Turkey) and which are open to share lessons with peer countries in the south.

Integrated Seed Sector Development Programme in Ethiopia – act. no. 23448
The overall objective 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 Oromiya Seed Enterprise, and the Ethiopian Seed Growers and Processors Association. The programme builds the capacity of private entrepreneurs and farmer organisations (in terms of organisational, managerial, financial and technical skills) to maintain their own investments. It also strengthens the capacity of governments (at the regional and the W*oreda* level) and non-government organisations (universities, research centres) to support the seed sector.

Capacity-building for Scaling up 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 (research institutes, universities, extension services) to scale up best practices.

Integrated Seed Sector Development (ISSD) Programme and ISSD Plus Programme in Uganda – act. nos. 23617 and 29417
These projects aims to build the capacity of local seed groups to become businesses which 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-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 (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/farm management and cooperation between stakeholders at all levels. The project consortium includes four partners: IFDC, Alterra, Wageningen University, Oxfam Novib and ZOA. In addition, over ten local

[102] www.endev.info

organisations are involved (including Adisco, OAP, Consedi and Réseau Burundi 2000+) as well as Dutch organisations (HealthNetTPO, Soil Cares and Trimpact).

Water Grand Challenge: Securing Water for Food – act. no. 26393
Water scarcity is one of the main challenges which 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 with less water and/or make more water available for food production, processing and distribution in developing countries. Innovations involve a) water efficiency and reuse, b) water capture and storage, and c) salinity and water intrusion. The activity will catalyse new investments of businesses, governments at all levels, NGOs and others to address water scarcity in the food value chain by providing financial and technical support as well as innovation acceleration support.

IFAD's Adaptation for Smallholder Agriculture Programme (ASAP) – act. no. 24659
The Netherlands supports IFAD's Adaptation for Smallholder Agriculture Programme (ASAP), which supports smallholder farmers to access the information tools and technologies that help to build their resilience to climate change. This programme also contains capacity-building elements. It is operative in more than thirty developing countries to make rural development programmes more climate-resilient.

Urban Dredging Demonstration Project – act. no. 26397
This project aims to increase the knowledge and capacities (trained staff, 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. This fact will help to reduce the risk of increased floods as a result of climate change.

Ghana Climate Innovation Centre (GCIC) – act. no 26945
The GCIC, supported by infoDev/World Bank Group, 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 it also enables developing countries to realise greater value in the innovation value chain, build competitive sectors and create jobs.

Please note that Sustainable Water Fund I, the Dutch Disaster Risk Reduction Team, EnDev and ESMAP were also included in our Second Biennial Report. However, as these programmes continued during 2015–2016, we considered it appropriate to include them in this report as well.

Good examples of support for the development and enhancement of endogenous capacities and technologies are the Energising Development Partnership Programme (EnDev), the Integrated Seed Sector Development (ISSD) Programme in Ethiopia, the Integrated Seed Sector Development Programme and the ISSD Plus Programme in Uganda, and the Ghana Climate Innovation Centre (GCIC).

As technological development and transfer is a complex and long-term process, *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 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, and shape policies and the enabling environment for the commercial dissemination of solar home 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. The Netherlands invested in fast-start climate finance to fund further pilots on the ground in a large number of developing countries through the Daey Ouwens Fund and the EnDev programme, as well as via systematic efforts to strengthen the enabling environment through the Lighting Africa/Lighting Global programme. This combination of approaches has strongly contributed to a self-propelling commercial sector which has served more than 110 million people worldwide with off-grid lighting and rural electrification products, and 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 the village level 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 excluded the technology from subsequent subsidy calls of the Daey Ouwens Fund. Nowadays, the original interest from the broad range of stakeholders has largely disappeared and is looked back on as the "Jatropha hype".

6.6 Provision of capacity-building support

Capacity-building of local partners in developing countries forms an integral part of many activities that support climate change mitigation and/or adaptation. As we do not consistently track capacity-building for climate action, we provide an illustrative list of activities that were at the implementation phase in 2015–2016 (see CTF Table 9 for further details).

Climate and Development Knowledge Network (CDKN) – act. no. 21868
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 putting an emphasis on 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 in strengthening their capacities to reduce the impact of 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.

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,	Adaptation	Partners for Resilience (PFR)

Indonesia, Kenya, Mali, Philippines, South-Sudan, Uganda		
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)
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	African 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)
Mali	Adaptation	Professional Education in the Niger Basin (FIBANI)
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

Source: CTF Table 9

Table 6.4: Examples of activities providing capacity-building support

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.

African Biogas Partnership Programme (ABPP) – act. no. 26010
The African Biogas Partnership Programme (ABPP) builds the capacity of the biogas sector in five African countries: Ethiopia, Uganda, Burkina Faso, Kenya and the United Republic of Tanzania. These countries are assisted 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, e.g. in the design of interventions and in the formulation of new policies. In the Mekong Delta, for example, 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 to 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 among other things on capacity-building in transboundary institutions such as river basin authorities or on the nucleus of such organisations which riparians are in the process of establishing.

World Resources Institute (WRI) – act. no. 18813
The Dutch government supports WRI's work on international climate change issues. One of the aspects 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
This programme aims, among other things, to improve knowledge on available water resources as well as to promote sustainable water allocation and monitoring for various sectors (energy, drinking water, fisheries, livestock, irrigation, and so on), 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. nos. 27054 and 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.

Professional Education in the Niger Basin (FIBANI) in Mali – act. no. 24966
Through this programme, professional education centres for sustainable land and water management in the Niger Basin are strengthened with a view to increasing food security.

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 partnerships programmes. Climate change is an integral part of the programmes. The geographical focus is on the partner countries in Dutch development cooperation as well as on river basins in Africa and the Middle East.
In addition, the Netherlands 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 18-month Master of Science courses 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 the capacity for response preparedness of national Red Cross and Red Crescent societies in Mali, the Central African Republic, Lebanon and Zambia so they can

better respond to disasters, including climate-related disasters, e.g. 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 productivity at the farmers' level as well as market issues, while also tackling underlying systemic issues. Climate change adaptation and mitigation are cross-cutting concerns. Building the capacity of the Ministry of Agriculture and Natural Resources, the Ministry of Livestock and Fisheries as well as other key players is part of ATA's mandate.

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 the major cities of Mozambique (21 cities) as well as 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 modeling 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 both on a policy and on a practical level, while enhancing the capacity of the Palestinian academic institutions throughout the activities. Key challenges include increasing water productivity in the agricultural sector as well as improving river basin management and safe deltas, both of which promote an increasing resilience to climate change.

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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
HCFC23	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^oC)
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

ABBREVIATONS

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
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
BLOW	Intergovernmental Wind Energy Agreement
BOVAG	Bond Van Automobielhandelaren en Garagehouders
BPM	Belasting personenauto's en motorrijwielen 4.5.4
BR	Biennial Report

C

CASCAPE	Capacity-Building for Scaling-up evidence-based best Practices in Ehiopia
CAF	Corporación Andina de Fomento (Development Bank of Latin America)
CBS	Netherlands Statistics (Centraal Bureau voor de Statistiek)
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
COP23	23th Conference of Parties
CP	Conference of Parties
CRF	Common Reporting Format
CTF	Common Tabular Format

D

DAC	Development Assistance Committee
DEI	Demonstratie Regeling Energie Innovatie
DES	Data Exchange Standards
DRR	Disaster Risk Reduction

E

EC	European Commission/European Community
ECN	Netherlands Energy Research Centre (Energie Centrum Nederland)
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 Assesment)
EPBD	Energy Performance of Buildings Directive
EPK	Energie Prestatie Keurmerk (Periodical Energy Performance Assesment)
ER	Emissions Registration
ERU	Emission Reduction Unit
ESD	Effort Sharing Decision
ESMAP	Energy Sector Management Assistance Programme
ETFF	Energy Transition Financing Facility
ETS	Emission Trading Scheme
EU	European Union
EZK	Ministry of Economic Affairs and Climate Policy (Ministerie van Economische Zaken en Klimaat)

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	Dutch development bank

G

GAFSP	Global Agriculture and Food Security Program
GCF	Green Climate Fund
GCIC	Ghana Climate Innovation Centre
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
HNR	Het Nieuwe Rijden (Ecodriving)
HNT	Het Nieuwe Telen (The Next Generation Cultivation)

I

IFC	International Finance Corporation
IGG	Inclusive Green Growth Department, Ministry of Foreign Affairs of the Netherlands

I&M	Ministry of Infrastructure and the Environment (Ministerie van Infrastructuur en Milieu)
IMO	International Maritime Organisation
IPCC	Intergovernmental Panel on Climate Change
ISDE	Investment Subsidy Renewable Energy
ISSD	Integrated Seed Sector Development
ITL	Independent Transition Log
IVDM	Institute for Sustainable Mobility

J

JI	Joint Implementation

K

KP	Kyoto Protocol

L

LDC	Least Developed Countries
LEE	Long-Term Agreement on Energy Efficiency for ETS companies (= MEE)
LED	Light Emitting Diode
LEI	Agricultural Economics Institute (Landbouw Economisch Instituut)
LNG	Liquefied Natural Gas
LNV	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	Environmentally Friendly Electricity Production Programme
MEWAT	Taskforce on Wate
MIA	Milieu Investeringsaftrek
MIT	Medium Sized Enterprise in Topsectors
MMR	Monitoring Mechanism Regulation
MS	Member State (s)

N

NEa	Nederlands Emissie Autoriteit
NEF	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 Kyoto Protocol)
NIR	National Inventory Report

O

ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OOF	Other Official Flows

P

PAMs	Policies and measures
PAPAB	Supporting Agricultural Productivity in Burundi
PBL	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
REB	The Regulatory Energy Tax
RED	Renewable Energy Directive
RIVM	National Institute of Public Health and the Environment (Rijksinstituut voor Volksgezondheid en Milieu)
RMU	ReMoval Unit on the basis of land use, land-use change and forestry
ROB	Reduction Programme for non-CO_2 greenhouse gases (Reductieprogramma Overige Broeikasgassen)
RVO.nl	Rijksdienst voor Ondernemend Nederland (Netherlands Enterprise Agency)

S

SAFAL	Sustainable Agriculture, Food Security and Linkages in Bangladesh
SCF	Strategic Climate Fund
SDE+	Stimulation of Sustainable Energy Production (Stimulering Duurzame Energieproductie)
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	Arbitrary Depreciation of Environmental Investments
VROM	(Ministry of Housing, Spatial Planning and the Environment (Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer): In 2010 a merger took place with the Ministry of V&W. The new name is: Ministry of Infrastructure and the Environment (IenM)
VWS	Ministry of Health, Welfare and Sport

W

WAM	With Additional Measures
WASH	Water, Sanitation and Hygiene
WBSO	Wet Bevordering Speur en Ontwikkelingswerk
WDF	Women Delegates Fund
WEM	With Existing Measures
WESP	Task force on Consumers and other sources of emissions
WFP	World Food Programme
WKK	Warmte Kracht Koppeling (Combined Heat and Power, CHP)
WRI	World Resources Institute

Z

ZOA	International relief and recovery organisation based in the Netherlands

ANNEX 1 MODELLING SYSTEM FOR PROJECTIONS

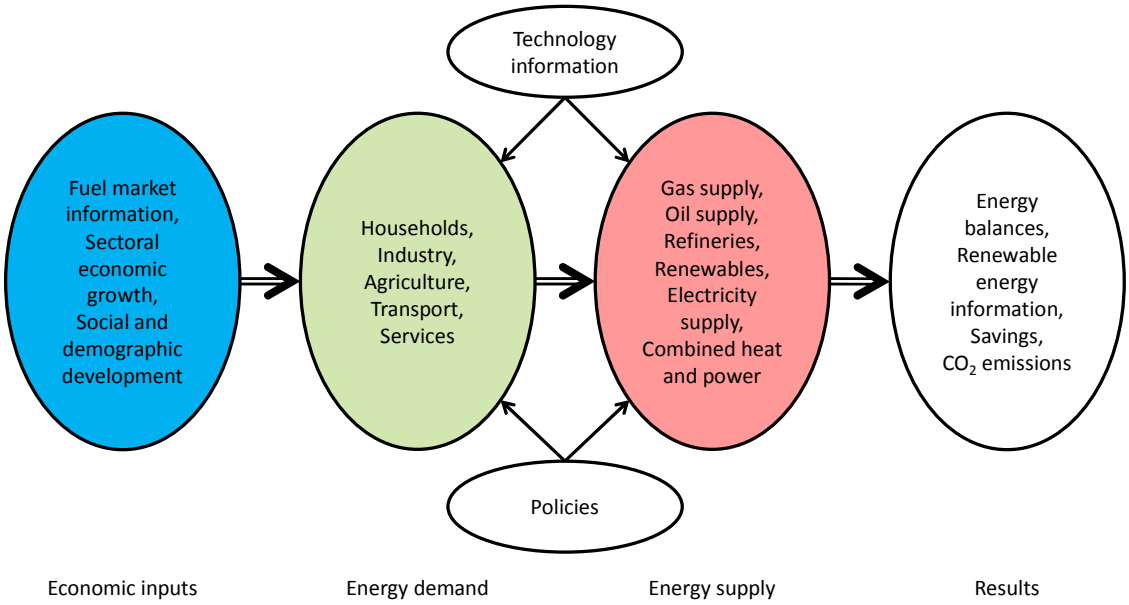
This annex briefly describes the modelling system for projections. In the Netherlands, a combination of modelling tools is used. The National Energy Outlook Modelling System (NEOMS) is the primary modelling suite, developed for over 20 years by Energy Research Centre of the Netherlands (ECN) and the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

National Energy Outlook Modelling System

NEOMS is a suite of models to simulate the various parts and sectors of the Dutch Energy System. Some constituent models have been developed in excel, some have been developed in AIMMS. Although the models differ in different ways, 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 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).

NEOMS enables 12 energy models of ECN to exchange data and produce consistent and detailed results.

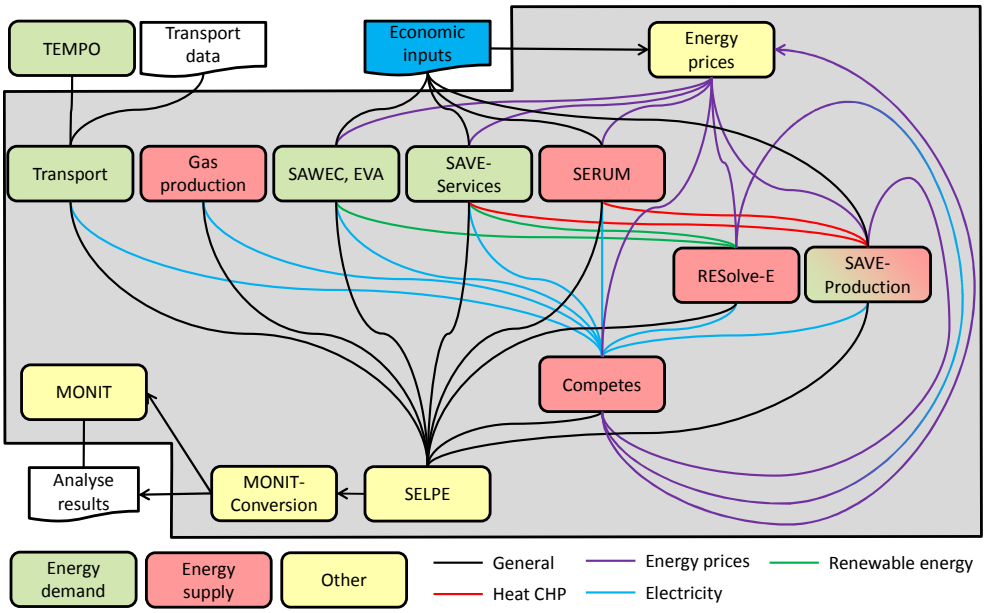


NEOMS enables ECN to calculate the energy use and the corresponding emissions for the Dutch energy system and for individual sectors. Detailed results include energy demand, supply, emissions, technology uptake, investments, costs, prices, policy impacts. The total system includes about 22 sub-sectors with all relevant technologies and fuels per sub-sector. Their CO_2 emissions are also calculated.

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 (TEMPO and/or external inputs).
- **Energy supply**
  - Combined heat and power (SAVE-Production),
  - Electricity supply (Competes),
  - Refineries and oil supply (SERUM),
  - Renewables (RESolve-E),
  - Gas supply (Gas 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 ECN model TEMPO and externally provided data 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 the centralised electricity production.
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 production (gas supply)
In this model, the supply of natural gas is calculated based on the availability of natural gas in the ‘Groningen’ gas field, and the other onshore as well as the offshore fields. Exogenous assumptions are made about the volume for gas storage and export. If demand exceeds this production, natural gas 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-Conversion (aggregation tool)
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.

MONIT (presentation tool)
This 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. Some of the results are also available on the Internet (http://monitweb.energie.nl/).

ANNEX 2 ENERGY BALANCES

Energy balance 2000 (including temperature correction based on degree days method)

Energy balance 2015 (including temperature correction based on degree days method)

Energy balance 2020 WEM

Energy balance 2020 WAM

Energy balance 2030 WEM

Energy balance 2030 WAM

Energy balance 2000 (including temperature correction based on degree days method)

(PJ)	Residential	Industry	of which chemical industry	Agriculture and horticulture (excl. mobile machines)	Commercial and public services	Water and waste sector	Transport (incl. mobile machines and fisheries)	Total final consumption	Refineries	Electricity production	Oil and gas extraction	Total energy sector	Total
Total	472	1193	771	163	264	51	518	2659	179	330	33	543	3202
Coal	0	93	8	0	0	0	0	93	0	232	0	232	325
Oil	3	455	420	2	9	0	512	981	155	34	0	189	1170
of which biofuel	0	0	0	0	0	0	0	0	0	0	0	0	0
Natural gas	379	414	227	133	149	3	0	1078	33	376	30	439	1517
Heat from nuclear energy	0	0	0	0	0	0	0	0	0	41	0	41	41
Electricity	72	126	33	12	94	-1	6	308	-1	-242	3	-240	68
Heat	8	95	80	15	12	-5	0	125	-8	-117	0	-125	0
Biomass (excl. biogas)	10	3	0	0	0	26	0	39	0	4	0	4	43
Biogas	0	1	0	0	1	3	0	4	0	1	0	1	5
Energy from other sources	0	5	4	0	0	26	0	31	0	0	0	0	32
Non-energy use	0	494	460	0	2	0	3	498					498
Coal	0	5	4	0	0	0	0	5					5
Oil	0	387	354	0	2	0	3	391					391
Natural gas	0	102	102	0	0	0	0	102					102
Final electricity consumption	72	147	44	15	97	7	6	344	9	18	3	30	374

source: NEV, 2017

Energy balance 2015 (including temperature correction based on degree days method)

(PJ)	Residential	Industry	of which chemical industry	Agriculture and horticulture (excl. mobile machines)	Commercial and public services	Water and waste sector	Transport (incl. mobile machines and fisheries)	Total final consumption	Refineries	Electricity production	Oil and gas extraction	Total energy sector	Total
Total	394	1153	818	140	262	65	493	2507	184	360	33	577	3085
Coal	0	99	0	0	0	0	0	99	0	362	0	362	461
Oil	2	549	536	1	-2	0	485	1035	121	21	0	141	1176
of which biofuel	0	0	0	0	0	0	13	13	0	0	0	0	13
Natural gas	289	315	180	128	127	3	2	863	54	250	26	329	1192
Heat from nuclear energy	0	0	0	0	0	0	0	0	0	39	0	39	39
Electricity	82	110	39	-3	120	-6	6	310	2	-258	7	-248	61
Heat	13	67	59	6	6	-21	0	71	1	-69	0	-68	4
Biomass (excl. biogas)	9	5	0	3	10	49	0	76	7	13	0	20	96
Biogas	0	2	0	5	0	5	0	13	0	1	0	1	14
Energy from other sources	0	5	4	0	0	35	0	40	0	1	0	1	41
Non-energy use	0	539	527	0	1	0	2	542					543
Coal	0	0	0	0	0	0	0	0					0
Oil	0	452	440	0	1	0	2	455					455
Natural gas	0	87	87	0	0	0	0	87					87
Final electricity consumption	82	124	45	31	121	8	6	372	9	20	7	36	408

source: NEV, 2017

Energy balance 2020 WEM

(PJ)	Residential	Industry	of which chemical industry	Agriculture and horticulture (excl. mobile machines)	Commercial and public services	Water and waste sector	Transport (incl. mobile machines and fisheries)	Total final consumption	Refineries	Electricity production	Oil and gas extraction	Total energy sector	Total
Total	370	1193	857	145	253	64	492	2517	186	249	42	477	2995
Coal	0	112	2	0	0	0	0	113	0	239	0	239	352
Oil	2	597	585	1	3	0	482	1085	108	0	0	108	1194
of which biofuel	0	0	0	0	0	0	35	35	0	0	0	0	35
Natural gas	253	277	159	113	118	3	2	767	58	168	36	262	1029
Heat from nuclear energy	0	0	0	0	0	0	0	0	0	43	0	43	43
Electricity	77	116	42	9	116	-6	8	321	8	-192	6	-178	143
Heat	19	74	66	11	14	-20	0	96	0	-75	0	-75	21
Biomass (excl. biogas)	19	13	2	4	2	45	0	83	0	66	0	66	148
Biogas	0	5	0	7	0	5	0	17	0	0	0	0	17
Energy from other sources	0	0	0	0	0	36	0	36	12	0	0	12	49
Non-energy use	0	565	563	0	0	0	2	567					567
Coal	0	2	1	0	0	0	0	2					2
Oil	0	474	473	0	0	0	2	476					476
Natural gas	0	89	89	0	0	0	0	89					89
Final electricity consumption	77	125	45	33	117	8	8	368	11	19	7	37	405

source: NEV, 2017

Energy balance 2020 WAM

(PJ)	Residential	Industry	of which chemical industry	Agriculture and horticulture (excl. mobile machines)	Commercial and public services	Water and waste sector	Transport (incl. mobile machines and fisheries)	Total final consumption	Refineries	Electricity production	Oil and gas extraction	Total energy sector	Total
Total	367	1186	850	145	249	63	492	2503	186	249	42	477	2981
Coal	0	114	2	0	0	0	0	114	0	240	0	240	354
Oil	2	597	585	1	3	0	482	1085	108	0	0	108	1194
of which biofuel	0	0	0	0	0	0	41	41	0	0	0	0	41
Natural gas	248	267	151	113	116	2	2	749	58	163	36	257	1006
Heat from nuclear energy	0	0	0	0	0	0	0	0	0	43	0	43	43
Electricity	78	115	42	9	114	-6	8	318	8	-190	6	-176	142
Heat	21	73	66	11	13	-20	0	98	0	-74	0	-74	24
Biomass (excl. biogas)	19	15	4	4	2	45	0	85	0	68	0	68	152
Biogas	0	5	0	7	0	5	0	18	0	0	0	0	18
Energy from other sources	0	0	0	0	0	36	0	36	12	0	0	12	49
Non-energy use	0	565	563	0	0	0	2	567					567
Coal	0	2	1	0	0	0	0	2					2
Oil	0	474	473	0	0	0	2	476					476
Natural gas	0	89	89	0	0	0	0	89					89
Final electricity consumption	78	123	44	33	115	8	8	366	11	19	7	37	402

source: NEV, 2017

Energy balance 2030 WEM

(PJ)	Residential	Industry	of which chemical industry	Agriculture and horticulture (excl. mobile machines)	Commercial and public services	Water and waste sector	Transport (incl. mobile machines and fisheries)	Total final consumption	Refineries	Electricity production	Oil and gas extraction	Total energy sector	Total
Total	354	1202	872	133	237	64	505	2496	170	207	24	401	2896
Coal	0	113	2	0	0	0	0	114	0	213	0	213	326
Oil	1	627	616	0	3	0	492	1125	105	0	0	105	1230
of which biofuel	0	0	0	0	0	0	35	35	0	0	0	0	35
Natural gas	226	288	179	74	98	2	5	692	45	71	21	137	830
Heat from nuclear energy	0	0	0	0	0	0	0	0	0	42	0	42	42
Electricity	82	119	42	19	115	-5	8	340	7	-134	3	-124	216
Heat	25	37	31	15	17	-20	0	75	0	-34	0	-34	41
Biomass (excl. biogas)	19	11	3	9	3	43	0	84	0	49	0	49	134
Biogas	0	6	0	16	0	7	0	28	0	0	0	0	28
Energy from other sources	0	0	0	0	0	37	0	37	13	0	0	13	50
Non-energy use	0	588	587	0	0	0	2	591					591
Coal	0	2	1	0	0	0	0	2					2
Oil	0	495	494	0	0	0	2	497					497
Natural gas	0	91	91	0	0	0	0	91					91
Final electricity consumption	82	122	43	34	115	9	8	371	11	21	3	35	406

source: NEV, 2017

Energy balance 2030 WAM

(PJ)	Residential	Industry	of which chemical industry	Agriculture and horticulture (excl. mobile machines)	Commercial and public services	Water and waste sector	Transport (incl. mobile machines and fisheries)	Total final consumption	Refineries	Electricity production	Oil and gas extraction	Total energy sector	Total
Total	342	1193	863	132	229	64	485	2445	170	191	24	385	2829
Coal	0	118	2	0	0	0	0	118	0	216	0	216	334
Oil	1	627	616	0	3	0	466	1099	105	0	0	105	1205
of which biofuel	0	0	0	0	0	0	33	33	0	0	0	0	33
Natural gas	215	280	170	73	90	2	5	665	45	70	21	136	801
Heat from nuclear energy	0	0	0	0	0	0	0	0	0	42	0	42	42
Electricity	76	117	39	20	113	-5	13	334	7	-123	3	-113	221
Heat	30	37	31	14	19	-20	-1	79	0	-35	0	-35	44
Biomass (excl. biogas)	19	11	6	10	3	43	0	87	0	22	0	22	108
Biogas	0	3	0	14	0	6	0	23	0	0	0	0	23
Energy from other sources	0	0	0	0	0	37	1	39	13	0	0	13	51
Non-energy use	0	588	587	0	0	0	2	591					591
Coal	0	2	1	0	0	0	0	2					2
Oil	0	495	494	0	0	0	2	497					497
Natural gas	0	91	91	0	0	0	0	91					91
Final electricity consumption	76	119	40	34	113	9	13	364	11	21	3	35	399

source: NEV, 2017

COLOFON / CREDITS

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