Sixth Netherlands National Communication under the United Nations Framework Convention on Climate Change

Ministry of Infrastructure and the Environment

CONTENTS

1 EXECUTIVE SUMMARY 4

2 NATIONAL CIRCUMSTANCES RELEVANT TO GREENHOUSE GAS EMISSIONS AND REMOVALS 13
2.1 Government structure 13
2.2 Population profile 14
2.3 Geographic profile 16
2.4 Climate profile 16
2.5 Economic profile 18
2.6 Energy profile 20
2.6.1 Energy consumption 20
2.6.2 Gas production 23
2.6.3 Refineries 26
2.6.4 Energy prices 26
2.7 Transportation 28
2.8 Industry 30
2.9 Waste 31
2.10 Building stock and urban structure 32
2.11 Agriculture 34
2.12 Forests 36

3 GREENHOUSE GAS INVENTORY INFORMATION 38
3.1 (A) Summary tables 38
3.2 (B) Descriptive summary 38
3.3 (C) Description of the national system 42
3.3.1 Scope and objectives of the National System 42
3.3.2 Institutional, legal and organisational aspects 43
3.4 (D) National Registry 53

4 POLICIES AND MEASURES 57
4.1 Introduction 57
4.2 (A) Policy-making process 57
4.2.1 The Netherlands' emission-reduction targets 57
4.2.2 National Climate Policy 58
4.2.3 Monitoring and evaluation of progress relating to climate change measures 58
4.3 (B) Domestic and regional programmes and/or legislative arrangements, as well as enforcement and administrative procedures 59
4.3.1 Arrangements and procedures: European policy context 59
4.3.2 Arrangements and procedures: national policy context 59
4.3.3 Provisions to make arrangements and procedures publicly accessible 60
4.3.4 Arrangements and procedures relating to participation in the mechanisms under Articles 6, 12, and 17 of the Kyoto Protocol 60
4.3.5 Arrangements and procedures related to implementation of Articles 3.3 and 3.4 of the Kyoto Protocol 61
4.4 (C) Policies and measures and their effects 62
4.4.1 Cross-Sectoral Policies 63
4.4.2 Energy 65
4.4.3 Industry 67
4.4.4 Transport 69
4.4.5 Agriculture 71

4.4.6 Forestry (CO_2) 73
4.4.7 Buildings Sector (households and services) 73
4.4.8 How policies and measures affect longer-term trends in greenhouse gas emissions 78
4.5 Policies and measures in accordance with Article 2 of the Kyoto Protocol 78
4.5.1 Promoting sustainable development 78
4.5.2 Steps relating to greenhouse gas emissions from aviation and marine bunker fuels 79
4.5.3 Minimising adverse effects 80
4.6 (D) Policies and measures no longer in place 82

5 PROJECTIONS AND THE TOTAL EFFECTS OF POLICIES AND MEASURES 83
5.1 Introduction 83
5.2 (A) Projections 83
5.2.1 Projections results 84
5.3 (B) Assessment of the aggregate effects of policies and measures 89
5.3.1 Effects on emissions of greenhousse gases 89
5.3.2 Sensitivity analysis and uncertainty 89
5.4 (C) Supplementarity relating to mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol. 90
5.5 (D) Description of methodology. 90
5.5.1 Models and methods used 90
5.5.2 Key variables and assumptions 92

6 VULNERABILITY ASSESSMENT, CLIMATE CHANGE IMPACTS, AND ADAPTATION MEASURES 93
6.1 (A) Expected impacts of climate change 95
6.1.1 Primary impacts of climate change and scenarios 95
6.1.2 Impacts on water safety (floods, droughts, fresh water) 97
6.1.3 Impacts on ecosystems and biodiversity 97
6.1.4 Impacts on agriculture 98
6.1.5 Impacts on recreation 99
6.1.6 Impacts on public health 100
6.1.7 Impacts on urban areas and housing 101
6.1.8 Impacts on energy, infrastructure, and transport 101
6.2 (B) Vulnerability assessment 103
6.3 (C) Adaptation measures 105
6.3.1 Adaptation for water safety (floods, droughts, fresh water) 106
6.3.2 Adaptation for nature and agriculture 108
6.3.3 Adaptation for public health, urban areas, and infrastructure 110

7 FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY 112
7.1 (A) Provision of new and additional financial resources 112
7.2 (B) Assistance to developing country parties that are particularly vulnerable to climate change 112
7.2.1 Mitigation 114
7.2.2 Adaptation 115
7.3 (C) Provision of financial resources, including financial resources under Article 11 of the Kyoto Protocol 117
7.3.1 Breakdown of climate-change-related expenditures 118
7.3.2 Breakdown of bilateral support on climate change 120
7.3.3 Financial resources, including under Article 11 of the Kyoto Protocol 122
7.4 (D) Activities relating to technology transfer 122
7.5 (E) Information under Article 10 of the Kyoto Protocol 130

8 RESEARCH AND SYSTEMATIC OBSERVATIONS 131
8.1 (A) General policy on research and systematic observation 131
8.2 (B) Research 131
8.2.1 Cooperation in European research ... 131
8.2.2 Cooperation beyond the European domain ... 132
8.2.3 National research programmes ... 132
8.3. (C) Systematic observations 135
8.3.1 Ground-based observations ... 135
8.3.2 Ocean-based observations, ARGOS ... 137
8.3.3 Satellite-based observations ... 137
8.3.4 Integration: GCOS ... 138

9 EDUCATION, TRAINING AND PUBLIC AWARENESS 139
9.1 General policy towards education, training, and public awareness 139
9.2 Primary, secondary, and higher education 140
9.3 Public information campaigns 141
9.3.1 Local Climate Agenda 2011- 2014 ... 141
9.3.2 Campaigns for the general public ... 142
9.4 Training programs, including exchange of personnel 144
9.5 Resource and information centres 145
9.6 Involvement and support of non-governmental organisations 146
9.7 New Delhi and Doha work programme on Article 6 of the UNFCCC 146

REFERENCES 148

GLOSSARY 155

ANNEX I SUMMARY TABLES ON EMISSION TRENDS 161

ANNEX II SUMMARY OF REPORTING OF THE SUPPLEMENTARY INFORMATION UNDER ARTICLE 7, PARAGRAPH 2, OF THE KYOTO PROTOCOL IN THE NC6 167

ANNEX CHAPTER 5 168

COLOFON / CREDITS 188

1 EXECUTIVE SUMMARY

Introduction

This report presents the Sixth National Communication from the Netherlands, as required under the Climate Change Convention as well as under the Kyoto Protocol. It describes the information required by the guidelines, including the supplementary information under Article 7.2 of the Kyoto Protocol. The report gives an overview of all required elements, but focuses in more detail on the developments since the Fifth National Communication. The Sixth National Communication has been written parallel to the First Biennial Report which is also required under the Climate Change Convention. Both reports provide a full coverage of all required information and therefore can be read independently of one another.

National Circumstances

The Netherlands is a constitutional monarchy. The legislative process is realised in a combined effort by the government and Parliament. The Ministry of Infrastructure and the Environment (I&M) is responsible for the environmental legislation and policy development. Other Ministries are responsible for integrating environmental policy targets and endorsing the environmental policies within their respective fields.

The Netherlands is a densely populated country. In 2012, the population amounted to 16.7 million people, with approximately 496 persons per km^2. A further important demographic factor influencing the pressure on the environment is a decrease in the number of persons per household to 2.2 in 2012.

The Netherlands is a low-lying country situated in the delta of the rivers Rhine, IJssel and Meuse, with around 24% of the land below sea level. The highest point is 321 metres above sea level, at the border with Belgium and Germany, and the lowest point is 7 metres below sea level. The surface area of the land, plus inland and coastal waters, amounts to 41,540 km^2. The land surface covers 33,718 km^2, of which 60% is used as agricultural land. While the use of land for agricultural is decreasing, land use for settlements and infrastructure is increasing, on the other hand. Forests make up roughly 10% of the land use.

The Netherlands is located in the so-called ’temperate zone’. The 30-year annual average temperature in the centre of the country is 10°C, while the mean annual average at 52^oN is close to 4°C. An increase of around one degree has been measured in the Netherlands over the last 100 years, with the three warmest summers of the last 300 years in 2006, 2007 and 2011.

The Gross Domestic Product (GDP) of the Netherlands, in 2011, was € 599 billion (using current prices). The Netherlands ranks relatively high on the list of agricultural exporters. Transportation has traditionally been an important activity due to the country’s favourable location for transporting goods from the harbours to the EU inland destinations. Rotterdam's ports are among the largest in the world. The ports function as a 'mainport' (hub) for transporting all kind of goods to many countries throughout Europe.

Agriculture in the Netherlands focuses on cattle breeding, crop production and horticulture; of which greenhouse horticulture is the most important subsector. The amount of horticulture in total agricultural production is increasing over time. The amount of fuel consumed by the greenhouse horticultural sector is comparable to fuel consumption in the commercial and public service sector (taking cogeneration into account).

Another characteristic of the Netherlands is the availability of large domestic reserves of natural gas; this is one of the factors contributing to a relatively large chemical industry (using natural gas as

chemical feedstock). The percentage of natural gas in the total end-use for energy was nearly 50% in 2002, which is extremely high. The share of renewable energy in total Dutch energy consumption has increased from 1.1 % in 2001 to 4.4 percent in 2012.

Greenhouse gas inventory information

In the Netherlands, the total direct greenhouse gas emissions (excluding emissions from Land Use, Land Use Change and Forestry, LULUCF) are estimated to be 194.4 Tg CO_2 eq in 2011. This is 8.8% lower than the 213.2 Tg CO_2 eq reported in the base year (1990; 1995 is the base year for fluorinated gases). Figure 1.1 shows the trends and relative contributions of the various gases to the aggregated national greenhouse gas emissions. Over the 1990-2011 period, emissions of carbon dioxide (CO_2) increased by 5.3% (excluding LULUCF), while emissions of non-CO_2 greenhouse gases decreased by 50% versus base year emissions. Of the non-CO_2 greenhouse gases, methane (CH_4), nitrous oxide (N_2O) and fluorinated gases (F-gases) decreased by 41%, 54% and 70% respectively.

In 2011, total greenhouse gas emissions (including LULUCF) decreased by 14.5 Tg CO_2 eq versus 2010 (197.7 Tg CO_2 eq in 2011).

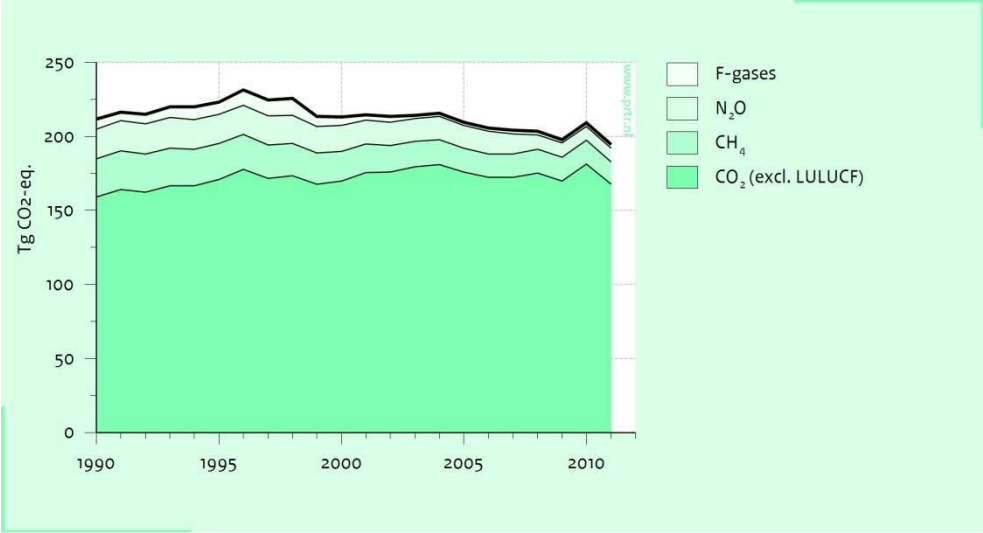

Figure 1.1 Greenhouse gases: trends and emission levels, 1990-2011

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 Infrastructure and the Environment (I&M) is the coordinating Ministry in the Netherlands for Climate Change Policy. NL Agency 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 National Emissions Authority (NEa)

Policies and measures

The Netherlands ratified the Kyoto Protocol on 31st May 2002. At the time of signing of the Protocol, the EU agreed upon a greenhouse gas reduction percentage of 8% for the Union as a whole. This common target was subsequently divided amongst the EU Member States in the so-called 'Burden Sharing Agreement'. For the Netherlands, this resulted in an emission reduction target of 6% below the emissions level in the base year, for the 2008-2012 period. For emissions of CO_2, CH_4 and N_2O, the base year is 1990, and for the F-gases it is 1995.

The above-mentioned Kyoto target for 2008-2012 was translated into an assigned volume of 1001 Mt over these 5 years. This meant that during this period, emissions should not exceed approximately 200 Mt of CO_2 equivalent per year. Of the assigned amount, 437 Mt has been transferred to Dutch companies participating in the EU Emissions Trading Scheme (ETS), either through auctioning (16 Mt) or through allocation (421 Mt). The companies must compensate excess emissions by purchasing foreign emissions credits. The remaining 564 Mt of CO_2 equivalent is available for the sectors that do not participate in the ETS (such as consumers, agriculture, transport and services). Here, the government needs to compensate excess emissions by purchasing foreign emission credits. With emissions of approximately 594 Mt, the Netherlands will use around 30 Mt of credits in order to comply with its Kyoto target.

The Ministry of Infrastructure and the Environment is the Designated National Authority (DNA) for the Clean Development Mechanism (CDM) and the National Focal Point for Joint Implementation (JI) in the Netherlands. NLAgency has been assigned to undertake public procurements of emission rights under CDM en JI. Voluntary Memoranda of Understanding (MoUs) have been signed with a number of countries for the implementation of CDM and JI projects. The Netherlands has now acquired sufficient credits to comply with the Kyoto target.

Most policies and measures described in the Netherlands' 5th National Communication (NC5) have been continued and therefore reappear in this 6th National Communication. Building upon current measures and the 'Climate Letter 2050' (2011), which sketched the long-term perspective of a (virtually) climate neutral country by 2050, the government published a Climate Agenda in which it announces new goals and measures, in October 2013. The lion's share of these measures results from the SER "Energy Agreement towards Sustainable Growth", in which more than forty parties (including central, regional and local government, employers and unions, nature conservation and environmental organisations, plus other civil society organisations and financial institutions) agreed on a package of additional measures related (mainly) to the built environment, energy and transport. The implementation of these provisions is intended to result in an affordable and clean energy supply, jobs, and opportunities for the Netherlands in the market for clean technologies. As part of the agreement, parties agreed to install a Committee that monitors the progress in light of the 2020 and longer term goals.

The approximately 375,000 hectares of forest in the Netherlands are managed according to the principles of Sustainable Forest Management (SFM), which also apply to newly planted forests.

Sustainable development is one of the priorities for the Dutch government. The "Green Growth: for a strong, sustainable economy" policy letter, submitted to parliament by the Dutch government in March 2013, contains the outline of the Dutch Sustainability policy. The government aims to strengthen the competitiveness of the Netherlands while reducing the burden on the environment and the dependence on fossil fuels. Green growth is one of the priority themes for the Dutch Government. Combining the innovative strength of industries, knowledge institutes and government is essential to achieve this ambition.

The Netherlands supports a second commitment period of the Kyoto protocol, contributes to the development of the Green Climate Fund, and is committed to providing climate finance to

support developing countries in their mitigation and adaptation activities. The Netherlands provided its pledged € 300 million in Fast Start Finance over the period 2010-2012.
.

Projections and the total effects of policies and measures

The previous 5th National Communication described the projections made in 2010, also known as the 'Referentieraming', (Reference projection). Due to changes in prices, policies and other relevant developments, this projection was updated in 2012 and became the "Geactualiseerde Referentieraming". These projections are used for the overview presented in chapter 5.

The scenarios underlying the emission projections in the 2012 Reference projection have incorporated new insights with regard to economic and demographic developments, sector developments, fossil fuel prices, the CO2 price and policies when compared with the Reference projection of 2010. Recent statistics were also taken into account. The base year for the model is 2010, as against 2007 for the previous projection. Whereas 2010 emission levels were a projection result in the previous projection, 2010 emission levels now reflect statistics for historical emission levels. The 2012 projection exercise visualises emission levels for greenhouse gases and air pollutants for 2020 and 2030 (similar to the previous projection).

Figure 1.2

Emission of greenhouse gases per gas

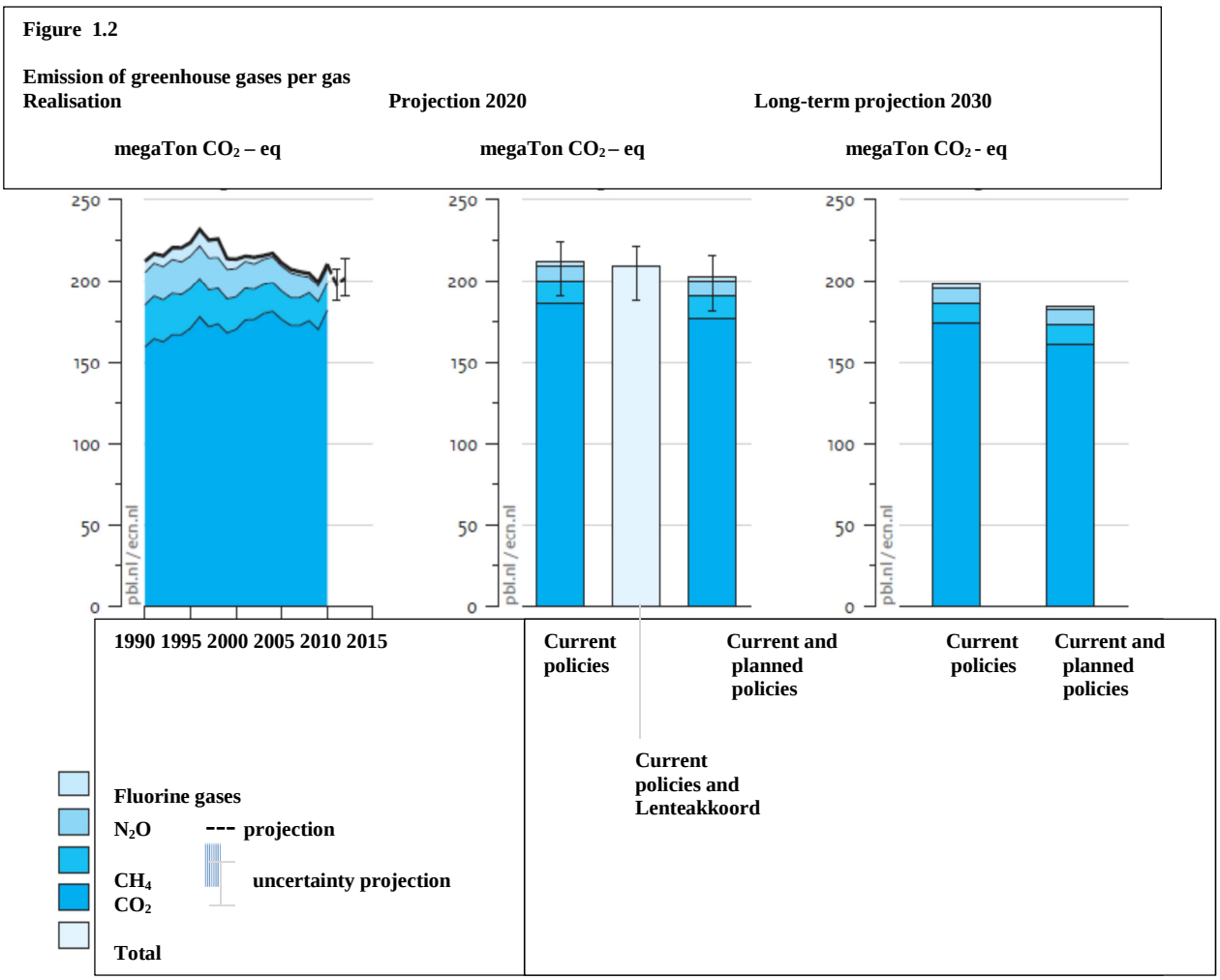

Figure 1.2 Historic and projected emissions of Greenhouse gasses

Three policy scenarios were included in the 2012 projection:

- Current policies, that had already been decided upon by February 2012;
- Current and planned policies, also including policies planned up to February 2012;
- Current policies including Lenteakkoord (spring agreement), which includes the same adopted policies as the other scenarios plus the policies agreed upon in the Dutch Parliament in spring 2012.

The 2012 projection did not include a policy scenario 'without measures'. The effects of the SER Energy agreement (2013) have been evaluated by PBL and ECN but are not taken into account in the results presented here, since the documentation for the updated projections was unavailable for this report. The results of the 2012 projection can be viewed in table 5.1.

Vulnerability assessment, climate change impact and adaptation measures

The climate in the Netherlands is expected to undergo significant changes over the coming decades. The most pressing consequences are warmer and wetter winters, drier and hotter summers, more extreme river discharge, changes in biodiversity, and a rising sea level. At the same time, the Netherlands is subsiding. These conditions, in a country such as the Netherlands – dominated by the sea and situated in a low-lying delta area, with four large rivers and with a high population density– give rise to climate change impacts which require risk assessments, and decisions on timely and smart interventions.

NC5 introduced the "National Programme for Spatial Adaptation to Climate Change" (ARK), which was implemented after a motion in Parliament in 2005 and resulted in the National Adaptation Strategy (NAS) "Make Space for Climate". Following the NAS, the government reformulated priorities for climate change adaptation in the Netherlands. Water management was the first priority to be re-evaluated in the light of long-term sustainable development and climate change. On the basis of the advice of the Delta Committee in 2008, an integral policy programme (Delta Programme) was initiated. Its objective is to protect the Netherlands from (coastal and river) flooding, to realise climate-resilient urban areas and to ensure adequate supplies of fresh water for present and future generations .

In 2012, a report by the Dutch Court of Audit concluded that, with due respect to the comprehensive approach in the Delta Programme, not all possible climate risks were covered. Around the same time, the European Commission developed its EU Climate Adaptation Strategy, which advocated the drafting of national adaptation strategies by all EU member states, among other things. These notions, combined with the urge to reformulate climate mitigation policy, resulted in the decision by the new government of that time, to draw up a comprehensive integral climate change policy agenda. This Climate Agenda was discussed in Parliament in October 2013 and covers both adaptation and mitigation. The Climate Agenda announces the intention to formulate a comprehensive National Adaptation Strategy, to be presented in Parliament by 2016 at the latest. It will be based on the most recent insights into climate change, risks, and vulnerability, among other things, and goes beyond the water-related approach of the Delta Programme.

Vulnerability assessments are generally realised through European research projects and national studies (see also Chapter 8). The most important and recent national efforts include the Delta Programme 2014 and the Netherlands Environmental Assessment Agency advice. Vulnerability assessments have largely focussed on water, agriculture and - to a lesser extent - urban planning and nature conservation. Recent studies called for a more comprehensive vulnerability assessment of: energy, infrastructure and transport, ICT, health and nature.

Financial resources and transfer of technology

Despite the economic crisis, the Netherlands maintained its ODA spending on average 0.7 % above GDP in 2010 – 2012. During the period under review, climate finance has generally been additional to the 0.7 % ODA spending for the MDG's.
The Netherlands committed € 300 million as its contribution towards Fast Start Finance in 2010 - 2012. This pledge was fulfilled at the end of 2012 and consists exclusively of mitigation and adaptation projects that have been allocated the OECD Rio marker 'principal'. Aside from efforts in terms of Fast Start Finance, the number of sector programmes in the Netherlands' development cooperation which are relevant for climate (Rio marker 'significant') also increased.

During 2009-2012, a total of 242 projects were supported, 93 of which were worldwide projects (incl. Caucasus), 19 of which were regional Africa projects, and 3 of which were regional projects in both Asia and Latin America. The remaining 127 were bilateral projects. Direct bilateral support for climate change actions was provided to 29 countries in various regions. This is presented in the pie charts below. Support for 'worldwide' projects also entails support through non-governmental organisations, public-private partnerships, and programmes with research institutes and multilateral organisations.

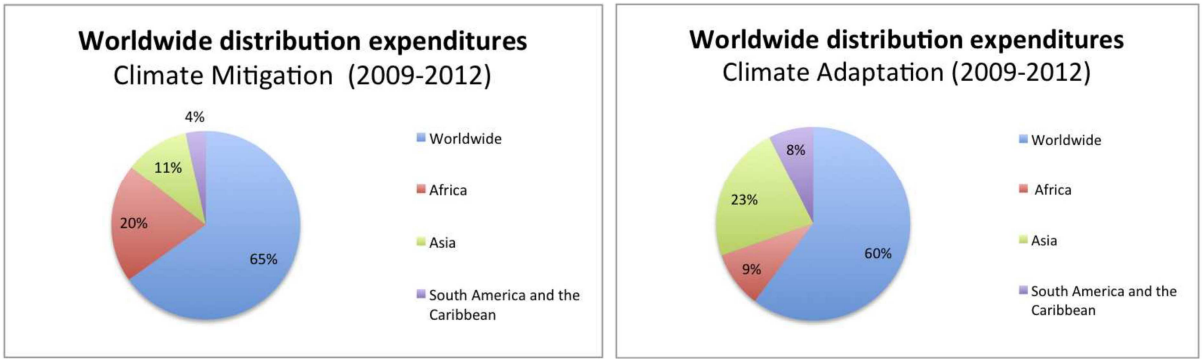

Figure 1.3 Support provided to climate change adaptation and mitigation, worldwide and per continent

The majority of mitigation expenditures (€261 million) relate to the energy sector (see table 7.4) as part of the Dutch renewable energy program. In addition, The Netherlands supports various civil society programmes that have activities in the sectors agriculture, rural development, forestry and environment. In its renewable energy programme (PREP), the Dutch government has opted to work through existing, proven channels. The bulk of the funds is channeled through bilateral projects and programmes executed by multilateral agencies ('worldwide' and 'regional'). The renewable energy programme also works with the private sector.
The Netherlands contributes to a variety of multilateral and intergovernmental institutions – including the Global Environment Facility – that assist developing countries. Between 2009 and 2012, the Global Environment Facility (GEF) received, on average, € 26.6 million (ODA and non-ODA) per year, 32% of which is dedicated to climate change (i.e.an average of € 8.5 million).

The Netherlands promotes the transfer of technology via various channels, e.g. through:
- EU programmes and mechanisms;
- participation in IEA programmes;
- bilateral or multilateral programmes and schemes.

These include regional cooperation, cooperation with developing countries and promotion of private sector involvement. Examples include involvement in the ETS, linked to the CDM/JI markets, the EU's Environmental Technologies Action Plan (ETAP) and the Global Energy Efficiency and Renewable Energy Fund (GEEREF).

Dutch support in relation to the transfer of technology is mostly provided in the form of support programmes relating to the private sector (encompassing hard and soft technologies). As of 2009, the

programme is called PSI (Private Sector Investment Programme), supporting innovative investment projects in emerging markets in Africa, Asia, Central and Eastern Europe and Latin America. A PSI project is an investment project, implemented by a Dutch (or foreign) company together with a local company, in one of the eligible developing countries. If this investment meets the criteria, it can be eligible for a PSI grant, which consists of a financial contribution to the costs of the investment.

The information on activities, actions and programmes undertaken to meet commitments under Article 10 is described in various parts of this National Communication (see also section 7.5 for an overview).

Research and systematic observation

The Netherlands' research on climate change covers the themes of climate system, impact and policy support and implementation studies. It is characterised by intensive participation in international and European programmes and clustering into a large national research programme of Knowledge for Climate.
Research activities are well embedded in, acknowledged by and co-steered within three large international scientific programmes in the field of global change research: the International Geosphere Biosphere Programme (IGBP), the World Climate Research Programme (WCRP) and the International Human Dimensions Project (IHDP). Extensive support is also given to the work of the Intergovernmental Panel on Climate Change (IPCC). Many of the leading Dutch institutions participate in research projects under the EU's 7th Framework Programmes for Research and Innovation (FP). The synergy and cooperation between European projects and the national research programmes reinforce the crucial international dimension of Dutch research activities

The national research activities in the Netherlands are clustered into research programmes through NWO (Netherlands organisation for scientific research), research programmes for national adaptation / mitigation, and programmes supported by various ministries, which include:

- National Research Programmes under the Water and Climate and the Sustainable Earth themes of NWO, National Research Programmes on climate issues, such as 'Knowledge for Climate' (KvK) and the Delta Programme.
- More specific R&D programmes of the various ministries, in areas closely related to climate change and variability (e.g. water), or mitigation (also on non-CO_2 greenhouse gases). An example is :Energy Transition, an interdepartmental programme of four ministries: Economic Affairs, Infrastructure and Environment, Foreign Affairs and Finance, which aims at a sustainable energy economy.

Cooperation is not only assured through clustering nationally and internationally, but also the national research programmes actively seek private sector participation, and facilitate the dialogue between stakeholders from scientific, policy and private sectors. To overcome barriers to exchanging data and information, the national research programmes closely coordinate their communication and research activities.

Results from the international, European and national research programmes are made available to the international community through reports, publications and the Internet. These results can often be obtained free of charge or at low cost.

With regard to systematic observation, the Netherlands actively participates in the various fields of climate-related monitoring, both nationally and within European and global programmes. An integrated national programme for implementing the Netherlands' contribution to GCOS has not yet been established. However, steps are being taken to develop and implement such a strategy: the Netherlands intends to organise a national conference in 2014 to coordinate a strategy to bundle all climate observations made by Dutch Institutes. The summary of this initiative will crystallise into a roadmap for implementing a GCOS contribution.

Monitoring activities on systematic observation and GCOS (Global Climate Observation System) in the Netherlands are firmly embedded in international programmes such as Framework programmes (at the European level) and GEOSS (Global Earth Observation System of Systems), at the global level. We also see international cooperation at project level.

Education, training and public awareness

The interdepartmental Dutch climate change programme has set ambitious targets. Communication is crucial in achieving changes. The general communication approach includes various steps:

- inform and raise awareness among the relevant target groups
- offer specific options for action, relevant and suitable for the target groups
- provide inspiring examples
- demonstrate the exemplary function of the government.

Within the Netherlands, surveys are frequently carried out into the awareness, knowledge, attitude and behaviour (practice) of the general public, for the Ministry of Infrastructure and the Environment (I&M) (or other parties). Most of these surveys show a significant awareness of climate change. These types of surveys do form a basis for learning and adopting a better understanding of the specific information needs, and of the national communication approach to climate change issues. I&M and the other ministries involved in climate policy regularly organise public information campaigns on climate change. The government also publishes extensive information on climate change policies and plans on various websites. Since the end of 2008, I&M also maintains a special website for the climate change-related campaign in cooperation with MilieuCentraal.

Public access to environmental information that is available from the government, including data on greenhouse gas emissions and energy use, has been further strengthened as a result of the Treaty of Aarhus being implemented into Dutch law.

Education and training are aspects of the work carried out by the intermediary organisations NL Agency (AgentschapNL) and MilieuCentraal. For example, the Dutch Programme 'Learning for Sustainable Development' and its successor ‘Duurzaam Door’ stimulate learning processes for sustainable development. Sustainable energy is one of the leading topics. The target group includes both youngsters and adults. Various Dutch universities and institutes offer training and other professional education programmes for domestic and foreign students and professionals in climate change, mitigation and adaptation related topics.

The ministries involved in climate policy also commission intermediary organisations to implement certain resource and information centre type tasks. To improve efficiency and prevent overlap, several of these organisations merged into two new organisations in 2005: NLAgency, focusing on professional parties, such as industry, local governments and companies, and MilieuCentraal, concentrating on consumers. They both operate extensive resources websites.

The Local Climate Agenda is a joint initiative bringing together representatives of local authorities and central government. The Ministry of Infrastructure and the Environment coordinated the activities to establish the Agenda in 2011, together with nine climate ambassadors (representing the municipal, provincial and water authorities) and their working groups. Over 135 local and regional governments have signed up to the agenda. Local authorities that join the Local Climate Agenda obtain access to the network and its knowledge infrastructure while promising to promote sustainable initiatives as well as inspire and connect societal actors. The changing role of the government from initiator to facilitator of local initiatives is a key building block of the agenda. Local climate policy covers a broad front: the built environment, sustainable mobility, corporate responsibility, renewable energy and climate-neutral towns and regions.

NGOs also play an important role in education, training and public awareness. In a large campaign known as HIER, 40 organisations (mostly NGOs such as WWF/ WNF, Red Cross, Oxfam Novib) work together to counter the negative effects of climate change through activities such as coordinated consumer campaigns, raising awareness, joint communication efforts and political lobbying. Through another campaign, “The Netherlands lives with water” 2003-2011, the Dutch have become more aware of the risks of coastal and river flooding. From 2011 onwards, communications to the general public have focused on various water projects in relation to climate change.

With the activities and efforts in the field of education, training and public awareness, the Netherlands also implements the (amended) New Delhi work programme. The activities also include special activities for young people, as well as regional cooperation actions and activities aimed at international education, training and capacity building.

2 NATIONAL CIRCUMSTANCES RELEVANT TO GREENHOUSE GAS EMISSIONS AND REMOVALS

2.1 Government structure

The Kingdom of The Netherlands compromises four countries: The Netherlands, Aruba, Curacao, and Saint Maarten. Since 10 October 2010 the islands of Bonaire, Saba and Saint Eustatius have been special municipalities (see figure 2.1). Reporting under the UNFCCC (Convention and KP) is restricted to the European part of the Kingdom, hereafter referred to as The Netherlands.

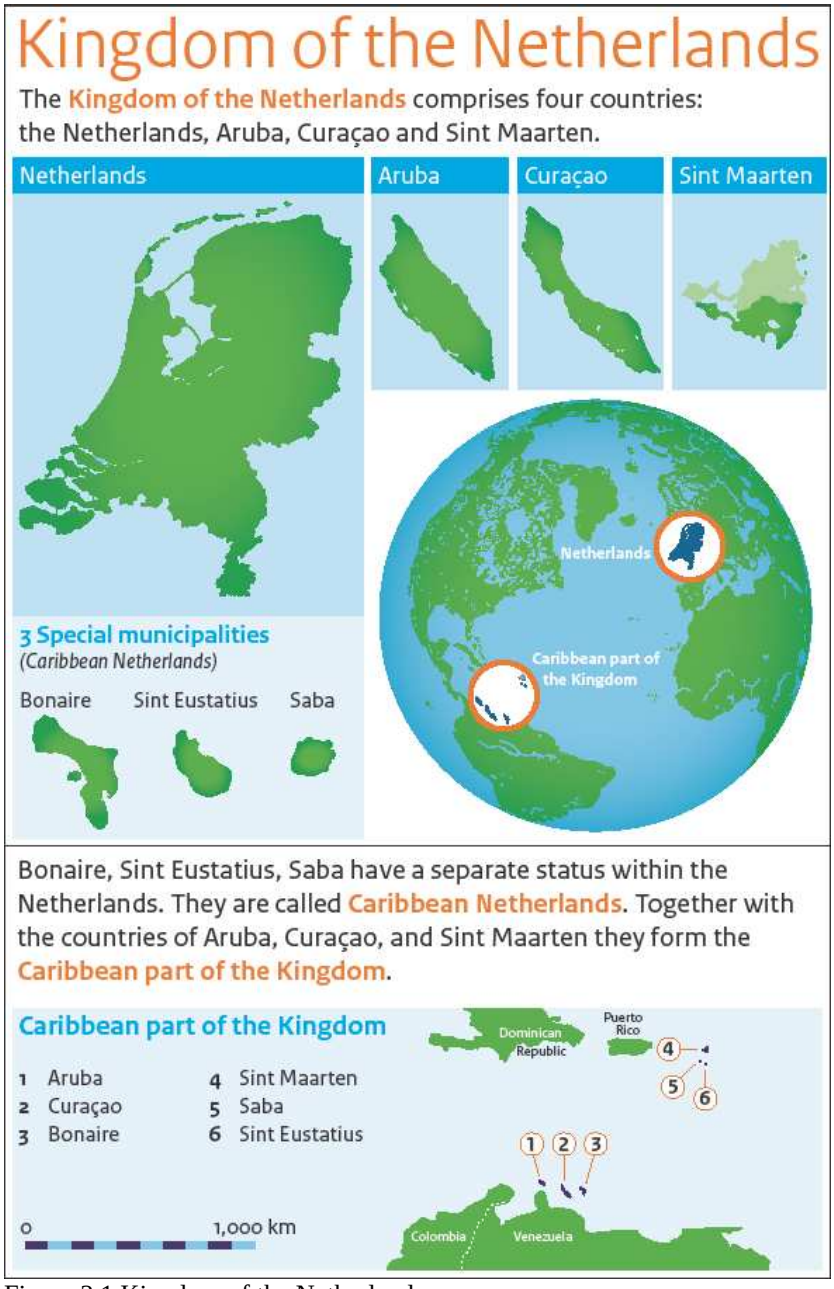

Figure 2.1 Kingdom of the Netherlands

The Netherlands is a constitutional monarchy. The legislative powers are vested in the national government, the 12 provinces and (as of 01-01-2013) the 408 municipalities (VNG, 2013). The Netherlands Parliament consists of a First Chamber (75 members, elected by the provinces) and a Second Chamber (150 members, elected directly by the citizens).

The legislative process is realised in a combined effort by the government and Parliament. Bills, draft Decrees and draft Orders in Council are first submitted to the Council of State. Legislation comes into force when published in the Bulletin of Acts ('Het Staatsblad') or the Government Gazette ('Staatscourant'). Policies can also be formulated in memoranda to Parliament. Commitments in these documents are politically binding and can be elaborated by legislation, e.g. a Decree or Order in Council or other binding agreements such as Long-Term Agreements. The regional governments, for example, are responsible for granting environmental licences and permits.

With the arrival of a new coalition government in 2010 a reorganisation of the Dutch government structure has been implemented. The Ministry of Transport, Public Works and Water Management and the Ministry of Housing, Spatial Planning and the Environment have merged into the new Ministry of Infrastructure and the Environment. Responsibility for housing policy, including energy saving from buildings, has shifted to The Ministry of the Interior and Kingdom Relations. The Ministry of Agriculture, Nature and Food Quality has become part of the Ministry of Economic Affairs, which is also responsible for energy policy.

The Ministry for Infrastructure and the Environment (known as the Ministry I&M) is responsible for environmental legislation and policy development. Other ministries are responsible for integrating environmental policy targets and endorsing the environmental policies within their respective fields. Many parties are involved in the policy-making process, e.g. economic sectors, consumers, advisory councils, research institutes, environmental protection organisations, and various trade unions and federations. The formulation and implementation of policy is usually carried out in collaboration or consultation with relevant 'target groups'. Good communication between government and market parties is given high priority. Environmental protection organisations also play an important role in the Netherlands, e.g. through participation in advisory councils.

2.2 Population profile

The period 1990-2012 saw a population increase in the Netherlands from 14.9 million to around 16.7 million inhabitants (Table 2.1). Annual growth fluctuates, but since 2000 it has been falling rapidly: growth was 0.8% in 1980, 1990 and 2000 but, since then, it has reduced to 0.5%, with the lowest value of 0.15% in 2006. For the coming years, a decrease in growth is expected; population growth could even go down to zero by 2040 (Figure 2.2).

Subjects		Periods	1950	1960	1970	1980	1990	2000	2010	2011	2012
Population by sex	Total population	*number*	10 026 773	11 417 254	12 957 621	14 091 014	14 892 574	15 863 950	16 574 989	16 655 799	16 730 348
Private households	Total private households	*x 1,000*	2 535	3 171	3 986	5 006	6 061	6 801	7 386	7 444	7 513
	One-person households		245	387	679	1 085	1 813	2 272	2 670	2 708	2 762
	Average household size	*number*	3.93	3.56	3.21	2.78	2.42	2.30	2.22	2.21	2.20
Population growth	Total population growth		173 507	138 754	161 809	117 572	117 871	123 125	80 810	74 549	47 677
	Total population growth, rate	*o/oo*	17.3	12.2	12.5	8.3	7.9	7.8	4.9	4.5	2.8
Population density		*number*	309	352	384	415	439	468	491	494	496

© Statistics Netherlands, Den Haag/Heerlen 11-11-2013

Table 2.1 Population key figures [1]

[1] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=37296ENG&D1=0,52-53,55,57-58,68&D2=0,10,20,30,40,50,60-62&LA=EN&HDR=G1&STB=T&VW=T

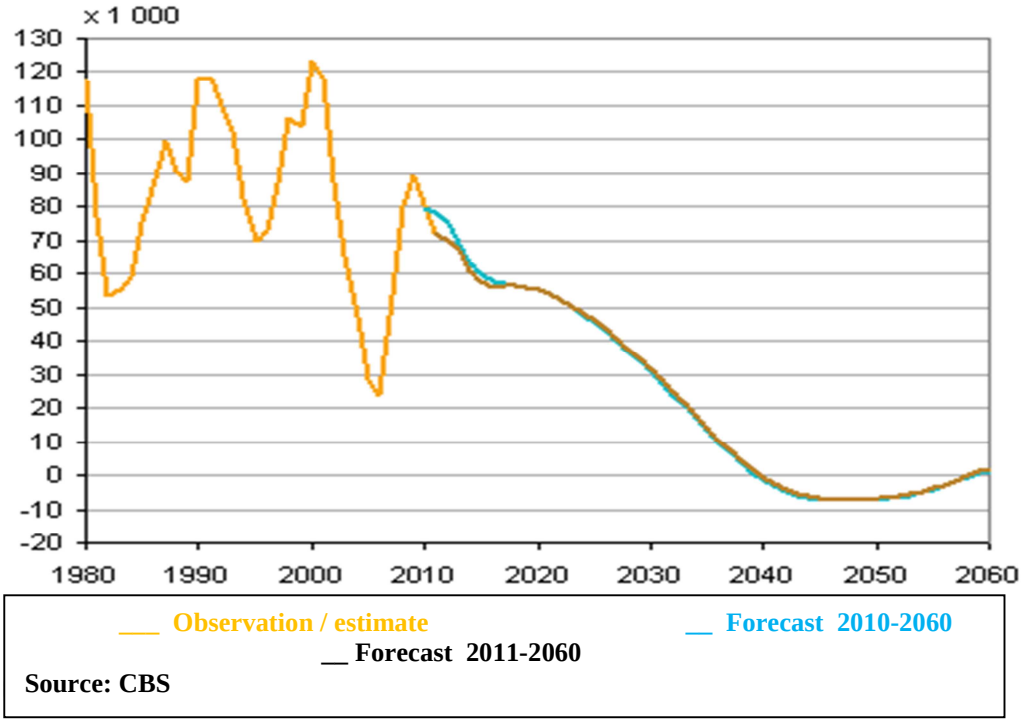

Figure 2.2 Population growth and forecast 1980-2060; CBS 2013

The Netherlands is a densely populated country. The population density increased between 1990 and 2012 from 439 to 496 persons per km^2. A further important demographic factor influencing the pressure on the environment is a decrease in the number of persons per household (from 2.5 in 1990, via 2.3 in 2000, to 2.2 in 2012). The number of households increased from 6.2 million in 1990 to 7.5 million in 2012, while the percentage of single-person households increased from 30% to 37% (CBS, 2013).[1] A consequence of this development is the need for more housing, and an increasing claim on land for new dwellings and infrastructure.

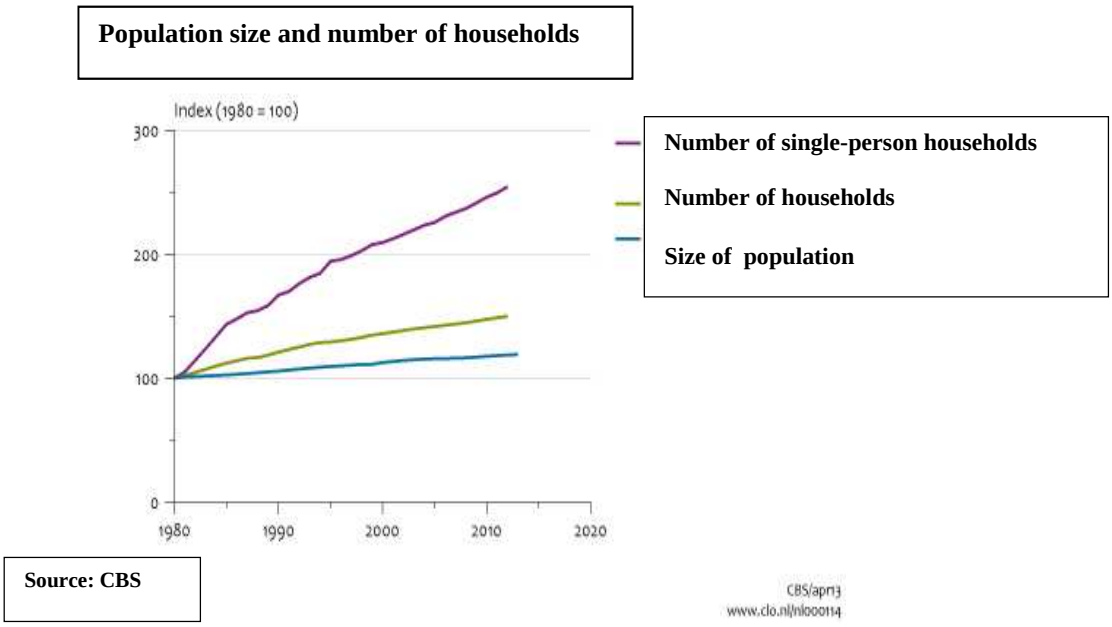

Figure 2.3 Population development 2010 and 2011, observation and forecast CBS 2013

2.3 Geographic profile

The Netherlands is a low-lying country situated in the delta of the rivers Rhine, IJssel and Meuse, with around 24% of the land being below sea level. The soils consist of fluvial and tidal deposits, partially covered by peat. After the ice age, this Holocene peat was formed behind the coastal dunes in the western part of the Netherlands, where polders have been created with controlled water levels. The eastern part of the Netherlands includes Pleistocene ice-pushed ridges covered with wind-borne sand deposits. The southern part consists mainly of Meuse terraces with loess deposits or wind-borne sand deposits. The highest point is 321 metres above sea level, at the border with Belgium and Germany, and the lowest point is 7 metres below sea level. The surface area of the land, plus inland and coastal waters, amounted to 41,540 km^2 on 1 January 2012. The land surface covers 33,718 km^2.
Although agricultural land is decreasing, it is still the main land use; agricultural land is about 60% (grassland is around 1.4-1.5 million ha and cropland 0.9-1.0 million ha). Forest land is almost 0.4 million ha and wetland around 0.8 million ha. The land use settlement increases over time: in 1990 settlement was 0.4 million ha and in 2009 0.6 million ha. The population density is highest in the 'Randstad' (a cluster of cities in the western part of the country consisting of Amsterdam, Rotterdam, The Hague and Utrecht, and the towns in between).

Figure 2.4 Key elements of the Netherlands' geographic profile

2.4 Climate profile

The Netherlands is located in a so-called 'temperate zone'. Due to strong maritime influences the climate is much milder than average conditions at the same latitude. The 30-year annual average temperature in the centre of the country is 10.0°C, while the mean annual average at 52°N is close to 4°C. Apart from this larger scale maritime, or rather oceanic effect, there is also a minor effect caused by the bordering North Sea. This results in marked gradients in most climatological elements within the first few dozen kilometres from the coast. Inland gradients are generally small. Table 2.2 compares some climatological characteristics of the coastal and inland climate of the Netherlands.

	De Kooy (coastal station)	Twente Airbase (inland)
Mean temperature (°C)		
- January / July	3.5 / 17.4	2.3 / 17.6
Mean daily temperature amplitude (°C)		
- January / July	4.3 / 6.5	5.3 / 10.8
Mean relative humidity (%)		
- January / July	88 / 80	88 / 76
Mean annual duration of sunshine (hr)	1,751	1,547
Mean annual wind speed at 10m h (m/s)	6	4
Mean precipitation (mm)		
- Annual	771	785
- Driest/wettest month	34 / 96	45 / 75

Table 2.2 Some climatological characteristics for De Kooy (coastal station) and Twente Air Base (around 150 km from the coast), based on observations for the period 1981-2010. Source: KNMI

Throughout the country, mean winter temperatures are about 3°C and mean summer temperatures are around 17°C. Coastal regions have more hours of sunshine than inland regions and a relatively small annual and diurnal temperature range. An increase of around one degree has been measured in the Netherlands over the last 100 years, levelling off in the most recent decade (KNMI, 2011). The years 2006, 2007, and 2011 are the top three warmest years of the last 300 years, with an average of 11.1°C; the 1981-2010 average being 10.1 °C. This also translates into a drop in the annual number of so-called 'heating degree-days' (HDD), which is an indicator of the demand for spatial heating (Figure 2.5). Mean monthly precipitation exhibits a rather strong annual cycle; the driest months are February, April and May; the wettest are October and November. The variation in mean annual precipitation deviates locally by no more than 16% from the national mean of 847 mm (KNMI, 2011).

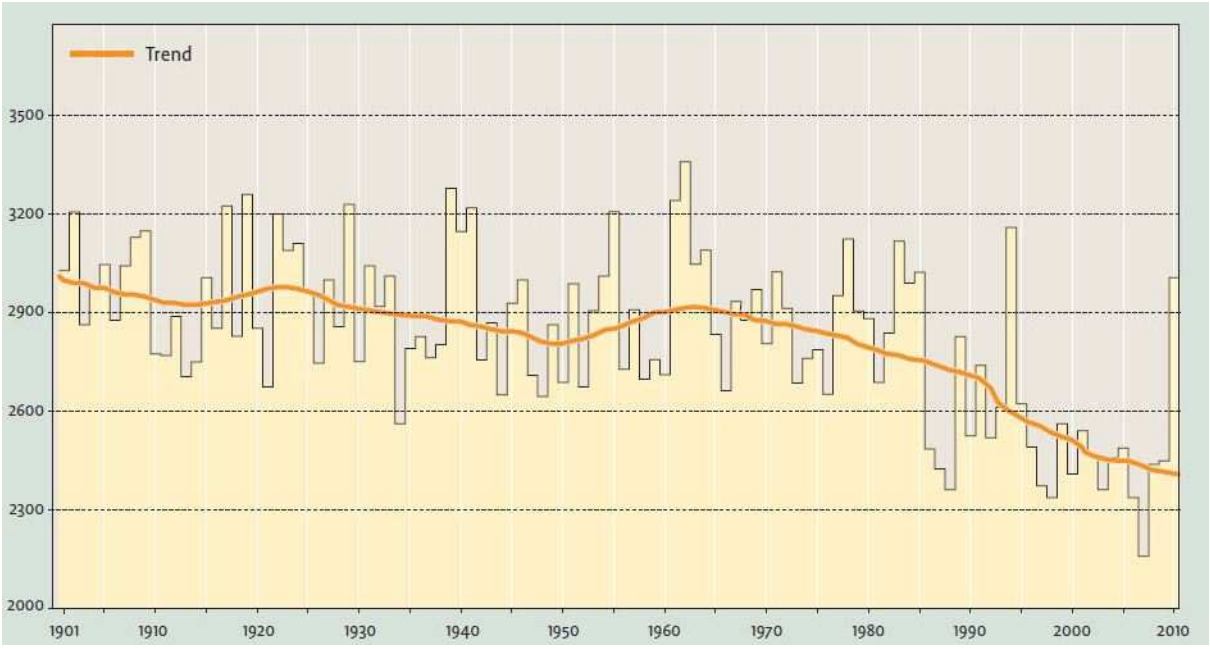

Figure 2.5 Development of the average surface temperature and the number of heating degree days (HDD [°C]) in the Netherlands during the period 1901-2010. Source: KNMI, 2011[2]

[2] KNMI, 2011, De Bosatlas van het Klimaat (Dutch Climate Atlas), Noordhoff Uitgevers Groningen / KNMI, ISBN 978 9001 120894 (on the web: www.klimaatatlas.nl)

2.5 Economic profile

The Gross Domestic Product (GDP) of the Netherlands was € 417 billion in 2000 and € 599 billion in 2011(value at current prices). Figures 2.6 and 2.7 show a decline in the GDP in 2008 and 2009 followed by a slight recovery in the following years.
The Netherlands ranks relatively high on the list of agricultural exporters. The principal exports are machinery and transport equipment (37% of the total value of exports in 2010), chemicals (13%) and food and other livestock products (13%) (CBS, 2013 export). Exports increased by around 216% between 1995 and 2010 (volume index, prices for 2000). Principal imports into the Netherlands in 2010 included machinery and transport equipment (42% of the total value), food and other livestock products (8%) as well as chemical products (11%) (CBS, 2013import).[3, 4]

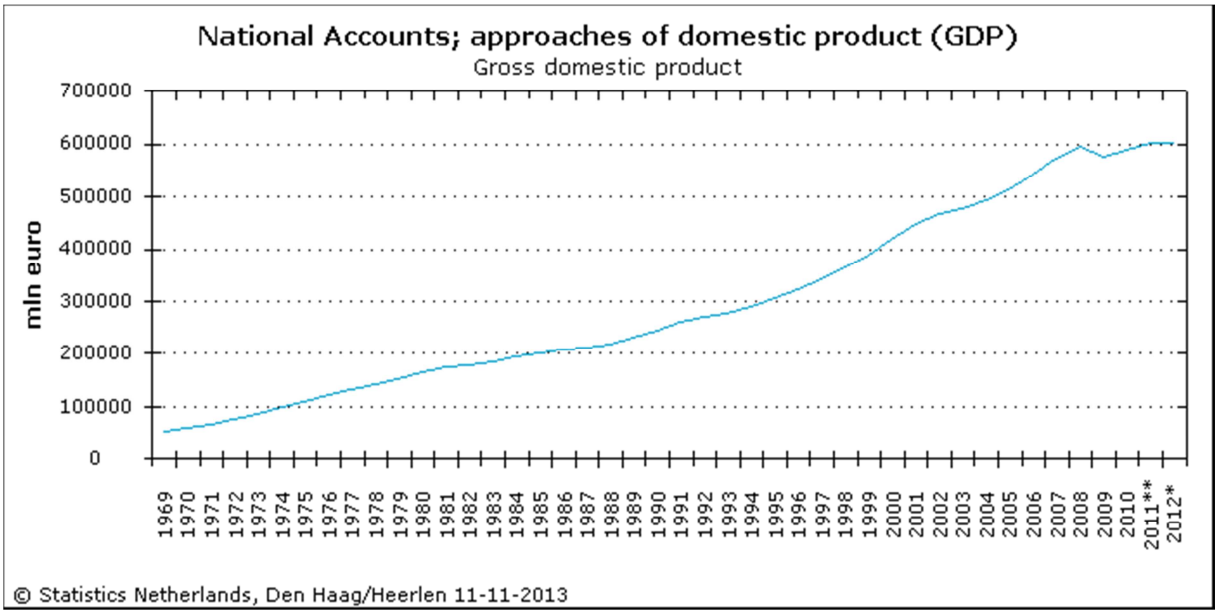

Figure 2.6 Gross Domestic Product 1970-2012[5]

[3] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=37595ENG&D1=131-148&D2=0&D3=39,44,49,54,59,64,69,74,79,84,89,94,99,104,109,114,119&LA=EN&HDR=T&STB=G1,G2&VW=T

[4] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=37595ENG&D1=159-173&D2=0&D3=4,9,14,19,24,29,34,39,44,49,54,59,64,69,74,79,84,89,94,99,104,109,114,119&LA=EN&HDR=T&STB=G1,G2&VW=T

[5] http://statline.cbs.nl/StatWeb/publication/default.aspx?DM=SLEN&PA=81117ENG&D1=21%2c89&D2=1%2c11%2c21%2c31%2c41-43&LA=EN&HDR=G1&STB=T&CHARTTYPE=3&VW=G

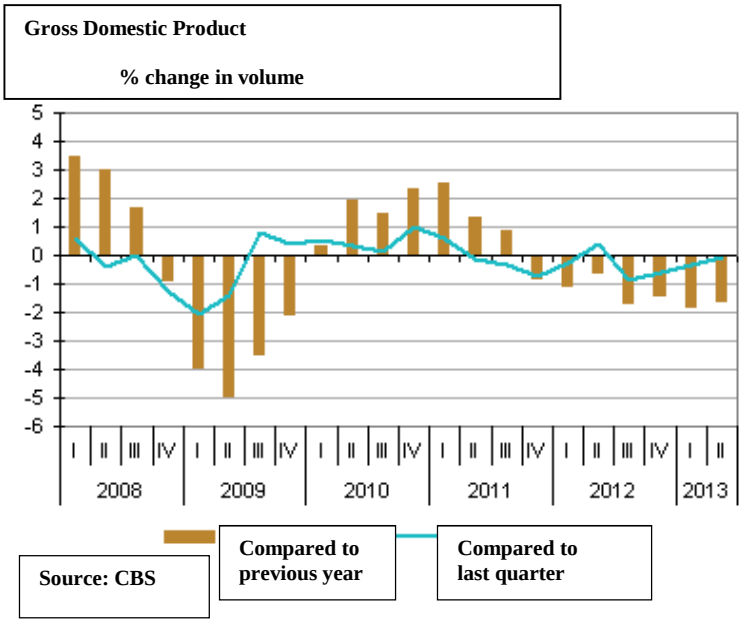

Figure 2.7 Fluctuations in GDP 2008-2012

The transport sector has traditionally been an important activity due to the country's favourable location for transporting goods from the coastal harbours to the EU inland destinations. The geographic situation also favours oil refineries in Rotterdam, from which large amounts of oil products are exported. Rotterdam's ports are among the largest in the world. The port functions as a main port (hub) for transporting all kind of goods to many countries throughout Europe. Schiphol Airport, near Amsterdam, is important as an air transit point for the rest of Europe. These main port functions explain the relatively high use of bunker fuels.

Another characteristic of the Netherlands is the availability of large domestic reserves of natural gas; this is one of the factors contributing to a relatively large chemical industry (using natural gas as chemical feedstock). The many refineries have also contributed significantly to this large industrial sector.

Over the last few decades the volume of many important variables, such as GDP, mobility, energy consumption and waste production, which strongly influence emissions development, has increased in the Netherlands. In terms of livestock numbers, a downward trend started around 1990, due to the milk quota system and various animal diseases. This downward trend was curbed in 2003 and livestock numbers have increased since then.

Private consumption increased by 41% over the period 1990-2010 although, in recent years, consumption growth has stagnated due to the economic crisis (CBS, 2013). Over the last few decades, households in the Netherlands have purchased a relatively high number of electrical appliances including washing machines, colour TVs, personal computers, microwave ovens etc. Combined with the increasing number of households, this has led to a significant growth in residential electricity consumption.

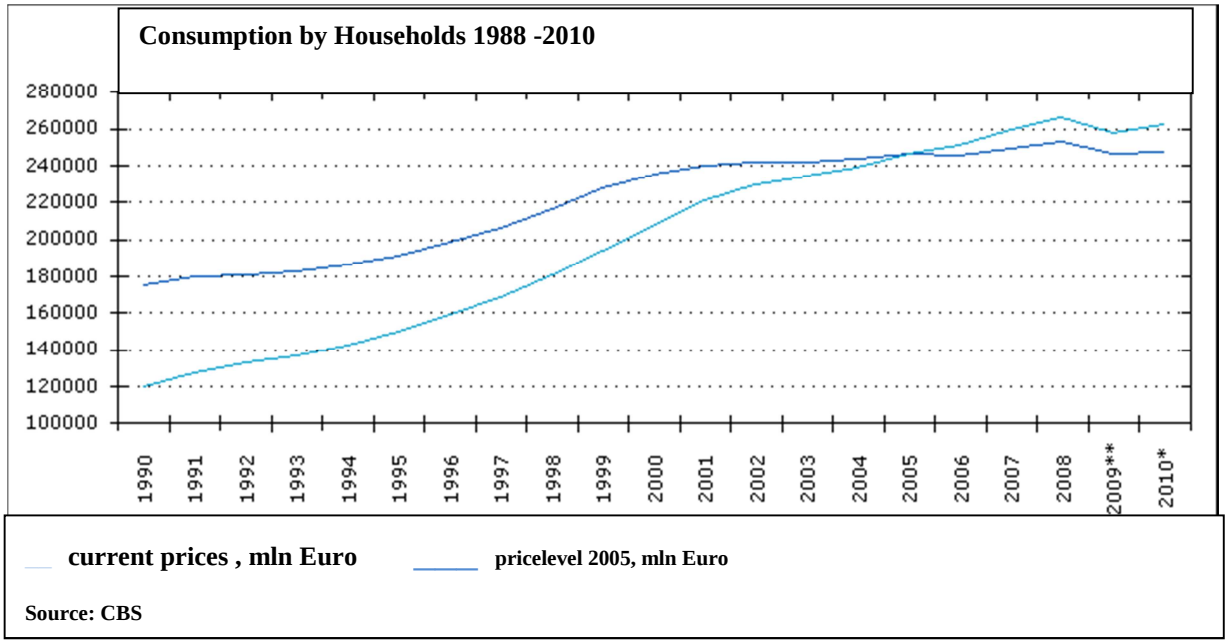

Figure 2.8 Private consumption 1988-2010[6]

2.6 Energy profile

2.6.1 Energy consumption

During the period 1990-2012 energy consumption in the Netherlands increased by 20 percent, reaching a maximum in 2010 of 3,493 PJ, while in 2012 the energy use was 3,281 PJ. As presented in figure 2.9 this increase was concentrated in the period up to 2005/2006 and in the use of natural gas and in oil products. Coal is mainly used for the generation of electricity, while natural gas has a wide application as a raw material, for electricity production, heating, transport etc. The peak in natural gas use in 1995 and 2010 is related to the additional gas use in cold winters (see also figure 2.5, heating degree days).

6 http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=37741NR&D1=3&D2=0,3&D3=a&HDR=T&STB=G1,G2&CHARTTYPE=3&VW=T

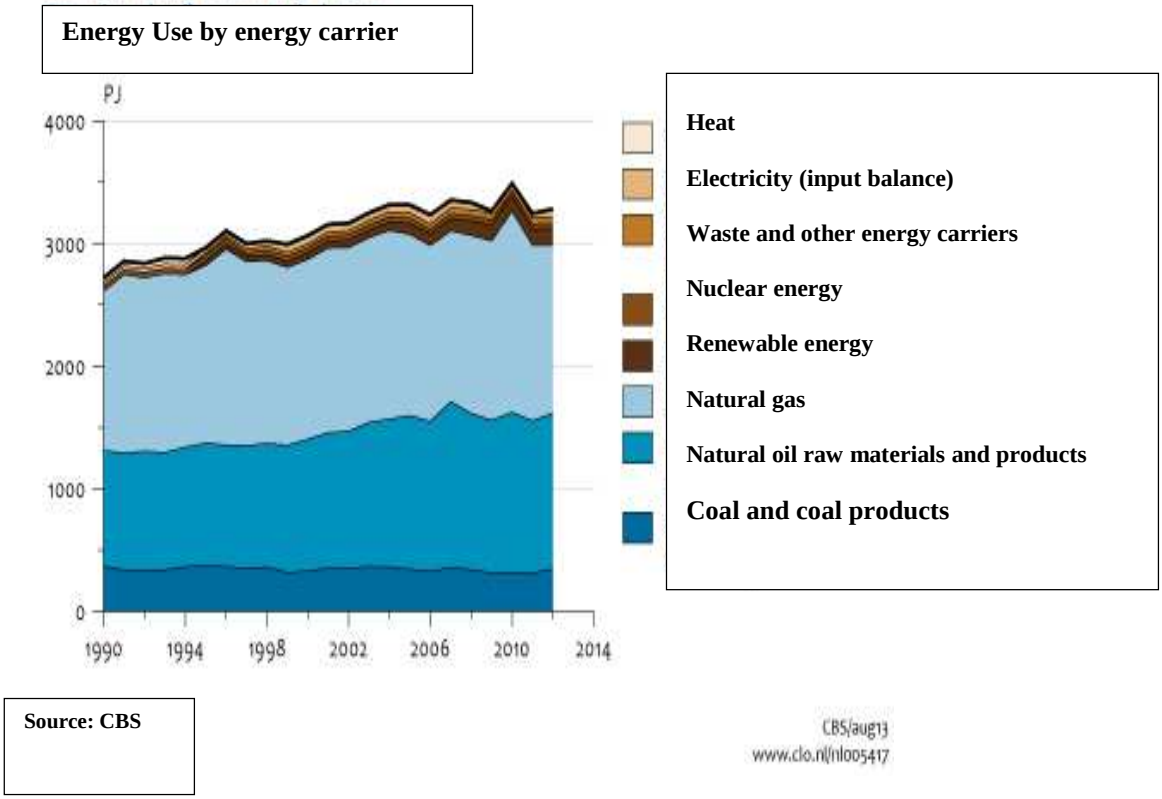

Figure 2.9 Energy use by energy carrier 1990-2012

The use of renewable energy increased in the 1990s on a limited basis: in 1990 1.1% of the energy used was from renewable energy sources and in 2001 this was 1.4% (see figure 2.10). In the early 2000s this rate of usage accelerated: in the period 2003- 2009 there was an annual increase of 0.4 percentage points per year. Since then growth has only amounted to 0.1 percentage points per year. This growth up to 2009 is clearly a result of the Dutch government's stimulation programme, which subsidises the extra production costs of renewable electricity (where these are higher than the costs of conventional electricity production) and the introduction of the obligatory use of bio-fuels in transport. Almost three quarters of renewable energy originates from biomass, i.e. production of electricity and heat in waste incineration plants, use of biomass in electricity production and bio-fuels in transport.

Industry is the main user of energy in The Netherlands: about 35% of the national energy is used within industrial companies. The dominant industrial use is the chemical and pharmacy industry; in 2012 this was responsible for almost three quarters (73.6%) of industrial usage. Energy usage in this industrial sector has been increasing since 1995, while energy usage in other industrial sectors is more or less stable or has shown a small decrease. Energy use in the chemical and pharmaceutical industries has increased by almost 39% since 1995. The increased importance of this industrial sector has also had a major impact on changes in the use of energy carriers. The use of natural gas in industry has decreased since 1995 by almost one quarter, while the use of oil and oil products almost doubled. The use of energy as a raw material (non-energy use) has also increased by almost 60% since 1995.

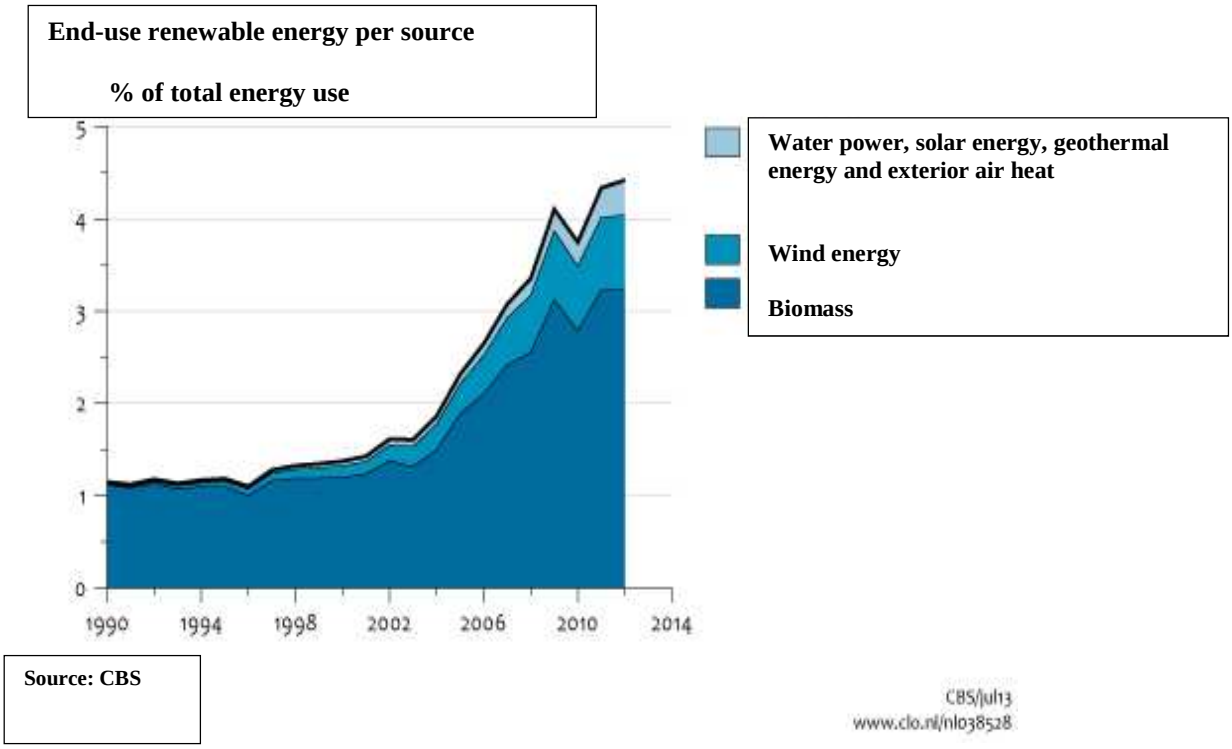

Figure 2.10 Contribution of renewable energy in the energy use 1990-2012

Natural gas dominates the energy use in households. As natural gas is almost exclusively used for heating, abnormally low temperatures in autumn and/or winter will show up in the energy usage rates over time. For example, in 2012 households used 313 PJ, about 6% more natural gas than in 2011, as a result of the cold winter 2011/2012 and a moderately cold autumn in 2012. The use of electricity has increased since 1990 steadily at an average of 2.2 percent annually. In 2012 electricity use was about 30 PJ (of the total energy use of households of 429 PJ), about 51% higher than in 1990. The use of heat produced in district heating and the use of heat from industry is on average about 5% of the energy used in households; in 2012 this was about 22 PJ.
In the transport sector, energy use increased in the period 1990-2012 by almost a quarter, from 450 PJ in 1900 to 576 PJ in 2012, despite the policy to promote energy efficient cars, as the number of cars and travel distances have increased. Road transport dominates energy use in the transport sector: 325 PJ in 1990 and 426 PJ in 2012. In 2012 private cars used about 46% of motor fuels, while company cars used about 27%. Heavy vehicles, mobile equipment and public transport account for about 27%. Due to the economic crises, energy use in transport decreased by about 2% in 2009; since 2011 the energy used is increasing again, but moderately. This increase is caused by the energy used for private cars; energy use in company cars is rather stable. The energy used for shipping increased from 90 PJ to 114 PJ in the period 1990-2012. Sea shipping is the main energy user and responsible for the increase: in 2012 sea shipping used 70 PJ; this was 47PJ in 1990. Inland shipping is rather stable with around 25-28 PJ, while fishing decreased from 12 to 4.4 PJ in the period 1990-2012.

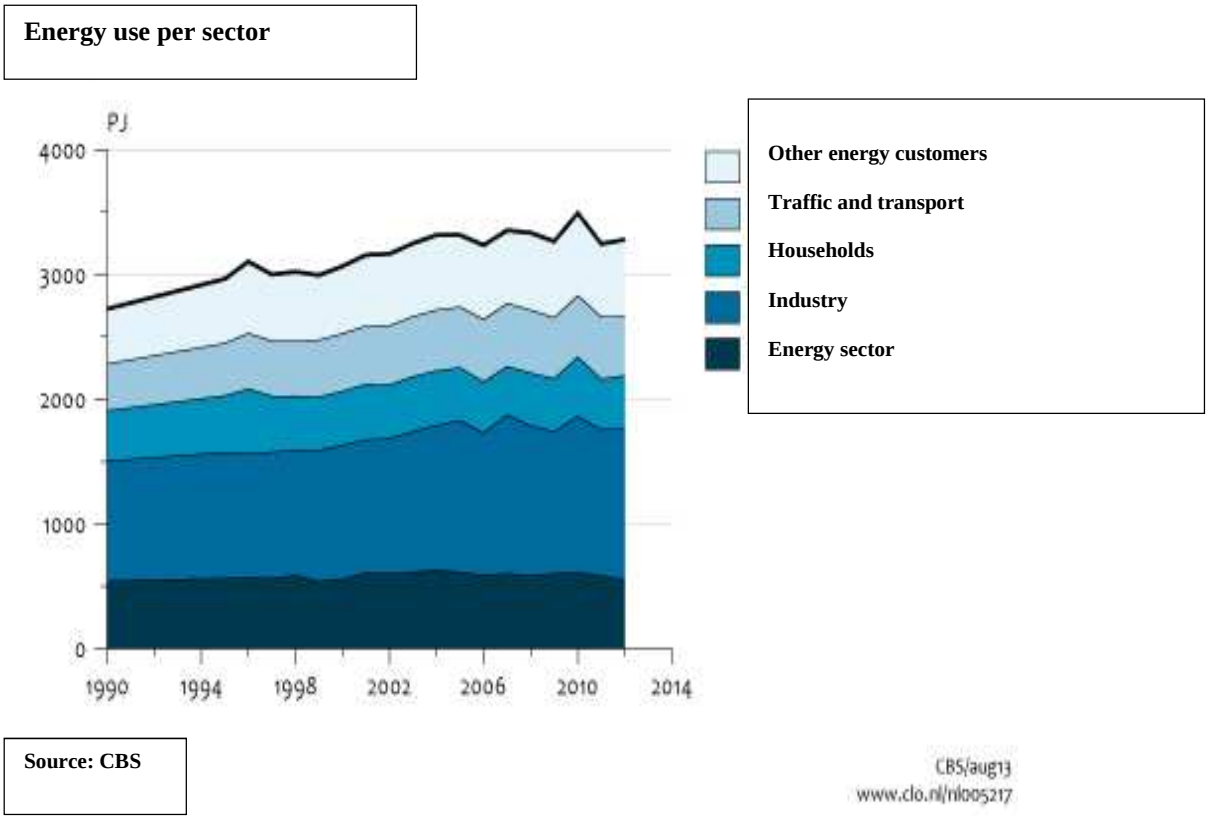

Figure 2.11 Energy use specified by energy users 1990-2012

The other energy uses encompass public and commercial buildings, services and agriculture. As in other sectors, energy use has increased since 1990, reaching 619 PJ in 2012.
In the agricultural sector the use of energy amounted to about 136 PJ in 2011 while this was 143 PJ in 1990. The energy use in horticulture is dominant and this mostly concerns the use of natural gas for heating. This natural gas use is related to the outside temperature so there are high usage rates in cold years, like 1996 and 2010, when gas use exceeded 150 PJ. Natural gas is not only used for heating glass houses, but also for electricity generation by combined heat and power (CHPs) and gas motors. In the period 2005-2009 in particular, the number of gas motors increased. This development resulted in a complete change of electricity use: while electricity use in the period 1990-2005 was around 8-13 PJ, this has changed into net production since 2008, as most of the electricity produced is sold. In 2010, net electricity sold was about 15 PJ.

2.6.2 Gas production

Since 1990 natural gas production in the Netherlands has totalled approximately 70-80,000 million Nm^3 per year (CBS 2013aardgasproductie). The policy of mitigating the depletion of the large Slochteren field to extend its use has increased the (mainly offshore) exploration and exploitation of other relatively small gas fields since the mid 1990s. Around half the initial reserves have now been used up, causing gas pressure in the fields to drop. To maintain the production rate, the number of wells, pumps and compressors is steadily increasing, resulting in an energy use for gas production of over 1% of the total amount produced.[7]

[7] http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=70846NED&D1=30,58,62&D2=0-1&D3=0&D4=a&HDR=G1,G2&STB=T,G3&VW=T

‘Green gas’ generation has also started in recent years. This gas is generated from biomass. Since 2011, liquid natural gas (LNG) has also been imported, via the port of Rotterdam, from countries like Algeria, Qatar and Trinidad & Tobago.

Electricity production

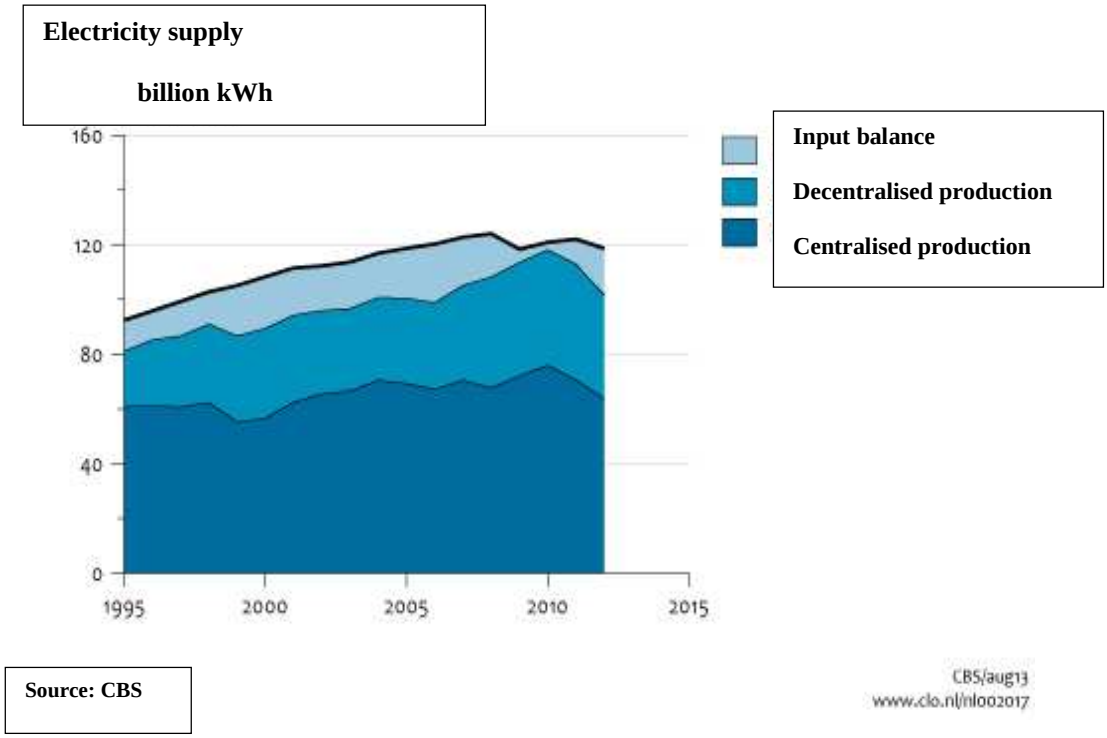

Figure 2.12 Supply of electricity

The increase in electricity consumption was mainly ‘countered’ by increased cogeneration and electricity imports. Boosted by a doubling of the installed capacity, the amount of combined heat and power (CHP) generation increased substantially from 1990 onwards, resulting in less fuel consumption for power generation compared to separated generation of electricity and heat. By the end of 2011 the installed CHP capacity in the Netherlands was 12.3 GW. This was 44 percent of the total installed electricity capacity (28.0 GW). Central CHP capacity decreased between 2009 and 2011 because plants were taken out offline. The decentralised capacity in some sectors (industry total, agriculture, waste incineration) still showed slight growth.

Since about 1999, the liberalisation of the European electricity market has resulted in a higher net import of electricity, increasing to 15-17% between 1999 and 2009. In the year 2012 electricity imports reached their highest ever level as it became cheaper to import electricity than to produce in the Dutch gas-fired plants. The majority of this electricity was imported from Germany, where increased electricity was produced by coal-fired plants due to the low prices of coal and where higher production of renewable electricity led to a higher rate of generation at some points during the year than could be used inside Germany. Imports also encompass electricity produced by hydro power in Norway.

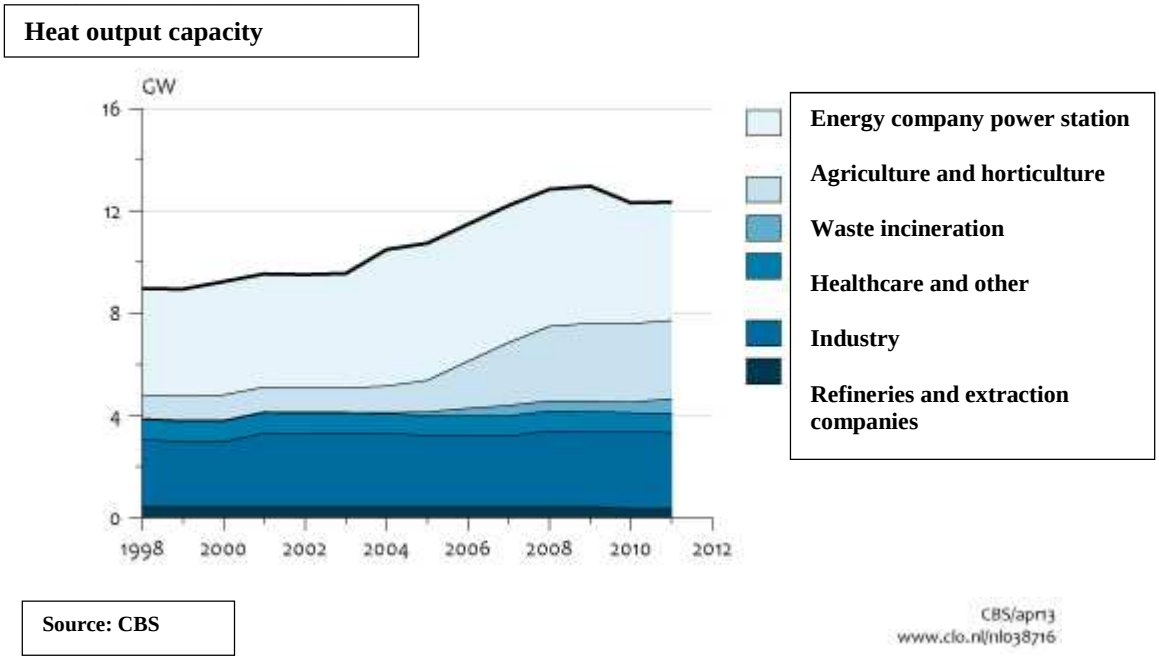

Figure 2.13 Heat output capacity

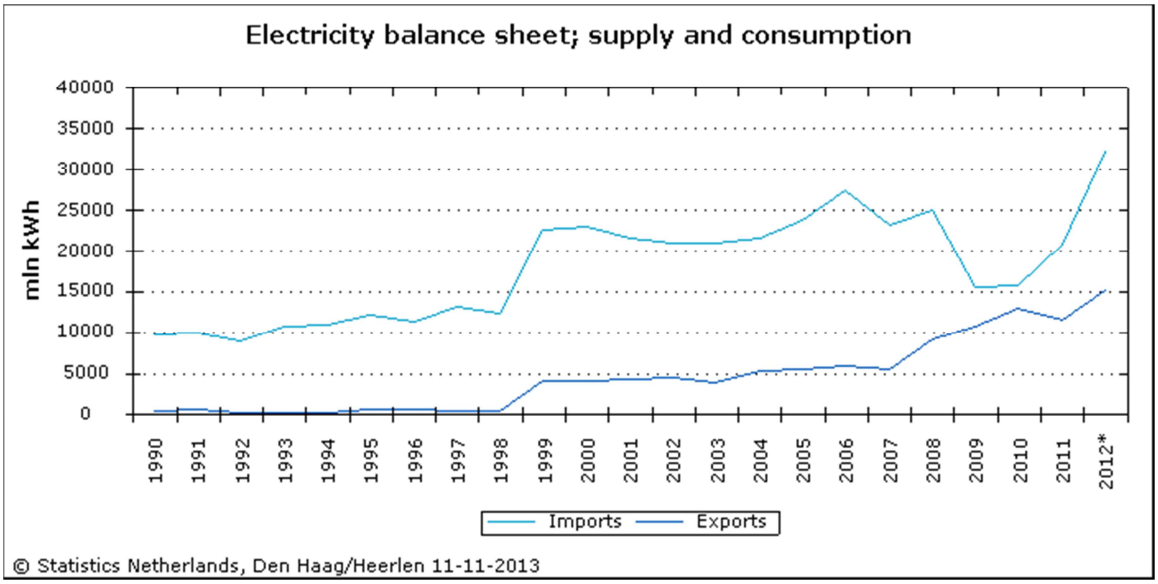

Figure 2.14 Supply and consumption of Electricity 1990-2012

During the period 1990-2012 the production of renewable electricity increased by a factor of 8, resulting in a share of almost 11% of total electricity consumption in 2012. By 2012 almost 60% of this came from biomass combustion and 40% from wind energy. Wind turbines are mainly located on land, 2,206 Megawatt in 2012, however they are beginning to find their way into the Dutch part of the North Sea too. By 2012 two windmill farms were generating a total capacity of 228 Megawatts and this figure is set to increase over the coming years.

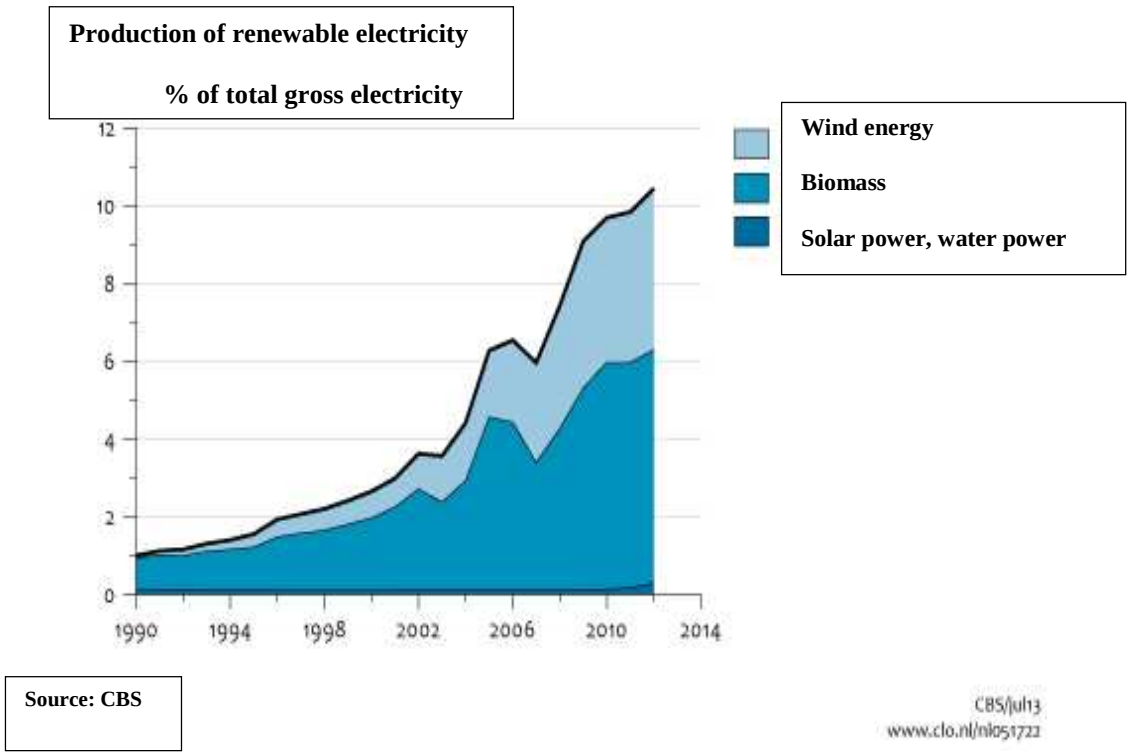

Figure 2.15 Contribution of renewable electricity in the electricity use 1990-2012

2.6.3 Refineries

The Netherlands has six large refineries, with four of them located in Rotterdam. These refineries have a total capacity of 61 million tons of crude oil. The degree of utilisation is high; in some years 100%. This high production level is related to the high efficiency rate, the proximity of many petrochemical industries and the influence of German demand. This makes Rotterdam the world's largest supplier of bunker fuel oil and means that Amsterdam Schiphol Airport is amongst Western Europe's largest suppliers of jet fuel bunkers. The refineries in the Netherlands produce many relatively light oil products (LPG, naphtha, petroleum) from heavier crude oil with a sulphur content of 1.5%.

2.6.4 Energy prices

Figure 2.6.8 provides the combined development of the prices of natural gas and electricity for households. By the end of 2012 this index is almost 2.4 times higher than in 1995. In the period 1995-2012 the energy cost for households in the Netherlands increased on average by 5.5 percent annually, while average inflation was 2.1 percent. During the economic crisis at the end of 2008, the index dropped, but by the end of 2012 it was almost back to the higher price level.

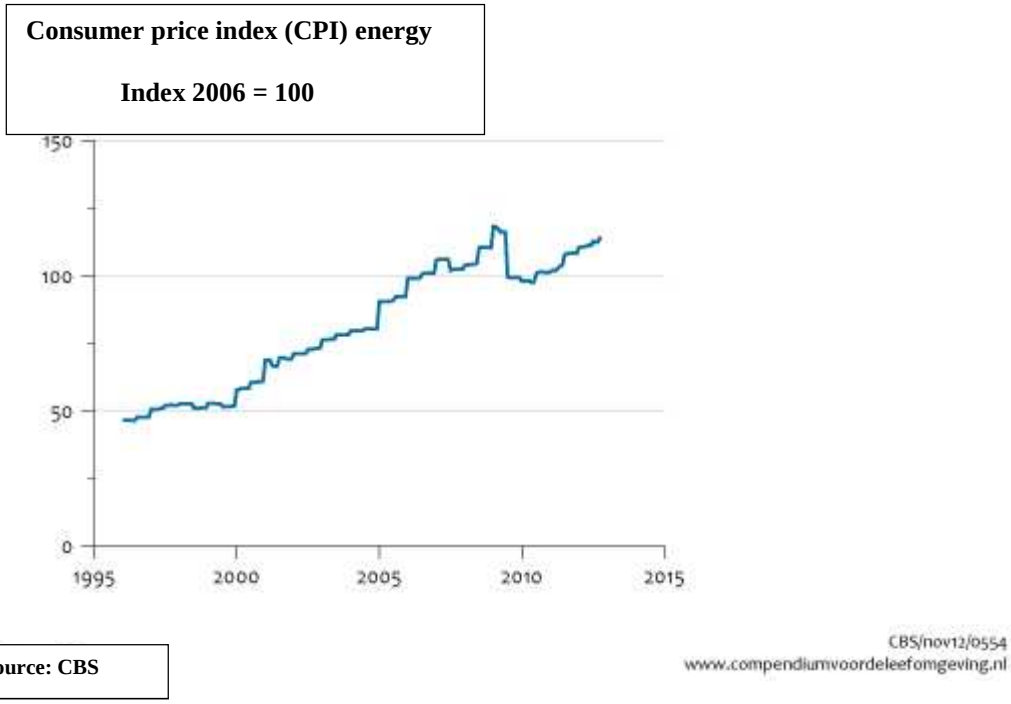

Figure 2.16 Consumer price index energy, 1995 -2012

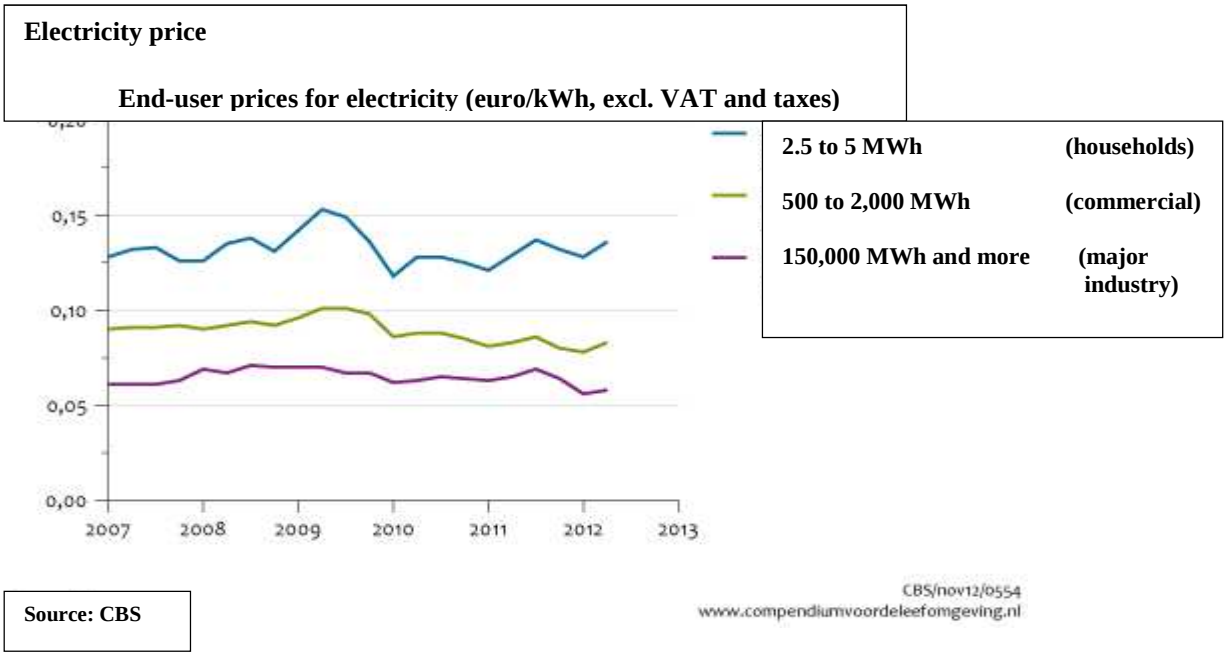

Figure 2.17 Consumer prices for Electricity, excluding taxes, 2007-2012

The electricity price depends on the fuel prices for oil, coal and natural gas, among other factors. Another important component is the cost of deployment of the power plant and transport networks. This is why fuel prices alone do not necessarily have a strong impact on the price of electricity. In the late 1990s, the natural gas and electricity prices for consumers increased as a result of Energy tax (known as Regulating Energy tax, REB until 2004) and the Environment quality Electricity Production tax (MEP). The MEP was intended to stimulate renewable energy, and applied from 2001 to 2007.

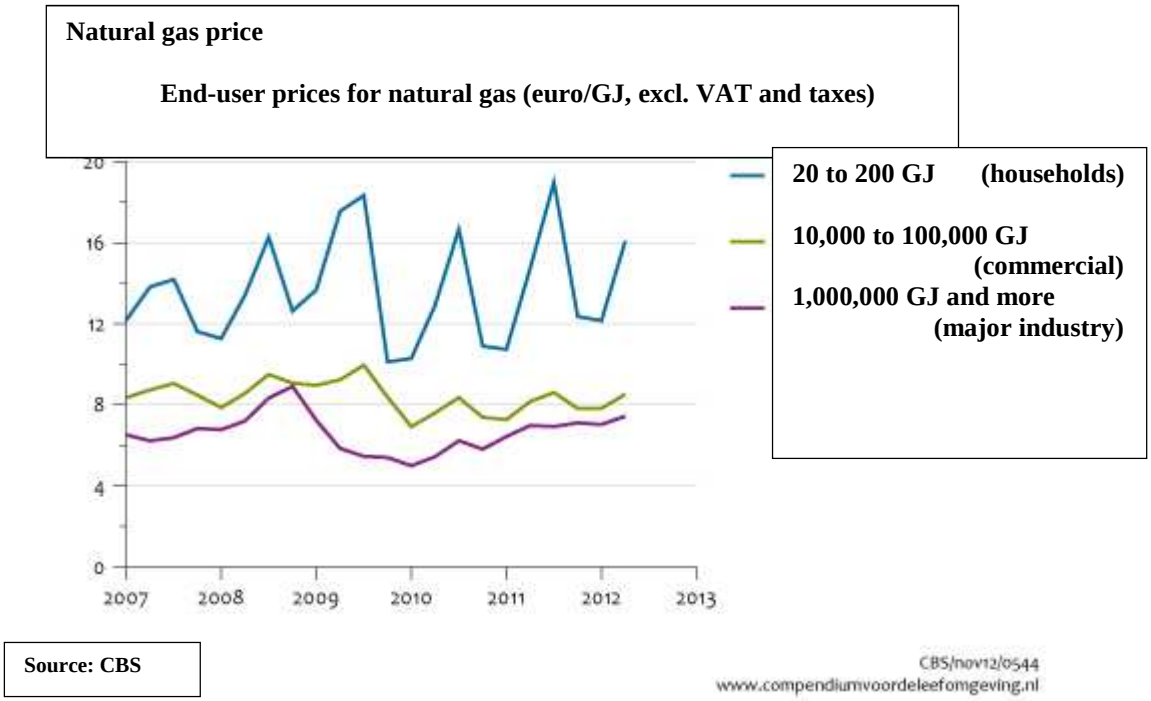

Figure 2.18 Consumer prices for natural gas, excluding taxes, 2007-2012

2.7 Transportation

Amsterdam Airport Schiphol

317	direct destinations
51 million	passengers, 1.5 million tonnes of cargo
423,400	air transport movements
290,000	jobs in the Netherlands, 64,000 people are employed at the Schiphol location
650,000 m²	terminal area, five main runways on 2,787 hectares
3.9 billion euro	total value of fixed assets
500	companies located at Schiphol
26 billion euro	contribution of aviation sector to the Dutch Gross National Product

Table 2.3 Facts and figures 2012 Schipholgroup

Transport volumes are influenced by demographic, economic, spatial and infrastructural factors. Air and international shipping are highly concentrated: in 2012 Schiphol Airport handled 95% (CBS, 2013) of all air passengers and 97% of all air freight (CBS, 2013), with the port of Rotterdam handling 75% of the total freight in tonnage (CBS, 2009o).

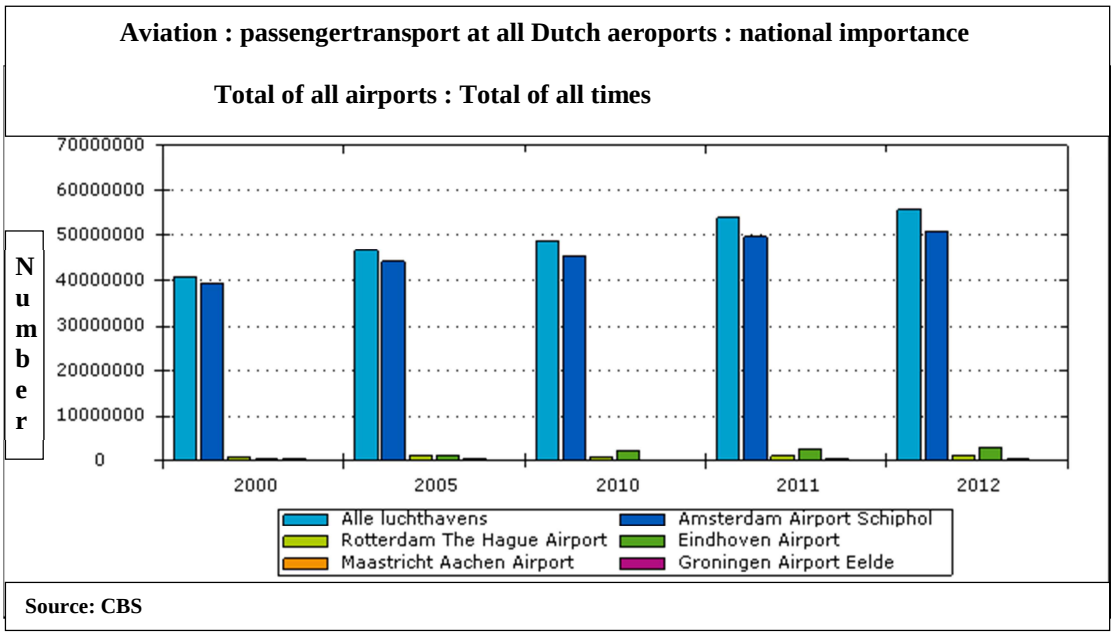

Figure 2.19 Passenger transport at Dutch aeroports [8]

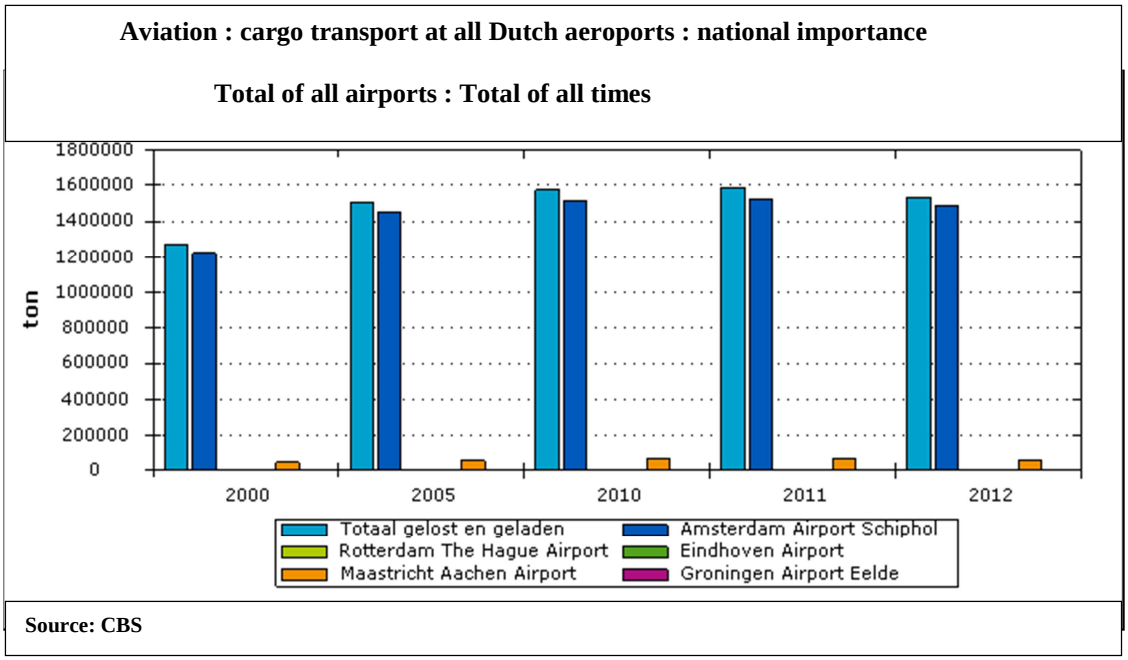

Figure 2.20 Cargo Transpor t at all Dutch Aeroports [9]

By far, the majority of transport emissions stem from road transport; the remainder comes from inland air transport, inland shipping, fisheries, rail transport, military transport and mobile equipment. CO2 emissions have risen mainly due to road transport.

[8] http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=37570HVV&D1=0-5&D2=0&D3=0&D4=2,7,12-14&HDR=T,G2,G3&STB=G1&CHARTTYPE=1&VW=G

[9] http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=37798HVV&D1=0-5&D2=0&D3=0&D4=2,7,12-14&HDR=T,G2,G1&STB=G3&CHARTTYPE=1&VW=G

2.8 Industry

In 1990, industry accounted for 19% and commercial and public services for around 60% of GDP. The other sectors each accounted for less than 10% of GDP. Since 1990 total industrial production (in constant prices) has only grown marginally. As a result, the industrial sector's share fell from 17% to 14% in 2008. Figure 2.21 shows a slight increase of production in the manufacturing industry between 2005 and 2012 and a decrease in mining and energy and water supply.

Figure 2.21 Contributions to value added and environmental themes 2012[10]

Compared to other EU countries the industrial structure of the Netherlands is relatively energy-intensive in terms of energy use per € production value. This is caused by several factors, including the chemical industry, which produces a high percentage of base chemicals compared to chemical industries in Germany, the UK or Denmark.

[10] http://www.cbs.nl/NR/rdonlyres/090445AD-E1CB-4147-A404-0C36F02DF112/0/2013c174pub.pdf

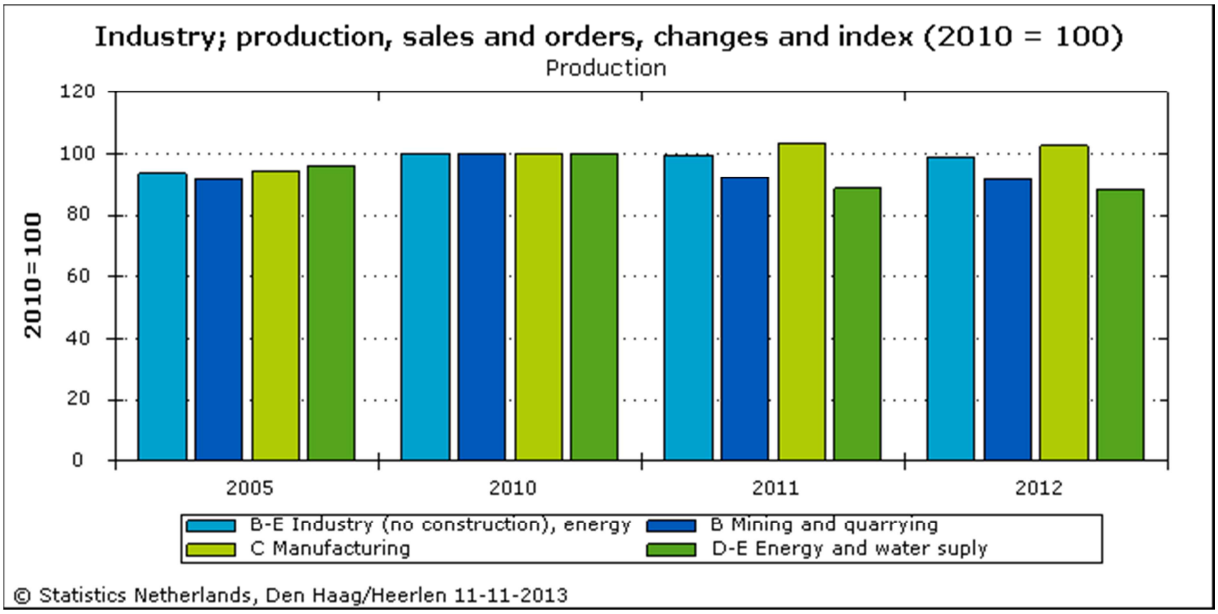

Figure 2.22 Industrial production 2005-2012[11]

2.9 Waste

The total amount of waste produced in 2012 (excluding polluted soil, dredging sludge and animal manure) amounted to 60 million tons. Figure 2.23 shows that, despite population growth and economic development, waste production has been rather stable at around 60 million tons since 2000. Governmental policies aimed at decoupling GDP growth and waste production are thus clearly successful.

Between 1990 and 2012 the rate for reusing waste (i.e. recycling and the use of waste for energy production) increased from 60% to almost 88% of the total amount (Figure 2.23). This included half of residential and office waste, most industrial waste and almost all demolition waste. Waste products from agriculture and coal-fired power plants were almost fully recycled. Approximately 6.9 million tons are not reused or recycled, of which residential waste has the largest share followed by office waste. As the figure shows, the amount of non-reused or recycled waste is still decreasing. In 2010 1.4 million tons of waste was disposed of in landfill sites; in 1990 this was almost ten times higher (13.9 million tons). This waste contained around 10% degradable carbon, leading to methane emissions (a few megatons CO_2 equivalent). The residual waste that is not reused or disposed of in landfill is incinerated; after increased volume of incineration in the 1990s and stabilisation at around 7.5-8.5 million tons in the 2000s, in 2010 only 5.1 million tons was incinerated.

The amounts of waste dumped on landfill sites have been substantially reduced as a result of the government's policy on waste management. This focuses firstly on prevention, secondly on reuse and thirdly on waste incineration with energy recovery. Separation of waste streams at the source for recycling purposes is a key factor, in particular for paper, glass, as well as garden and food wastes (compost).

[11] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=81810ENG&D1=0&D2=0-1,5,41&D3=16,101,118,135&LA=EN&HDR=G2&STB=G1,T&VW=T

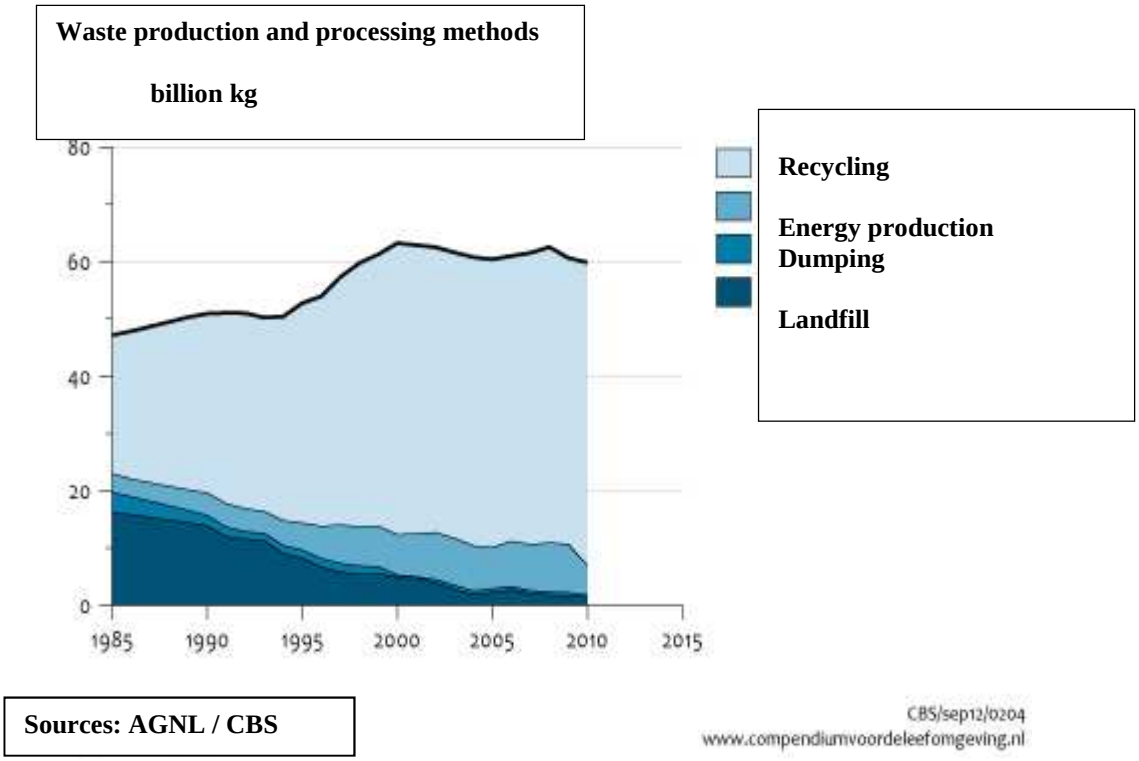

Figure 2.23 Waste generation and methods of disposal 1985-2010; Source: CBS/PBL/WUR, 2009c[12]

2.10 Building stock and urban structure

On January 1, 2012, there were 7.4 million homes in the Netherlands. That is an increase of 10% compared to January 1, 2000. There were 833 thousand homes built between 2000 and 2012 and more than 170 thousand demolished.
In the past 12 years, 833 thousand new homes have been completed. That is an average of 64,000 homes per year. In this century, the year 2009 was the most productive with 83,000 new homes and 2010 was the least productive with 56,000 new homes.

In the Netherlands, between 2000 and 2010, housing stock increased by 8.9 percent (an average of 0.9 percent per year). The annual number of new homes built in the Netherlands following a decrease in the period 2001-2003 to almost 60,000 homes, rose steadily to nearly 83,000 in 2009. Then construction plummeted to a production of only 56,000 in 2010. In 2011, new construction was again slightly higher but still at historically low levels.
The relative increase in housing, also taking into account other additives (such as splitting up houses), withdrawals by demolition and administrative corrections, shows a similar picture. With the highest annual increase of 1.1 percent on January 1, 2008 and the lowest, less than 0.6 percent, on January 1, 2011.

[12] http://www.milieuennatuurcompendium.nl/indicatoren/nl0204-Afvalproductie-en-wijze-van-verwerking.html?i=1-4

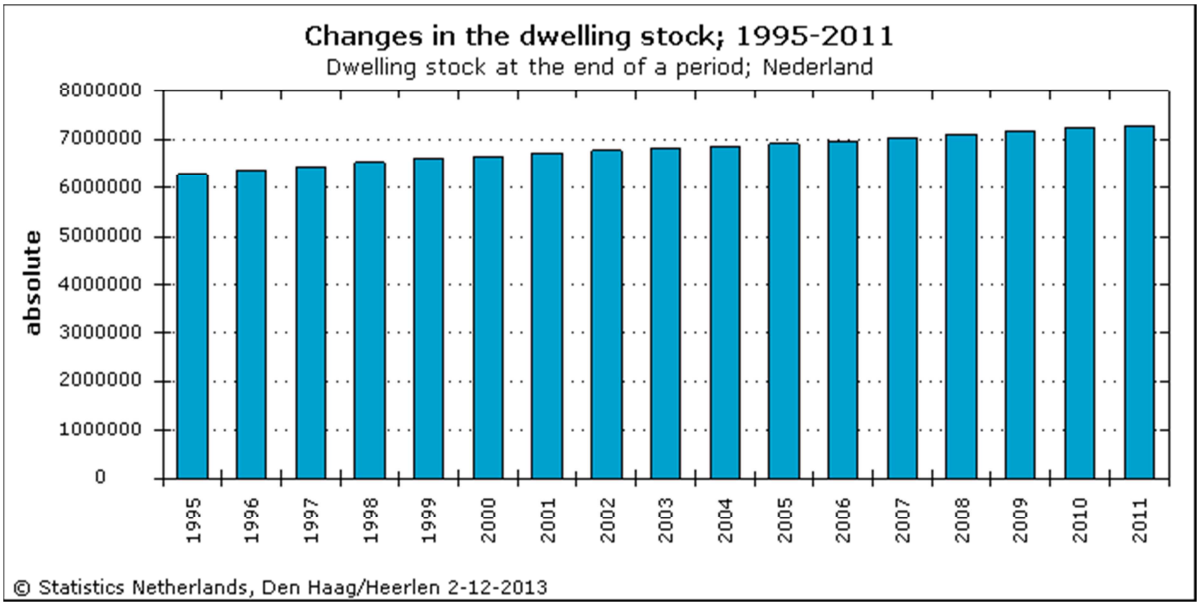

Figure 2.24 Trends in total number of residences and annual production of new homes.[13]

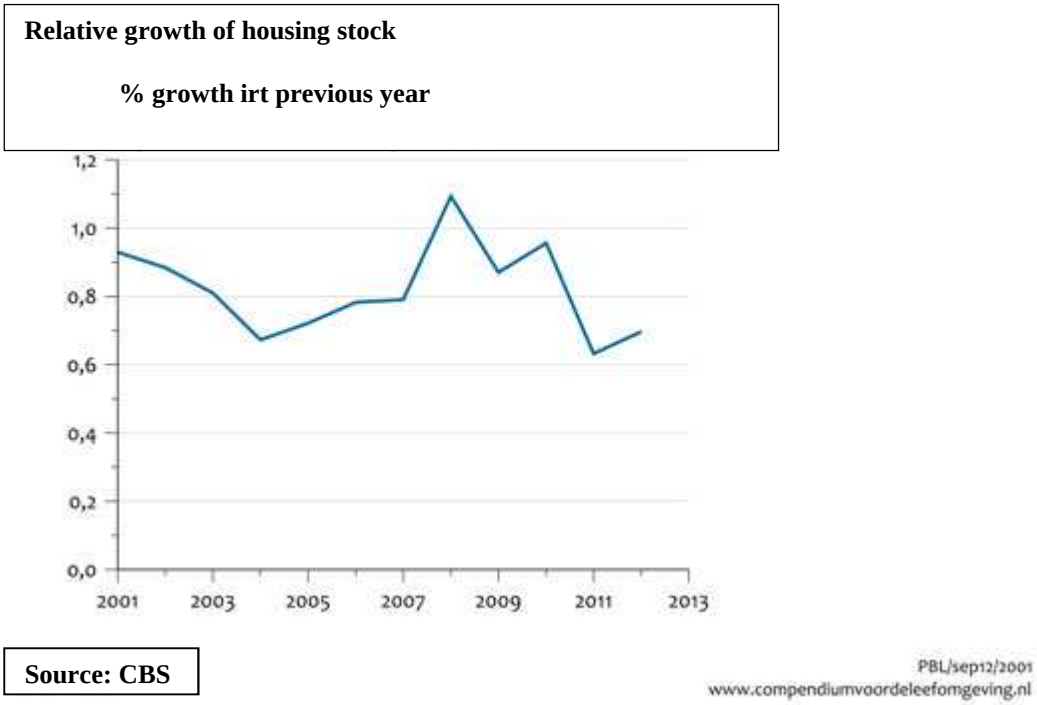

Figure 2.25 Relative growth of the housing stock, 2001-2012

13

http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=37263ENG&D1=15&D2=0&D3=4,9,14,19,24,29,34,39,44,49,54,59,64,69,74,79,l&LA=EN&HDR=G2&STB=G1,T&VW=G

The energy label for houses and other buildings has been around since 2007. This label provides a quick indication of the energy consumption of a home. Of the more than seven million homes in the Netherlands on 1 July 2012 about 2.2 million homes have an energy label.
The majority of homes have a C or D label (30% and 27%), approximately 15% of homes have a green label (A, A + and A + +, B) and three percent of the distributed labels concern the high-energy efficient class A (including A + and A + +).

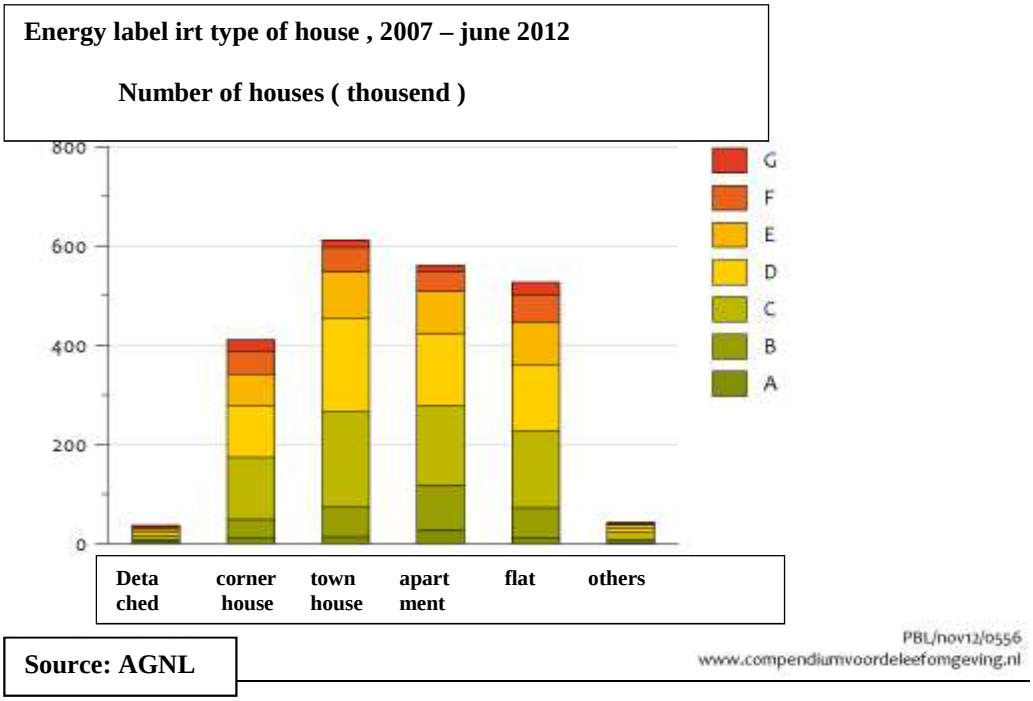

Figure 2.26 The energy for homes and buildings in existence since 2007[14]

2.11 Agriculture

In 2012 there were nearly 69 thousand farms and horticultural enterprises in the Netherlands. Of these companies, 25 percent relates to dairy farms and 17 percent relates to arable farms. In 2000 there were 24 percent and 15 percent of dairy farms and arable farms respectively.
In the period 2000 - 2012 the total number of farms decreased by 29 percent.
The largest decrease was in the greenhouse branch, with reductions of 59 percent in cut flowers, 55 percent in vegetable production and 49 percent in both the bedding and pot-plant companies.
The number of horse and pony companies rose by 27 percent in 2009 and then fell again significantly. The total increase over the period from 2000 to 2012 was 4 percent.
The number of arable farms fell between 2000 and 2009 and has stabilized since then.
Poultry farms saw a significant decrease following bird flu in the spring of 2003. In the subsequent years the number of poultry farms recovered again.

[14] http://www.compendiumvoordeleefomgeving.nl/indicatoren/nl0556-Energielabels-woningen.html?i=9-53

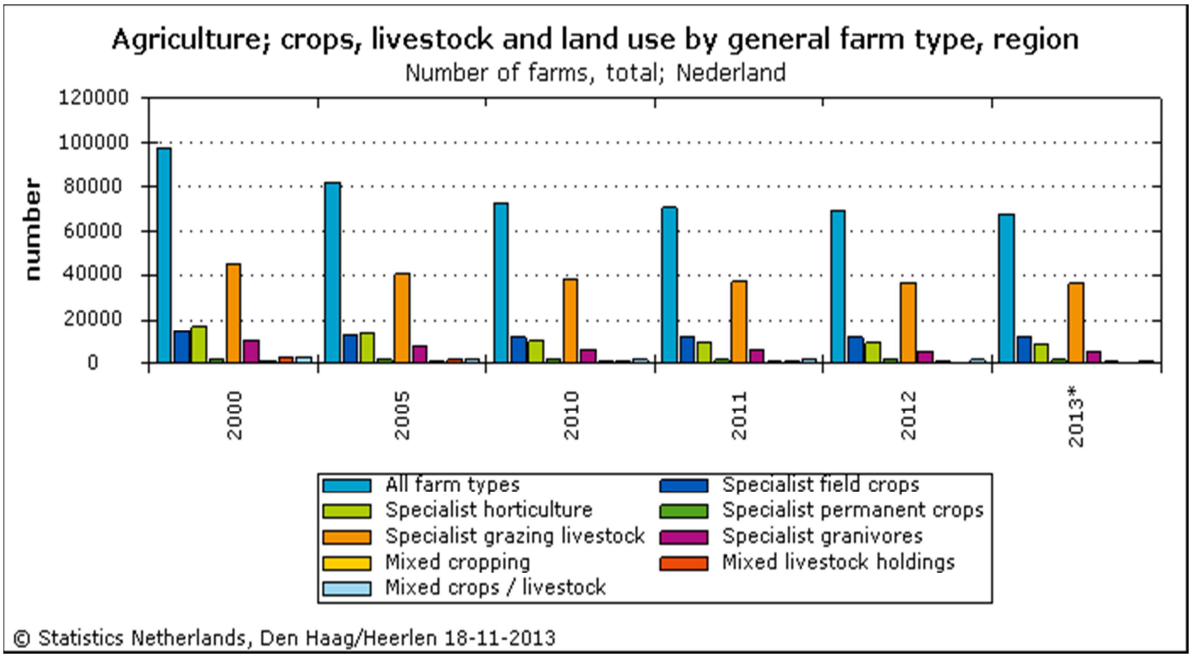

Figure 2.27 Number of farms, 2000-2013[15]

Agriculture in the Netherlands focuses on cattle breeding, crop production and horticulture; of which greenhouse horticulture is the most important sub sector. The amount of horticulture in total agricultural production is increasing over time. The amount of fuel consumed by the greenhouse horticultural sector is comparable to fuel consumption in the commercial and public service sector (taking cogeneration into account). Due to the fact that the quota system for milk production is set to end in 2015, the number of dairy cows has been slowly increasing since 2008.

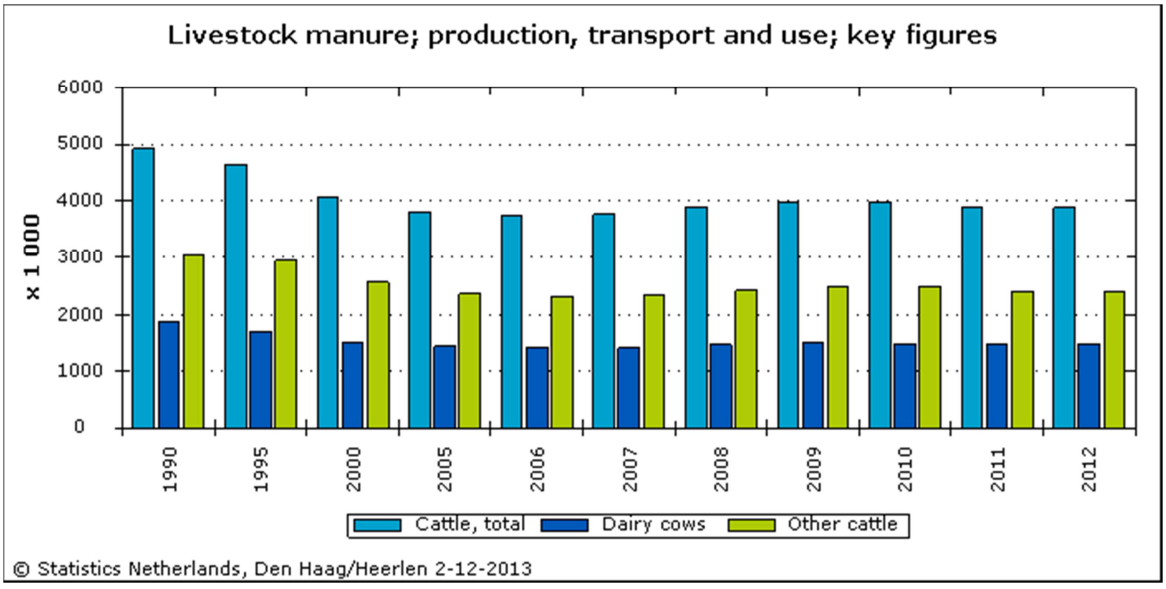

Figure 2.28 Livestock manure, transport and use [16]

[15] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=80783ENG&D1=0&D2=a&D3=0&D4=0,5,10-13&LA=EN&HDR=G2,G3&STB=T,G1&VW=G

[16] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=80408ENG&D1=3-5&D2=12,17,22,27-34&LA=EN&HDR=T&STB=G1&CHARTTYPE=1&VW=G

The most important agricultural crops are cereals, maize for fodder, potatoes and sugar beets. Legislation concerning manure has resulted in a more even distribution of manure over agricultural areas. Excess manure is increasingly being used on arable cropland. Legislation concerning ammonia banned the surface spreading of manure and required manure injection and incorporation into the soil. This has resulted in more nitrogen being absorbed by grassland and cropland, supposedly leading to higher emissions of nitrous oxide. Also, as a consequence of the increasingly strict manure/nutrient policies (both Dutch and EU), the number of farms that produce more manure (minerals) than they are allowed to use on their own land is increasing. This has led to an increase in the export of manure (see tables below). Furthermore, more farmers are looking for ways to process manure (e.g. separation of liquid and solid fractions) or to use manure as an input for energy production (fermentation, biogas).

Livestock manure; production, transport and use; key figures

October 10 2013 | more info

Subjects	Manure production	Transport, processing and export	
	Manure production, total	Net manure exports	
		Nitrogen exports (N)	Phosphate exports (P2O5)
Periods	*mld kg*	*mln kg*	
1990	87.4	6.0	3.2
1995	82.6	22.0	10.8
2000	75.6	14.7	13.1
2005	70.1	14.9	14.3
2010	72.2	37.9	24.7
2011	71.4	38.7	25.2
2012	71.2	.	.

© Statistics Netherlands, Den Haag/Heerlen 18-11-2013

Table 2.4 Livestock manure: production, transport and use[17]

2.12 Forests

The forested area in the Netherlands currently consists of 375,000 ha. The forested area therefore amounts to around 10% of total land area. Originally the largest part of the forested area in the Netherlands was planted using regular spacing and just one or two species in even-aged stands, with wood production being the main purpose. A change towards multi-purpose forests (e.g. nature, recreation), which was first started in the 1970s, has had an impact on the management of these even-aged stands.

Type of forest	Share in 2005	Share in 2012 / 2013
Unmixed coniferous	32%	26%
Mixed coniferous	7%	6%
Mixed coniferous/broadleaf	21%	23%
Unmixed broadleaf	21%	20%
Mixed broadleaf	15%	21%
Open/young forest	4%	2%
Clear-cut area	0%	1%
Unknown	0%	1%

Table 2.5 Composition of forests in the Netherlands. Source: National Forest Inventory (in press)

[17] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=80408eng&D1=0-2,35-36&D2=12,17,22,27,32-34&LA=EN&HDR=T&STB=G1&VW=T

Most of the forested areas in the Netherlands are currently managed according to Sustainable Forest Management principles. Newly established forests are also planted according to these principles. The results of this management style are clearly shown in the National Forest Inventory. Unmixed coniferous stands decreased in favour of mixed stands. Table 2.5 shows the composition of forests in the Netherlands. Natural regeneration plays an important role in the transformation process from the even-aged, pure stands into those with more species and more age classes. This is why most of the forest areas in the Netherlands can be considered ‘semi-natural’.

3 GREENHOUSE GAS INVENTORY INFORMATION

3.1 (A) Summary tables

The Netherlands submitted its most recent greenhouse gas inventory (period 1990-2011) to the UNFCCC in April 2013. The Netherlands resubmitted its CRF tables in October 2013 as a result of the UNFCCC review in September (only a very small increase of emissions in 2010 and 2011).The summary tables including CO2 equivalent emission trend tables are shown in Annex 3.1 of this National Communication. The main trends are explained in Section 3.2. below.

3.2 (B) Descriptive summary

This section summarises the trends in greenhouse gas emissions over the period 1990-2011, by greenhouse gas and by sector, as described in the National Inventory Report 2013. More detailed explanations are provided in the NIR 2013 (Coenen et al, 2013).

Emission trends for aggregated greenhouse gas emissions

Total direct greenhouse gas emissions (excluding emissions from Land Use, Land-Use Change and Forestry, LULUCF) in the Netherlands in 2011 are estimated at 194.4 Tg CO2 eq. This is 8.8% lower than the 213.2 Tg CO2 eq reported in the base year (1990; 1995 is the base year for fluorinated gases). Figure 3.1 shows the trends and relative contributions of the different gases to the aggregated national greenhouse gas emissions. Over the period 1990-2011 emissions of carbon dioxide (CO2) increased by 5.3% (excluding LULUCF), while emissions of non-CO2 greenhouse gases decreased by 50% compared with base year emissions. Of the non-CO2 greenhouse gases, methane (CH4), nitrous oxide (N2O) and fluorinated gases (F-gases) decreased by 41%, 54% and 70% respectively.

In 2011 total greenhouse gas emissions (including LULUCF) decreased by 14.5 Tg CO2 eq compared to 2010 (197.7 Tg CO2 eq in 2011).

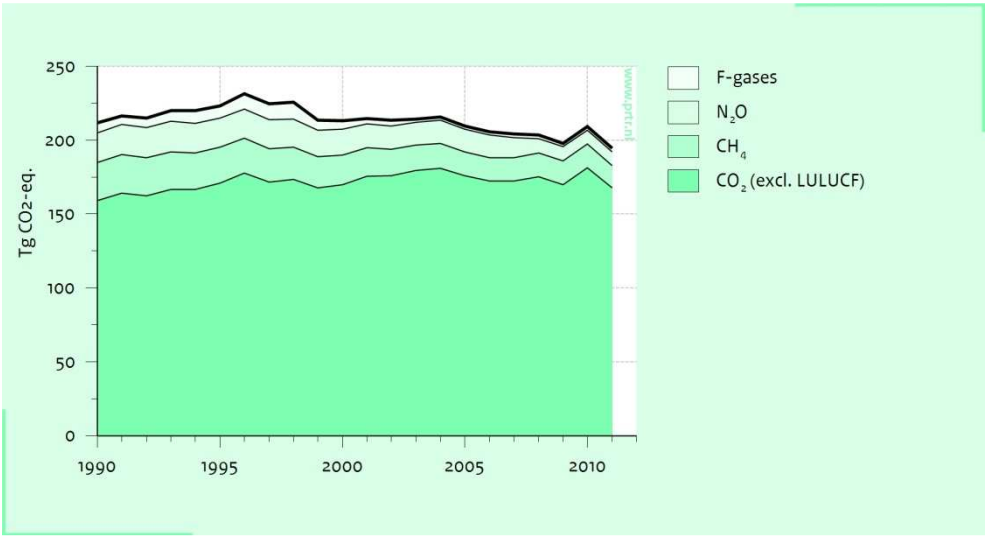

Figure 3.1 Greenhouse gases: trends and emission levels, 1990-2011

Emission trends by gas

Carbon dioxide
Figure 3.2 shows the contribution of the most important sectors, as defined by the Intergovernmental Panel on Climate Change (IPCC), to the trend in total national CO2 emissions (excluding LULUCF). Over the period 1990-2011 national CO2 emissions increased by 5.2% (from 159.2 to 167.5 Tg). The Energy sector is by far the largest contributor to CO2 emissions in the Netherlands (96%), with the categories 1A1 Energy industries (39 %), 1A4 Other sectors (23 %) and 1A3 Transport (22 %) as the largest contributors in 2011.

The relatively high level of CO2 emissions in 1996 is mainly explained by a very cold winter, which increased energy use for space heating in the residential sector. The resulting emissions are included in category 1A4 (Other sectors). The relatively low level of CO2 emissions in category 1A1 (Energy industries) in 1999 is explained by the marked increase in imported electricity and a shift from the use of coal to residual chemical gas and natural gas in 1999; the share of imported electricity almost doubled. However, this increased import of electricity led to only a temporary decrease in CO2 emissions. The pre-1999 annual increase in CO2 emissions from this category (about 1-2 %) was observed again over the period 2000-2004. Imports of electricity decreased in 2008.
CO2 emissions decreased by 7.4 % in 2011 compared with 2010, mainly due to decreased fuel combustion in the Energy sector.

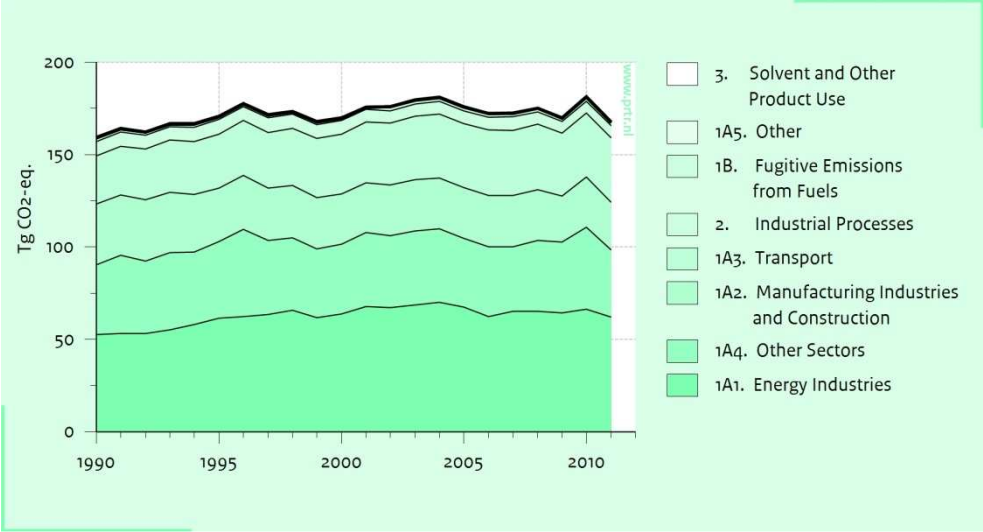

Figure 3.2 CO_2: trend and emission levels of sectors, 1990-2011

Methane
Figure 3.3 shows the contribution of the most important IPCC sectors to the trend in total CH_4 emissions. National CH_4 emissions decreased by 41 %, from 1.22 Tg in 1990 to 0.73 Tg in 2011 (25.7 to 15.3 Tg CO_2 eq). The Agriculture and Waste sectors (60 % and 22 % respectively) were the largest contributors in 2011.
Compared with 2010 national CH_4 emissions decreased by about 4.2 % in 2011 (0.7 Tg CO_2 eq), due to the decrease in CH_4 emissions mainly in categories 4 (Agriculture) and 6A (Solid waste disposal on land).

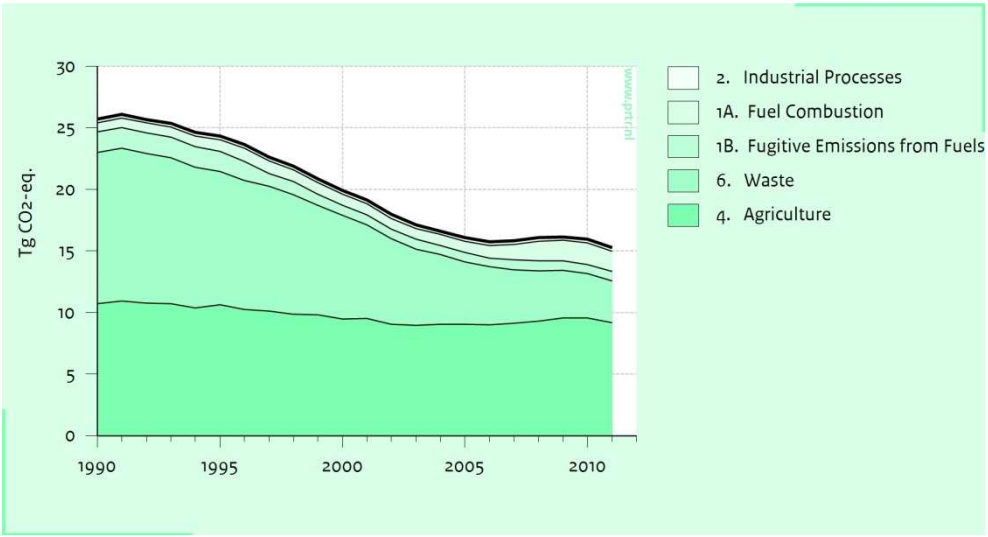

Figure 3.3 CH_4: trend and emission levels of sectors, 1990-2011

Nitrous oxide

Figure 3.4 shows the contribution of the most important IPCC sectors to the trend in national total N_2O emissions. The total national inventory of N_2O emissions decreased by about 54 %, from 64.4 Gg in 1990 to 29.4 Gg in 2011 (20.0 to 9.1 Tg CO_2 eq). The sector contributing the most to this decrease in N_2O emissions is Industrial Processes (whose emissions decreased by more than 84 % compared with the base year). Compared with 2010, total N_2O emissions decreased by 2.1 % in 2011 (-0.20 Tg CO_2 eq), mainly due to decreased emissions from agricultural soils.

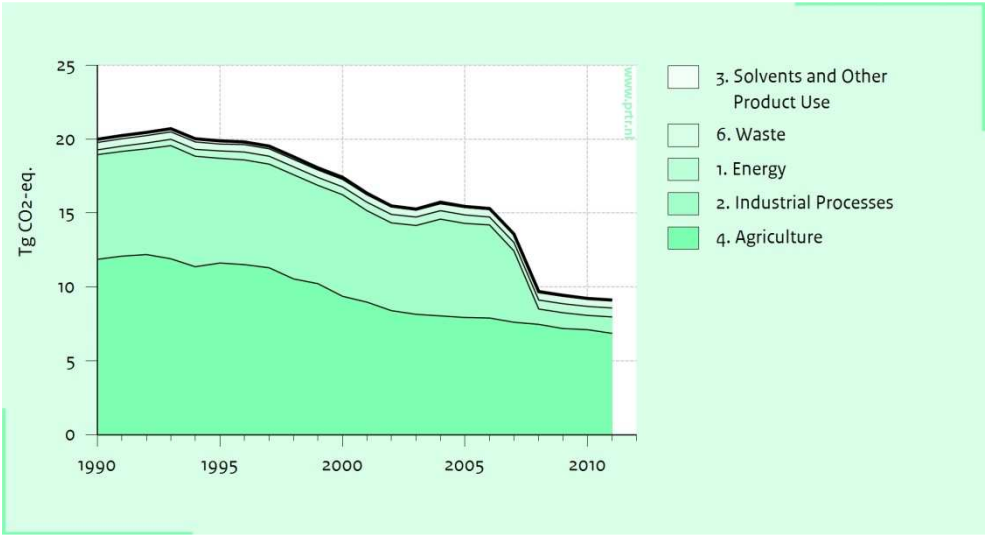

Figure 3.4 N_2O: trend and emission levels of sector %ages, 1990-2011

Fluorinated gases

Figure 3.5 shows the trend in F-gas emissions included in the national greenhouse gas inventory. Total emissions of F-gases decreased by 70 % between 1995 and 2011, from 8.2 Tg CO_2 eq in 1995 (base year for F-gases) to 2.5 Tg CO_2 eq in 2011. Emissions of hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) decreased by approximately 65 % and 91 % respectively during the same period, while sulphur hexafluoride (SF_6) emissions decreased by 49 %.

Emissions between 2010 and 2011 decreased by 5.6 %, 12 % and 20 % respectively for HFCs, PFCs and SF_6. The aggregated emissions of F-gases decreased by 7.2 %.

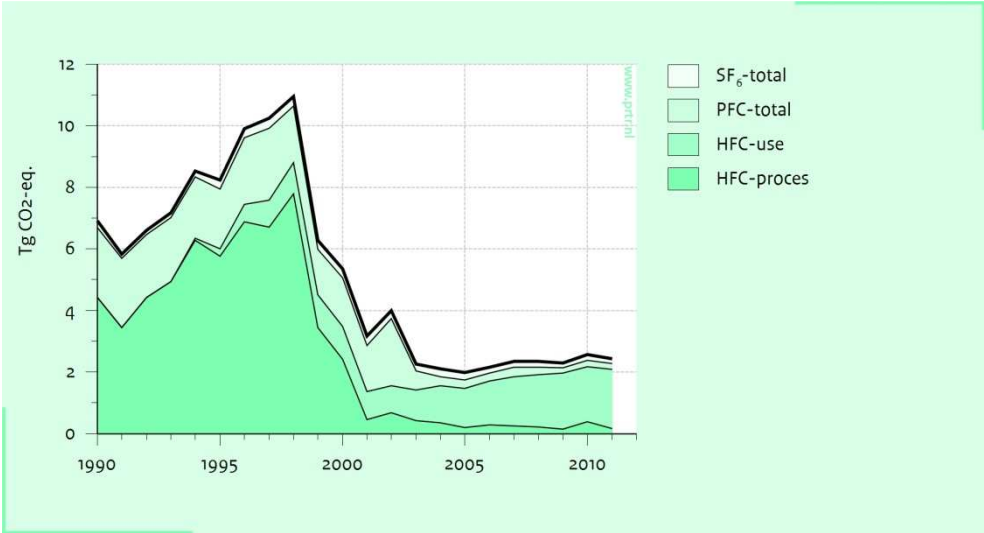

Figure 3.5 Fluorinated gases: trend and emission levels of individual F-gases, 1990-2011

Emission trends specified by source category

Figure 3.6 shows an overview of emissions trends per IPCC sector in Tg CO_2 equivalents.

The IPCC Energy sector is by far the largest contributor to total greenhouse gas emissions in the national inventory (contributing 71 % in the base year and 83 % in 2011; the relative share of the other sectors decreased correspondingly). The emissions level of the Energy sector increased by approximately 6.6 % in the period 1990-2011, and total greenhouse gas emissions from the Waste, Industrial Processes and Agriculture sectors decreased by 71 %, 56 %, and 29 %, respectively, in 2011 compared with the base year.

Compared with 2010, greenhouse gas emissions in the Energy sector decreased by about 14.0 Tg in 2011 as a result of the mild winter in 2011 compared with the cold winter in 2010.

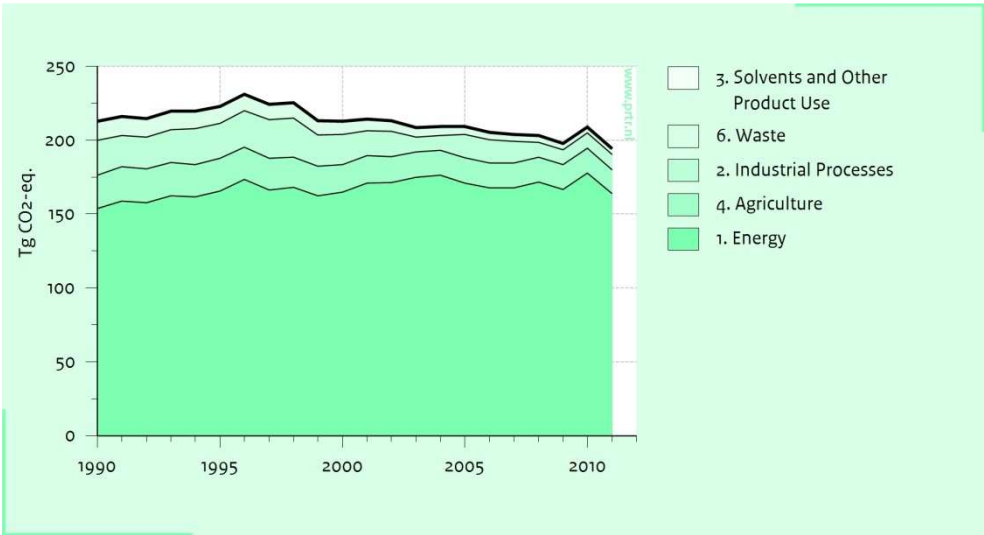

Figure 3.6 Aggregated greenhouse gases: trend and emission levels of sectors, 1990-2011

Emission trends for indirect greenhouse gases and SO_2
Figure 3.7 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 2011 were reduced by 61 % and 71 % respectively. For SO_2 the reduction was as much as 83 %; and for NO_x 2011 emissions were 57 % lower than the 1990 level. With the exception of NMVOC, most of the emissions stem from fuel combustion.

Because of the problems identified with annual environmental reporting (see section 1.3.2), emissions of CO from industrial sources are not verified. However, experts have suggested that possible errors will have a minor effect on total emissions levels. Due to lack of data, the time series for 1991-1994 and 1996-1999 were interpolated between 1990 and 1995.

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

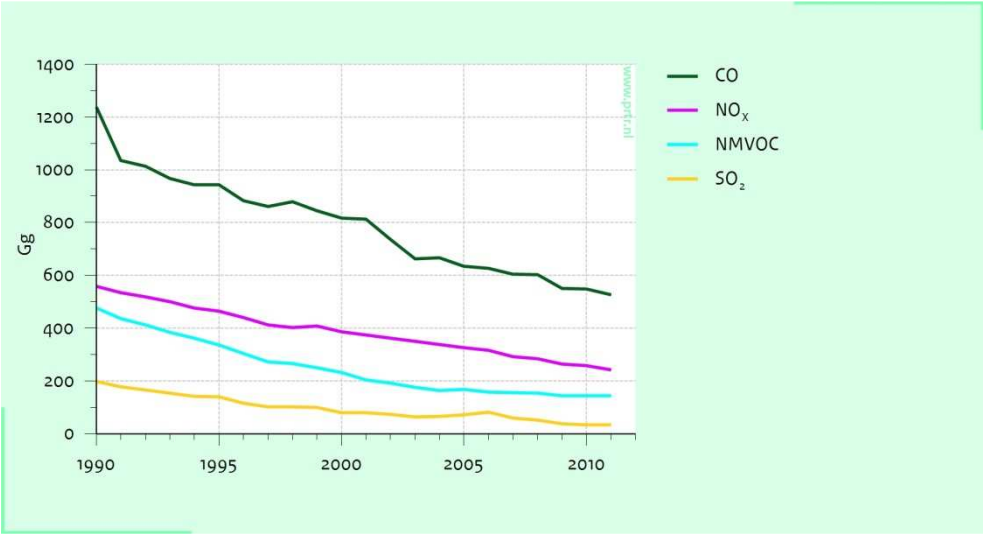

Figure 3.7 Emission levels and trends of NO_x, CO, NMVOC and SO_2 (Units: Gg)

3.3 (C) Description of the national system

3.3.1 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 the exception of an organisational change that came into effect as of January 1st 2010. This report details the system as it operates on December 31st 2013, describing how the required functions are performed in the Netherlands, following the outline from the reporting guidelines (see Box 1).

Objectives of the National System
Under the Kyoto Protocol, a National System[18] 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, and for reporting and archiving inventory information. The objectives of the Netherlands' 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[19];
- 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.

NLAgency coordinated the establishment of the National System and was subsequently also assigned the role of 'single national entity' (NIE).

Box 1 Outline

Institutional and organisational aspects (Section 3.3.2), 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.

Methodological and process aspects (Section 3.3.3), 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 3.3.4), 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.

3.3.2 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:
NL Agency, PO Box 8242, 3503 RE Utrecht, The Netherlands.
Designated representative with overall responsibility for the inventory:
Harry Vreuls, Harry.Vreuls@agentschapnl.nl, *telephone: +31 88 6022258.*

[18] Definitions used in this report are those used in UNFCCC guidelines
[19] As required by Article 5, and to report these emissions by sources and removals by sinks in accordance with Article 7, paragraph 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)

The Minister of Infrastructure and the Environment (I&M) has appointed NL Agency by law as the single national entity (NIE).

Roles and responsibilities regarding the inventory process

(b) The roles and responsibilities of the 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 Infrastructure and the Environment (I&M) is the coordinating Ministry in the Netherlands for Climate Change Policy. The Minister of Infrastructure and the Environment has been given, by law, the authority to appoint a single national entity (also known as NIE), as defined in the guidelines under Article 5.1 of the Kyoto Protocol. The Minister has appointed NL Agency as NIE with overall responsibility for the national inventory. NL Agency is responsible - amongst other things - for assembling and providing the annual reports to the UNFCCC, coordinating the QAQC process, operating as focal point for the UNFCCC for the report, including supporting the UN review process. Parts of the annual report are provided by other organisations.

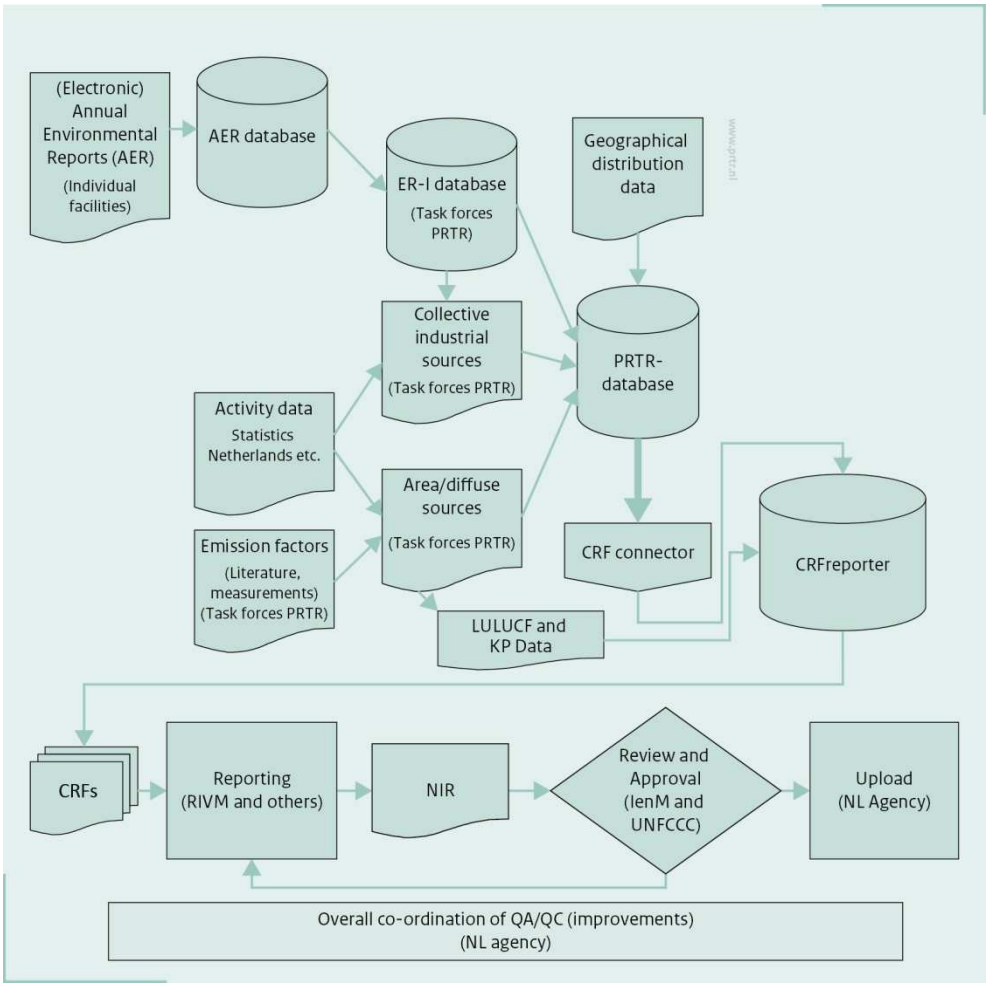

Figure 3.8. Schematic overview of the main steps in the primary process. In practice there are various feedback loops.

The inventory and reporting process is illustrated in Figure 3.8 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 is taken from the national emissions registrations project (ER). This is a collaborative project (started around 1974) involving a series of bodies and ministries in the Netherlands. The objective of the project is to agree on one national dataset for emissions inventories covering some 350 pollutants to air, water and soil; this dataset is used for a variety of international and national applications. Its coordination is assigned to RIVM, 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 protocols. These are drafted and maintained by NL Agency (the NIE); this is done in cooperation with the relevant emission experts.

The ER project uses primary data from various data suppliers:

Statistical data
Statistical data is provided under various (not specifically greenhouse gas-related) obligations and legal arrangements. These include national statistics from Statistics Netherlands (CBS) and a number of other sources of data on sinks, water and waste. The provision of relevant data for greenhouse gases is guaranteed through covenants and an Order in Decree, the latter being in preparation by the Ministry of Infrastructure and the Environment. For greenhouse gases, relevant agreements with respect to waste management are in place with CBS and Rijkswaterstaat Environment.An agreement with the Ministry of Agriculture, Nature and Food Quality (LNV, now EZ) and related bodies was established in 2005.

Data from individual companies
Data from individual companies is provided in the form of electronic annual environmental reports (AER). A large number of companies have a legal obligation to submit an AER that includes - in addition to other pertinent information - emission data validated by the competent authorities (usually provincial and occasionally local authorities that also issue environmental permits to these companies). A number of companies with large combustion plants are also required to report information under the EU emission trading system (ETS) and under the BEES/A regulation. Some companies provide data voluntarily within the context of environmental covenants. The data in these specific AERs is used to verify the CO_2 emissions calculated from energy statistics for industry, the Energy sector and refineries. If reports from major industries contain plant-specific information on activity data and EFs of sufficient quality and transparency, this data is used in the calculation of CO_2 emission estimates for specific sectors. The AERs from individual companies provide essential information for calculating the emissions of substances other than CO_2. The calculations of industrial process emissions of non-CO_2 greenhouse gases (e.g. N_2O, HFC-23 and PFCs released as by-products) are mainly based on information from these AERs, as are the calculated emissions from precursor gases (CO, NO_x, NMVOC and SO_2). Only those AERs with high quality transparent data are used as a basis for calculating total source emissions in the Netherlands.

Additional greenhouse gas-related data
Additional greenhouse gas-related data is provided by other bodies and consultants that are specifically contracted to provide information on sectors not sufficiently covered by the data sources listed above. For greenhouse gases, contracts and financial arrangements are made (by RIVM) with,

for example, various agricultural institutes and TNO. In addition, NL Agency contracts out various tasks to consultants. A number of agricultural institutes have been contracted by the Ministry of Economic Affairs in the field of LULUCF. Under on a written agreement between the Ministry of Economic Affairs 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 ER project. Data is collected and processed by five task forces (see box 2) according to predetermined methods described in the Monitoring Protocols.

Arrangements for reporting, QA/QC coordination and review
The data is stored in the ER's Central Database system. The CRF is generated automatically from this ER database.

The overall annual report for the UNFCCC is drafted and coordinated by NL Agency (the NIE). To ensure the involvement of the relevant experts from the various bodies (CBS, TNO, PBL, RIVM, etc.) that supplied the relevant emission estimates, this 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. 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 to ensure consistency with the ER data. Overall coordination, including the elaboration of Part 2 of the NIR, is carried out by NL Agency/NIE. The elaboration of Part 2 involves various bodies, including the Ministry of Economic Affairs (EZ).

NL Agency/NIE submits the annual report to the UNFCCC after approval by the Ministry of Infrastructure and the Environment. NL Agency 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 Emission registration (ER)

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

Taskforces
Various emission experts from the participating organisations participate in the Taskforces 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 Emission Register and the dataset 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 Taskforces as described below:

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

Taskforce on Transportation
Covers the emissions to soil, water 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.

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

Taskforce on Water - MEWAT
This Taskforce calculates the emissions from all sectors to water, and includes Rijkswaterstaat, Deltares, Netherlands Environmental Assessment Agency (PBL), RIVM, Statistics Netherlands (CBS) and TNO.

Taskforce on Consumers and other sources of emissions - WESP
Covers 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 Minister of Infrastructure and the Environment (I&M) to appoint an authority responsible for the National System and the National Inventory. The Minister has appointed NL Agency as this authority (NIE) [2005, Netherlands Government Gazette (Staatscourant)].

The Act also specifies that the National Inventory must be based on methodologies and processes as laid down in the monitoring protocols. Adjustments to the protocols will require official publication of the new protocols and an announcement of publication in the Netherlands Government Gazette (Staatscourant).

3.3.3 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. The figure 3.9 illustrates the steps and the QA/QC tools used in each step.

(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 the development of emission estimates are described the previous section. This paragraph describes the methodology and process aspects of this.

The choices with regard to the activity data to be used, emission factors to be selected, the methods to be selected and the steps in producing the emission estimates have been made in various ways: During the establishment of the national system an improvement programme was implemented with the relevant bodies and experts, as well as with independent experts. This assessed all relevant data, factors and methods. This was done in workshops and through special (background) studies, amongst other things. Choices were made in line with the IPCC and UNFCCC guideline concerning (changes in) methods, data and factors. These 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.
The annual QAQC cycle (see below) guarantees that attention is constantly paid to possible further necessary and/or possible improvements. The results of internal and external QAQC and review processes form an important basis for this.
In addition, a long-term process has been implemented in recent years which is introducing a more thorough systematic review of methods, processes, data and factors, gradually covering all sectors. This process is aimed at longer-term improvements by assessing the impact of developments in guidelines (IPCC 2006), new policies and science on the methods and processes to be used in good time.

More detailed information about how the processes have been implemented is provided by describing (in the Section below) the implementation of the various functions of a National System as part of an annual management cycle in the Netherlands.

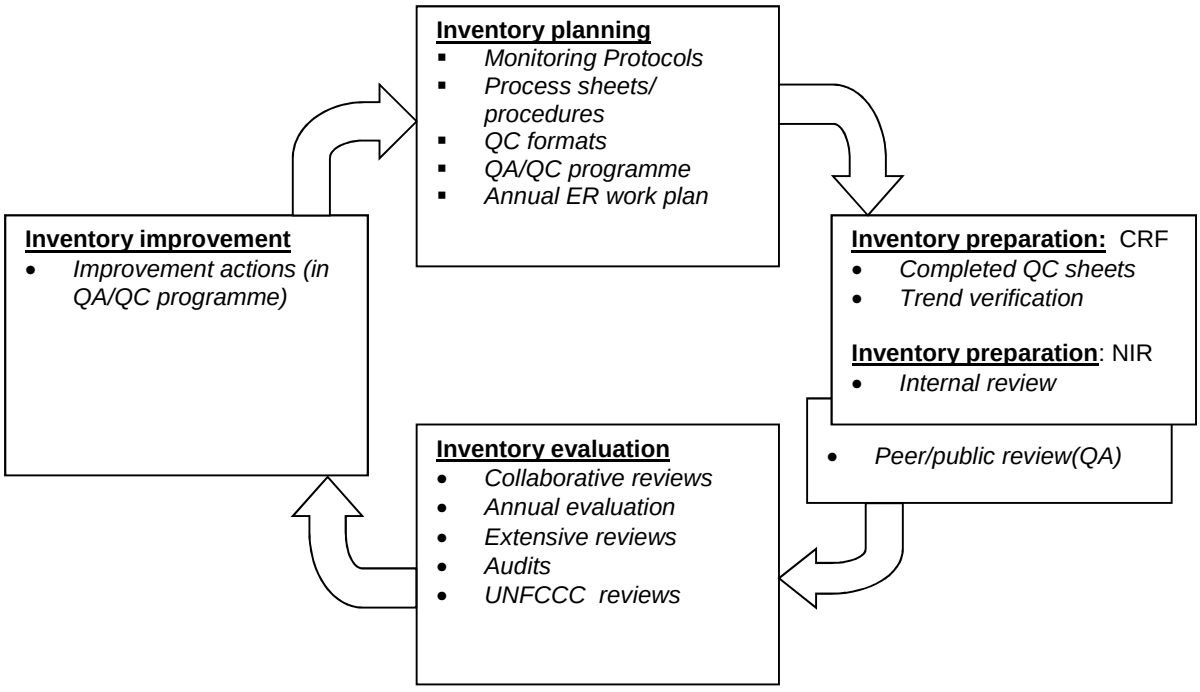

Figure 3.9. Annual cycle

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

- *Monitoring Protocols* describe the choice of method, activity data and emission factors, as well as specific tasks, responsibilities, working processes and time schedules. The Protocols are officially listed in the Netherlands Government Gazette (Staatscourant) as formalised in a General Administrative Order[20]. The Protocols constitute part of (and are listed in) the annual inventory report and are also published on the National System website[3].
- *Set of procedures* describing other relevant processes, e.g. the preparation of CRF and NIR, documentation and archiving, key source and uncertainty analyses.
- *Set of agreements* on the basic institutional, legal and organisational structure. These have been recorded in contracts, legal arrangements and covenants (see previous section).
- *QA/QC programme*, including the planning of activities and improvement projects.
- *Annual Working Plans* of the ER providing more detail on planning of the ER process, including the working procedures to be used and documentation/registration sheets to be applied.

The agreements, protocols, procedures and QA/QC programme are reviewed annually, updated (if necessary) and approved for use in the next cycle. NL Agency is responsible for updating the QA/QC programme, including the improvement cycle. Updates are approved by I&M, in consultation with the Consultative Committee NIE[21]. For LULUCF issues, I&M will seek agreement from the Ministry of Economic Affairs (EZ).

The annual planning is further detailed in the Annual Work Plans, specifying staffing, 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[22] after consultation.

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

- data collection, data processing and emission estimation in accordance with the Monitoring Protocols 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 a 'paper trail' for the estimates;
- performing the general QC procedures (Tier 1) as detailed in the Annual Work Plans, results and corrections (and approval) are documented;
- elaborating the CRF and NIR in accordance with the related procedures, including 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 will be done by the ER 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 as also described in the Procedures of the National System.

[20] Staatsblad 2005, 664; www.nlagency.nl/nie
[21] Consisting of representatives of the Ministries (IenM, EZ) and bodies (CBS, ER, NEa, PBL) involved.
[22] For the ER, approval is given by the ER Steering Committee.

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

If necessary as part of the inventory preparation process, recalculations are also performed and documented in accordance with the related IPCC guidelines. Methods can only be changed after formal approval of the revised methods and Protocols by the NIE Advisory Board (Klankbordgroep NIE) and I&M, since these also have to be included in the Protocols. This is achieved using initiator's arguments for why a change in methods, data or factors is better and/or necessary. This assessment also looks into whether the change has been sufficiently reviewed and documented.

Changes can be initiated by all parties involved; they can be based on UN review team recommendations 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 notification to experts and organisations with a potential interest.
- implementing an annual internal evaluation and improvement cycle, implemented jointly by NIE and ER, comprising two major steps:
    - around June: evaluating the previous cycle and updating the QA/QC programme;
    - around October: updating Planning and Protocols, if needed, for the next cycle.

Inventory improvement

The annual list of improvement actions is an integral part of the QA/QC programme. If results, particularly those from UN reviews, give rise to urgent improvement actions, additional actions may be adopted. Improvements that influence methods or may cause recalculations require formal approval in accordance with the relevant procedure. Proposals for methodological changes are sent by the ER to the NIE, which adds a recommendation about the proposals and sends them to the NIE Advisory Board for approval (see also text above at e). The QA/QC programme also includes non-annual review and audit activities which contribute towards 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 Netherlands' archiving system is centrally accessible for the NIE, with the exception of confidential information. Confidential information is not archived centrally, but is only maintained and archived by the work package leader. The confidential information can also be accessed by the project leader, the project secretary and the work package leader's deputy. 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.[3]
- facilitating UN reviews and responding to any related requests for clarification under the EU monitoring mechanism and the UNFCCC. This task is performed by the NL Agency as the NIE.

3.3.4. 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. The various tools and QA/QC activities are further elaborated in the QA/QC programme. Various 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 QAQC system, programme, plan and their implementation are described in this section, which also highlights information concerning internal and external evaluation, as well as review processes and their results.

QAQC programme
The QA/QC programme describes the quality objectives of the inventory, National System and the QA/QC plan, and 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. The QA/QC programme is essentially an internal document that is available for UN review. NL Agency is responsible for the coordination and implementation of the programme. It will be updated, where necessary, about once a year, usually in the autumn as part of the planning cycle.

The objectives are further elaborated in the programme into more specific quality objectives relating to improving transparency, consistency, comparability, completeness and accuracy (the 'inventory principles').

The 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.

Generally the main actions include:

Quality control
- maintaining a transparent system through Protocols, Procedures and 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 of external agencies;
- applying General QC (Tier 1) procedures as part of the standard working processes, in accordance with the IPCC Good Practice Guidance and, where applicable, source-specific QC procedures for selected sources. The main responsibility for implementation lies with the ER. 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 5 years).

Quality assurance
This is primarily implemented by staff not directly involved in the inventory process which is coordinated or implemented by NL Agency. 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 a long-term process aimed at the implementation of the 2006 IPCC Guidelines after 2014;
- annual audit on selected part(s) of the National System;
- outside agencies archive 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:

- Document and archive relevant information about 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 QAQC programme, based on experiences from reviews and QAQC actions.

Results from internal and external evaluations and reviews

Various actions are taken to improve and maintain the quality of the National System. These actions include:

- Annual UNFCCC reviews of the functioning of the National System. In 2007, the National System was reviewed during the initial review. The review team concluded that The Netherlands' National System had been established in accordance with the guidelines for national systems under article 5, section 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 the specific functions of inventory planning, inventory preparation and inventory management. In the annual review reports the expert review teams report that the National Systems continues to fulfil the requirements and did not provide any recommendation.
- Follow-up of the annual recommendations of the UNFCCC reviews. In recent National Inventory Reports (NIRs) a more detailed overview on the recommendations and actions is incorporated in chapter 10 of each NIR..
- Annually the European Commission conducts a check on the Dutch draft data for greenhouse gas emissions, the elaborations in the draft National Inventory Report and changes compared to previous years. Results from these checks are used in finalising the reporting to the UNFCCC.
- In 2012 the European Commission conducted an in-depth technical review of Dutch greenhouse gas emission inventory. The EU technical expert review team identified a small number of recommendations for improvements. These recommendations were taken into consideration during the preparation of the next greenhouse gas emission estimates.
- Annual QA activities by NL Agency in its role as NIE: internal reviews on the entire NIR, audits on part of the NIR and a peer review on a part of the NIR, outsourced to an external expert. These activities have led to separate recommendations on the improvements of quality of the NIR and methodology descriptions in the protocols.

Official consideration and approval

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

The Ministry of Infrastructure and the Environment 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 Economic Affairs on LULUCF issues.

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

The Netherlands actively seeks to continuously improve its inventory. The previous sections describe its quality improvement cycle and programmes and the main results. In addition, the Netherlands actively participates in what may be considered a 'regional programme' activity; the experts within the EU regularly convening to discuss experiences with their respective inventories, with the aim of identifying and, where relevant, implementing improvement actions. This is achieved through expert workshops, working group meetings and joint EU research programmes.

In recent years the Netherlands has also participated in special programmes whereby experiences with inventories are exchanged within government-to-government expert assistance programmes (G2G). This was recently implemented with Croatia and Kazakhstan (on ETS issues) and with Romania (on inventory issues), amongst others.

3.4 (D) National Registry

This section describes the Netherlands' 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-(0)6 52595182
Fax number	+31-(0)70-3391394
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 in the Central European Emissions Trading Registry (EU Registry) with all the Parties that are also members of the European Union.
The 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 the capacity can be found in the readiness documentation which is available on the UNFCCC website.[23]

(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) [24]

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 functionality to perform issuance, conversion, external transfer, (voluntary) cancellation, retirement and reconciliation processes using XML messages and web services as specified in the DES.

In addition the CIE registry software implements functionality 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, 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) (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 is 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 minimises the sending 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 transaction proposal messages logs and confirms the receipt of these messages if they are technically valid. The content validation and processing is then performed sequentially. This separation allows for swift communication with the ITL while still performing extensive business checks. This also significantly improves the transaction handling capacity of the

[23] https://extranet.unfccc.int/registry-systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx

[24] See decision 24/CP.8.

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, thereby ensuring 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, 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.[25]

(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. The public area is accessible to everyone.[26]
The restricted area is only accessible to authorised users.[27]
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 home-page 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 publicly available.[28]

The user terms and conditions are also available through the public area of the Registry.[29]
The main entry point to the National Registry is [30]:

(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 which is available on the UNFCCC website.[31]

Physical security
The European Emissions Trading Registry is hosted and facilitated by the European Commission.

[25] https://extranet.unfccc.int/registry-systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx
[26] http://www.emissieautoriteit.nl
[27] https://ets-registry.webgate.ec.europa.eu/euregistry/NL/index.xhtml

[28] http://www.emissieautoriteit.nl/english/public-information-kyoto
[29] https://www.emissieautoriteit.nl/emissierechten/eu-register/gebruiksbepalingen
[30] https://ets-registry.webgate.ec.europa.eu/euregistry/NL/index.xhtml
[31] https://extranet.unfccc.int/registry-systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx

A description of the physical security can be found in the readiness documentation which is available on the UNFCCC website.[32]

(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 relating 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) which is available on the UNFCCC website.[33]

[32] https://extranet.unfccc.int/registry-systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx
[33] https://extranet.unfccc.int/registry-systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx

4 POLICIES AND MEASURES

4.1 Introduction

This chapter provides an overview of climate-change-related policies and measures in the Netherlands, focusing on the emission-reduction efforts necessary to comply with the commitments under the Kyoto Protocol.

Section 4.2 describes the overall policy context. The main policies and measures implemented are outlined in Section 4.3, while Section 4.4 goes on to describe policies and measures that are no longer in place since the previous National Communication. Sections 4.5 and 4.6 are dedicated to the participation in the mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol and the supplementary of the Netherlands' climate change policies and measures. Sections 4.7 and 4.8 report on other issues required under Art. 7.2 of the Protocol, i.e. 'policies and measures in accordance with Article 2' and 'domestic and regional programmes and/or legislative arrangements, and enforcement and administrative procedures'.

4.2 (A) Policy-making process

4.2.1 The Netherlands' emission-reduction targets

As a party to the Kyoto Protocol, the Netherlands had an emission reduction target for 2008-2012. As targets for the next commitment period have not yet been set, current policies aim for the 2020 emission reduction targets that have been agreed upon in the European Union.

Kyoto target 2008-2012
The Netherlands ratified the Kyoto Protocol on 31st May 2002. At the time of signing of the Protocol, the EU agreed upon a greenhouse gas reduction percentage of 8% for the Union as a whole. This common target was subsequently divided amongst the EU Member States in the so-called 'Burden Sharing Agreement' (European Council decision 2002/358/CE). For the Netherlands, this resulted in an emission-reduction target of 6% below the emissions level in the base year for the 2008-2012 period. For emissions of CO_2, CH_4 and N_2O, the base year is 1990, and for the F-gases it is 1995. Section 4.2.3 shows how the Netherlands will comply with its 2008-2012 Kyoto target.

Targets under EU legislation
With the introduction of the EU Emission Trading Scheme (see par. 4.4.1), a large part of European emissions were capped under an EU-wide maximum cap. As a result, national targets under EU legislation only take into account the emissions outside the ETS.

- For the emissions covered by the EU ETS, under an EU-wide cap,the goal is to reduce emissions of greenhouse gases by 21% in 2020 compared to 2005 levels .
- For the emissions of greenhouse gases in the Netherlands not covered by the EU ETS, the goal is a reduction of 16% in 2020 compared to 2005 levels.

For emissions not covered by the ETS, this means the target is to reduce emissions to 104 Mt, with non-ETS base year emissions in the Netherlands being 127 Mt following Decision 2013/162/EU (and the adjustment by the EC in June 2013).

National targets
All short- and mid-term goals must be viewed in the light of the ambition to achieve domestic emission reductions of approximately 80% to 95% compared to 1990 levels by 2050. The Netherlands proposes to increase the EU's climate ambitions to at least minus 40% in 2030. A new target for the Netherlands will be derived from the final EU target.

4.2.2 National Climate Policy

A package of climate change measures is in place in all relevant sectors of the economy.
The Ministry for Infrastructure and the Environment is responsible for the overall national climate change policy framework, while the Ministry of the Interior and Kingdom Relations and the Ministry of Economic Affairs are also involved.(See paragraph about the departmental division in chapter 2.1)

In 2011, the Government agreed upon a translation of the overall (non-ETS) 2020 goal into sectoral 2020 goals, along with agreements about which minister is responsible for reaching each target. These goals are:

	Sectoral goal (Mt, 2020)
CO_2 industry & energy	10.7
CO_2 transport	35.5
CO_2 built environment	22.5
CO_2 agriculture	5.75
Non-CO_2 GHG Agriculture	16
Non-CO_2 GHG Other sectors	8.8
Total	99.25

Table 4.1: Sectoral goals for 2020.

Building upon current measures and the 'Climate Letter 2050' (2011), which sketched the long-term perspective of a (virtually) climate neutral country in 2050, in October 2013 the government published a Climate Agenda in which it announces new goals and measures. The main part of these measures result from the SER "Energy Agreement towards Sustainable Growth", in which over forty parties (including central, regional and local government, employers and unions, nature conservation and environmental organisations, plus other civil society organisations and financial institutions) agreed on a package of additional measures related (mainly) to built environment, energy and transport. The implementation of these provisions is intended to result in an affordable and clean energy supply, jobs, and opportunities for the Netherlands in the market for clean technologies.

As part of the agreement, parties agreed to install a Committee that monitors the progress in light of the 2020 and longer term goals. Parties have committed themselves to considering additional measures in case the evaluation in 2016 shows too little progress.

4.2.3 Monitoring and evaluation of progress relating to climate change measures

The overall development of greenhouse gas emissions is being monitored through the emission inventory system (described in Chapter 3). Emissions under the EU-ETS are being monitored through annual reporting in accordance with EU-ETS. The Environmental Assessment Agency (PBL) biennially publishes "The Assessment of the human environment ", which is a report on the current status and future trends in the Dutch environment in relation to government policies and societal trends.

Existing and planned policy measures are regularly being assessed and compared with an updated reference scenario "Geactualiseerde Referentieraming" (Verdonk and Wetzels, 2012, see chapter 5). Our latest projections show that the Netherlands should be able to comply with its Kyoto target (see below) and is also on track to achieve its 2020 target for greenhouse gases that do not fall under the EU ETS. Taking into account the implemented policies, 2020 emissions in the range of 93 – 108 Mt CO_2 equivalents have been projected, compared to the target of 105 Mt. This does not even take into account measures taken after February 2012, including the SER Energy Agreement, which will lead to more reductions. An analysis has been made of the presumed effects of the measures under the SER Energy Agreement, which will be evaluated in 2016.

Kyoto target
The above-mentioned Kyoto target over 2008-2012 was translated into an assigned amount of 1001 Mt over these 5 years. This meant that during this period, emissions should not exceed approximately 200 Mt of CO_2 equivalent per year. Of these Assigned Amount Units, 437 Mt have been transferred to Dutch companies participating in the EU Emissions Trading Scheme (ETS), either through auctioning (16 Mt) or through allocation (421 Mt). The companies have to compensate for excess emissions by purchasing foreign emissions credits. The remaining 564 Mt of CO_2 equivalent were available for the sectors that do not participate in the ETS (such as consumers, agriculture, transport and services). Here, the government needs to compensate for excess emissions by purchasing foreign emission credits. With emissions of approximately 594 Mt, the Netherlands will use around 30 Mt of credits in order to comply with its Kyoto target (see 4.3.4)

4.3 (B) Domestic and regional programmes and/or legislative arrangements, as well as enforcement and administrative procedures

4.3.1 Arrangements and procedures: European policy context

As an EU Member State, the Netherlands is also subject to EU climate policy and thus it applies EU Common and Coordinated Policies and Measures (CCPMs) relevant to climate change. These include, amongst others, the European Council Decision 2002/358/CE on the burden sharing of the EU's emission-reduction target for the Kyoto Protocol, and Decision 280/2004/EC on the so-called 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 to achieve this aim. Also included are Directive 2003/87/EC, which introduced the European system for CO_2 emissions trading, and the Effort Sharing Decision 406/2009/EC. Other CCPMs encourage combined heat and power production, the introduction of biofuels for transport and the reduction of CH_4 emissions from landfill waste sites.

4.3.2 Arrangements and procedures: national policy context

Apart from the institutional arrangements that explicitly respond to the Netherlands' signing of the Kyoto Protocol, which are described in Section 4.2, there are more general legislative arrangements and enforcement and also administrative procedures in place to ensure compliance with environmental rules and regulations. These arrangements pre-date the ratification by the Netherlands of the Kyoto Protocol.

The Environmental Management Act provides the legal basis for most environmental regulations that effect emissions of greenhouse gases (for example regarding waste prevention and landfill policy, environmental permits and CO_2 emissions trading). The Act also provides the framework for enforcing commitments undertaken in Long-Term Agreements and the Benchmarking Covenant by companies that do not participate in emissions trading.

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

The Housing Act provides the legal basis for the energy performance standards (EPN and EPC) that apply to new buildings. With the EPN it is possible to calculate the EPC (energy performance indicator). The standards are laid down in the Buildings Decree pursuant to the Housing Act. The Buildings Decree also sets a maximum EPC level to limit the energy consumption of a building. Furthermore, the Buildings Decree empowers municipal authorities to grant building permits. In the event of violations of building permits, municipal authorities have recourse to administrative sanctions based on Article 25 of the Municipalities Act and to criminal sanctions based on Article 108 of the Housing Act.

4.3.3 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 website [34] as indicated in Section 2.1. The Freedom of Information Act and the Environmental Management Act also provide for public access to information regarding the enforcement of environmental rules and regulations. Under the Act of 22nd December 2005, the Freedom of Information Act was extended with a provision for the reuse of official government information, in accordance with Directive 2003/98/EG of the European Parliament and the European Council of November 17, 2003.

4.3.4 Arrangements and procedures relating to participation in the mechanisms under Articles 6, 12, and 17 of the Kyoto Protocol

The Ministry of Infrastructure and the Environment is the Designated National Authority (DNA) for the Clean Development Mechanism (CDM) and (as of 2013) the National Focal Point for Joint Implementation (JI) in the Netherlands. The government use of the project-based mechanisms (Clean Development Mechanism and Joint Implementation) to comply with the Kyoto target of 1001 Mt CO_2 eq. in the commitment period 2008-2012 (an average of 200 Mt per year) will be approx. 30 Mt (see 4.2.3). As presented in paragraph 7.3.3, the Netherlands has acquired sufficient credits to do so.

Clean Development Mechanism
Various types of instruments are deployed by the government in order to acquire Certified Emission Reductions (CERs). For the selection of CDM projects and the purchase of CERs that meet the quality specifications of the government, various intermediary organisations have been contracted along four tracks:

1. governmental agency NLAgency conduct a public procurement procedure called CERUPT
2. facilities with multilateral and regional financial institutions: the International Bank for Reconstruction and Development (IBRD), the International Finance Corporation (IFC) and the Corporación Andina de Fomento (CAF)
3. a facility with a private international bank: the Rabobank
4. participation in carbon funds: the Prototype Carbon Fund (PCF) and the Community Development Carbon Fund (CDCF)

In order to encourage the implementation of CDM projects, voluntary and non-legally binding Memoranda of Understanding (MoUs) have been signed with Argentina, Bolivia, Brazil, Colombia, Costa Rica Ecuador, El Salvador, Guatemala, Honduras, Indonesia, Mexico, Nicaragua, Panama and Uruguay.

The Netherlands has decided not to use CERs from HFK23 projects to comply with the Kyoto target 2008-2012 and the ESD target for 2020.

[34] www.rijksoverheid.nl,

Joint Implementation
The government has developed three instruments for obtaining Emission Reduction Units (ERUs) from JI projects:

1. governmental agency NLAgency conducted several public procurement procedures called ERUPT
2. facilities with the World Bank (a cooperative arrangement between the IBRD and the IFC) and the European Bank for Reconstruction and Development (EBRD)
3. participation in a carbon fund: the Prototype Carbon Fund (PCF)

Voluntary and non-legally binding MoUs on the implementation of JI projects have been agreed with Bulgaria, Czech Republic, Croatia, Estonia, Hungary, New Zealand, Romania, Slovakia and the Ukraine.

"Greened" Assigned Amount Units
The government signed an agreement with Latvia to purchase Assigned Amount Units in 2009. The financial revenues will be and have been used for climate-change-related activities in Latvia.

Instrument	**Clean Development Mechanism**		**Joint Implementation**		**International Emission Trading**	**Total**
	Organisation	*Mt delivered*	*Organisation*	*Mt delivered*	*Mt delivered*	*Mt Expected*
Tenders	NL Agency	1.0	NL Agency	8.3	-	
Multilateral and regional financial institutions	CAF, IBRD, IFC	27.8	EBRD, IBRD, IFC	4.2	-	
Private financial institutions	Rabobank	2.4		-	-	
Participation in Carbon Funds	CDCF, PCF	0.2		1.2	-	
Bilateral agreements		---		-	3.0	
Total delivered		28.2		13.7	3.0	44.9

Table 4.2: Situation as of 31st July 2013 with regard to the Kyoto target.

4.3.5 Arrangements and procedures related to implementation of Articles 3.3 and 3.4 of the Kyoto Protocol

The approximately 375,000 hectares of forest in the Netherlands, which cover about 10% of the total surface of the country, have a number of functions, including recreation, nature, landscape, CO_2 sequestration and wood production. Dutch forests produce around 8% of the wood consumed. Because the production from the inland woods is large enough to increase the domestic wood production, the national administration is trying to encourage the harvest of wood.

Most of the forest area in the Netherlands is managed according to the principles of sustainable forest management, which also apply to newly planted forests. The Forest Act and the Flora and Fauna Act ensure the sustainable management of forests. The Forest Act contains the obligation to report felling activities and to replant within three years of felling, while the Flora and Fauna Act ensures that the negative consequences of (management) activities on biodiversity are minimised. The sustainable forest management principles and the three aforementioned Acts ensure that the implementation of activities complying with article 3.3 and 3.4 (Forest Management) contribute to the conservation of biodiversity and sustainable use of natural resources.

4.4 (C) Policies and measures and their effects

This section describes 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 section is limited to domestic and EU policies and measures implemented or planned in the Netherlands. The policies and measures described are those that were known on 6th September 2013, which was when the SER Energy Agreement (see below) was signed.

Most policies and measures described in the Netherlands' 5th National Communication (NC5) have been continued and therefore reappear in this 6th National Communication. The most important new policies and measures that have been implemented since NC5 have also been included in this communication. Policies and measures that have been repealed and are no longer in place are listed in Section 4.6.

The section below is organised by sector, using the sectoral definitions requested by the UNFCCC guidelines (Energy, Transport, Industry, Agriculture, Forestry and Waste). Due to the model used for emissions projections, in this report these sectors are defined based on economic activities within sectors and not, as is the case in the IPCC source categories, based on the processes that cause greenhouse gas emissions. Table 4.3 provides an overview of how the sectors in this report can be transposed to the IPCC source categories. Some additional sector differences occur because all mobile sources are clustered in the transport sector, and emissions from flue gas desulphurisation are allocated to the energy sector. IPCC category 5 is not included in the emissions projections. Policies and measures regarding forestry are described under Agriculture.

Each section describes the groups of policies and measures organised for each greenhouse gas; only the most important measures are described in detail. At the end of sections the estimated impacts of the (packages of) the main policies and measures are presented in Table 4.6. Not all the policies and measures are included in this table; some policies and measures are presented in combination while on the other hand policies and measures are implemented in more then one sector but presented for just one sector in this table. Also most policies and measures with low impacts are not included in the table.

The projected effects have been estimated based on the background of the reference scenario as described in Chapter 5. Please note that average yearly mitigation impacts, as presented in Table 4.6 are given for three periods (2005-2010; 2005-2015; 2005-2020) and cumulative for the period 2005-2020. These numbers should not be confused with the actual emission reductions in the years 2010, 2015, 2020. Those will in most cases be higher than the averages presented here, for policies generally have more effect in later years: e.g. because norms are tightened or subsidies increased yearly, or because measures were put in place after 2005. Please be also aware of the fact that some level of double counting can not be avoided as the policies and measures are not implemented in isolation, but in combination with others. For the ETS in the energy and industry the average annual data are presented for the period 2008-2010 and for 2008-2012, to ensure consistency with the data published by the Netherlands Emission Authority for the ETS period 2008-2012. For the whole period 2005-2020, as well as the average annual reported for this period, the data are based on a fifteen years period.

Sector	Activity	IPCC Source category
energy	centralised and own generation of power, energy distribution, oil and gas production, refineries, cokes manufacturing	1A1, 1B, small part of 2[1]
industry	chemicals, foodstuffs and luxury items, paper, basic metals, construction materials, other metals, other industry, cokes manufacturing, construction	main part of 2[2], main part of 1A2[3]
transport	transport incl. mobile equipment and off-road vehicles related to construction, agriculture and services	1A3, small part of 1A4c, small part of 1A2f, small part of 1A4a[4]
agriculture	agriculture and horticulture excl. mobile equipment and off-road vehicles	main part of 1A4c[5], 4
waste	waste incineration[6] and landfills	6
buildings	solvents, households, services excl. mobile equipment and off-road vehicles	3, main part of 1A4a[7], 1A4b

1. emissions due to flue gas desulphurisation in coal power plants. This is the main part of the emissions reported under 2A3 "lime stone and dolomite use".
2. excluding the part included in energy.
3. off-road vehicles for industry and construction (part of 1A2f) are included in transport.
4. transport includes off-road vehicles related to industry and construction (part of 1A2f), agricultural tractors (part of 1A4c) and mobile equipment from the service sector (part of 1A4b).
5. agricultural tractors (part of 1A4c) are included in transport.
6. when electricity is generated through waste incineration, the emissions are allocated to the energy sector.
7. mobile equipment from the services sector (part of 1A4a) is included in transport.

Table 4.3 Sectors used in this report relate to IPCC source categories

The effects are presented for groups of policies and measures affecting the different sectors rather than for individual measures. In analyses performed at a fairly high level of aggregation, it is often neither possible nor meaningful to separate out the impacts of individual instruments and programmes that focus on the same emissions source or activity.

Interaction of policies
The policy descriptions in the main text include the actual and expected interactions with other relevant policies and measures, and with Common and Coordinated Policies and Measures of the European Union (CCPMs).

Information on non-GHG mitigation benefits and on costs related to policies and measures
Impacts other than emission reductions (including economic impacts to the extent of feasibility, costs, non-greenhouse gas mitigation benefits and interactions with other policies and measures) are included in the text where possible and in par. 4.4.9, but are not shown in the summary tables.

At the request of the Dutch Ministry of Infrastructure and the Environment and the Ministry of Economic Affairs, the Energy research Centre of the Netherlands (ECN) and the Netherlands Environmental Assessment Agency (PBL) periodically update the so-called "Options Document for Energy and Emissions (Optiedocument Energie en Emissies)". The next update is scheduled in early 2014. The options for additional domestic reductions in greenhouse gas emissions can be assessed based on the data of this Options Document. In addition, ECN and SEO made a thorough analysis of the societal cost and benefits of several climate change mitigation options in their 2012 report "Kosten en baten van CO2-emissiereductie maatregelen". In the Climate Agenda it was announced that there will be a follow-up study in 2014 on the cost-effective effort sharing of a 2030 target across the sectors. It will be accompanied by proposals for new measures based on criteria such as technical potential, cost effectiveness and feasibility.

4.4.1 Cross-Sectoral Policies

Existing instruments that are basically cross sectoral include: Energy Investment Tax Deduction (EIA), Reduction Programme for Non-CO_2 Gases (ROB), Energy Tax, Sustainable Energy Production (SDE+), Long-Term Agreements, Benchmark Covenant, CO_2 Emissions Trading, and the Local Climate Agenda. The policies are described in the sections where their impacts are greatest, except for

the Reduction Programme for Non-CO_2 Gases and CO_2 Emissions Trading, which are described in this section.

In the paragraphs below a clear distinction is made between 'existing measures' (WEM), 'additional measures' (WAM), or both (WEM+WAM).
The most recent measures as included in the Energy agreement of 2013 are **not** taken into account, On 6th September 2013, the government entered into an agreement with other social partners regarding (additional) energy policies up to 2020 (the so-called 'SER Energieakkoord')[35]. The effects of this agreement have been evaluated by PBL and ECN (2013) but are not taken into account in the results that are presented in this chapter. [36]

CO2 Emissions Trading
As prescribed by Directive 2003/87/EC, a trading system for CO_2 emissions started within the EU on 1st 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 upfront and are required to annually submit allowances that are equal to their actual emissions. Companies are allowed to use credits from Kyoto mechanisms to comply with their obligations (see also Section 4.5). The EU ETS covers 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.

The EU ETS is now in its third phase, running from 2013 to 2020. A major revision (Directive 2009/29/EC) in 2009 to reinforce the system means 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). The EU also aims to link the EU ETS with compatible systems around the world (Switzerland, Australia).

The cap of the ETS will be reduced over time in order to reduce total emissions. In 2020, emissions from sectors covered by the EU ETS will be 21% lower than in 2005. Despite the stringent cap, the carbon price has dropped. This is due to a growing surplus of allowances, largely because of the economic crisis, which has depressed emissions more than anticipated.

Reduction Programme for Non-CO_2 Gases (WEM+WAM)
This Programme (Dutch acronym: ROB) was set up in 1998 and focuses on the reduction of Dutch emissions of non-CO_2 greenhouse gases. The target is a reduction of 8-10 Mt CO_2 eq. in 2020, working towards the desired level of 25-27 Mt CO_2 eq. This would mean a reduction of 50% in these gases compared to the reference year (1990). In 2012, a reduction of about 50% (relative to 1990) was already achieved based on reductions in, for example, the nitric acid industry (through admission into the EU Emissions Trading System, ETS), the aluminium industry, HCFH222 production, the waste disposal industry and agriculture. A potential additional annual reduction of 2 to 4 Mt CO_2 eq. has been assessed for the future.

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

[35] www.energieakkoordser.nl/~/media/files/energieakkoord/overzicht-belangrijkste-maatregelen-energieakkoord.ashx
[36] www.pbl.nl/sites/default/files/cms/publicaties/pbl-2013-uitgangspunten-referentiepad-evaluatie-SER-energieakkoord-1214.pdf

From 2009 on, ROB has been focusing on targeting the most significant sources: cooling (fluorinated gases), industry (semiconductor industry, caprolactam production), sewage treatment facilities (methane and nitrous oxide), agriculture (methane and nitrous oxide), CHP engines (methane) and the monitoring of sources of non-CO_2 greenhouse gases. Subsidies have stopped, as they are not considered to be as effective anymore. The focus of the reduction policy is on 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-legislations regarding ozone and F-gases. The revision of the F-gases regulation that was carried out based on a proposal of the European Commission may provide opportunities for the implementation and a new impulse to further reduce F-gas emissions in the Netherlands.

Where emission reductions in agriculture (the major source of non-CO_2 greenhouse gas emissions in the Netherlands) are concerned, the Ministry of Economic Affairs is now primarily responsible (see paragraph 4.4.5). Based on a voluntary agreement between the government and the sector, which was signed in 2008, projects are carried out aiming for an emission reduction of 30% in 2020 (relative to 1990).

Energy tax
The objective of this policy is to boost energy savings by putting an incentive on reducing the consumption of gas and electricity, which should direct consumers toward 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, and the level of the Energy Tax depends on 1) the energy consumption of a customer – the higher the consumption, the lower the energy tax levied (degressive tariff structure) –, and 2) specific agreements between different sectors and the government.

For small (residential) consumers the Energy Tax accounted for approximately ~40% of the natural gas and ~30% of electricity price in 2012. Industrial consumers pay a much lower tariff because of their larger consumption. In addition, there is a specific clause in the Environmental Taxes Act (Article 36q), which exempts companies that enter into a Long Term Agreement with the government from paying energy taxes on electricity consumption that goes over 10 million kWh per year and from taxes on fuel for non-energy use (feedstocks). The Energy Tax also has a separate lower gas tariff for the horticulture sector (fixed up to 2013). This means that these companies are taxed in the same way as the energy-intensive large-scale consumers. In return, the sector has entered into voluntary agreements on energy efficiency with the government.

Local Climate Agenda
The Local Climate Agenda is a joint initiative bringing together local authorities (provinces, municipalities and regional water authorities) and central government. They exchange knowledge on best practices and report and address obstacles in legislation, aimed at realising more successful initiatives (for more information see chapter 9).

4.4.2 Energy

Besides the EU ETS, CO_2 policies relating to the energy sector have traditionally fallen into two general categories, i.e. those aimed at encouraging the use of renewable energy, and those that encourage energy efficiency (see industry). Some of the important policy instruments currently in effect are described below.

20% of the primary energy consumption in the EU must come from renewable sources (RES) by 2020. This objective has been translated into specific targets for each member state. For the Netherlands, the target is 14% by 2020. The present share of renewables is about 4% (10% RES share in electricity). As a result of the Energy Agreement, the Dutch Government's commitment is to extend the ambitions for RES in the Netherlands and to reach a 16% share of renewables by 2023. According to the forecasts,

significant additional contributions of various RES sources will be necessary to achieve this target by 2020.

In the 2020 context, it appears that the CO_2 price is not enough to bring effective support for RES deployment to the energy market. In the Netherlands, subsidy schemes are the main means of achieving this target.

Boosting Renewable Energy Production
In 2011, the feed-in premium scheme for renewables was transformed into the so-called SDE+, a floating feed-in premium system, fully financed by a surcharge on the energy tax paid by the end-consumers of natural gas and electricity. The SDE+ takes an innovative tender approach based on a selection of projects proposed by the private sector along cost-effectiveness criteria with regard to the expected cost of the various available technologies. The premium is to be paid once the facility is in operation based on the power production for a period of up to 10 or 15 years. The SDE+ takes a technology-neutral approach; all renewable energy technologies are eligible (renewable electricity, gas and heat). 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. Payments for MEP and SDE are financed through the government budget.

Intergovernmental Wind Energy Agreement (BLOW)
The BLOW target of 1500 MW of onshore wind power in 2010 was reached in 2007. Today, about 2150 MW has been realised, which translates to a mitigation of about 2.8 Mt CO_2 eq. annually. The perspective for the longer term amounts to a total of 6000 MW capacity of onshore wind in 2020. To achieve this, implementation agreements have been entered into with the provinces that are responsible for spatial planning. In March 2009, the Government Coordination Rule was introduced for onshore wind projects above 100 MW. This means that, for these projects, the Minister of Economic Affairs is responsible for spatial planning and coordinates the attribution of environmental and other permits.

CCS
The CCS directive was implemented in 2012. Newly built coal-fired plants must be ‘capture ready’. The large-scale CCS demonstration project ROAD has been ongoing since 2010. The central government will produce a long-term strategy regarding the role of CC (U)S in the transition to an entirely sustainable energy system. The aim is to publish this strategy by mid-/ end-2014.

Smart metering (dissemination of smart meters)
The smart meter rollout will take place in two stages. A small-scale rollout will be in place for experience purposes from 2012 to 2014. During the small-scale rollout, up to 500,000 smart meters for electricity and gas will be installed during regular meter replacements (e.g. depreciation), in newly built houses, during large scale renovations and by customer request. Based on these experiences, the rollout will continue on a larger scale from 2014, ultimately offering every household (and small business) a smart meter. The aim is to have a smart meter fitted in at least 80% of households and small businesses by 2020, as mandated through the third Energy Package of the EU.

CH4

“Emission regulation CH_4 emission gas engines” (Besluit Emissie-eisen Stookinstallaties (BEMS))
Gas engines are widely applied to simultaneously produce heat and electricity (CHP) in the horticulture sector in the Netherlands and in the service sector to a lesser extent. Part of the natural gas in gas engines remains unburned and is emitted as methane. This is called ‘methane slip’. Through the Emission Requirements Combustion Installation Decree (BEMS), the government has set maximum emission levels for methane (hydrocarbons). The BEMs was evaluated in 2013. Due to anticipated regulations from the EC, new maximum emission levels have not yet been considered.

4.4.3 Industry

Besides the EU ETS, policies affecting CO_2 emissions in industry are generally aimed at improving industrial energy efficiency. These include the Long-Term Agreements (LTA) with industrial sectors backed up by environmental permits based on the Environmental Management Act, and the Energy Investment Tax Deduction regime within the corporate tax system (known as EIA).

Long-Term Agreement Energy Efficiency ETS enterprises (LEE) for ETS enterprises
The Benchmarking covenant described in NC5 was followed in 2009 by the Long-term Agreement Energy Efficiency ETS enterprises (LEE) for ETS enterprises. This voluntary long-term agreement focuses on the promotion of energy savings in the Netherlands. LEE was signed by four government ministers (Economic Affairs, Agriculture, Nature and Food Quality, Housing, Spatial Planning and the Environment, and the State Secretary of Finance), the Confederation of Netherlands Industry and Employers (VNO-NCW), the participating ETS enterprises and relevant trade associations and commodity boards. This agreement has the following objectives:

- Each ETS enterprise draws up an Energy Efficiency Plan (EEP) and implements it. It must at least contain an overview of:
    - possibilities for adopting profitable measures at existing facilities at the time of joining and the result of those measures, expressed in the percentage of energy efficiency improvement per year and the related amount of avoided CO_2 emissions.
    - the target for the energy efficiency improvements and the avoided CO_2 emissions related to the period over which the Energy Efficiency Plan applies, including an indication of which measures are to be taken at which time.
    - profitable measures are taken to mean measures that have a positive net cash value at an internal interest rate of 15 percent. Alternatively, a cost recovery period of 5 years may be applied.
- Each ETS enterprise will bring its Energy Efficiency Plan for the period 2013-2016 up to date by 1st October 2012 at the latest, and the plan for 2017-2020 by 1st October 2016 at the latest.

Long-Term Agreements on Energy Efficiency
The year 2001 saw the first series of Long-Term Agreements (LTA / MJA1). In 2007, there were three different categories of LTAs: for companies and organisations in the tertiary sector (services sector), for companies in the agricultural sector, and for industrial companies with an energy consumption up to 0.5 PJ/year. Companies with a higher energy consumption can join the Energy Efficiency Benchmarking Covenant, unless they can prove that joining an LTA makes more sense.

Negotiations between the government and less energy-intensive industries have resulted in a second and third generation of Long-Term Agreements on energy efficiency (MJA3). The government supports these agreements with fiscal incentives such as the EIA (see below) and enforces them with environmental permits. Companies not participating in MJA3 are required (in their permits) to implement all energy-saving measures with an internal rate of return of at least 15% after taxes. Since 2001, the national government has designated € 14 million to enabling permit authorities to step up their activities to reinforce the role of energy measures in environmental permits.
Furthermore, the different economic sectors have recently prepared strategic visions for 50% energy savings in 2030 as a continuation of the work that is still to be completed by 2020 (WAM).

Within the scope of the Energy Agreement for Sustainable Growth, large energy-intensive companies – the ones that are covered by the ETS – will join the government in endeavouring to supplement the Long-Term Voluntary Agreement on Energy Efficiency [*MEE*-covenant] with a framework of company-specific (i.e. one-to-one) agreements. These will focus on improving the energy efficiency and competitiveness of the companies concerned. There will also be an EPA (Energy Performance Assessment) pilot project (with evaluation) for other companies (i.e. non-MEE companies). An independent centre of expertise will be set up to assist businesses and funding bodies in identifying the most effective measures regarding energy efficiency in industry (and agriculture as well). The impending disappearance of combined heat and power (CHP) will not help in this regard. However,

apart from the generic measures mentioned here, the government chooses not to interfere in the market economy process through financial or fiscal favouring of specific – mature – technologies such as CHP. Support for CHP under the SDE / SDE+ scheme ceased in 2010.

Energy Investment Tax Deduction
The Energy Investment Allowance (EIA) is a tax relief programme. It gives a direct financial advantage to companies in the Netherlands that invest in energy-saving equipment and sustainable energy. Entrepreneurs may deduct 41.5% of the investment costs for such equipment from their company's fiscal profits, over the calendar year in which the equipment was purchased. Investment costs of up to a maximum of € 118 million may be reported per calendar year.

Green Deal
The Dutch government has set up the Green Deal with a society programme to encourage, amongst other things, energy saving and the local generation of renewable energy. Exploiting opportunities related to saving energy and local sustainable energy generation is not only a matter of finance. In practice, there are often other difficulties, which mean that not enough is invested in improving energy efficiency and in the local generation of renewable energy. With the Green Deal instrument, the government helps individuals, companies and local governments to set up actual projects.

General policy for non-CO2 green house gases in industry
Around 2000 substantial reductions in non-CO_2 greenhouse gases were achieved through:

- Environmental permit requirements for the producers of HCFC-222 and aluminium to limit emissions of fluoride and other pollutants, resulting in a reduction in HFC emissions achieved through the implementation of an after burner system and a reduction in PFC emissions.
- Voluntary agreements with the oil and gas and the aluminium industry to improve their energy efficiency, resulting in reductions of CH4 and PFC emissions.
- Withdrawing regulations to reduce 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 N2O reductions were achieved in nitric acid production. Emissions in 2007 were 4.4 Mt CO2 eq., and after the introduction of reduction techniques in 2008 they had fallen to 0.6 Mt CO2 eq. and 0.2 Mt CO2 eq. by 2011.

Reduction policies after 2009 resulted in lower reductions than in the period before 2009, because the most cost-effective techniques had already been implemented. After 2009, the focus was put on reducing N2O emission in caprolactam production, and implementing mitigation agreements with the semi conductor industry.

N_2O

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 nitric acid production facilities – DSM and Yara – were affected by this decision with a permits emissions ceiling of 1.2 Mt CO_2 eq. in 2010 and 1.0 Mt CO_2 eq. in 2020.

The opportunities for N_2O reduction in caprolactam production are being studied together with other European countries. This may lead to the implementation of reduction technology in the Dutch industry. An ETS opt-in may be an option.

PFC, SF_6

Low PFC, SF_6 semiconductor industry (WEM)
PFC and SF_6 are used for cleaning processing chambers and in the etching process in the semiconductor industry. SF_6 is also used in the power current sector and in the production of double-glazing and electron microscopes. Total Dutch emissions of SF_6 (as reported under IPCC sector 2F8) contribute less than 0.5%.

There is only one producer of semiconductors in the Netherlands, with a single production location. Due to production growth and the increased complexity of the production processes, absolute emissions increased with 0.1 Mt CO_2 eq. over the last decade. Thanks to several PFC-reduction measures, the producer realised a high relative emission reduction. With a new Global Semiconductors Industry Voluntary Agreement (2010 -2020), the semiconductor industry aims to achieve a 30% relative reduction of F-gases in 2020 compared to 2010.

4.4.4 Transport

Mobility and Transport is one of the areas within the SER Energy Agreement for which a common target and working programme has been agreed. There is broad agreement on an emission target of 25 Mt Co_2 eq. for 2030, which entails an additional 6 Mt reduction based on existing policy. Ambitious European measures regarding cleaner (and more economical) cars and fuels play a crucial role in this, but a working program will also be set into force under the Agreement. Measures include the continuation of fiscal measures to boost the production of cleaner vehicles, pilots for zero-emission distribution into cities, and stimulating working plans for large companies in order to achieve a 20% reduction in Co_2 emissions in the mobility department.

CO_2

Biofuels (WEM+WAM)
The European Directive 2009/28/EG on renewable energy has been implemented into Dutch legislation. This Directive states that Member States should ensure that in 2020 a minimum of 10% of all energy consumption in transport must come from renewable sources. In practice, this target is mainly fulfilled with biofuels. Due to the incentive of the double counting of advanced biofuels, their share was more than 50% of the target in 2012. Dutch policy is aimed at maximising the share of advanced biofuels that are not produced from food/feed crops.

	2011	2012	2013	2014
Target share	4.25	4.50	5.00	5.50
Petrol (minimum share)	3.50	3.50	3.50	0
Diesel (minimum share)	3.50	3.50	3.50	0

Table 4.4 The minimum share of biofuel in fuels for road transport (percentage)

Because blending biofuels is obligatory, there are no additional tax incentives or subsidy programmes. There are some initiatives in order to stimulate cars with alternative fuels at local and regional level.

There was a national subsidy programme for Innovative Biofuels for Transport some time ago. € 60 million in total was set aside for the production of innovative biofuels in the Netherlands. The first tender had a budget of €19.4 million and four projects were supported. This program helped build biodiesel plants that can produce biodiesel from waste and residues.

Filling Stations for Alternative/Biofuels (WAM)
A subsidy programme for filling stations for alternative fuels was launched some time ago. This resulted in the construction of around 100 filling stations for biogas and 35 for high blend bio-ethanol

(E85). A new project was launched in order to boost hydrogen filling stations. A proposal for the new directive on the deployment of alternative fuels infrastructure will be negotiated soon, which will be implemented over time once it has been established.

Het Nieuwe Rijden/Eco Driving
The Dutch Eco Driving programme was started in 1999 and is based on a long-term strategy. From 2010 onwards, the implementation of the program was designated to the Institute for Sustainable Mobility (IVDM) for a period of four years in order to achieve a transfer of the program to the market. IVDM has set a target to achieve 1 Megaton of CO_2 savings for the end of 2014. To this end, IVDM finances projects that have demonstrated the ability to save CO_2 and provides information about saving CO_2. For further information[37]

Kilometre charge - road pricing
The current Dutch government in 2012 decided not to implement a road-pricing scheme in this cabinet term, nor will this administration undertake any action in this respect.

Sustainable Transport (Lean and Green)
Lean and Green is a programme that facilitates primarily transport companies to move to a higher level of sustainability by taking concrete measures that not only reduce the CO_2 footprint but also save money. The programme started in 2008 with subsidies from the Ministry of Infrastructure and the Environment; by now, more than 300 companies have earned this award, which encourages them to reduce CO_2 emissions by 20% within 5 years.

CO_2 emission performance standards EU
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 the Council (23rd April 2009), which set 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 must comply (on average) with the limit value curve set by the legislation. This will rise to 75% in 2013, 80% in 2014, and 100% from 2015 onwards. A target of 95g/km is specified for the year 2020. An official decision in the shape of a regulation regarding the modalities for reaching this target and the aspects of its implementation, including the excess emissions premium, is expected in the last quarter of 2013.

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 the Council (11th May 2011) which set emission performance standards for new light-commercial vehicles 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 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 must comply (on average) with the limit value curve set by the legislation. This will rise to 75% in 2015, 80% in 2016, and 100% from 2017 onwards. A target of 147g/km is specified for the year 2020. An official decision in the shape of a regulation on the modalities for reaching this target and the aspects of its implementation, including the excess emissions premium, is expected in the last quarter of 2013.

Car tax
The Netherlands has a favourable fiscal regime for the purchase of business cars with low CO_2 emissions. As a result, average CO_2 emissions of the Dutch fleet has dropped sharply, and they are now well below the European average (see table below).

[37] www.hetnieuwerijden.nl

Ontwikkeling CO_2							
	2005	2009	2010	2011	2012	2015	2020
EU	164.4	145.7	140.3	n.v.t.	n.v.t.	130	95
Nederland	169.9	146.9	135.8	126.2	118,5		

Bron: European Environment Agency; zie pagina 19 van publicatie Monitoring CO_2 emissions for new passenger cars in the EU: summary of data for 2012, EEA 30 april 2013.

Table 4.5: Development CO_2 emissions of Dutch fleet

Due to the fiscal policy, sales of electric cars and especially dual fuel cars have risen sharply over the past two years.

Truck of the future
In the demonstration programme 'truck of the future', various measures are examined that allow companies from the transport sector to save fuel, thus reducing CO_2 emissions. Through the program, for which the government has provided subsidies, an insight is obtained into fuel-saving measures and the extent to which these measures are commercially interesting. Over the next few years we want to work towards the broadest possible roll out of these measures.

Increase of maximum speed
The maximum speed on motorways was raised from 100 or 120 to 130 km/h in 2012 on those stretches where this was deemed acceptable in terms of safety, noise, nature and air quality. This lead to around 0.35 Mt of extra CO_2 emissions a year.

N_2O

The Netherlands has no policies aimed specifically at N_2O emissions from the traffic sector. NOx policies have led to more petrol-driven passenger cars being equipped with catalytic converters, resulting in higher N_2O emissions per kilometre. Since the percentage of petrol-driven cars with catalytic converters has increased substantially since 1990, the average N_2O emission factor also rose dramatically during the period 1990-1999 (from 9 to 15 mg/km), slightly dropping to 12 mg/km in 2003. The total impact stabilised over the last few years and was 0.4 Mt CO_2 eq. in 2012.

4.4.5 Agriculture

The government's ambition for the agricultural and horticultural sector is a reduction of CO_2 emissions to a level of 5-6 Mt in 2020, which is an emissions decrease of 1-2 Mt CO_2 in comparison to 'business as usual'. The government's ambition for the other greenhouse gases is to reduce emissions to a level of 25-27 Mt CO_2 eq. in 2020, of which 16 to 17 Mt is the level to be achieved within the agricultural and horticultural sector.

The Clean and Efficient programme distinguishes three separate main areas of concern regarding policy measures pertaining to the reduction of CO_2 emissions in agriculture:

- The agricultural processing industry (mainly Long-Term Agreements and innovation). Designated to the Ministry of Agriculture, Nature and Food Quality, whereas the resulting CO_2 emission reductions fall within the 'Industry' sector.
- Greenhouse horticulture: focuses on energy savings and sustainable production of the remaining energy demand (electricity and heat).
- Other agricultural activities (primary sectors etc.): focus on energy saving and co-fermentation, the production of biomass to generate energy and increased use of precision soil cultivation.

The Clean and Efficient policies pertaining to other greenhouse gases focus particularly on limiting the emissions of nitrous acid (N_2O) in industry, methane (CH_4) and nitrous acid (N_2O) in agriculture and methane-slip in CHP motors.

CO_2

Based on the Clean and Efficient Working Programme a covenant was reached, known as the Covenant Clean and Efficient Agricultural Sectors (Schone en Zuinige Agrosectoren).
The main aims of this Covenant are:

- CO_2 emissions: a reduction of 3.5 to 4.5 Mt in 2020 compared to 1990.
- Other greenhouse gases: reduction of 4.0 to 6.0 Mt CO_2 equivalents in 2020 compared to 1990.
- Energy saving: an average annual energy efficiency improvement of 2% over the period 2011-2020.
- Approximately 150 PJ of sustainable energy in 2020, including approximately 12 PJ of wind energy.

Secondary aims relate to:

- Contributing to making the agricultural sector generally more sustainable through a 'green growth strategy'.
- Presenting the agricultural sector as a producer of sustainable energy, increasing fossil fuel independence .

An annual plan will be drawn up for each sector that covers the coming year. These plans describe specific projects that, in the given year, must contribute to the realisation of the final policy target. This policy programme will be evaluated and redesigned in 2013/2014, taking into account the ambitions and the results achieved so far.

CH_4, N_2O

Until 2020, no sectoral reduction targets will be imposed on agriculture. The sector is expected to take cost-effective measures that contribute to emission reductions of greenhouse gases on a voluntary basis. There are three categories of measures that can contribute to reducing emissions:

- Developing Best Management Practices for reducing N_2O emissions. The emissions are reduced by reducing nitrogen flows on farms.
- Taking measures related to cattle feed to reduce CH_4 emissions. The composition of feed can affect the production of methane via the cattle's digestive systems. In general: the better the digestibility, the lower the methane emissions.
- Taking measures concerning manure storage to reduce emissions of CH_4. Manure fermentation is the main option for reducing methane emissions from manure.

An important legislation for restricting the amount of CH_4 emissions is found in the (EU) milk quota, which limits the number of dairy herds held in the NL. The number of dairy herds in NL is still uncertain after 2015 when the milk quota system will have ended.

From 2013 onwards, new environmental policies on manure use will apply. They will have a significant (positive) effect on the climate, as they promise to increase CH_4 production for renewable energy.

N_2O

Precision soil cultivation
Research indicates that precision soil cultivation in agriculture using GPS can considerably reduce N_2O emissions. By implementing this method, N_2O emissions can be reduced by around 169 tons of N_2O-N per year. The effects are most significant on clay soil.

4.4.6 Forestry (CO_2)

Over the past decades, forest policy in the Netherlands has been integrated into the nature policy. The development of a nature network is a central theme of the nature (and forest) policy. The nature network is a cohesive network of high-quality nature wetland and terrestrial reserves. 560,000 ha of this network was completed by 2011. The aim is to have converted an additional 80,000 ha into nature reserves by 2027. Part of this will be achieved through afforestation and reforestation. Combating climate change is just one of the benefits of the ecological network.

4.4.7 Waste (CH_4)

According to the Environmental Management Act (Wet Milieubeheer), the Minister of Infrastructure and the Environment (I&M) must issue a Waste Management Plan once every six years. The National Waste Management Plan 2002-2012 (Landelijk Afvalbeheerplan 2002-2012) was the first in line. It was replaced in 2009 by a new plan for the period 2009-2021.

The policy aims to minimise the production of waste, to maximise recycling and other recovery and to minimise the amount of waste that remains for disposal, especially landfill. An important target of the waste policy is, among other things, to increase overall recycling from 79% (in 2008) to 83% (in 2015). In order to achieve this target, the focus is on the separate collection of household waste, 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 Waste Framework Directive.
Optimisation of waste management makes an important contribution to the mitigation of the greenhouse effect. Landfill of organic waste, for example, generates substantial methane emissions. This is one of the reasons why the waste policy focuses on maximising waste recycling and limiting waste disposal.

In 2010 around 2% of wasted produced in the Netherlands was landfilled. This waste could not be recycled or burned.

4.4.8 Buildings Sector (households and services)

The building stock is considered to be an important sector in which significant CO_2 emission reduction and energy efficiency improvements can be achieved for both new and existing buildings. The policies developed by the Dutch government for building stock (from 2005 to August 2020) can be divided into three main categories:

- New Buildings
- Existing Buildings
- Appliances (Eco design)

Besides the further development and introduction of a broad package of policy instruments at national level, several EU Directives were implemented during this period. The relevant EU Directives in this context are the Energy Performance of Buildings Directive (EPBD) and the Eco design Directive.
In order to achieve policy targets in the building sector, the government, actors on the housing market, social housing associations, private homeowners and residents must work closely together. The Dutch government explicitly opted for a stakeholder-oriented approach by working via agreements, for instance.These agreements or covenants were renewed in 2012 and brought together in one broad covenant called the Koepel covenant, which has as main target to achieve energy savings, and restrict the energy use to 540 PJ by 2015, in order meet the related emission level of 22.5 Mt in 2020.

New Buildings (WAM)
The government has announced that, from 2011 onwards, the requirements for improving the energy efficiency of new residential buildings will be tightened by 25% and, from 2015 onwards, by 50% compared to the current standard. Furthermore, the government is aiming at the construction of completely energy neutral (new) buildings in 2020. The government has also stated that, as of 2015, new non-residential buildings must be 50% more energy efficient compared to the standard (in 2007). Therefore, the Energy Performance Requirement for commercial buildings will be tightened.

In April 2008 an agreement was signed with several builders' associations to underline the following aspects: tightening of energy efficiency requirements for new buildings, recasting of the calculating methodology, and the introduction of 10 areas of excellence in which extremely low-energy houses will be constructed. This agreement, called the Lenteakkoord, was renewed in 2012 under the Koepel covenant and aims at a 50% energy reduction in new buildings over the period 2012-2015.

The Built Environment Innovation Agenda describes the route along which energy innovations in the Built Environment can be encouraged and implemented on a large scale. The Agenda includes both technical and process innovations in new and existing buildings. Special attention is paid to accelerating the application of sustainable energy concepts.

Existing Buildings
A wide variety of policy instruments were set up between 2005 and 2012 in order to encourage the retrofitting of existing buildings.

Agreements
- *Covenant 'More with Less' for existing buildings (WAM):* an overall agreement with building contractors, energy suppliers and the installation industry was signed in January 2008 to ensure that 500,000 existing buildings will be 30% more efficient in 2011. This covenant was renewed in 2012. Starting in 2011, 300,000 buildings must be sufficiently improved every year. The main target for existing buildings is to realise a reduction in energy consumption of at least 30% in 2.4 million buildings by 2020.
- *Covenant with social housing organisations (WAM):* in October 2008 an agreement was drawn up between the Dutch government and the interest group for social housing associations, plus the interest group for tenants. The main target of this agreement is to achieve additional energy savings of 24 PJ. This covenant was renewed in 2012.

Financial instruments
- Energy Investment Deduction (WAM): the scope of the Energy Investment Deduction was broadened in January 2009. By significantly improving the energy performance of a commercial building (to level B of the Energy Performance Certificate range, which runs from G to A), or increasing the assessment by two levels – for example from G to E – owners can qualify for a tax reduction. In 2009 and 2010, as part of the economic and financial crisis package, social housing organisations could also qualify for an Energy Investment Deduction. This means that social housing corporations were allowed to use this allowance in relation to profit tax. Improvements in the energy efficiency of houses became eligible for a tax deduction on 1st July 2009. These Energy Investment Deductions for social housing organisations ended in December 2010.

Furthermore, several instruments have been deployed that financially reward private homeowners for improving the energy efficiency of their homes.

- Subsidy scheme for customised energy advice (WAM): a subsidy scheme was introduced in July 2009 to finance 'customised energy advice' to promote improvements to the energy performance of dwellings. This subsidy scheme applies to private homeowners. The subsidy was maximised at € 200 per household. This subsidy scheme ended at the end of 2010.
- Several other financial instruments were also in place, such as a subsidy scheme for insulating glazing, lowering VAT on insulating glazing, and green financing (WEM).
- There was a subsidy scheme for solar PV for homeowners from July 2012 to August 2013. Total budget was € 50 million. This scheme ended when the budget ran out.
- In February 2013, the Dutch government announced a Revolving Fund for Energy Savings. The first part of this Revolving Fund will start in December 2013 and is meant for private homeowners. The second part of this revolving Fund is meant for landlords and housing associations and is expected to start mid-2014.

Regulating instruments (WEM/WAM)

- Implementation of EU law:
  With the implementation of the EPBD Directive, the mandatory Energy Performance Certificate was introduced in January 2008. It is continually being improved and the new model was re-launched in October 2009. With a mix of standards – introduced with the European Eco design Directive – plus other encouraging measures, the Dutch government will promote the broad application of more energy-efficient appliances.
- Public buildings:
  One of the ambitions of the 'Clean and Efficient' policy programme is to set a standard in sustainability for the privately owned sector. New government buildings must be 25% more energy efficient than the official requirements at that time.The Long-Term Agreements on energy efficiency (LTAs) are agreements between the Dutch government and companies and institutions that focus on the more effective and efficient use of energy. From the perspective of the buildings sector, the LTAs with universities, higher professional education buildings, and university hospitals are most relevant with regard to improving energy efficiency in buildings.
- Energy performance of new buildings (households and buildings: improving the energy performance standard and tightened energy performance coefficient, EPC (WEM+WAM):
  The EPN for non-residential buildings varies according to the type of building and has been tightened three times since its introduction in 1995. The government has announced that, as of 2017, new non-residential buildings will have to be 50% more energy efficient compared to the standard in 2005.
- Encouraging Local Climate Initiatives (WAM):
  This new remittance scheme (Stimulering Lokale en Regionale Klimaatinitiatieven: SLOK) began in July 2008 and ended in 2011. The scheme was meant to be an extra contribution by the national administration to realising the 'Clean and Efficient' climate policy targets of 2% energy savings per year, 20% renewable energy in 2020 and a 30% reduction in the emission of greenhouse gases in 2020. The SLOK scheme focused on reducing emissions of CO_2, CH_4 and N_2O at local level.
- In addition to the Koepel covenant, the Dutch Government agreed to a set of additional goals in a agreement called the Nationale Energieakkoord in 2013. This Agreement for the period 2014 to 2020 has the following goals: a 1.5% energy saving in the national final use, resulting in final savings of 100 Petajoules in 2020. A higher share of renewable energy, now 4.4%, increasing to 14% in 2020 and 16% in 2023, creating at least 15,000 extra jobs. The calculated outcome of the policy could result in 100 Petajoules extra energy savings, of which 12 to 43 Petajoules belong to the built environment. In order to meet these goals in the built environment the government will invest in a revolving fund for homeowners (see financial instruments) and grant a subsidy to the corporation sector to make their (rental) housing stock more energy efficient, and municipalities and provinces will check if companies fulfil their obligation based on existing environmental law, to apply energy savings measures that have a payback period of less than 5 years.

GHG affected	Name of Policy / Cluster of policies	Objective and/or activity affected	Type of instrument	Estimate of average annual mitigation impact per year (since 2005) Mt CO2 eq. 2010	2015	2020	Estimate of cumulative mitigation impact Mt CO2 eq. 2005-2020
		Energy					
CO_2	CO_2Emission Trading System (ETS)	Cost-optimisation of CO_2 reduction efforts	Regulatory	0,7[1)]	0,8[2)]	0,6	9,4
CO_2	SDE+ and other financial incentives of renewables [Green investment, EIA/VAMIL, MEP, Coal covenant, BLOW covenant, energy tax]	Stimulate the production of energy with renewable energy sources by subsidizing the as-yet unprofitable components of application	Economic, Fiscal, Voluntary/ negotiated agreement	1,9	3	4,3	64,6
		Industry					
CO_2	CO_2 Emission Trading System & Long-term Agreement on Energy Efficiency for ETS enterprises (MEE]*	Cost-optimisation of CO_2 reduction efforts	Regulatory/ Economic	0.4[1)]	1.4[2)]	0.5	7.1
CO_2	Long-term Agreement on Energy Efficiency for non-ETS enterprises [MJA] & Fiscal measures for energy and other green investments [EIA, MIA, VAMIL]	Improving energy efficiency and reduce CO_2 emissions	Economic, Fiscal, Voluntary/ negotiated agreement, Regulatory	0.2	0.3	0.4	4.4
N_2O	N2O Nitric acid production	Reduction Programme Non- CO_2 gases	Economic	1.1	0.6	0.4	5.6
		Transport					
CO_2	Decision biofuels as renewable energy for transport	To curb the CO_2 emissions from transport by setting obligation for a mandatory share of biofuels that needs to be blended with fossil sources of transport fuels	Regulatory	0.0	0.1	0.2	2.3
CO_2 CH_4 N_2O	Efficient Driving Campaign & Trucks for future	Increase the energy efficiency of driving by training and awareness	Information, Education	0.1	0.1	0.0	0.4
CO_2	EU CO_2 emission standards for cars & Fiscal policy on car efficiency	To curb the CO_2 emissions of transport by setting CO_2 standards for cars within the European Union & stimulating the purchase of passenger cars with low CO_2 emission through fiscal incentives	Regulatory/ Fiscal	0.0	0.0	0.1	0.9
		Agriculture					
CO_2 CH_4 N_2O	Convenant Clean & efficient Agrosectors	Reduce GHG emissions up to 10.5 Mton in 2020 compared to 1990; Increase energy efficiency of 2% per year in the	Economic, Fiscal, Voluntary/ negotiated agreement,	0.1	0.1	0.2	1.9

GHG affected	Name of Policy / Cluster of policies	Objective and/or activity affected	Type of instrument	Estimate of average annual mitigation impact per year (since 2005) Mt CO2 eq. 2010	2015	2020	Estimate of cumulative mitigation impact Mt CO2 eq. 2005-2020
		period 2011-2020; approximately 150 PJ of sustainable energy in 2020	Regulatory, Research				
CO_2	EU ETS & Sectoral emission trading system horticulture	ETS and a national sectoral trading system	Regulatory, Voluntary agreement	0.0	0.1	0.1	1.2
CH_4	Emission regulation CH4 emission gas engines" [Besluit Emissie-eisen Stookinstallaties (BEMS)]	A regulation to curb the emission of CH_4 from gas engines.	Regulatory	0.0	0.0	0.1	0.9
CH_4	Size of cattle stock and manure management	Milk quota, livestock reduction; ended in 2015	Regulatory/Voluntary	0.0	0.0	0.0	0.4
N_2O	Ammonia and manure policy	Reduce emissions through manure and ammonia management	Regulatory	0.2	0.1	0.1	1.1
		Waste					
CH_4	Landfill policy	Reduction in amount of landfilled waste, reduction of CH_4 emissions from landfill sites	Voluntary/ negotiated agreement, Regulatory	0.1	0.2	0.2	2.8
		Built environment					
CO_2	Energy performance standards (EPN) (new buildings) & Ecodesign directive)	To stimulate energy savings in new building by setting minimum energy performance standards. To limit the environmental impact of energy-using and energy-related products by setting standards for the design of products	Regulatory	0.0	0.0	0.0	0.1
CO_2	Covenant energy efficiency in the built environment (More with Less; Koepel convenant)	To stimulate energy savings in existing residential buildings through a package of instruments	Voluntary/ negotiated agreement	0.0	0.3	0.4	2.7
CO_2	"Block-by-block incentive scheme" [Blok-voor-blok programma] & Innovation programme built environment	Facilitating investments in the improvement of the energy quality of homes and to speed up application of renewable energy concepts in built environment through innovation	Voluntary/ negotiated agreement	0.0	0.0	0.0	0.0

Table 4.6 Main (packages of) policies and measures by sector
(* = policies and measures are included in the 'current and planned policies' (see chapter 5); [1)] 2008-2010; [2)]2008-2012)

4.4.9 How policies and measures affect longer-term trends in greenhouse gas emissions

Several measures that focus on short-term green house gas reductions also have an impact on longer-term emissions, most notably on CO_2 standards for cars and eco design labelling. Under the ETS, the cap of maximum allowed emissions will also continue to be lowered after 2020.

The Netherlands is aware of the importance of setting long-term goals and actively trying to achieve them. Acting now reduces the effort needed later on, while also showing that an impact on green house gases can be made. In the view of the government, the involvement of all relevant social partners is key to the transition to a low carbon economy. It is for that reason that we have engaged in the SER energy agreement towards sustainable growth. As follow-up to this agreement, a Committee will be formed to evaluate the progress towards our short-term and long-term mitigation goals. In addition, as a follow-up to its 2013 Climate Agenda, the Ministry for Infrastructure and Environment will draw up an agenda for renewing our mitigation policies in the light of the significant further reductions required between 2020 and 2030.

4.5 Policies and measures in accordance with Article 2 of the Kyoto Protocol

Article 2 of the Kyoto Protocol asks to specifically address:

- policies and measures to promote sustainable development.
- the steps taken to promote and/or implement decisions by ICAO and IMO to limit or reduce associated emissions.
- how it strives to implement policies and measures in such a way as to minimise adverse effects.

This information is provided in the following paragraph.

4.5.1 Promoting sustainable development

The EU published the renewed EU sustainable development strategy in 2006, and it was reviewed in 2009. The strategy sets goals for member states and the EU regarding climate, energy, transport, consumption and production, natural resources, public health, social inclusion, demographic development, migration and poverty. It underlines that in recent years the EU has mainstreamed sustainable development into a broad range of its policies. In particular, the EU has taken the lead in the fight against climate change and the promotion of a low-carbon economy. At the same time, unsustainable trends persist in many areas and the efforts need to be intensified. The review takes stock of EU policy measures in the areas covered by the EU SDS and launches a reflection on the future of the EU SDS and its relation to the Lisbon strategy. In 2011, the EU launched a communication focusing on promoting a Resource-Efficient Europe, outlining how we can transform Europe's economy into a sustainable one by 2050.
The OECD will review the Environmental Performance Policy of the Netherlands in 2015 with regard to the domestic and international commitments.

The Dutch National Strategy for Sustainability was 'peer reviewed' by Finland, Germany and South Africa in the spring of 2007. The recommendations are included in the final report "A new Sustainable Development Strategy: an opportunity not to be missed", which was published by the Advisory Council for Research on Spatial Planning, Nature and the Environment (RMNO).

The policy letter "Green Growth: for a strong, sustainable economy", sent to parliament by the Dutch government in March 2013 contains the outline of the Dutch Sustainability policy. The government aims to strengthen the competitiveness of the Netherlands while reducing the burden on the environment en the dependence on fossil energy. Green growth is one of the priority themes for the

Dutch Government. Combining the innovative strength of industries, knowledge institutes and government is essential to achieve this ambition.

Sustainability policy focuses on 8 areas: Climate, Energy, Water, Building, Food, Bio-based Economy, from Waste to Resources and Mobility. It promotes the uses of 4 instruments to achieve green growth: smart use of market incentives, revision of laws and regulations, innovation and the government acting as a network partner. An international approach and joint EU actions are essential to achieve the objectives and to secure a level international playing field

4.5.2 Steps relating to greenhouse gas emissions from aviation and marine bunker fuels

In accordance with Article 2.2 of the Kyoto Protocol, the Netherlands is still committed to achieving a limitation or reduction of greenhouse gas emissions not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organisation (ICAO) and the International Maritime Organisation (IMO) respectively.

ICAO
The Netherlands is fully committed to and involved in the challenges caused by climate change and is working towards resource-efficient, competitive and sustainable aviation. A comprehensive approach is considered the best way to reduce aviation emissions, and a number of policy initiatives related to sustainability and climate change are key in Dutch civil aviation policy. Measures apply to all of the four pillars of the so-called '4-pillar strategy' for sustainable aviation, comprising innovative technology, ATM measures, market-based measures and the use of sustainable biofuels.

With respect to an international sector such as aviation, the Netherlands prefers a global system for CO_2 reduction, which is why it supports the EU in trying to achieve an agreement at the ICAO Assembly in October 2013 to work on the development of a proposal for a global system to be decided upon in 2016. Implementation would follow in 2020. In the mean time, the EU ETS would continue in one way or another depending on the decision taken at the Assembly on a framework for regional reduction systems. Over the past decade, the Netherlands has been involved in the development and application of measures at European level aiming at the reduction of CO_2 emissions, such as the EU ETS and SES on Air Traffic Management:

EU ETS
After the EU Council decided on including aviation in the EU ETS Directive in late 2008, implementation took several years to prepare for the first trading year (2012). All Dutch airlines have complied with the directive and the associated obligations on monitoring, reporting and verification. In the light of the developments within ICAO regarding the development of a global reduction system, the EU has decided to temporarily deviate from the ETS directive. This means that all flights between the EU and third countries will be temporarily exempt from compliance with the monitoring, reporting and verification obligation associated with the EU ETS. For all intra-EU flights, the ETS applies unchanged. The EU will decide whether the deviation will be continued depending on the outcome of the international process.

Air traffic management
The Netherlands is strongly committed to the ICAO environmental and sustainability goals for air traffic management. For the larger part, this is organised in a joint European effort – the single European sky –, which is expected to reduce CO_2 emissions by up to 10% by 2020. Examples of measures in this project are the simplification and optimisation of the airspace and procedures for its use. A strategy has been laid down in the Dutch Airspace Vision, accompanied by a performance-based navigation roadmap and an aeronautical information management roadmap. Implementation over the next years will ensure an optimised flow of air traffic, which will contribute to the internationally agreed sustainability goals. The Netherlands is deeply involved in the deployment of sustainable *biofuels* for aviation both at the European and national level. Through initiatives of one of

the national air carrier and associated companies, the Netherlands is at the forefront of the implementation of bio-kerosene. With essential elements for a bio-kerosene infrastructure already in existence, the Netherlands is working on the further development of a bio-kerosene market, adapting its national implementation of the EU Renewable Energy Directive accordingly and making public/private arrangements to secure its commitment and future involvement.

IMO

According to decisions of the Marine Environment Protection Committee (MEPC), the IMO focuses on developing technical, operational and market-based measures for reducing CO_2 emissions from shipping. At its 62nd meeting, the MEPC decided on the Energy Efficiency Design Index (EEDI) for new ships and the Ship Energy Efficiency Management Plan (SEEMP) for all ships, which will be in force as of this year. For its deliberations on these matters, the Committee makes use of the Second IMO Study on GHG emissions from ships, which estimated emissions of carbon dioxide (CO_2) from international shipping based on activity data and international fuel statistics. The resulting consensus estimate for 2007 was that CO_2 emissions from international shipping amounts to 843 million tonnes, or 2.7% of global CO_2 emissions compared to the 1.8% estimate in the 2000 IMO study. In the absence of future regulations on CO_2 emissions from ships, in the base scenario these emissions were predicted to increase by a factor of 2.4 to 3.0 by 2050. MEPC has agreed on a GHG Update Study that will become available in 2014.

In June 2013, the European Commission presented a strategy for the inclusion in its climate policy of measures to reduce the maritime GHG emissions, consisting of a step-by-step approach that starts with a proposal for the monitoring, reporting and verification (MRV) of maritime CO_2 emissions, followed by setting the emissions targets and the development of market-based measures. The first step, MRV, is under discussion between the EU member states and the European Commission.

Nationally, the Netherlands is monitoring a voluntary agreement between ship owners, ship operators, the logistic sector, hydraulic engineers, the shipbuilding industry, and the Ministry of Infrastructure and the Environment concerning the reduction of GHG emissions by the maritime sector.

4.5.3 Minimising adverse effects

The Kyoto Protocol was adopted in pursuit of the ultimate objective of the Convention, and hence its full implementation by the Netherlands is intended to contribute to preventing dangerous anthropogenic interference with the climate system. Ambitious mitigation goals are necessary to ascertain a future for all countries.

In striving to develop policies and measures to reduce greenhouse gas emissions, parties subscribed to the Kyoto Protocol should implement those policies and measures in a way that minimises any adverse effects, including the adverse effects of climate change, effects on international trade, and social, environmental and economic impacts on other parties, especially the developing country parties identified in article 4, paragraphs 8 and 9 of the Convention.

Adverse impacts on developing countries are reduced if the global temperature increase is limited to 2 degrees Celsius, if dependence on fossil fuels decreases, and if Annex I parties are able to develop low-carbon energy systems and reduce fossil fuel consumption.

The Netherlands promotes more recognition by the COP of the importance of market mechanisms and the innovation capacity of the private sector. In addition, it stresses the need to use public funds for capacity development and strengthening of the institutional framework.

The Netherlands supports a second commitment period of the Kyoto-protocol, contributes to the development of the Green Climate Fund, and is committed to providing climate finance to support developing countries in their mitigation and adaptation activities. The Netherlands participated in the Transitional Committee of the Green Climate Fund (sharing a chair with Denmark). This Fund will, among other things, seek to use public funds to attract private finance for both mitigation and adaptation investments. On the Board of the Green Climate Fund, the Netherlands once again shares a

chair with Denmark. The Dutch priorities focus on linking climate change on the one hand with poverty reduction, gender and private sector climate finance on the other.
The Netherlands has developed a foreign policy agenda on five priority Global Public Goods in order to improve development policy coherence: 1) trade and finance, 2) climate change, 3) food security, 4) migration, and 5) peace and security. Chapter 7 describes the financial resources, regional distribution and activities in more detail.
The Netherlands gives much attention to two main issues: (1) the development of a climate finance architecture, paying special attention to multilateral channels, market mechanisms and market actors, and (2) the integration of adaptation in water and food security policies and programs.
The Netherlands provided € 300 million in *Fast Start Finance* (for more financial information see chapter 7) over the period 2010-2012. The Netherlands is working on a scenario for gradually scaling up its contribution (public and private sector finance) towards its 'fair share' in the 2020 global climate finance objective of an annual 100 billion USD. The Netherlands contributed to enhancing transparency regarding the Fast Start Financing initiative.[38]
Dutch climate finance is made transparent within the context of the Dutch contribution to the International Aid Transparency Initiative (IATI).
The flexible mechanisms under the Protocol – (1) Emissions Trading (i.e. the European Union Emissions Trading Scheme EU ETS), (2) Joint Implementation and (3) Clean Development – are all tools incorporated into the Protocol in order to share efforts aimed at reducing greenhouse gases, ensuring that investments are made where the money has optimal greenhouse gas reducing effects, and thus ensuring a minimum impact on the world economy. The Netherlands has made use of each of the flexible mechanisms, as was explained earlier in this chapter (par. 4.3.4). It has also signed MoUs regarding CDM projects with several countries worldwide. The Netherlands is supporting the World Bank's "Partnership for Market Readiness", which will help countries use the carbon market. The PMR will promote new market instruments as well as adjustments or expansion of the CDM.
To buy carbon credits under the Clean Development Mechanism, the Dutch Ministry of Infrastructure spent € 151 million between 2005 and 2008 and for the period 2009-2012 € 132,6 million. The Ministry of Economic Affairs purchased carbon credits under Joint Implementation for € 53,4 million between 2005 and 2008 and for the period 2009-2012 € 109,1 million.

In total, the Netherlands contracted 33.2 million tonnes of carbon credits from CDM-projects, 17.1 million tonnes from JI-projects, 3 million tonnes of carbon credits from Latvia (Green Investment Scheme) and 2.2 million tonnes from participation in Carbon Funds (PCF) in order to realise its obligations under the Kyoto Protocol.

Monitoring Policies and Measures
All Dutch embassies with a development co-operation component (see chapter 7) will draft a Multi-Annual Strategic Plan for their spearhead programmes in which they are expected to integrate gender, climate change and disaster risk reduction and environment. They will monitor and report on their progress annually and contribute to reaching the objectives of, amongst other things, the Climate Change conventions (using the OECD DAC Rio Marker system). To promote the integration of sustainability and climate, a Dutch Sustainability Unit has been set up to assist central and general development programs with the integration of indicators for sustainable development and climate change. This unit is run by the Netherlands Commission for Environmental Assessment.

All ODA-supported activities are registered in an electronic database to track financial commitments and implementation progress. Each activity is assessed, and specific markers for water, biodiversity, desertification and climate change (the OECD DAC Rio Markers) are assigned. To monitor the contribution of ODA-supported activities, the Ministry of Foreign Affairs – the Directorate-General for Development Co-operation (DGIS) – conducts a quarterly assessment of newly submitted activities. On each computer in the Foreign Ministry and the embassies, the database can be accessed through a 'Dashboard' application, allowing for up-to-date monitoring and reporting.

[38] http://ec.europa.eu/clima/policies/finance/international/faststart/index_en.htm

The Netherlands also regularly reports to the European Union on its Fast Start Finance.

Minimising adverse effects regarding biofuels production
All biofuels on the market in Europe and the Netherlands must be in compliance with the sustainability criteria laid down by the Renewable Energy Directive (2009/28/EG). Only if the biofuels are sustainable, they are allowed to be used for fulfilling the blending target. Compliance with these criteria must be demonstrated through one of the adopted certification systems. These certification systems are controlled by an independent audit. All biofuels produced in the Netherlands fulfil these requirements.

4.6 (D) Policies and measures no longer in place

The following sections contain a summary of policies that have been repealed or have expired since the Netherlands' 5th National Communication.

- The SDE feed-in premium scheme was replaced with the more cost-effective SDE+ scheme. There are still payments taking place for projects with an SDE grant, as subsidies in the SDE typically run for 12 to 15 years. However, no new projects are granted subsidies under the SDE scheme.
- Predecessor of the SDE was the MEP (Environmentally Friendly Electricity Production Programme). It was repealed on 18th August 2006 and was replaced with the SDE scheme. Because the subsidy for sustainable electricity was granted for 10 years, most producers of renewable electricity with MEP still receive MEP subsidies, many of them until 2017.
- Support for CHP under the SDE / SDE+ scheme was repealed in 2010, as the government prefers generic measures over financial or fiscal favouring of specific – mature – technologies such as CHP.
- The remittance scheme SLOK (Stimuleringsregeling Lokale Klimaatinitiatieven) was repealed in 2012, at the end of the climate agreement period (2007-2011) between central and local governments. The focus was switched from subsidising to encouraging (through communication and knowledge exchange) those initiatives that are profitable without subsidies (through the Local Climate Agenda). The evaluation of the climate agreement 2007-2011 shows that the SLOK scheme did contribute to the continuity of climate policy by municipalities, but this has not been quantified.

5 PROJECTIONS AND THE TOTAL EFFECTS OF POLICIES AND MEASURES

5.1 Introduction

The previous National Communication (5)[39] described the projections made in 2010, also known as the Referentieraming (Daniëls en Kruitwagen, 2010)[40]. Due to changes in prices, policies and other relevant developments, this projection was updated in 2012 and became the Geactualiseerde Referentieraming (Verdonk and Wetzels, 2012)[41] , on which the overview in this chapter is based.

Section 5.2 presents the main results for the years 2020 and 2030. Emission projections for precursor gases are described in Section 5.3, while Section 5.4 is dedicated to uncertainty and sensitivity analyses. The use of credits from project-based emission reductions outside of the Netherlands is discussed in Section 5.5. The methodologies and assumptions underlying the projections are described in more detail in Section 5.6 and Annex 5.1.

5.2 (A) Projections

Scenarios used, and major changes relative to the previous National Communication
The scenarios underlying the emission projections in the 2012 'Referentieraming' have incorporated new insights with regard to economic and demographic developments, sectoral developments, fossil fuel prices, the CO_2 price and policies compared to the Referentieraming of 2010. Recent statistics were also taken into account. The base year for the model is 2010, compared to 2007 for the previous projection. Whereas 2010 emission levels were a projection result in the previous projection, 2010 emission levels now reflect statistics on historical emission levels. The 2012 projection exercise projects emission levels for greenhouse gases and air pollutants for 2020 and 2030 (similar to the previous projection).

The 2012 projection exercise must however be viewed as an update of the 2010 projection, as the underlying methods (models, basic assumptions etcetera) where similar. The main parameters used in the 2010 and 2012 projections are presented in Annex 5.1. The following policy scenarios were included in the 2012 projection:

Policy scenario 'current policies'
This scenario only includes policies that had already been decided upon by February 2012, including instrumentation and financing. A major difference when compared to the 2010 projection is the change in the feed-in premium scheme for boosting the use of renewable energy.

Policy scenario 'current and planned policies'
This scenario includes the same current policies as the former scenario, plus policies that were being planned (also up to February 2012). The effects of the planned policies are less certain, since policies may still be subject to change. Planned policies that are included are, for example, raising the maximum speed limit on motorways (which has since been implemented), compulsory co-combustion of biomass, more stringent energy performance standards for residential buildings by 2015 and more stringent (2020) CO_2 emission standards for new cars and light duty trucks. In addition, particular policies that were previously included as planned are no longer included in the 2012 projection. These mainly include various small subsidy schemes, sectoral programmes and road pricing.

[39] NC-5
[40] www.rivm.nl/bibliotheek/digitaaldepot/E10004.pdf
[41] www.ecn.nl/docs/library/report/2012/e12039.pdf

Policy scenario 'current policies including Lenteakkoord[42]
This scenario includes the same adopted policies as the other scenarios, plus the effects of the policies that were agreed upon in the spring of 2012 by political parties in the Dutch House of Representatives during the governmental budget for 2013. This political agreement is also referred to as the 'Lenteakkoord'. Policies included in this scenario are, amongst other things, higher energy taxation for the use of gas, a tax on the use of coal by power plants, fewer fiscal benefits for mobility, and a fund that should boost investments in sustainability and renewable energy. Effects were only determined for greenhouse gases in 2020. Some of these policies were indeed incorporated, while others, such as the proposed reduction of fiscal benefits for work-related travel, were eventually decided against.

The 2012 projection did not include a policy scenario 'without measures'. See Annex 5.1 for an overview of which policies are included in the different policy scenarios and for a comparison with the 2010 projection. For a description of these policies and measures, see chapter 4.4 and , table 4.3.

Energy agreement of 2013 not taken into account
In 2013, the government entered into an agreement with other social partners regarding energy policies up to 2020 (the so-called 'SER Energieakkoord')[43]. The effects of this agreement have been evaluated by PBL and ECN (2013) but are not taken into account in the results that are presented in this chapter. For that purpose, the 2012 projection was slightly updated with regard to energy prices, the CO_2-price and policy (the tax on coal use was included) (Koelemeijer et al., 2013)[44]. The documentation for the updated projections was unavailable for this report.

5.2.1 Projections results

General trends
From a national perspective, the emission of greenhouse gases in the Netherlands increased significantly between 1990 and 1995 (see figure 5.2.1). Between 1995 and 2010, general emission levels tended to decrease as a whole. The trend after 1995 can be explained by a sharp decrease of non-CO_2 emissions since 1990, especially with regard to the emission of fluorinated gases and nitrous oxide. The emissions of CO_2 on the other hand have been increasing up until 2010.
For 2020, the emission levels are expected reach levels similar to those of 1990. Although emissions from transport, buildings and agriculture are generally in decline, this decline is more or less cancelled out by increasing emissions from industry and the energy sector. Emissions from industry and the energy sector are expected to start decreasing between 2020 and 2030. These trends will result in national emissions below 1990 levels by 2030.
The sectoral trends are discussed below.

[42] www.rijksoverheid.nl/documenten-en-publicaties/kamerstukken/2012/05/25/voorjaarsnota-2012.html
[43] www.energieakkoordser.nl/~/media/files/energieakkoord/overzicht-belangrijkste-maatregelen-energieakkoord.ashx
[44] www.pbl.nl/sites/default/files/cms/publicaties/pbl-2013-uitgangspunten-referentiepad-evaluatie-SER-energieakkoord-1214.pdf

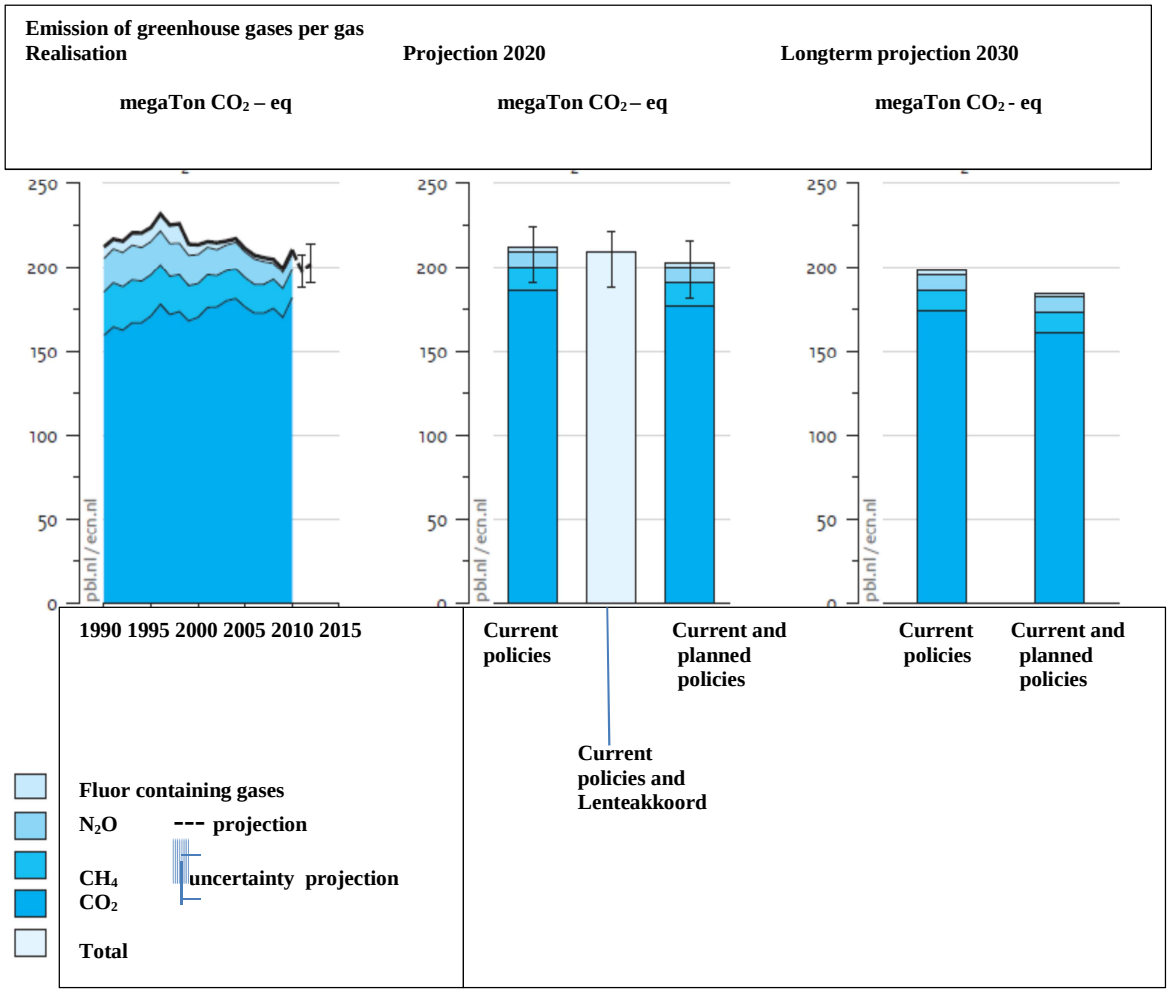

Figure 5.1 Emission of greenhouse gases per gas

Energy and industry

Emissions from the energy and industry sector are expected to increase significantly until 2020. With the current policies, emissions will increase from 100 Mt CO_2 to 118 Mt CO_2. This can be explained by the increasing net capacity of power production and higher energy demands from industrial sectors and refineries. Policies that encourage the use of renewable energy mitigate the increase of emissions from these sectors to a certain extent. The renewable energy share will have increased from 4% in 2010 to 8% (with an uncertainty range of 7% to 10%) by 2020. After 2020, emissions will decrease to 109 Mt CO_2 by 2030 as older power plants are taken offline and the share of renewable energy continues to increase to 13%.

Including planned policies, the emissions from these sectors will increase to 111 Mt CO_2 due to the increased use of renewable energy (more wind energy on land and biomass combustion). The share of renewable energy use will increase to 11% (range: 9% to 12%). After 2020, emissions should have decreased to 101 Mt CO_2 by 2030 as older power plants are taken offline and the share of renewable energy continues to increase to 16%.

The effects of the 'Lenteakkoord' policies for these sectors are limited. The most significant effect on emissions is expected to be produced by the taxation of coal use by power plants, leading to an additional emissions reduction of around 1.5 Mt CO_2 by 2020.

Emissions from these sectors are largely covered by the European Emission Trading System (ETS).

Buildings

This sector includes residential and utility buildings and the commercial, trade and governmental sectors. The general trend is a decline in energy consumption due to energy savings. Emissions will decrease from 28.4 Mt CO_2 in 2010 to 25.9 Mt CO_2 by 2020 with current policies and 25.5 Mt CO_2

including planned policies. The 'Lenteakkoord' policies lead to 0.2 Mt CO_2 fewer emissions due to additional investments in energy savings. After 2020, emissions will decrease even further. On a sub-sectoral level, emissions from utility buildings, especially in the non-profit sector, will increase. This can be explained through demographic developments (leading to more emissions from hospitals) and more employment in offices. Emissions from residential buildings are expected to decrease as a result of improved energy efficiency and the increased use of renewable energy technologies such as sun boilers. Electricity demand will decline due to the effects of the European Eco Design directive.
This sector falls almost entirely outside of the scope of the EU ETS.

Transport
CO_2 emissions from the transport sector (excluding international aviation and maritime bunker fuel use, but including mobile machinery from agriculture and the construction sector, fisheries and military aviation and navigation) are projected to decrease from 37.5 Mt CO_2 in 2010 to 34.5 Mt CO_2 by 2020 with the current policies in place. This decrease can mainly be attributed to the effects of the European CO_2 emission standards for new passenger cars and light duty trucks and the increasing use of biofuels in transport. When the planned policies, such as (more stringent) CO_2 emission standards for passenger cars and light duty trucks in 2020, are taken into account emissions from this sector will have decreased to 33.8 Mt CO_2 eq. by 2020. It should be noted though that the projections assume that the gap between the type-approval and the real-world fuel efficiency of passenger cars and light duty trucks does not increase further compared to 2010 levels.
The policies of the 'Lenteakkoord' will lead to an emission reduction of about 0.6 Mt CO_2 by 2020 compared to the planned policy scenario[45]. After 2020, emissions will decrease further to 34.1 and 30.8 Mt CO_2 by 2030 in the scenarios when including current and current + planned policies respectively.
This sector is not covered by the EU ETS.

Agriculture
CO_2 emissions from the agricultural sector (excluding mobile machinery) will decline from 10.4 Mt CO2 in 2010 to 7.1 Mt CO_2 by 2020 with planned policies. Although the area of horticulture increases, the use of renewable energy and energy efficiency also increases. Including planned policies, emissions will further decline to around 6.9 Mt CO_2 by 2020. After 2020, emissions will further decline due to the increasing use of renewable energy, such as geothermal heat use and the improvement of energy efficiency.

Non-CO_2 (agriculture and other sectors)
Non-CO_2 emissions are expected to decline from nearly 29 Mt CO_2 eq. in 2010 to about 24 Mt CO_2 eq. by 2030. In the agricultural sector, methane emissions from manure storage due to increased digestion of manure can be used to produce renewable energy, encouraged through the feed-in premiums for biogas. Nitrous oxide emissions will decrease through the use of less fertilizer and keeping cattle in stables for longer (instead of in the field). Non-CO_2 emissions from other sectors as a whole will decline too due to declining methane emissions from landfills, reduction measures implemented by fertilizer producers and the lower use of fluorinated gases in products. On the other hand, methane emissions produced through co-generation will increase due to higher production.

Forestry sector (not included in national totals presented elsewhere)
Projections for the forestry sector are not included in the Geactualiseerde Referentieraming.
Given the age class structure of the Dutch forests, there is a slow decrease of removals from forest land remaining forest land. As yet, no significant changes have been assumed for the projections for land converted to forest land. Table 5.1 shows the emissions and sinks for the forestry sector based on the forest management reference level submission of the Netherlands (submitted in 2011) and the NIR 2013.

[45] As stated earlier, the proposed reduction of fiscal benefits for work-related travel were eventually decided against in the House of Representatives.

[Mt CO_2]	2010	2015	2020
Forest Land remaining Forest Land	-1.6	-1.3	-1.1
Land converted to Forest Land	-0.5	-0.5	-0.5

Table 5.1 Projected developments for the forestry sector

International bunkers

The Netherlands did not update the projection for the emissions from international navigation and aviation. The latest projections were reported in the National Communication 5 and are shown in Figure 5.2.

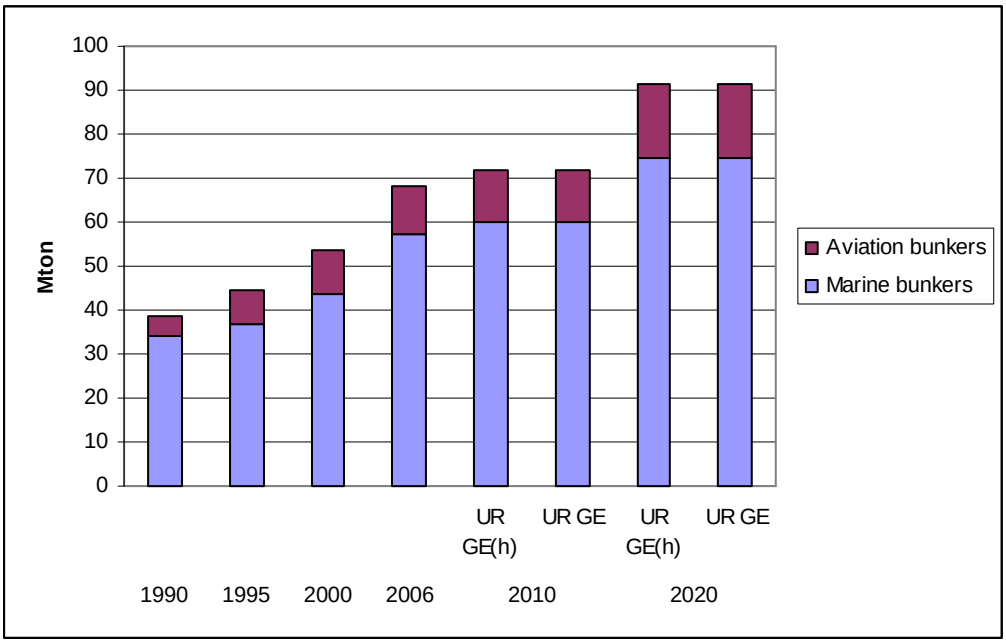

Figure 5.2 Emissions from international aviation and navigation (Daniëls et al., 2009)

Emissions of NOx, NMVOC and SO2

The emissions from the precursor gases NOx, NMVOC and SO_2 are expected to decline. These emissions have been declining since 1990, which can be explained through the implementation of various air quality policies that restrict the emissions from industrial installations, power plants, agricultural activities and vehicles. The historical and projected developments for the emissions of the precursor gases are illustrated in the figures 5.3-5.5 below.

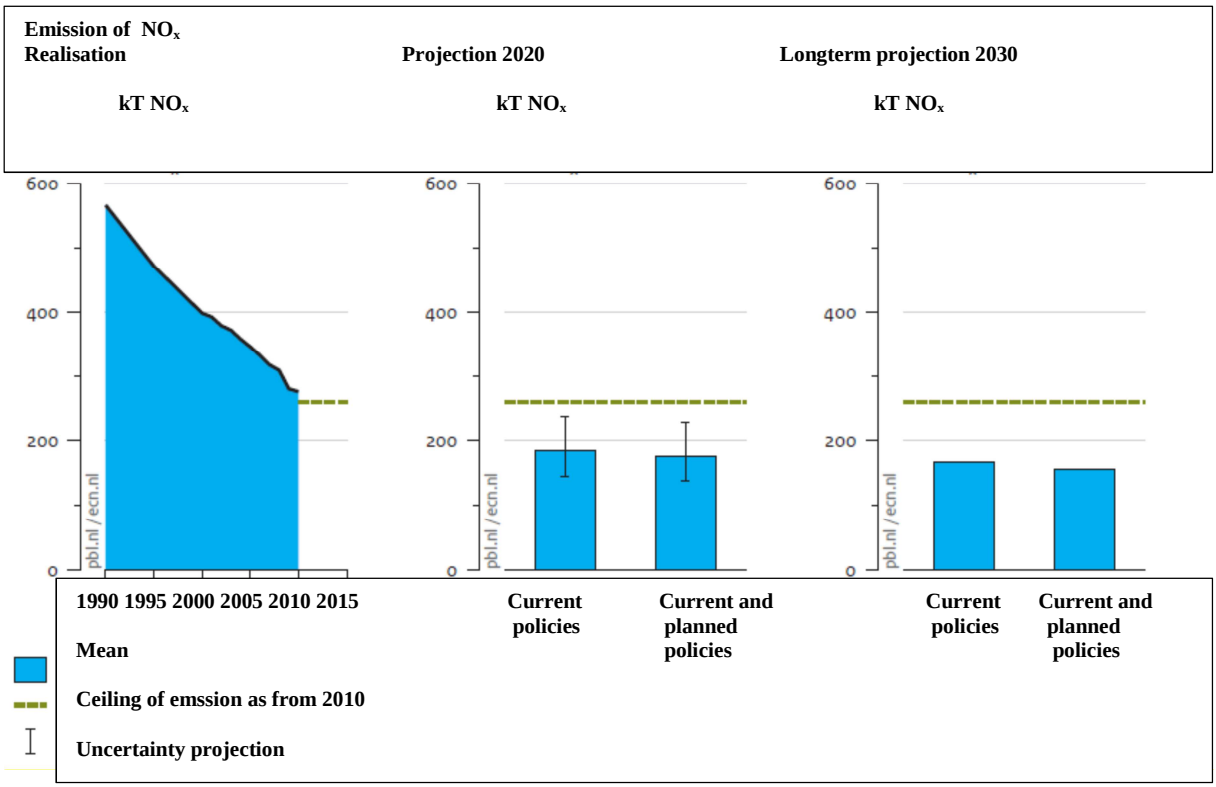

Figure 5.3.Emission of NO_x

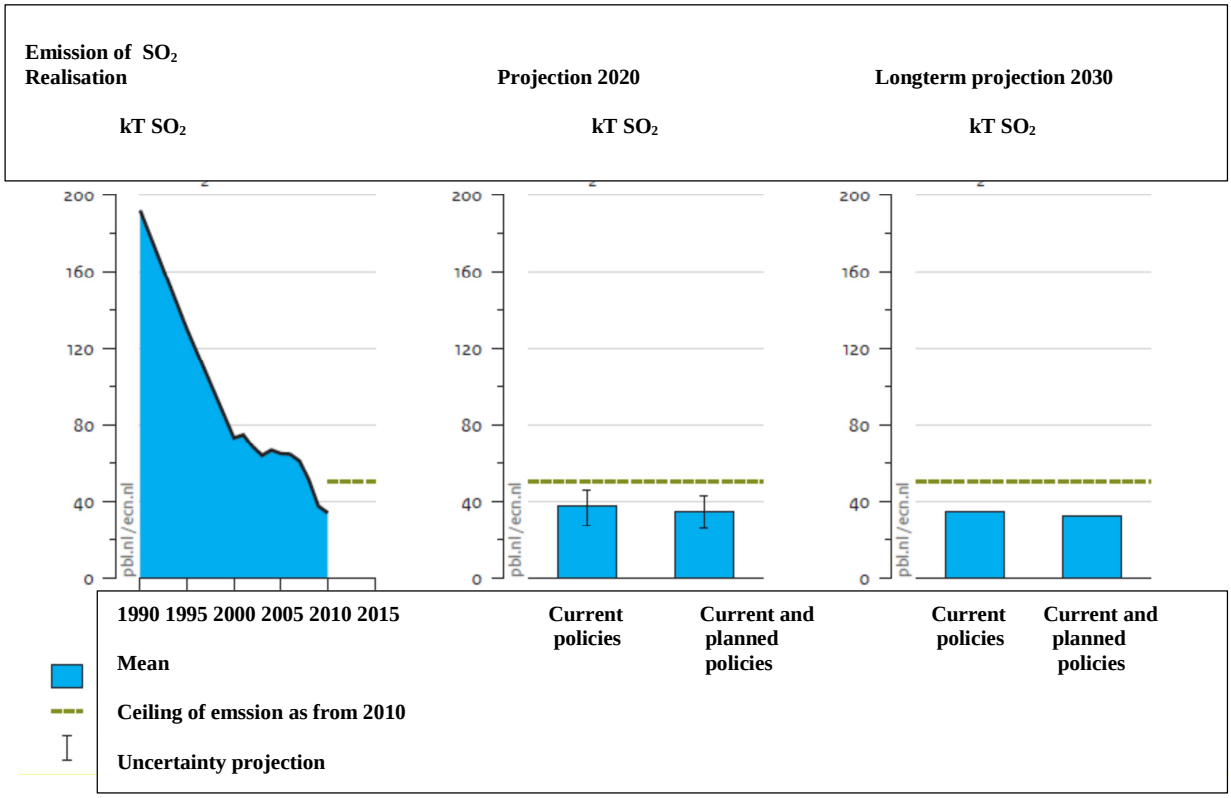

Figure 5.4 Emission of SO_2

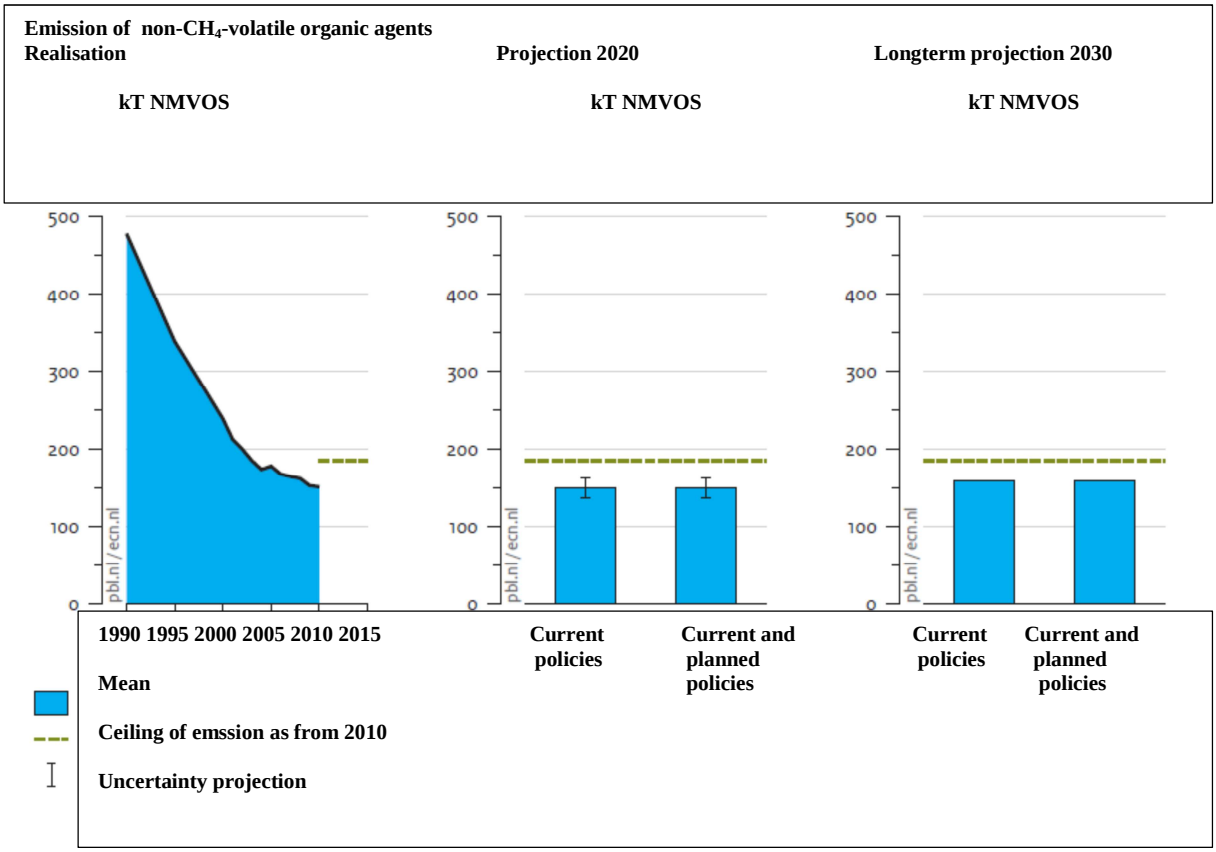

Figure 5.5 Emission of non-CH_4-volatile organic agents

5.3 (B) Assessment of the aggregate effects of policies and measures

5.3.1 Effects on emissions of greenhouse gases

For 2020, the emission levels are expected reach levels similar to those of 1990. Although emissions from transport, buildings and agriculture are generally in decline, this decline is more or less cancelled out by increasing emissions from industry and the energy sector. Emissions from industry and the energy sector are expected to start decreasing between 2020 and 2030. These trends will result in national emissions below 1990 levels by 2030.

As an EU Member State, the Netherlands is also subject to EU climate policy and thus it applies EU Common and Coordinated Policies and Measures (CCPMs) relevant to climate change. With the introduction of the EU Emission Trading Scheme (see par. 4.4.1), a large part of European emissions were capped under an EU-wide maximum cap. For the emissions covered by the EU ETS, under an EU-wide cap, the goal is to reduce emissions of greenhouse gases by 21% in 2020 compared to 2005 levels . For emissions not covered by the ETS, the target is to reduce emissions to 104 Mt, with non-ETS base year emissions in the Netherlands being 127 Mt following Decision 2013/162/EU. In the projections with current and planned policies the emissions level by 2020 is 103.2 Mton CO_2-equivalent for the ETS and 99.4 CO_2-equivalent for the non-ETS.

5.3.2 Sensitivity analysis and uncertainty

In the 2010 projection, the relevant experts established uncertainty margins based on a combination of extra sensitivity analyses and expert judgement. These estimations have been used as the basis for the uncertainty margin that was calculated for the 2012 projection. During this process, methods were

used that are also applied by the IPCC (see IPCC (2000) 'Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories')[46]. An uncertainty propagation analysis was used, resulting in a range for the projections scenario containing the emissions with a very high level of certainty (90% chance/confidence interval). This results in a range for emissions of 191 Mt CO_2 eq. to 224 Mt CO_2 eq. by 2020 for the policy scenario with current policies. For the policy scenario that includes planned policies, the range is 181 to 215 Mt CO_2 eq. Ranges have also been calculated for the use of renewable energy (see sections above). No range has been calculated for 2030.

5.4 (C) Supplementarity relating to mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol.

Both companies and the government acquired credits as defined in articles 6 and 12 in order to meet their reduction commitments for the Kyoto Protocol in the period 2008-2012. Companies also acquired such credits because European member states like the Netherlands have implemented a European emission trading system, which covers the activities of mostly large, industrialised companies (about 40% of total European emissions). The EU ETS requires these companies to compensate for their emissions through sufficient emission allowances and/or credits[47]. For the emissions that fall outside the scope of ETS, not so-called non-ETS emissions, the government was responsible for acquiring enough emission allowances and/or credits.

The government acquired 45 million credits[48] in order to meet their obligations under the Kyoto Protocol. Based on preliminary emission statistics up to 2012, only 30 million credits were actually required[49],[50]. Although companies that fell within the scope of ETS received more free allowances than necessary to compensate for their emissions, they also surrendered 29 million credits to the government. This is 6.8% of their 2008-2012 allocation of allowances. These companies are allowed to surrender no more than 10% of their 2008-2012 allocation in the period up to 2020. It is not known how many credits where acquired by ETS companies in the Netherlands.

5.5 (D) Description of methodology.

5.5.1 Models and methods used

Autonomous social developments are reflected in growth series of activity data (industrial production, passenger km, tonne km, livestock numbers, etc.). In turn, these developments result in a demand for energy, including the non-energy use of fuels (e.g. feedstock). Investments in energy technologies and efficiency improvements are modelled using input regarding technological progress, policies and developments of energy prices and investment costs. Subsequently, the energy supply is modelled based on similar input parameters. The final step is the calculation of emissions. Energy use and emissions are calculated using a combination of models.

---

[46] www.wbcsdcement.org/pdf/tf1/Table_of_contents.pdf

[47] The use of credits has been limited to about 10% of the 2008-2012 allocation. www.pbl.nl/publicaties/nederland-voldoet-aan-de-kyoto-verplichting-uitstoot-broeikasgassen

[48] The Dutch government expects to acquire 48 million credits by the end of July 2013.

[49] http://www.iioa.org/conferences/intermediate-2004/pdf/wilting.pdf

[50] http://www.google.nl/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0CDEQFjAA&url=http%3A%2F%2Fwww.cpb.nl%2Fsites%2Fdefault%2Ffiles%2Fpublicaties%2Fdownload%2Fworldscan-model-international-economic-policy-analysis.pdf&ei=8e-

[51] www.ecn.nl/docs/library/report/1995/95005.pdf

[52] www.ecn.nl/publicaties/author/41901

Macroeconomic projections for the mid-term are derived from modelling exercises performed by the Netherlands' Bureau for Economic Policy Analysis (CPB). The PBL Netherlands Environmental Assessment Agency determines the macroeconomic trends up to 2030, based on the ranges of long-term projections made by CPB and PBL. The macroeconomic trend is then used as input for the sectoral economic projections, calculated by PBL using the DIMITRI model (Wilting et al., 2001)[11.] This model determines economic growth in approximately 20 different sectors. Information on the international demand for products and prices is based on calculations carried out using the Worldscan general equilibrium model (Lejour et al., 2006)[51] and is used as input for DIMTRI.

The economic growth output of the DIMITRI model is further differentiated into about 110 subsectors that influence emissions, and together with information on developments in the physical production capacity, they are used as input for the SAVE models by the Netherlands' Energy Research Center (ECN) (Boonekamp, 1994)[52.] SAVE was originally designed to project energy use and energy efficiency improvements, with key economic parameters and structural developments as input.

The SAVE models used include households, services and the industry/CHP/agriculture model. These models simulate final energy use based on extensive information about technologies. The SAVE models also take the effect of environmental and energy policies into account. The development of energy demand can be broken down into a volume, a structural, a climate, and an energy-saving effect.

ECN uses several models for energy supply (see Volkers, 2006)[53]. Simulation models comparable to SAVE are used to project renewable energy, production of natural gas, and growth in combined heat and power. Projections for passenger transport by road and rail were derived from the Dutch National Model System (LMS). Freight transport in the Netherlands by road, rail and water was modelled using TRANS-TOOLS, a European transport network model. The future composition of the car fleet and the inland shipping fleet was modelled by PBL using dedicated models, including Dynamo (passenger cars) and EMS (inland shipping).
The projections for transport volumes and fleet composition were subsequently converted into projected energy use and resulting emissions of greenhouse gases and air polluting substances by the transport sector.
ECN uses the linear programming model SERUM to calculate production streams in the petroleum-refining sector. The POWERS model, developed by ECN in cooperation with Erasmus University of Rotterdam [Rijkers, 2001][54]**,** generates equilibrium in the electricity market based on final demand for electricity and determines electricity supply and prices simultaneously. POWERS is a multi-actor adaptive model of the Dutch electricity market. This means that the decisions regarding production volume, allocation of the plants, and price setting made by each market player are based on information from the previous period. Finally, the linear programming model SELPE is used to generate physical equilibriums for all energy streams.

The outputs from SELPE, fuel combustion and the non-energy use of fuels per sector are used to calculate the energy-related CO_2 emissions per sector. Based on sectoral figures from CPB, ECN and PBL (transport), PBL also calculates the non-CO_2 greenhouse gas emissions per sector. This calculation takes into account climate policy, technology and structural economic aspects affecting non-CO_2 greenhouse gas emissions.

53 www.ecn.nl/publicaties/author/41901

54 www.ecn.nl/publicaties/author/41901

5.5.2 Key variables and assumptions

The key variables used in the projections are listed in Table 5.2 below. More detailed information about parameters and the assumptions that have been used is provided in Annex 5.1

	Units reported	**Historic values**			**projected values (current policies)**		**projected values (current + planned policies)**	
		2000	**2005**	**2010**	**2020**	**2030**	**2020**	**2030**
General economic parameters				Historic/ Projected				
1a. Gross Domestic Product	Millions of Euro2000	417,960	446,282	480,470	560,965	646,185	560,965	646,185
1b. Gross domestic product growth rate		3.9%	2.0%	1.6%	2.1%	1.5%	2.1%	1.5%
2a. Population	x1000	15.864	16.306	16.575	17.229	17.688	17.229	17.688
2b. Population growth rate and base year value		0.8%	0.2%	0.5%	0.3%	0.2%	0.3%	0.2%
3. International coal import prices	Euro2000/GJ	2.39	2.10	2.22	2.59	2.75	2.59	2.75
4. International oil import prices	Euro2000/GJ	5.30	6.75	8.60	12.49	14.23	12.49	14.23
5. International gas import prices	Euro2000/GJ	3.67	4.07	4.74	7.09	8.12	7.09	8.12
Carbon price (EU ETS)	Euro2010/ton	0	12.25	15.92	12.00	36.00	12.00	36.00

Table 5.2 Key variables used in the projections (see also annex 5.1)

6 VULNERABILITY ASSESSMENT, CLIMATE CHANGE IMPACTS, AND ADAPTATION MEASURES

The climate in the Netherlands is expected to undergo significant changes over the coming decades. The most pressing consequences are warmer and wetter winters, drier and hotter summers, more extreme river discharge, changes in biodiversity, and a rising sea level. At the same time, the Netherlands is subsiding. These conditions, in a country such as the Netherlands – dominated by the sea and situated in a low-lying delta area, with four large rivers and with a high population density– give rise to climate change impacts asking for risk assessments and decisions on timely and smart interventions.

NC5 introduced the "National Programme for Spatial Adaptation to Climate Change" (ARK), which was implemented after a motion in Senate in 2005 and resulted in the National Adaptation Strategy "Make Space for Climate" (ARK 2007). Following the NAS, the government reformulated priorities for climate change adaptation in the Netherlands. Water management was the first priority to be re-evaluated in the light of long-term sustainable development and climate change. On the basis of the advice of the Delta Committee in 2008 (Deltacommissie 2008. See also NC5), an integral policy programme (Delta Programme) was initiated. Its objective is to protect the Netherlands from (coastal and river) flooding, to realise climate-resilient urban areas and to ensure adequate supplies of fresh water for now and generations ahead (Delta Commissioner 2013. See also Box 6.1).

The Delta Programme has been the main vehicle for climate change adaptation planning in the Netherlands over the last five years. The resulting focus on water management and - to a lesser extend - spatial planning was challenged in a report by the Dutch Court of Audit (Roenhorst and van der Geest November 2012). The report concluded that, with due respect to the comprehensive approach in the Delta Programme, not all possible climate risks were covered. It also concluded that, outside the Delta Programme, there was a lack of overall coordination of adaptation planning. In particular, health, energy, transport, and recreation were identified as sectors where vulnerabilities and risks are insufficiently explored. Around the same time, the European Commission developed its EU Climate Adaptation Strategy, which advocated the drafting of national adaptation strategies by all EU member states, among other things. These notions, combined with the urge to reformulate climate mitigation policy, resulted in the decision by the then new government to draw up a comprehensive integral climate change policy agenda. This Climate Agenda was discussed in Parliament in October 2013 and covers both adaptation and mitigation. The Climate Agenda announces the intention to formulate a comprehensive National Adaptation Strategy, to be presented in Parliament at the latest by 2016 (Min I&M 2013). It will be based on the most recent insights in climate change, risks, and vulnerability, among other things, and goes beyond the water-related approach of the Delta Programme.

Box 6.1 The Delta Programme and Adaptive Delta Management

The Delta Programme is aimed at guaranteeing that the Netherlands remains safe and attractive, now and in the future, and that the fresh water supply is adequate. The Delta Programme is a nationwide programme, and has an advisory role towards the national government. The national government, provinces, municipalities, and regional water boards work together with input from social organizations, the business community, and knowledge institutes (Delta Commissioner 2013, www.deltacommissaris.nl). The Minister of Infrastructure and the Environment bears the responsibility. A Delta Commissioner was appointed to prepare and oversee the implementation of the Delta Programme. His main responsibility is to prepare an annual report that outlines progress and the steps that will be taken in the year ahead. Each year, the Minister of Infrastructure and the Environment presents the Delta Programme report to the House of Representatives as part of next year's national budget. The legal framework for the implementation of the current national adaptation strategy in the Netherlands is 'the Delta Act on flood safety and fresh water supply' (hereinafter: the Delta Act).The Delta Act is formally an amendment of the Water Act and anchors the Delta Programme, the Delta Fund, and the role of the Delta Commissioner. The Delta Act entered into force on 1 January 2012.

The Delta Programme is currently being developed in nine sub-programmes (See also Delta Commissioner 2013). Three sub-programmes apply to the whole of the Netherlands:
- Safety;
- Fresh water;
- New Urban Development and Restructuring.

The other six sub-programmes are regional:
- Rhine Estuary-Drechtsteden;
- South-western delta;
- IJsselmeer Region;
- Rivers;
- Coast;
- Wadden Region.

Administrative consultations regarding the three national sub-programmes take place within the so-called Administrative Umbrella Consultations. The six regional sub-programmes are discussed in regional high-level steering groups and administrative consultation bodies.

The Delta Programme uses an integrated approach when tackling the issues of safety, water supply, and the role that spatial planning can play in resolving those issues. Key decisions regarding flood risk management, fresh water supply, and spatial adaption, as well as regional strategies will be proposed to Parliament in September 2014. After approval, the implementation of the proposed policy and strategies can start. This will take several decades. E.g. new flood risk management standards have to be accomplished in 2050. The Delta Programme will take account of uncertainties about the future impact of climate change as well as spatial and socio-economic development (See the next section for the use of scenarios). For the Delta Programme, a new planning approach was developed, called 'adaptive delta management'. Key elements of adaptive delta management are:
- Linking short-term decisions with long-term tasking around flood risk management and fresh water;
- Incorporating flexibility in possible solution strategies (where effective);
- Working with multiple strategies and moments to switch between them (i.e. adaptation paths);
- Linking different investment agendas.

Preparing for future changes requires short-term measures that tie in with the long term, i.e. measures that expand our adaptability and increase the ability to withstand extreme situations. Finalising measures for impacts fifty to a hundred years ahead is difficult and in most cases not advisable. After all, solutions must be able to grow along with new insights and circumstances. On the other hand, it is essential that measures are taken now, considering that it took several decades to complete the Delta Works. Implementing adaptive delta management involves three steps:
- What short-term developments in other policy areas might interfere with water safety and fresh water supply measures?
- Insight into the flexibility of the possible solutions. For example, can the solutions be easily implemented on a step-by-step basis and adapted in case circumstances change?
- What decisions must be taken now in order to make the adaptive approach possible?

These three steps ensure that necessary measures are taken early, while at the same time keeping sufficient options open for additional measures required in the future to protect the Netherlands against flooding and to ensure a sufficient supply of fresh water. To enable this approach, monitoring, reporting, and evaluating schemes for refining adaptation are developed.

In the process, all relevant material, like results of research and knowledge programmes (Knowledge for Climate), experiences from international cooperation (International Water Programme, Delta Alliance, Connecting Delta Cities), and assessments by the Netherlands Environmental Assessment Agency (PBL 2011) are taken into account.

This chapter reports on climate change impact studies (Section 6.1), vulnerability assessments (Section 6.2), and adaptation strategies (Section 6.3) in the Netherlands. For a more detailed description of national impact and vulnerabilities, the reader is referred to the assessments by the Netherlands Environmental Assessment Agency (PBL 2011; PBL 2012), which are also the main source for the sections below. Details on international cooperation and capacity building can be found in Chapter 7. Details of research activities and programmes are described in Chapter 8.

6.1 (A) Expected impacts of climate change

This section describes impacts of climate change in the Netherlands. It distinguishes between primary effects, such as temperature and sea level rise (Section 6.1.1), and the impacts thereof on the various sectors of society (Secondary effects, Section 6.1.2 - 6.1.8). Figure 6.1 gives an overview of climate impacts, distinguishing between primary and secondary effects. The main source for these sections are assessments by the Netherlands Environmental Assessment Agency (PBL 2011; PBL 2012).

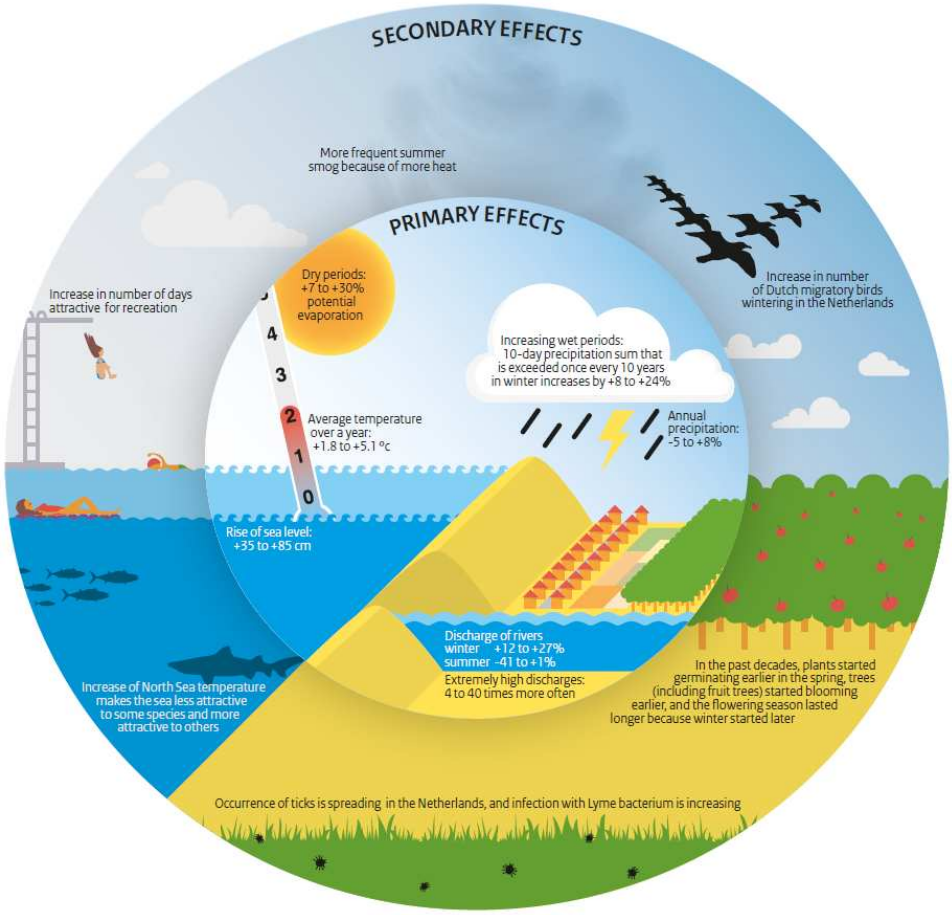

Figure 6.1 Overview of primary and secondary effects of climate change

6.1.1 Primary impacts of climate change and scenarios

In 2006, the Royal Netherlands Meteorological Institute (KNMI) published four climate scenarios for the Netherlands for 2050 and 2100. For the first time in their analyses of the future climate, the KNMI used a whole range of advanced global and regional climate models combined with information from time series of measured data, which allowed them to incorporate changes in air circulation patterns in their models.

Given the uncertainties about whether and how these circulation patterns are affected by the enhanced greenhouse effect, the KNMI decided to use two sets of climate scenarios: one set in which the circulation patterns remain unchanged (current situation) and a second set in which the circulation patterns do change (see Table 6.1). Both sets consist of two scenarios. In the first scenario, the average global temperature in 2050 is one degree higher than in 1990 and in the second scenario, it is two degrees higher than in 1990. The calculations for the climate scenarios with altered circulation patterns

provide strong evidence for more frequent dry summers similar to those experienced in 1976 and 2003 in the Netherlands.
Extreme changes – such as those that would be caused by a reversal of ocean currents and that would cause widespread social disruption – have not been included because the chances of such events occurring are low. According to current understanding, there is an 80% chance that the trends in the Dutch climate will be within the range covered by the four scenarios. This means that in 2050 there is an 80% chance that the average winter temperature will rise by between 0.9 and 2.3°C and that the sea level will be 15 to 35 cm higher than in 1990 (see Table 6.1).

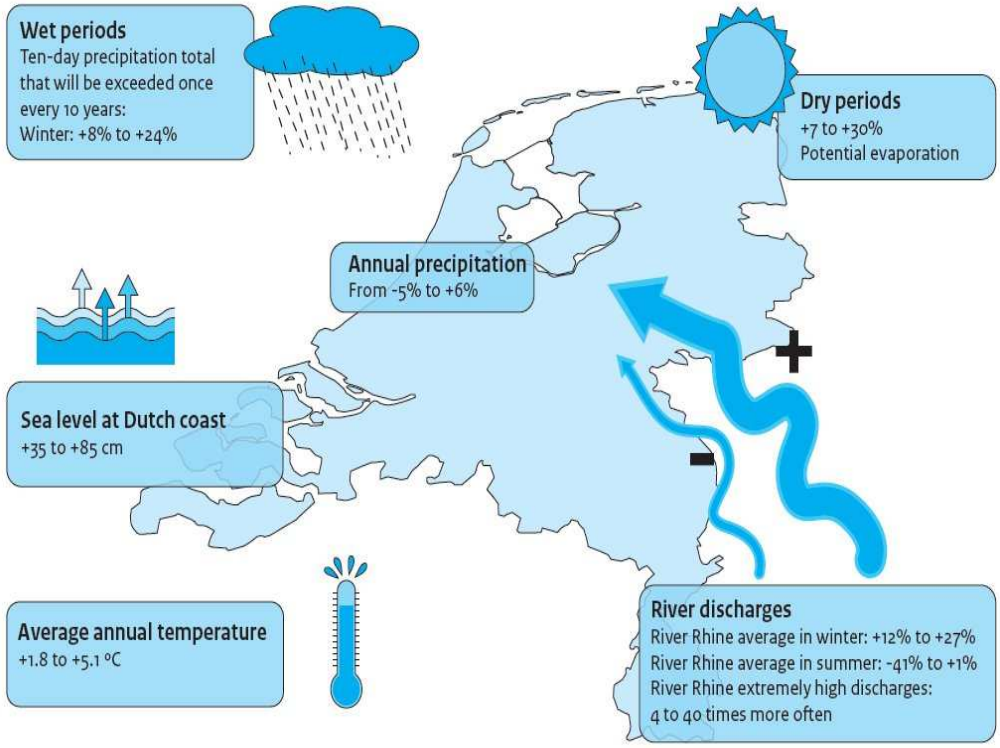

Figure 6.2 Possible climate changes for the period 1990 – 2100, according to KNMI'06 scenarios. (Source: PBL (2012))

2050	G	G+	W	W+
Average temperature	+0.9°C	+1.2°C	+1.8°C	+2.6°C
Changes in air flow patterns in Western Europe	no	yes	no	yes
Winter average temperature	+0.9°C	+1.1°C	+1.8°C	+2.3°C
Coldest winter day per year	+1.0°C	+1.5°C	+2.1°C	+2.9°C
Average precipitation	+4%	+7%	+7%	+14%
10 Day total rainfall exceeded once in 10 years	+4%	+6%	+8%	+12%
Highest average daily wind speed per year	0%	+2%	-1%	+4%
Summer average temperature	+0.9°C	+1.4°C	+1.7°C	+2.8°C
Warmest summer day per year	+1.0°C	+1.9°C	+2.1°C	+3.8°C
Average precipitation	+3%	-10%	+6%	-19%
10 Day total rainfall exceeded once in 10 years	+13%	+5%	+27%	+10%
Potential evaporation	+3%	+8%	+7%	+15%
Sea level absolute rise	15-25 cm	15-25 cm	20-35 cm	20-35 cm

Table 6.1 Climate scenarios for the Netherlands (KNMI 2006; KNMI 2009)

An update of these scenarios was published in 2009 (KNMI 2009). In this update, it was concluded that the general scenarios were not overruled and together describe the most likely changes in the Netherlands, including associated uncertainties. The results also indicate which scenarios are most

likely, given certain observations. The rapid warming in the Netherlands and Western Europe is best accounted for in the W/W+ scenarios. The increase in the intensity of heavy showers is well described in the G/W scenarios. Besides possible long-lasting periods of drought, as in the G+/W+ scenarios, periods of wetness will likely occur more frequently, as in the G/W scenarios, in particular in the coastal zone (KNMI 2009). It should be noted however that deductions about the likeliness of particular scenarios depend on the observed variable (e.g. may differ between temperature and precipitation) and that trends in observations may not persist in the future. A new generation of updated scenarios will be available in 2014, which will include more regionally differentiated information.

The KNMI'06 scenarios describe the most likely range of future climate changes in the Netherlands. They are the official starting point for impact studies and climate adaptation planning. For the Delta Programme, the KNMI'06 climate scenarios were matched with the socio-economic WLO (Welvaart en Leefomgeving – Prosperity and Environment) scenarios (Janssen et al. 2006) to form the so-called Delta Scenarios. The Delta scenarios are guiding the process of climate proofing the Netherlands, in particular for water management.[55] These scenarios are the basis for the risks and vulnerability assessments that are developed in the Netherlands on the national and sub-national level. In the national assessments, water, coastal areas, disaster risk reduction, civil protection, and cross-sectoral impacts are covered (PBL 2011; PBL 2012).

6.1.2 Impacts on water safety (floods, droughts, fresh water)

The main impacts of climate change on water safety are:
- raised likelihood of coastal erosion and flooding (very likely);
- an increase in peak discharges from the rivers in the winter, raising the likelihood of flooding, especially in coastal area (very likely);
- raised water levels in the IJsselmeer area and the main inland waterways of Zuid-Holland and Zeeland, thus raising the likelihood of flooding and water stagnation (very likely);
- more frequent flooding in urban areas after extreme rainfall events (likely);
- a decrease of river discharges in summer and increased chance of water quality deterioration caused by drought (more likely than not);
- greater penetration of saline water into surface water bodies, impacting fresh water availability (very likely).

Over the past 100 years, the sea level has risen by about 20 cm. This rising sea level leads to coastal erosion and reduces the safety along the coast. The climate scenarios also predict higher wind speeds, although this increase is small and lies within the current variability in wind speed from year to year. The expected higher precipitation in winter and less snowfall will make discharges in the Rhine and Meuse catchment more extreme. It is important to note that actual discharges will depend, next to climate change, on factors such as water management of the upstream river basin. A critical flood situation can occur if spring tide, storm conditions, and high river discharge coincide. As the sewage systems were designed to cope with less violent downpours, heavier summer storms also will mean more flooding in urban areas.

6.1.3 Impacts on ecosystems and biodiversity

Significant effects of climate change on ecosystems and biodiversity are:
- growing/breeding season starts earlier (very likely);
- cold-loving species declining, new warm-loving species increasing (very likely);
- changes in species composition (very likely);
- changing bird migration patterns (very likely).

[55] http://www.deltacommissaris.nl/english/topics/delta_scanerio

Climate change will allow some plant and animal species (see Figure 6.3) from warmer, more southerly regions to become established in the Netherlands. This is a natural process, but it also involves pest species or nuisance species. Examples include the oak processionary caterpillar and the western corn rootworm. Plant growing and flowering periods, as well as bird-breeding times have shifted in response to climate change and food chains can be disrupted in the process. Hydrological changes in groundwater and surface water, as well as temperature changes, are putting ecosystems such as forests, coasts, and peat grassland areas under increasing pressure. Our aquatic and wet terrestrial ecosystems, such as stream and river systems, wetlands, wet heath, and raised bog, are particularly sensitive to extremes in the weather.

Climate change will be advantageous for some plants and animals and disadvantageous for others. The actual impact will be co-determined by non-climate factors such as the dispersal and adaptive capacity of species and management issues such as an improvement in water quality and more robust ecological networks (PBL 2010).

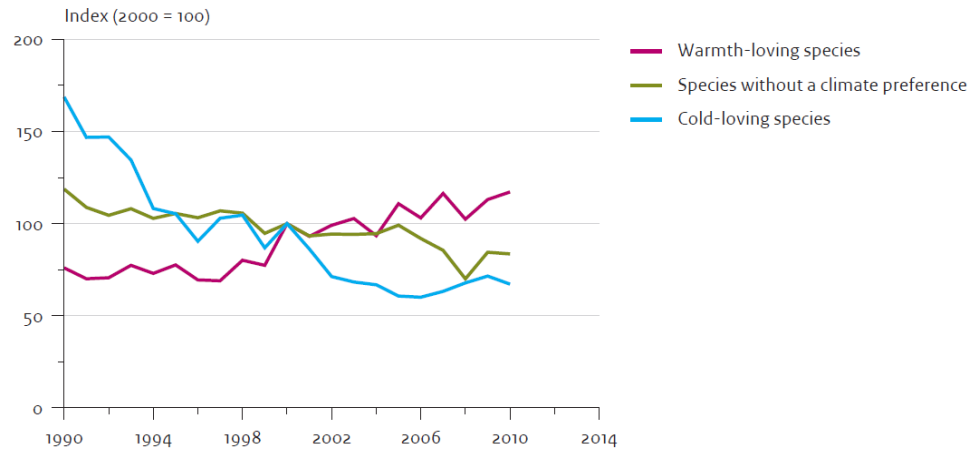

Figure 6.3 Climate change impacts on species in the Netherlands (Source: PBL (2012))

6.1.4 Impacts on agriculture

The main effects of climate change on agriculture are:
- increase in productivity due to higher temperatures and CO_2 concentrations (very likely);
- extension of the growing season (very likely);
- crop damage and production constraints due to water stagnation in wet periods (very likely);
- crop damage from soil water deficits and/or brackish groundwater seepage (more likely than not);
- changes in the distribution, frequency, and intensity of fungal diseases, insect pests, and weeds (about as likely as not).

Changes in the climate will generally improve the average climatic conditions for farming in the Netherlands. Higher temperatures mean longer growing seasons and thus higher potential crop yields. Dutch agriculture can often react flexibly to changing climatic conditions; smaller yields in dry years will often be compensated by higher prices and the favourable location of the Netherlands in Europe. Potatoes and dairy production are examples of agricultural commodities where the competitiveness of the Netherlands is high[56] (Hermans et al. 2010).

On the down side, too much water (flooding and water stagnation) as well as too little water (drought) can result in yield loss and economic damage. The drought risk is highest in areas that have little or no access to water from rivers or ditches and areas where the water table is low (see Figure 6.4). In

[56] (Hermans et al. 2010

addition, new pest and diseases may occur. The agricultural sector sees extreme weather events as one of the biggest challenges posed by climate change. [57]

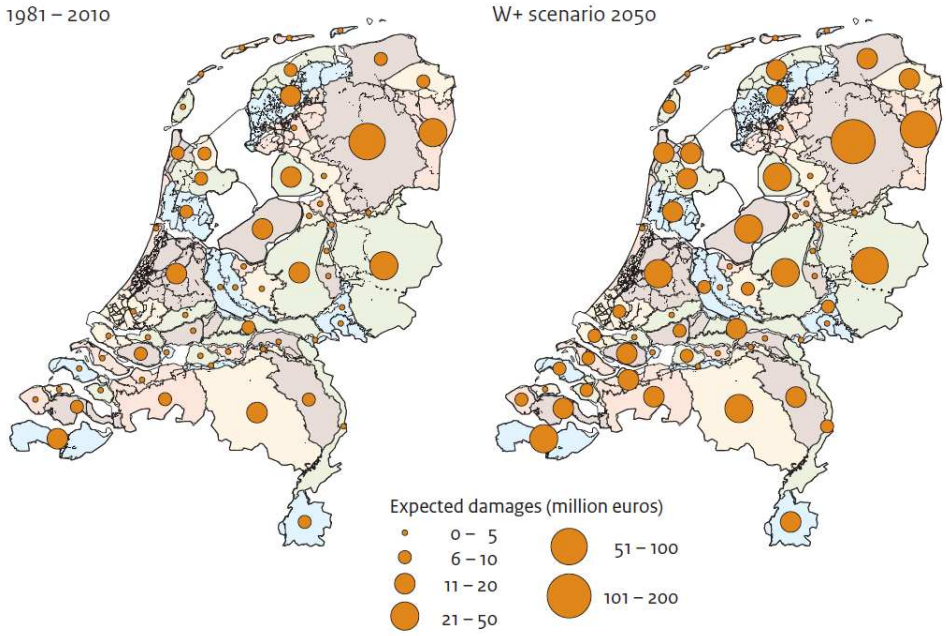

Figure 6.4 Drought risk in agriculture (Source: PBL (2012))

6.1.5 Impacts on recreation

The consequences of climate change for the recreation sector are:
- a longer tourist season due to higher temperatures in spring and summer (very likely)
- restrictions on water-based recreation, such as reduced navigability and more delays at bridges and locks (likely);
- decline in bathing water quality (more likely than not);
- increase in number of day trips (unknown);
- rise in number of foreign tourists (unknown).

Depending on the climate scenario, net spending in the recreation sector may rise by between 1 and 6% (see figure 6.5). However, no account has been taken of any changes in leisure and recreation behaviour. European studies show that, in the months of June, July, and August, the temperature in the traditional holiday regions in the Mediterranean will be too high for many tourists. In the more temperate climates, on the other hand, conditions will become more favourable. The Netherlands will have a pronounced "Netherlands-Waterland'-character (the popularity of water sports is growing). The numbers of foreign tourists coming to the Netherlands may rise and more people may remain in the Netherlands for their holidays. Nevertheless, the Netherlands is not expected to develop into a tourist honeypot as a result of climate change because the summer weather will probably remain unpredictable.

Rising sea levels and more severe storms will increase erosion of beaches and dunes. Large-scale beach nourishment will be required to maintain beach width. The positive effects will provide opportunities for recreation in the Netherlands to strengthen, given an improved competitive position to Southern Europe.

[57] http://www.pbl.nl/

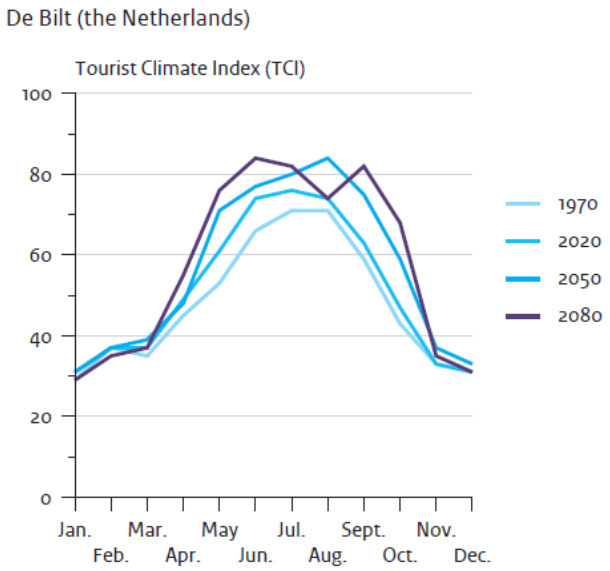

Figure 6.5 Climate conditions for tourists (Source: PBL (2012))

6.1.6 Impacts on public health

The direct consequences of climate change for public health are:
- an increase in mortality during summer, due to heat stress (likely);
- a reduction in mortality during winter (more likely than not);
- an increase in mortality from flooding and high water levels (unlikely);
- an increase in stress caused by more frequent flooding and high water levels (very likely); higher mortality from storms (about as likely as not).

Indirect health consequences are increases in:
- vector-transmitted diseases, such as malaria (unlikely) and Lyme disease (likely);
- diseases linked to air quality (ozone and particulates) (likely);
- allergies: increase in hay fever (likely) and increase in house-mite allergy (unknown);
- water-related diseases (about as likely as not);
- food-related diseases (unlikely);
- exposure to UV-related disorders (likely);

Many of the indirect effects depend on changes in behaviour: people are projected to go outside more often and for longer periods because (on average) it will become warmer and they will spend more time on outdoor leisure and recreation activities. Exposure to UV radiation, air pollution and pollen, water-borne diseases (cyanobacteria, amoebae), and Lyme disease will increase as a result. The ozone layer above the Netherlands will probably recover more quickly because of climate change, counteracting exposure to UV radiation.

Although climate change has an influence on diseases, it is only one of the factors determining human health. Other factors are projected to have a greater impact, including more frequent travel abroad, which makes it easier for diseases to spread, as well as infectious diseases, quality of the indoor environment, changing lifestyle, and eating patterns (obesity and cardiovascular disease).

6.1.7 Impacts on urban areas and housing

The consequences of climate change for urban areas are:
- more erosion of road infrastructure by heavy rain and flooding, following drought, consequence is more maintenance (very likely);
- increasing flooding and obstruction of roads by incapacity of storm water drainage and roads surface (very likely), by failure of flood defences (unlikely), by pluvial flooding, and by changing groundwater levels (about as likely as not);
- increasing damage to houses with wooden foundations caused by low groundwater levels (unknown);
- increasing chance of surface water pollution caused by sewage overflow after heavy precipitation (likely);
- more damage to houses from extreme storms (about as likely as not).

Heat stress will feed demand for 'intelligent' buildings built to stay cooler in summer. Existing buildings have a depreciation period of 40 to 50 years and retrofitting these buildings is an expensive option. However, given the rate of climate change, the changing functional demands being made on buildings (such as more comfort) are of greater influence than the demands made on the building by the changing climate.

6.1.8 Impacts on energy, infrastructure, and transport

The consequences of climate change for the energy, infrastructure, and transport sectors are:
- a decline in natural-gas consumption in winter (very likely);
- an increase in electricity consumption in summer (very likely);
- an increase in the frequency of cooling water constraints for facilities such as power plants (very likely);
- reduction in ice accretion on wind turbines (very likely);
- increase in corrosion due to higher precipitation and higher temperatures (likely);
- increase in damage to oil rigs, high-voltage transmission lines, roads, bridges, and vehicles from extreme storms (more likely than not);
- fewer problems due to extreme winter conditions, e.g. fewer occasions when roads need to be gritted or salted, reduction in damage to rail tracks and roads by frost and salt/grit, fewer constraints on water transport from ice cover, and fewer travel delays (likely);
- greater occurrence of melting road surfaces and deformation of rail tracks in hot temperatures (likely, on the short term about as likely as not);
- reduced navigability of rivers due to periods when water levels are too high or too low (very likely);

The Stern Review Report states that the economic costs of storms and floods could be very high. More precipitation combined with higher temperatures will accelerate corrosion of viaducts, bridges, and other infrastructure, and inspections and maintenance work will be needed more often.

The relatively short depreciation periods for investments in the road haulage sector allow it to react flexibly to climate change. Compared to the change in the levels of use (increased traffic, heavier vehicles), climate change contributes little to wear and tear, proceeding as it does at a slow pace compared to the frequency of regular maintenance work of dry infrastructure. However, investments in transport by rail and waterway require more time, and the replacement periods of materials are much longer, thus making them more vulnerable. The effects of low river discharges could become an important factor in water transport.

Following these impact assessments, the vulnerability and adaptation to climate change for the Netherlands are summarised in table 6.2 for the areas of interest to the UNFCCC. Most are elaborated upon in sections 6.2 and 6.3. The main source for these sections below are the assessments by the Netherlands Environmental Assessment Agency (PBL 2011; PBL 2012).

Vulnerable area	Examples/comments/adaptation measures reported
Agriculture and food security	**Vulnerability:** The agricultural sector is particularly wary of increasing risks for diseases and pests and an increase in weather extremes. In the coastal zones, the sector is vulnerable to salinization. The Netherlands is vulnerable to animal diseases because of high animal density, multiple transportations, and many contacts abroad. **Adaptation:** Research still plays an important part in identifying opportunities and threats and in developing innovative strategies. Insurance schemes are offered, which is also a new business opportunity for the insurance sector (Botzen et al. 2010).
Biodiversity and natural ecosystems	**Vulnerability:** Changes already occur in nature and some ecosystems show irreversible effects as a result of the rise in temperature. Dutch aquatic and wet terrestrial ecosystems, such as stream and river systems, wetlands, wet heath, and raised bog, are particularly sensitive to extremes in the weather. The effects of future changes will be beneficial for some plants and animals and disadvantageous for others, an important aspect being the adaptive capacity of species. The speed at which climate change occurs will also determine the nature and severity of these effects. **Adaptation:** The resistance of the natural environment is to be increased by creating larger connected areas, corridors, and a sufficient variety of favourable environmental conditions. The realisation of such ecological networks has experienced setbacks under the previous and current government. Increasing the adaptive capacity of nature calls for a transition from a focused conservation to a more development-oriented policy and / or more dynamic target species policy. Climate buffers will contribute to climate-proofing nature to a considerable extent, as they are able to grow with the pace of climate change.
Coastal zones	**Vulnerability:** Safety against flooding from the sea can be ensured with current, available methods, even in the worst-case scenario of 1.5 meters sea level rise per century. Flood defences that did no longer comply with the current standards are in the process of being restored or reinforced. **Adaptation:** The Netherlands continues the strategy of sand replenishment as a way of enabling the coastal foundation zone to grow concurrently with the rise in sea levels. Where possible, this is to take place by naturally distributing and transferring sand along the coast (Delta Programme | Coast 2013). In addition, innovative solutions are piloted to increase coastal safety by 'building with nature' or developing new multi-functional dyke concepts.
Drought	**Vulnerability**: Agriculture and nature can suffer from more frequent and longer lasting soil water deficits during the summer. Water intake, and with it the country's fresh water supply, come under pressure. Urban areas will experience heat stress (heat islands) and are vulnerable to damage to foundations by decreases in groundwater levels during long periods of drought. Drought can impact the stability of dykes and road constructions. **Adaptation:** Climate buffers will help to hold water from (extreme) precipitation. Sandy soils especially will benefit from stimulating retention to be less burdened by dehydration during heat waves. Some municipalities are climate proofing the urban area by green-and-blue measures (green roofs and public spaces, and the construction of new open water). Dyke and road constructions are reconsidered.
Fisheries	**Vulnerability:** The temperature of North Sea water has risen by 0.5 °C and the Wadden Sea by a whole degree; cod and flatfish are moving away. In the absence of natural enemies, exotics can be invasive and thus cause ecological and economic damage. A familiar example is the Japanese Oyster, which is invading mussel beds in the Zeeland delta and in the Wadden Sea. Already-present exotics (in small numbers) may still become invasive as a result of climate change. Dutch coastal waters may temporarily become less saline when more fresh water is pushed out due to higher river discharges. Few marine organisms can withstand these sudden fluctuations in salinity. In the Wadden Sea, the sea level rise causes a problem if it is not compensated by the influx of sand and silt. Intertidal areas will be uncovered less or no longer, significantly affecting the Wadden area. **Adaptation:** Innovation in the fisheries sector (sustainable fishing). Actions are aligned with European policy development, including the implementation of the Water Framework Directive, the Marine Strategy Framework Directive, and the Common Fisheries Policy. Research plays an important part in identifying opportunities and threats and in developing innovative strategies.

Vulnerable area	Examples/comments/adaptation measures reported
Forests	**Vulnerability:** Climate change in the Netherlands will not only affect tree growth (positive) but also the competitiveness in mixed forests and thereby the species composition (shifts). The direction of change will depend heavily on locality. The effects of wetter winters and drier summers are very dependent on soil type. There is an increased risk of natural fires in summer. **Adaptation:** Climate buffers in the sands and the hills, the upstream areas, will help to store water from (extreme) precipitation, so the sandy soils especially will be less burdened by dehydration during heat waves. Information sharing and coordination between authorities to cope with natural fires has been streamlined (www.infopuntnatuurbranden.nl).
Human health	**Vulnerability:** The Netherlands is vulnerable to flooding, with the probability of large numbers of affected people in a single flood episode. Due to large population densities and mobility, the urban area in particular is also vulnerable to allergies, summer smog, infectious diseases transmitted, heat stress and water- and foodborne diseases. Health effects still seem to be limited, but it is uncertain how this could develop in a worst-case scenario. **Adaptation:** Developing schemes for contingency and evacuation plans. National Heat Plan. Green-and-blue measures in urban areas, paying due attention to potential positive as well as negative consequences of these measures for human health. Building codes and urban adaptation.
Infrastructure and economy	**Vulnerability:** The economic costs of storms and flood damage can be very high in the Netherlands. Low river discharges are projected to become a limiting factor in water transport and electricity production. The urban areas (flooding, heat stress) and the transport and energy networks are vulnerable to the disruptive effects of weather extremes. **Adaptation:** The focus is primarily on prevention: water safety, climate-proof designing, building, and maintenance. Since 2012, insurance against calamities is being offered for house owners. This is not widely used because of high premiums in flood prone areas. Flood damage of a larger scale can partly be compensated by the Injury Allowance Act (WTS).
Water resources	**Vulnerability:** Water intake, and with it the country's fresh water supply, come under pressure with the rising sea level and salt water penetrating further inland via the rivers and groundwater. The adaptive capacity of the fresh water supply is limited in its current setting. Precipitation deficits can cause considerable problems as early as 2050. Dry summers, like the one of 2003, will occur more frequently, leading to damage to agriculture and shipping. **Adaptation:** Retention areas; blue services; adapting to salinazation, self-sufficiency, water regulation. A comprehensive set of strategic adaptation decisions is being prepared in the Delta Programme.

Table 6.2 Summary of information on vulnerability and adaptation to climate change

6.2 (B) Vulnerability assessment

Vulnerability assessments are generally realised through European research projects and national studies (see also Chapter 8). The most important and recent national efforts include the Delta Programme 2014 (Delta Commissioner 2013) and the Netherlands Environmental Assessment Agency advices (PBL 2011; PBL 2012). Vulnerability assessments have largely focussed on water, agriculture, and - to a lesser extent - city planning and nature conservation. Recent studies called for a more comprehensive vulnerability assessment of: (1) energy, (2) infrastructure and transport, (3) ICT, (4) health, and (5) nature (PBL 2013). [58] These assessments will be commissioned in preparation of a comprehensive National Adaptation Strategy. Next to the effects of the KNMI scenarios introduced in the previous section, the assessments will consider 'worst-cases'.

[58] *http://books.google.nl/books/about/Aanpassing_aan_klimaatverandering.html?id=po7EkQEACAAJ&redir_esc=y*

Risks increase as a result of an increase in frequency of events as well as of potential damages (people and assets). Nearly 60% of the Netherlands is prone to flooding, including the economic centre. Therefore, flood protection, not only from the sea but also from the major rivers, is of vital importance. In addition, summers are expected to become hotter and drier, which may jeopardize the fresh water supply. Vulnerabilities differ per sector. Agriculture, industry, and nature will be restricted in their water use first, before drinking water supply will be affected.
The scope of water-safety issues has become clearer since 2009. The national monitoring programme of the dykes showed that a number of dykes do not meet the standards. In addition, at the end of 2011, the updated analyses of social costs and benefits of flood defences and the risk in terms of victims due to flooding became available. The studies indicate that for most parts of the Netherlands safety standards result in acceptable risks; however, a number of areas could benefit from a higher safety standard. Furthermore, the Delta Programme scenarios (see Section 6.1) have been used to assess the regional vulnerability of fresh water supply in 2050. Specific vulnerabilities include:

- In the coastal provinces where salinization can occur, in a dry year, no water of the desired quality can be withdrawn for long periods, especially in Gouda.
- On the higher, sandy part of the Netherlands, where there is no water supply from the rivers, bottlenecks can occur in an average year due to a lack of moisture in the soil and a groundwater level decline.
- In a dry year, the undisturbed supply of cooling water for the energy supply and of drinking water in a large part of the Netherlands can come under pressure. This can cause irreversible damage to nature and damage to infrastructure. In the area that receives water from the Ijsselmeer, these issues come into play in an extremely dry year. The IJsselmeer could offer additional fresh water buffering capacity to prevent water stress.

The agricultural sector is particularly wary of increasing risks of diseases and pests and an increase in weather extremes. 'Blue-tongue' reached the Netherlands in 2006. As a result of climate change and international transports, outbreaks of other animal diseases that have not yet occurred in the Netherlands are more likely in the future. The Netherlands is vulnerable to animal diseases because of high animal density, multiple transportations, and many contacts abroad. The vulnerability of the agricultural sector to drought differs between farm types and cultivation methods. In general, the more intensive the cultivation system, the greater the efforts taken to prevent damage. Greenhouse horticulture, for example, depends heavily on the availability of water of good quality, but is less vulnerable because, for this very reason, investments have already been made in facilities to collect and store water (PBL 2012).

Changes are already occurring in nature and some ecosystems, such as the IJsselmeer, which shows irreversible effects as a result of the rise in temperature. Consequently, the feasibility of the current goals of preservation in nature policy becomes increasingly uncertain with ongoing climate change. While knowledge of the further effects of climate change on species and ecosystems is still limited, the possible measures that might be taken to strengthen the adaptive capacity of biodiversity and ecosystems are already known. These are international and national corridors between nature areas and the improvement of environmental conditions and the connection to the hydrological system.

With respect to health, the possible increase in epidemics and diseases to humans, animals, and plantsis uncertain, but the adaptive capacity seems limited. People in urban areas are particularly vulnerable due to population density and mobility. Urban areas and the transport and energy networks are also vulnerable to the disruptive effects of weather extremes (flooding, heat stress). Socio-economic development has intensified the use of infrastructure, adding to its vulnerability. Considering the national highway network, spots vulnerable to flooding were investigated in 2012, both for the present situation and under future climate change. As a follow-up, a risk investigation is presently carried out in order to be able to plan and prioritize adaptation measures as appropriate. Given the population concentration in urban areas and the importance of transport and energy networks for society to function well, a detailed analysis of the vulnerability is required and will be commissioned in preparation of the next National Adaptation Strategy.

6.3 (C) Adaptation measures

At the time of the fifth national communication NC5, the National Adaptation Strategy "Make Space for Climate" had just been issued (ARK 2007). This strategy promoted spatial adaptation for safety, environment, biodiversity, and sustainable development. Non-spatial measures, such as for vaccination programmes in the health sector, were to be included in the appropriate sectoral policies. However, coordinated action at the national level on the implementation of the National Adaptation Strategy was not set into motion when the National Programme for Spatial Adaptation to Climate Change (ARK) ended in 2010. Without a coordinated national approach to adaptation, adaptation actions are addressed in individual programs, of which the Delta Programme is the most prominent example. Thus, attention attributed to adaptation and the approaches employed differ between sectors. A report by the Dutch Court of Audit (Roenhorst and van der Geest 2012) concluded in November 2012 that health, energy, transport, and recreation in particular need further attention in adaptation policy. In addition, crossover effects and the interaction between different climate issues deserve closer consideration. Therefore, the government has embarked on the preparation of a comprehensive integral climate change policy agenda (October 2013), which includes the start of a comprehensive National Adaptation Strategy to be presented in Parliament by 2016 latest. The National Adaptation Strategy will present a sectoral as well as an inter-sectoral approach and encourages different parties to reflect, cooperate, reconsider, and take action. National and international coordination of adaptation lies with the Ministry of Infrastructure and the Environment.

Concrete climate change adaptation projects presently focus on mainstreaming and 'no regret' options. Implementation is often realised by regional and local authorities, especially where spatial developments are concerned. Coalitions of the willing for regional and local initiatives are on the increase (see for example Box 6.2). Important developments remain: the Climate Agreements between the National government and the Associations of Provincial Authorities (IPO) and the Dutch Municipalities (VNG), the Hotspot projects in the Knowledge for Climate programmes, the development and use of the Climate Atlas, and (inter)national cooperation with the business community and the Delta Alliance (MinIenM 2013). Several studies are running to embed adaptive capacity in planning instruments, such as a strategic social-environmental assessment (planMER), Cost-Benefit Assessment, Water Assessment, and Building Act (in Dutch: *Watertoets* and *Bouwbesluit*).

The following sections summarise how the most affected policy sectors deal with adaptation, in both recent national policy plans and implementation.

Box 6.2 Adaptation to climate change in the city of Rotterdam

In 2008, the city of Rotterdam started the climate adaptation programme 'Rotterdam Climate Proof' in close cooperation with the national research programme 'Knowledge for Climate'. Together with the regional Delta Programme, the work resulted in the Rotterdam Adaptation Strategy (RAS). The strategy will be accompanied by tools such as a societal cost-benefit analysis for climate adaptation. Measures are selected to have multiple benefits and contribute to the social-economic development of the city. Examples are green roofs, so-called 'water squares', and a new rowing course that enlarge the water storage capacity of the city. Floating architecture is piloted in the old port areas.

The Rotterdam approach to adaptation has attracted attention internationally. The European Commission selected Rotterdam as one of the 'Peer Cities' in the Cities Adapt Programme. Businesses profit from Public-Private Partnerships and international cooperation. Nationally, the Rotterdam Adaptation Strategy will become one of the pillars of the new National Adaptation Strategy.
http://www.rotterdamclimateinitiative.nl/en

6.3.1 Adaptation for water safety (floods, droughts, fresh water)

Overall national policy outline
Climate change and adaptation measures are strongly integrated into the water policy agenda. Over the last decade, the Fourth National Policy Document on Water Management (Vierde Nota Waterhuishouding), the Water Management in the 21st Century Advisory Committee (Commissie Waterbeheer 21e eeuw), the National Administrative Agreement on Water (Nationaal Bestuursakkoord Water), Outlook on Water (Watervisie), and the advice of the second Delta Committee represented an important impulse for water management. Nevertheless, it has been recognised that increasingly extreme river discharges and the rise in sea levels will mean that technical measures, such as raising dykes, will no longer be sufficient.

This has been a driving force behind the Delta Programme. Conclusions from the Delta Programme in 2013 include (Delta Commissioner 2013):

- Safety standards: It is not necessary to raise the standards for the whole of the Netherlands by a factor of ten, as was recommended by the Delta Committee in 2008. However, the water safety standards in parts of the country are in need of updating, particularly in the rivers area, parts of the Rhine Estuary-Drechtsteden region, and at Almere. An individual basic safety level will apply for the Netherlands and safety levels will not be reduced for anyone.
- Freshwater supply: the water system can be more robust. Possible measures include: taking action to optimise water distribution in the main water system, limiting salt intrusion, and ensuring an alternative fresh water supply system. In addition, water users will have to adapt their demand to the amount of water that is available.
- In the Rivers Region, Rhine Estuary-Drechtsteden, and the South-western Delta (the Rhine-Meuse Delta), combinations of strengthening dykes and widening rivers, linked to flood-proof spatial development are sufficient to keep these areas safe at high water in the long term. For the protection of a few areas, including Alblasserwaard and Krimpenerwaard and along the River Lek, more drastic measures are needed to keep safety at the right level.
- The increase of 1.5 metres in the water level of the IJsselmeer as recommended by the Delta Committee in 2008 is no longer a consideration. The fresh water supply can be sufficiently increased with a lower rise, in combination with flexible management of the water level in the summer months. In the long term, pumps might be needed to discharge surplus water.

The protection against flooding is proposed to shift towards a risk-based approach. Not only the probability of flooding but also the consequences of flooding, like casualties, damage and disruption, will be included in this approach. Measures to reduce flood risk consist of protective measures (like dykes), (flood-proof) spatial planning, and disaster management/evacuation. Within this multi-layered safety approach, the optimum mix of measures is elaborated by the involved authorities in regional processes, and this may result in more differentiation in design conditions of the flood defences. Despite this differentiation, a tolerable risk is put forward to guarantee every citizen a similar base level of safety against flooding. A new tolerable individual risk level (i.e. a basic safety level regarding individual loss of life due to flooding) of 1/100.000 years (10-5) is proposed in the Delta Programme for everyone living or working in an area that is protected by dykes, dunes or dams (Delta Commissioner 2013). A broad risk-based approach is seen as an improvement. A focused differentiation in levels of protection can be an economically efficient method to reduce the risks. A risk-based approach also recognises opportunities offered by so-called multi-layered safety. In accordance with the European Flood Directive, the Delta Programme 2013 propagates a three-layer safety model. The first level of safety is protection against flooding (dykes, dunes, barriers and dams). This is and remains the basis of our safety during high water. However, spatial planning can also limit the effects of flooding in the areas behind the dykes and thus contribute to water safety. That is the second layer of multi-layered safety. The third layer is emergency management. This approach to safety will be fleshed out in the coming two years in the Netherlands. In addition, transboundary cooperation remains important. The EU Floods Directive lays the foundations for international coordination on peak discharges and flood risk management. There is as yet no formal framework for the international distribution of Rhine water in extremely dry years and no international agreements

have been made in this regard. For the Meuse catchment, the Netherlands and Belgium have made agreements in the Meuse discharge treaty on the distribution of Meuse water during periods of low discharge.

Adaptation measures
Alongside all these plans for ensuring the future safety and liveability of the Netherlands, the implementation of measures is already in full swing. These include:

- Coastal zone*:* with 'The coast is growing', the Netherlands opts for sand replenishment as the key solution for coastal defence, which enables the coastal foundation zone to grow concurrently with the rise in sea level. Where possible, this is to take place by distributing and transferring sand naturally along the coast (See Box 6.3). In addition, the Cabinet is opting for a cohesive approach to spatial development that allows for a balanced development of nature, economy, and accessibility in the existing coastal areas.

Box 6.3 Sand Engine (Building with Nature)

Between Ter Heijde and Kijkduin along the western coast, 21.5 million cubic meters of sand have been deposited. The so-called Sand Engine is 128 hectares. The width of the beach is about 2 kilometres. The peninsula extends approximately one kilometre into the sea. Wind, waves and currents are to spread the sand. In this way, the coast grows naturally, making it safer and creating new nature. In addition, it is no longer required to bring sand on the shore every five years, which saves costs and is less disruptive to the beaches and coastal ecosystem. It is expected that the peninsula produces 35 acres of new beach and dune after 10 to 20 years. The public can walk on the Sand Engine within safety restrictions. The natural developments are closely monitored. After a few months, for example, it was already clear that the point of the Sand Engine was growing faster towards the coast than expected.

- Rivers: the Flood Protection Programme (Hoogwaterbeschermingsprogramma) and programmes for river widening, Room for the River (Ruimte voor de Rivier), and the Meuse projects (Maaswerken) are nearing completion. By 2015, the Rhine will be able to handle a peak discharge level of 16,000 m^3/s and the Meuse a discharge level of 3,800 m^3/s. Where possible and cost-effective, measures are already being implemented for discharging 18,000 m^3/s from the Rhine and 4,600 m^3/s from the Meuse. To anticipate these higher discharges, reservation zones for flood protection have been identified.

Regional and local measures
Provinces and Water Boards are responsible for the water adaptation measures at the regional level. Most of the measures consist of creating ‘space for water’ during peak discharges, generally taking place in winter and spring. Common measures are retention areas, river widening, and bypasses. These measures preferably are of an integral character, combining water issues with other space-consuming issues (housing, leisure, biodiversity, farming etc.) in order to create more value for society as a whole (see also Section 6.3.2).

So-called Water Plans are developed at different scales and with different legal status. For example, a Water Plan at the level of municipalities, a Municipal Sewerage Plan (including rainwater collection), a Provincial Water Plan, a Water Management Plan of the Water Authorities, and a country-wide National Water Plan. These different water plans together offer opportunities for water-inclusive planning. At present, most Dutch municipalities have developed their UrbanWater Plan, even though this plan is still optional. An increasing number of municipalities include adaptation measures in their Water Plans. The aim is to increase green spaces and water in city developments, making urban areas more attractive and liveable, which can contribute towards a climate-resilient city. Measures focus on separating the run-off from rainfall and sewerage. They include increased infiltration of precipitation, retaining groundwater at levels beneficial to the ecosystem and increased capacity to remove excess water. Municipalities are required to compensate for lost infiltration capacity. Large projects are subjected to a water assessment process.

International cooperation in preparing for adaptation
In addition to the cooperative actions on national and regional levels, the Netherlands actively cooperates with other countries in low-lying delta areas that also face a challenging climate adaptation: to learn from each other, to protect them against floods, and to ensure sufficient amounts of clean water. In doing this, the Netherlands will be entering into long-term cooperation agreements. These partnerships will be based on the existing Partners for Water (Partners voor Water) programme. Box 6.4 gives examples. Chapter 7 provides more extensive information on international cooperation.

Box 6.4. Jakarta Coastal Development Strategy and Mekong Delta Plan (commissioned by Partners for Water)

Jakarta Coastal Development Strategy - Jakarta is a city built in the coastal plains of the Jakarta Bay. Issues of floods from rivers and from the sea, the issue of land subsidence and the issue of urban development (including the plans to expand the seaport facilities) are closely linked. The need for an integrated approach in which these issues are addressed simultaneously is undisputed. There is a need to integrate the efforts of various governmental organizations and private developers, ideally in the form of public-private partnerships. The purpose of the Jakarta Coastal Development Strategy project was to set an integrated strategic decision-making process in motion that leads to effective, feasible and sustainable solutions. For this purpose, the project aimed at developing common perceptions among the stakeholders, experts, and decision-makers of the flooding problems in a comprehensive development context and to define shared visions and joint strategic directions as a basis for planning, investment, and implementation.

Main activities:
- synchronisation of sector plans (transportation, sanitation, water supply, etc.);
- setup of legal and institutional framework;
- dissemination and socialisation;
- special topics (land subsidence, morphology, ground water extraction);
- support master planning phase preparation.

Mekong Delta Plan - Building on the experience with the Delta Programme, the Dutch Government has pledged to assist in Delta planning worldwide. One of the first projects is the Mekong Delta Plan. The Mekong Delta is densely populated with a large rural population living off a combination of rice farming and aquaculture. Various climate impacts are projected for the delta: salt-water intrusion, increased flood risks, and higher water stress during the dry season. An assessment of the sea-level rise suggests that about half of the delta could be flooded. Socio-economic challenges include a rapidly increasing population (especially in the urban centres) and the need to transform the rice-based economy to a more industrialized system.
Dutch companies are assisting the Vietnamese government with the development of a Mekong Delta Plan. The main activities are:
1) To analyse and understand the existing and future problems in the Mekong Delta;
2) To contribute to the development of realistic long-term scenarios;
3) To contribute to the drafting of an integral strategic vision;
4) To contribute to the drafting of possible and realistic alternative solutions and categorise these according to their feasibility and timely achievement;
5) To contribute to the preparation of the Mekong Delta Plan.

The final version of the Mekong Delta Plan is to be presented to the Vietnamese government in December 2013.

6.3.2 Adaptation for nature and agriculture

Overall national policy outline
Climate change is likely to have a considerable impact on current biodiversity conservation goals. This requires a reassessment of aspects, such as the effectiveness of the Dutch National Ecological Network (now called 'Nature network Netherlands) under climate change, and of the resilience and adaptation options of agriculture, both at home and abroad. Solutions will often have a strong spatial impact on the already intensively used Dutch landscape.

Research still plays an important part in identifying opportunities and threats and in developing innovative strategies in this domain. Three broad types of adaptation can be distinguished:

- Innovation at the level of whole areas (vital countryside) by capitalising on the large coupled transitions in energy, water, and land use[59]
- Renewal of agriculture and horticulture, in view of globally increasing salinity of delta areas and innovations on the production level (Provincie Zuid-Holland 2012);
- Renewal of nature policy and biodiversity conservation goals, responding to climate change (e.g. MinEZ 2013).

The resilience of the natural environment can be expected to be increased by creating larger connected areas, corridors, and a sufficient variety of favourable environmental conditions (High-Low-Netherlands, wet-dry and fresh-salt gradients etc.). Increasing the adaptive capacity of nature calls for a transition from a focused conservation (biodiversity, target species) to a more development-oriented policy (the functioning of ecosystems, the creation of conditions) and/or a more dynamic target species policy (updating the species every few years). An important policy instrument in this respect is the creation of a network of existing and planned nature conservation areas. Starting 2014, the responsibility for this network will be transferred to the provinces. Its name was changed from Dutch National Ecological Network (EHS) to 'Nature network Netherlands'. The previous and current government aims to implement the network as was previously agreed, including the connection zones, yet at a slower pace.

Presently, the Netherlands does not have a coherent policy for natural fires and there is no clear division of responsibilities between the various tiers of government. A national project on Interauthority Collaboration on Natural Fires was launched in December 2009 to cope with an increasing natural fire risk. It delivered the National working programme Natural Fires (Interauthority Collaboration on Natural Fires 2011). In addition, an online National Information Hub on Natural Fires was established. [60] (www.infopuntnatuurbranden.nl).

Adaptation measures
The 'Nederland later' study (PBL, 2007) showed that for the low-lying Netherlands there are important synergies between climate adaptation and nature in developing river nature landscapes, adjusting the water management in the reclaimed land (polders) and peatlands, and in developing peat nature. In the high-lying Netherlands, there are opportunities for synergy in the development and restoration of brook valley systems and seepage zones.

Climate buffers will, to a considerable extent, contribute to climate proofing the Netherlands, as they are able to grow at the pace of climate change. Climate buffers serve to reduce the risk of flooding (and other water problems), while simultaneously reducing the effects of prolonged drought (both agriculture and nature) and creating secondary positive effects for living, landscape, cultural heritage, and recreation. In the Netherlands, five nature conservation organisations (Natuurmonumenten, Bird Life International, National Forest Service, ARK Nature, and the Wadden Sea Society) are committed to the development of natural climate buffers. [61] They are already working at different sites, experimenting with combinations of wet and robust nature and different functions (security, walking, living, water storage, etc.) per landscape type:

- For the river landscape, natural erosion and sedimentation are to restore a meandering pattern that, within the bed and the floodplains, creates 'room for the river'. Deepening of the floodplains, for example with side channels, reduce the impoundment of high water. This decreases the risk of flooding and dyke breaches. The sands and the hills, the upstream areas, will have to hold water from (extreme) precipitation for a longer period, so discharge (in lower areas) is more gradual. This can be achieved by restoring the, often channelled, streams to their natural meandering pattern, among other things. An additional advantage is that the sandy soils, in particular, will have less burden of dehydration during heatwaves.

[59] http://www.klimaatlandschappen.nl
[60] www.infopuntnatuurbranden.nl
[61] www.klimaatbuffers.nl

- The dunes must provide more natural local spray, from the sea surface also, so some (narrow) dunes can increase and broaden. This way, the dune area will become resilient and ultimately more defensible. In addition, high-quality ecological sea inlets can form.
- In the tidal landscape of the Wadden Sea and Zeeland, measures must be taken to restore (and further promote) the natural sedimentation, so the growth of flats, meadows, silts, and salt marshes can keep pace with the sea level rise (and subsidence).
- In the peat grassland areas, the continued subsidence needs to be halted. Raising groundwater levels will slow down the process. Some parts (climate buffers) may have to be given another destination, so even peat growth (ground rise) is possible. These areas may also be used for storing excess water and developing high-quality nature.

Agricultural adaptation and green and blue services

The National Policy Plan for Spatial Development indicates that in the western peat areas subsidence should be limited. To make this work, the principle 'function follows mark' has arisen. In several experiments, the effects of this principle on agricultural yield losses have been researched. Approximately 675,000 hectares of the network of conservation areas could be wetter, including 52,900 ha of farmland. In an experiment, the groundwater level was increased in some agricultural fields from 110 cm-ground level (normal level) to 75 cm-ground level (high level), without affecting yields and product quality.
The 'Farming with water' programme aims to have farmers, in addition to the primary agricultural function, actively create opportunities to incorporate water in their businesses. The aim is to help achieve water quantity and quality objectives such as (peak) water storage, water conservation, and improved ground and surface water quality. Farmers are granted fees for delivering these 'blue services'.

Additional adaptation options for the agricultural sector are studied. Next to feasibility, it is assessed when measures become cost-effective. By testing options, the agricultural sector can prepare itself without yet implementing adaptation options at a large scale. Options range from growing halophytic crops (such as common sea lavender, common glasswort, and salt-tolerant varieties of potato for reducing fresh water dependency) to building fresh water storage and irrigation systems.

6.3.3 Adaptation for public health, urban areas, and infrastructure

A vulnerability of urban areas to climate change relates to flooding after peak precipitation and damage to foundations by decreases in groundwater levels during long periods of drought. Due to the large population concentrations, urban areas are also vulnerable to increasing risks relating to allergies, infectious diseases, and heat stress during extremely hot summers. The magnitude of these health effects still seems to be limited, but it is uncertain how this could develop in worst-case scenarios.

In 2007, a National Heat Stress Plan was prepared in a cooperative project between the Ministry of Health, RIVM, the Dutch Red Cross, ActiZ, and the National Health Authority (GGD) (VWS 2007). It offers a range of specific measures that can be taken locally by institutions and care providers, to ensure they are ready and act appropriately in periods of sustained heat. However, these action plans have yet to prove their worth in practice (PBL 2012). The exact extent of the negative climate impact on mortality and morbidity cannot be assessed correctly, as yet, due to lack of data. For this reason, the project 'Heat in the city' (Knowledge for Climate Programme) looks at what climate change means in terms of temperatures in the urban environment, and subsequently to heat stress and thermal comfort. The sub-programme 'New Urban Development and Restructuring' of the Delta Programme also addresses the problem of reducing the health effects of heat and maintaining good water quality during periods of extreme rainfall and drought in urban areas. It takes an integrated approach to improving the climate resilience of cities. Some municipalities are already developing and implementing action plans to this end, based partly on calculations made using the climate module in the Atlas for the Living

Environment (Atlas Leefomgeving: [62] These action plans can be most effective if they are implemented through urban restructuring and new development projects (PBL 2011).

Because of the uncertain health risks, it is necessary to carry out monitoring and surveillance to signal new developments, to have action plans ready, and to continue to participate in international studies to learn more about the health risks. This includes research on potential health impacts of adaptation itself. For example, whether water bodies intended for retention and cooling can contribute to water- and vector-borne diseases.

The Delta Programme also has a link with infrastructure. The question to be answered is how to make and keep vital infrastructure climate- and extreme weather-resilient, to ensure safety and prevent disintegration of economy and society. Infrastructure here can be roads, but also electricity, gas, and telecom infrastructure. To find ways to adapt to climate change, the Knowledge for Climate Programme pays special attention to road infrastructure and climate. On a European level, commissioned by CEDR, the 'Road owners adapting to climate change' programme is running in order to generate tools for Road Authorities to adapt roads to climate change and extreme weather like drought and heavy rainfall. The development of tools to assess the cost effectiveness of climate change adaptation is an important driver.

Adaptation measures
Adaptation measures include both spatial and non-spatial measures. Spatial measures address adaptations through urban planning, renewal, and restructuring. Non-spatial measures include technical measures (such as more extensive monitoring), early identification, and assessment of health risks, better public information, cultural and behavioural adaptations, regulatory changes, and making climate resilience an integral part of national and local environmental and planning policies. Thus, heat stress can be controlled with proper and timely information and extra care to vulnerable groups. In combating allergies, a combination of spatial (nature, non-allergenic plants) and non-spatial measures (monitoring, education) is possible. The climate proofing of the urban area against flooding can be increased by non-spatial measures (drainage, green roofs, water squares) or by spatial measures such as the construction of new open water (ditches, canals, ponds). An example of adapting to changing weather patterns is the updating of design guidelines for infrastructure to account for changing characteristics of showers. The Dutch technology platform for transport, infrastructure and public space (CROW) prepared a guidebook on 'Adapting public space to climate change', which offers municipalities information and project examples in this area (CROW 2010).

[62] www.atlasleefomgeving.nl

7 FINANCIAL RESOURCES AND TRANSFER OF TECHNOLOGY

7.1 (A) Provision of new and additional financial resources

Despite the economic crisis, the Netherlands maintained its ODA spending on average 0.7 % above GDP in 2010 – 2012. During the period under review, climate finance has generally been additional to the 0.7 % ODA spending for the MDG's.

The Netherlands committed € 300 million as its contribution towards Fast Start Finance in 2010 - 2012. This pledge was fulfilled at the end of 2012 and consists exclusively of mitigation and adaptation projects that have been allocated the OECD Rio marker 'principal'. Fast Start Finance (activities marked 'principal') are indicated in the table below as this is the expenditure that the Netherlands considers to be its share in international climate finance during the years 2010 – 2012.

Aside from efforts in terms of Fast Start Finance, the number of sector programmes in the Netherlands' development cooperation which are relevant for climate (Rio marker 'significant') also increased. Both principal and significant marker expenditures are presented in the NC6 and included in the table below.

	ODA Expenditures (€ x 1,000)			
	2009	**2010**	**2011**	**2012**
Financial Resources The Netherlands				
ODA percentage of GNI	0.81%	0.81%	0.75%	0.70%
ODA environment total (x1,000)	618,540	573,580	749,781	429,254
ODA Environment % of GNI	0.11%	0.097%	0.122%	
Fast Start Finance				
Principal (bilateral and multilateral prg.)[63]		44,900	118,100	144,600
National Communication 6				
Programmes Principal (bilateral and multilateral)	54,313	47,478	115,145	127,197
Multilateral Principal (LDCF)		-	-	25,000
Multilateral core support (attribution excl. LDCF)	32,415	44,031	58,431	51,952
Programmes Significant (attribution)	55,928	49,365	54,939	45,519
Civil Society Alliances (attribution)	-	-	59,133	104,096

Table 7.1: Official Development Assistance expenditures and climate-relevant expenditures. Source: HGIS (Homogeneous Budget for International Cooperation), 2011 (p21, p28) and 2012 (p29, p31) and Netherlands' database.

7.2 (B) Assistance to developing country parties that are particularly vulnerable to climate change

The specification on Climate expenditure 2010 – 2012 includes both the FSF-related projects (principal) and the climate relevant projects in other programmes (significant).

63 *Note: The FSF includes only activities that have the primary objective to contribute to climate mitigation and/or adaptation, including bilateral, regional and multilateral programmes (marked 'principal'). The National Communication 6 separates multilateral programmes in countries and regions from support provided to multilateral organisations. Some small differences may occur between FSF and NC6 as FSF includes contributions for regional and bilateral programs that form part of a wider multilateral portfolio and the FSF includes a contribution to the REDD+ mechanism, and in 2012 support to LDCF (€ 25m), which are part of the multilateral contributions under NC6.*

During 2009-2012, a total of 242 projects were supported, 93 of which were worldwide projects (incl. Caucasus), 19 of which were regional Africa projects, and 3 of which were regional projects in both Asia and Latin America. The remaining 127 were bilateral projects. Direct bilateral support for climate change actions was provided to 29 countries in various regions. This is presented in the pie charts below. Support for 'worldwide' projects also entails support through non-governmental organisations, public-private partnerships, and programmes with research institutes and multilateral organisations. For example, it includes a large partnership programme on renewable energy with GIZ (Gesellschaft für Internationale Zusammenarbeit). The focus of these programmes is mostly Sub-Saharan Africa.

	Expenditures				
	2009	2010	2011	2012	Total
Worldwide					
Adaptation	3,743	4,421	71,888	102,593	182,644
Mitigation	68,784	58,294	89,485	100,352	316,915
Africa					
Adaptation	170	83	4,494	4,895	9,643
Mitigation	13,131	18,900	30,079	29,081	91,191
Asia					
Adaptation	6,031	2,697	5,857	8,971	23,557
Mitigation	13,770	6,715	21,508	7,239	49,231
South America and the Caribbean					
Adaptation	1,451	1,895	1,667	2,682	7,693
Mitigation	3,161	3,837	4,241	4,116	15,356
Total	***110,242***	***96,843***	***229,217***	***259,928***	***696,230***

Table 7.2: The Netherlands Financial contributions, within ODA, to climate change in 2009-2012 (€ 1000). Note: some projects contribute to both mitigation and adaptation.

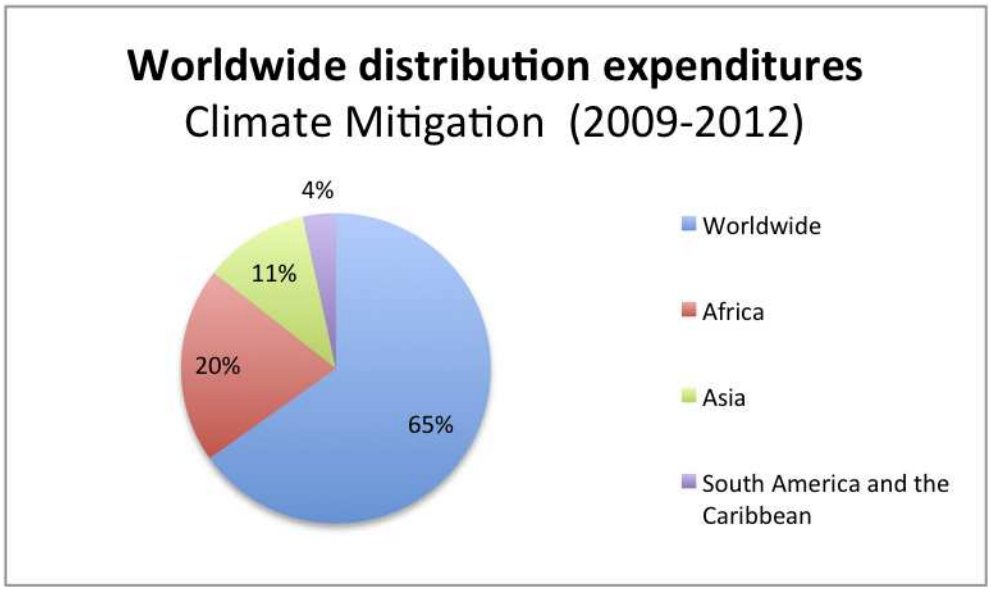

Figure 7.1: Support to climate change mitigation provided worldwide and per continent

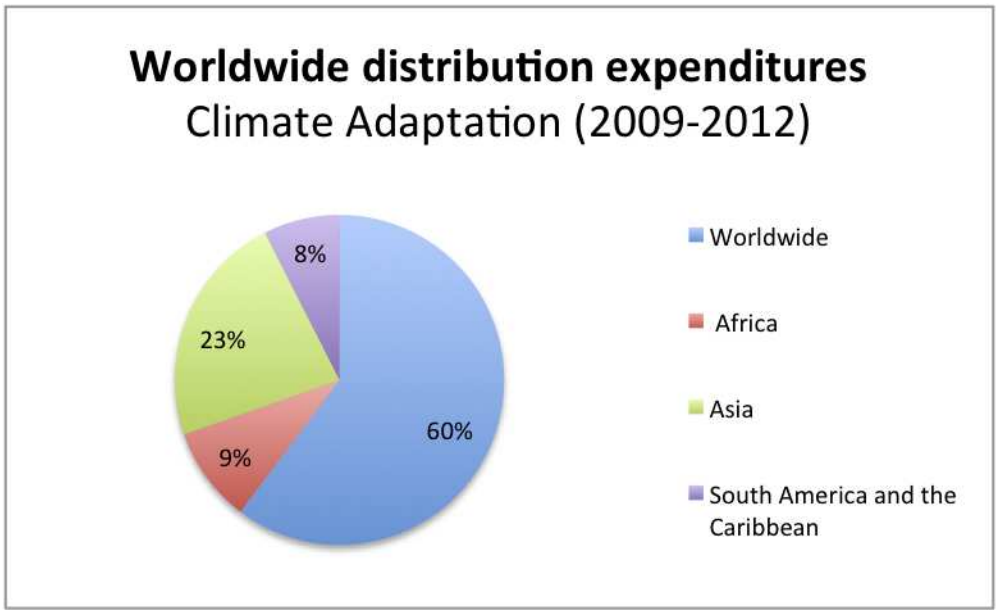

Figure 7.2 . Support provided to climate change adaptation, worldwide and per continent

7.2.1 Mitigation

In the period 2009-2012, the budget for development cooperation provided €447 million in financial support to 120 projects concerning climate change mitigation (64 'Principal', 56 'Significant'). In addition, 48 projects support both adaptation and mitigation objectives. Capacity building and transfer of technology is often an integral part of support programmes. Specific examples are provided in the next paragraph.

The majority of mitigation expenditures (€261 million) relate to the energy sector (see table 7.4) as part of the Dutch renewable energy program. In addition, The Netherlands supports various civil society programmes that have activities in the sectors agriculture, rural development, forestry and environment. This for example includes capacity building, reducing emissions from deforestation and degradation of forests and peatlands and reforestation. For example, The Netherlands contributed to the integration of environment and climate in the programs financed by the International Fund for Agricultural Development (IFAD). Via the EU it contributed to the successful Forest Law Enforcement, Governance and Trade (FLEGT) programme, aimed at a world wide support to legal timber production and export. Also the Dutch support to the World Bank Forest Carbon Partnership Facility directed at REDD (Reducing Emissions from Deforestation and Forest Degradation) contributed to the international climate objectives.

Projects relating to renewable energy in developing countries
In its renewable energy programme (PREP), the Dutch government has opted to work through existing, proven channels. The bulk of the funds is channelled through bilateral projects and programmes executed by multilateral agencies ('worldwide' and 'regional'). The renewable energy programme also works with the private sector.

- The Netherlands works closely with Germany on providing access to renewable energy in the Energising Development (EnDev) Partnership. EnDev is implemented in 24 countries through a delegated cooperation with the German government. It focuses on market development for decentralised technologies such as cook stoves, micro hydro, and small-scale solar solutions. In addition to the €47 million for the period 2005-2008, the organisation GIZ (Gesellschaft für Internationale Zusammenarbeit) received €63 million for the period 2009-2012 for renewable energy projects in developing countries.

- The bilateral projects, such as in Rwanda, Mozambique, and Indonesia have mostly been implemented through the embassies, partly through delegated cooperation with Belgium, Sweden, and the World Bank.
- In the context of the Climate Investment Funds, the Netherlands made a considerable contribution to the launch of the Scaling-up Renewable Energy Programme (SREP), with the ambition to transform renewable energy sectors in low-income countries, especially geared towards the productive use of energy.
- In general, the Netherlands strives to co-operate with the private sector and also encourages its non-governmental partners to do so. The Daey Ouwens Fund of Agency NL has supported almost 30 small-scale and innovative private sector projects. FMO operates its Access to Energy Fund to support the larger private sector investments.
- Support to low-carbon development is an important mitigation measure. Examples of interesting programmes of the Dutch renewable energy programme have been the Africa Biogas Partnership programme and the Rwanda National Energy Access programme. The Africa Biogas Partnership[64] aims to bring the successful work of SNV and HIVOS on domestic biogas in Asia to Africa. The programme will support the installation of 70,000 biogas plants in Ethiopia, Kenya, Tanzania, Uganda, and Burkina Faso. This will provide households with a clean cooking fuel, improved sanitation, and an excellent organic fertilizer. The Netherlands financed the energy sector plan of Rwanda to connect households to the main grid and develop renewable energy-based power generation (mainly hydropower, including the Rusumo Falls hydropower plant). The Dutch development bank FMO has joined the KivuWatt project: a gas extraction facility and 25 MW power plant using the methane from Lake Kivu).

The Netherlands has defined a specific target to provide an environmentally friendly, modern energy supply by 2015 for 10 million people who are currently dependent on traditional fuels. This objective was reached in 2012. In the coming years, renewable energy support by the Netherlands will focus more on leveraging international climate finance, in particular from the private sector, and demonstrating concrete results in terms of inclusive development and gender. For example, the Netherlands also supports the African Enterprise Challenge Fund (AECF), a private sector-oriented challenge fund and its Renewable Energy and Adaptation to Climate Technology (REACT) window for Mozambique.

Together with UNDP, the World Bank, and the US Department of Energy, the Netherlands has supported the greening of the energy sector portfolio of multilateral development banks. This resulted in a programme to develop green energy for small-scale urban and rural users in Asia and Africa (called FINESSE: Financing Energy Services for Small-scale End-users). A result of this programme was the establishment of the Asia Alternative Energy Programme (ASTAE), which is still supported by the Netherlands. Through ASTEA, the Netherlands for example supports the development of geothermal energy in Indonesia. In a multilateral context, support was also provided to the Energy Fund for Africa (World Bank, IFC, and African Development Bank and the ESMAP programme (Energy Sector Management Assistance Programme)). The results of these programmes are an enhanced understanding of the application of renewable energy, strengthening of national organisations, and access to energy services by the poor (examples are hydropower in Zambia, solar power in Mongolia, and credit for renewable energy projects in Southeast Asia).

Projects related to Central and Eastern Europe
Projects related to Central and Eastern Europe are described in other sections, especially in section 7.5.

7.2.2 Adaptation

The Cancun framework for adaptation requires implementation. The Netherlands is contributing with its experiences and expertise on water security, spatial planning, its integrated approach on the nexus climate-food security-water provision, and last but not least the excellent cooperation between

[64] http://africabiogas.org/

government, expertise institutes, and the private sector. The Dutch expertise is especially focused on delta areas that are threatened by sea level rise. To support climate change adaptation in developing countries, the Netherlands is integrating awareness of climate change and the response to its anticipated impact in the design of its main co-operation priorities (water, food security).

Projects relating to developing countries, including capacity building
The development cooperation budget included €175 million in financial support to 76 projects relating to adaptation to climate change (17 'Principal', 59 'Significant'), of which 53 projects support both adaptation and mitigation. Capacity building and knowledge sharing are considered two of the important elements of support to climate change adaptation, and include vulnerability assessments (but these are not reported separately). An example is mentioned in the next paragraph. The Netherlands supports various projects related to climate change adaptation in agriculture, forestry, and the environment sector (€25 million). In the water sector, climate adaptation is often a crucial element in Integrated Water Resources Management (total expenditures in 2009-2012 were €29 million).

During the reporting period, the Netherlands cooperated on climate and energy with various partner countries, including Afghanistan, Bangladesh, Benin, Burundi, Ethiopia, Ghana, Indonesia, Yemen, Kenya, Mali, Mozambique, Palestinian Territories, Rwanda, South Sudan and Uganda.

In addition, the Netherlands provided financial and technical assistance for the integration of climate risks in national development plans and budgets. E.g. Colombia approved its climate strategy and the institutional setup for implementation in the field of climate adaptation, low carbon development, and REDD+. In Bolivia, progress was made regarding the integration of climate in national development policy, e.g. adaptations in small-scale agriculture (potatoes, wine, quinoa), in water management (the Beni floodplain) and at the municipal level. In Vietnam, the Netherlands contributed to the formulation of a national climate-adaptation strategy for the Mekong delta and for the region of Ho Chi Minh City. Dutch expertise aided the standardisation of sea dikes, as well as the development of future scenarios and a flooding mitigation/warning system for the Mekong Delta.

In the Partners for Water programme, attention is given to 5 countries with similar deltas as the Netherlands - Bangladesh, Egypt, Indonesia, Mozambique, and Vietnam – in the field of improved delta management and climate adaptation.

The Netherlands also supports the British initiative Climate and Development Knowledge Network (CDKN), which aims to provide demand-led support through research and technical assistance to 60 developing countries.
The Netherlands co-financed the World Bank study '*The Economics of Adaptation to Climate Change*'. This study has been finalised and the results are being used by the participating countries to further elaborate their climate policies.

In relation to climate adaptation, The Netherlands supports various Integrated Watershed Management programmes. Since 2004, The Netherlands supports the Mekong River Commission on flood management (€11 million contribution). The Flood Management and Mitigation Programme (FMMP) builds on the Mekong River Commission's (MRC) Flood Management and Mitigation Strategy Implementation Programme (FMMSIP). The FMMP provides support through technical assistance, training and capacity building to identify flood risks in time and provide and install warning mechanisms. In Bolivia, the Viceministerio de Recursos Hídricos y Riego is implementing the National watershed Plan with a total budget of US$108 million, to which The Netherlands contributes with US$16 million.

A noteworthy supported project is the establishment of the Red Cross/Red Crescent Climate Centre[65]. The centre's main approach is to raise awareness; stimulate climate adaptation and disaster risk reduction (both inside and outside the Red Cross and Red Crescent); analyse relevant forecast

[65] http://www.climatecentre.org/

information on all time-scales, and integrate knowledge of climate risks into Red Cross/Red Crescent strategies, plans, and activities. As of 2011, the Netherlands will support the 'Disaster Risk Reduction and Climate Change Adaptation Alliance', a co-operation that includes the Red Cross, Wetlands International, CARE, and Cordaid (total €36 million). In addition, in the programme of the Ecosystem Alliance of IUCN, BothEnds, and Wetlands International (€40 million), climate change formed an integral part of the design and implementation. The programme aims to improve rural livelihoods and ecosystem management and integrates adaptation to climate change.

Projects related to Central and Eastern Europe
Projects related to Central and Eastern Europe are described in other sections, especially in section 7.5.

7.3 (C) Provision of financial resources, including financial resources under Article 11 of the Kyoto Protocol

Provision of financial resources
In the period 2010-2012, the Netherlands pledged €300 million to Fast Start Finance. Fast Start Finance expenditure has been reported to the European Union. This financing encompasses projects that focus on climate change mitigation and adaptation, and has been increasing over the years (see table 7.1).

The Netherlands contributes to a variety of multilateral and intergovernmental institutions – including the Global Environment Facility – that assist developing countries (see table below). Between 2009 and 2012 (see table 7.1), the Global Environment Facility (GEF) received, on average, € 26.6 million (ODA and non-ODA) per year, 32% (based upon the OECD/DAC assessment of November 2011[66], which means a revision of the previous 40% used in NC5) of which is dedicated to climate change (i.e. an average of €8.5 million).

	Expenditures (x 1,000)			
	2009	2010	2011	2012
Global Environment Facility (47044)				
ODA	2,062	20,400	40,160	38,820
Non-ODA (HGIS)	-	816	816	3,282
Total	***2,062***	***21,216***	***40,976***	***42,102***

Table 7.3: Financial contributions to the Global Environment Facility (€ x 1000)[67].
Source: HGIS 2010 (figures 2009) and Dashboard (figures 2010, 2011 and 2012)

A donation is made to UNFCCC through the contribution made to the GEF. Support for scientific, technological, and training programmes can also be an integral part of contributions through multilateral, bilateral, and civil society channels. The Netherlands also has a special programme with the Dutch NGO-sector, which is supporting a total of 20 alliances with €2 billion during the period 2010-2016. Eleven alliances contribute partially or fully to climate change adaptation or mitigation objectives (see table 7.5).

[66] http://www.oecd.org/dac/stats/49187939.pdf
[67] For 2001-2004, see National Communication 4, table 7.1, p. 94 (http://unfccc.int/resource/docs/natc/netnc4.pdf)

7.3.1 Breakdown of climate-change-related expenditures

The OECD, with assistance from the Netherlands, developed a set of 'Rio markers' that allows it to distinguish between climate-related funding and other funding. Within these categories, a distinction is made between activities marked 'principal' or 'significant'[68]. Additional markers are used to distinguish support for adaptation and mitigation. By applying the guidelines of the OECD-DAC, a distinction can be made between budget allocations for adaptation and mitigation, as presented in the tables below.
The Netherlands has contributed to climate-related activities through multilateral, regional and bilateral channels. The tables show a breakdown of climate change expenditures between 2009 and 2012. These include the Global Environment Facility, the Least Developing Countries Fund (LDCF) and the set-up of the Green Climate Fund (€200,000 to the World Bank).

	Attribution	Climate related expenditures (€)			
		2009	2010	2011	2012
Multilateral institutions (core)					
World Bank Group (44000)	0.0%	-	-	-	-
World Bank IDA (44003)	3.6%	489,600	2,008,440	12,139,560	5,696,280
IBRD (44001)	0.0%	-	-	-	-
IFC (44004)	0.0%	-	-	-	-
Regional Dev. Bank Group (46000)	3.6%	1,954,637	2,483,920	2,291,287	3,348,683
AfrDB (46002)	3.6%	8,958	145,932	194,241	191,293
AsDB (46004)	3.6%	-	-	-	-
EBRD (46015, 46016, 46019)	3.6%	-	-	115,200	21,600
IDB (46012)	3.6%	-	-	-	-
EDF Association	5%	9,552,600	9,761,400	8,161,528	7,035,800
ODA Budget European Union	5%	11,720,000	13,268,350	16,493,800	16,493,350
Subtotal		***23,725,795***	***27,668,042***	***39,395,616***	***32,787,006***
Specialized United Nations Bodies (core)					
UNDP (41114)	5%	4,965,000	4,615,000	3,315,000	3,199,500
UNEP (41116)	20%	1,828,000	1,828,017	1,428,446	1,428,446
FAO (41301)	10%	250,000	250,000	250,000	250,000
IFAD (41108)	0%	-	-	-	-
UN Habitat (41120)	10%	45,000	-	-	-
UNCCD (411101)	20%	27,200	27,802	27,816	26,592
UN ISDR (41315)	20%	149,600	157,300	176,000	200,000
Subtotal		***7,264,800***	***6,878,119***	***5,197,262***	***5,104,538***
Multilateral climate-related funds					
GEF (prj #15112, 23360) - ODA	32%	659,840	6,699,200	12,850,400	12,420,800
LDCF (#24566)	100%	-	-	-	25,000,000
Special Climate Change Fund		-	-	-	-
Adaptation Fund		-	-	-	-
Green Climate Fund		-	-	-	-
UNFCCC Trust Fund Suppl. Act		-	-	-	-

[68] The environmental sustainability marker – 'principal' or 'significant' objective - identifies activities that would not have been undertaken without this objective or activities, which includes such objectives but are not one of the principal reasons for undertaking the activity.

Other multilateral climate related funds		-	-	-	-
Montreal Protocol (47078)	40%	-	867,130	970,216	883,463
Subtotal		***659,840***	***7,566,330***	***13,820,616***	***38,304,263***
Multilateral Scientific Institutes (core)					
CGIAR (prj #21975)	40%	-	1,600,000	-	-
CIFOR (prj # 21428)	40%	649,189	318,993	17,647	-
ICARDA (prj # 19686)	40%	-	-	-	756,000
ICRAF (prj #16643)	40%	115,831	-	-	-
Subtotal		***765,021***	***1,918,993***	***17,647***	***756,000***
Total		**32,415,456**	**44,031,485**	**58,431,141**	**76,951,808**

Table 7.4: Climate-change-related core financial contributions to multilateral institutions within ODA (€)
Source: HGIS 2011 (p.28) and Dashboard figures 2010, 2011 and 2012. The numbers in brackets are the channel codes used by The Netherlands in their database.

The Netherlands also provides financial support to civil society alliances (20 in total, 11 relevant for climate change). In consultation with these alliances, the contribution to climate change has been estimated. These percentages differ from the regular OECD systems and are reported separately below. Two alliances are fully counted under bilateral support.

	Attribution	**Climate-related expenditures (€)**			
		2009	**2010**	**2011**	**2012**
Civil Society Alliances					
Dutch Consortium for Rehabilitation	10%			-	3,124,341
IMPACT Alliance	10%			-	15,716,386
Cordaid Alliance	33%			27,027,248	23,432,271
Fair, Green and Global Alliance	39%			-	3,266,610
Connect 4 Change Alliance	15%			-	2,483,247
HIVOS Alliance	25%			-	27,554,121
United Entrepreneurship Coalition	4%			-	344,279
WASH Alliance	10%			-	1,776,428
ICCO Alliance	41%			32,105,891	29,522,682
Partners for Resilience Red Cross	100%	already part of the bilateral expenditures			
IUCN Alliance	100%	already part of the bilateral expenditures			
Subtotal		***-***	***-***	***59,133,139***	***104,096,024***

Table 7.5: Climate-change-related core financial contributions to civil society alliances within ODA (€)
Source: The Netherlands database.

In addition, the Netherlands also provided in total €306 million for the period 2009-2012 in non-ODA funds to support climate change mitigation and adaptation (see Table 7.6). Besides assistance to developing country parties that are particularly vulnerable to climate change, the Netherlands also provides support to countries in Central and Eastern Europe, especially in relation to mitigation.

	Expenditures (€ x 1,000)			
	2009	2010	2011	2012
Non-ODA Nature and Environment				
Clean Development Mechanism	22,550	14,232	47,345	48,489
Joint Implementation	44,283	42,607	12,255	9,954
GEF non-ODA	-	816	816	3,282
International Cooperation Environment	4,312	3,589	3,052	4,307
Water Management (Partners for Water)	10,724	9,518	11,225	13,216
Total	**81,869**	**70,762**	**74,693**	**79,248**

Table 7.6 Climate-change-related financial contributions non-ODA (€ x 1.000). Source: HGIS annual reports 2009-2012

In 2008, the Netherlands supported the establishment of the Climate Adaptation Fund with a contribution of €100,000 (in addition to the fund itself). In relation to food security, the former Dutch Ministry of Agriculture, Nature, and Food Quality supported regional organisations in East Africa to integrate climate change adaptation into rural development programmes (€300,000). The Dutch Partners for Water programme combines the expertise in water and climate from various parties: the government, NGOs, companies, and research institutes. In the period 2008-2012, the programme received €44.7 million from the Dutch Ministry of Transport, Public Works, and Water Management and its successor, the Ministry of Infrastructure and the Environment.

Specific support programmes and related financial resources are mentioned in paragraph 7.2.

7.3.2 Breakdown of bilateral support on climate change

Between 2009 and 2012, the Netherlands supported 242 projects, of which €344 million relates to programmes marked 'principal'. In total €549 million can be attributed to contributing to climate change mitigation and adaptation.

		Expenditures (x 1,000)				
		2009	2010	2011	2012	Total
Mitigation						
	Principal	52,817	44,223	98,621	75,420	271,080
	Significant	45,802	42,365	37,951	26,567	152,685
	Subtotal	*98,619*	*86,588*	*136,571*	*101,987*	*423,765*
Adaptation						
	Principal	1,456	1,518	8,315	10,958	22,247
	Significant	9,698	6,335	68,665	68,343	153,042
	Subtotal	*11,154*	*7,853*	*76,980*	*79,301*	*175,288*
Mitigation and Adaptation	**Principal & Significant**	468	2,402	15,666	78,640	97,177
Total		**110,242**	**96,843**	**229,217**	**259,928**	**696,230**

Table 7.7: Climate change financial contributions on mitigation and adaptation within ODA (€ 1.000.000)

Note: The National Communication 6 separates multilateral programmes in countries and regions from (core) support provided to multilateral organisations. Some small differences may occur between FSF and NC6 as FSF includes contributions for regional and bilateral programmes that form part of a wider multilateral portfolio. The FSF includes a contribution to the REDD+ mechanism, and in 2012 support to LDCF (€ 25m).

Bilateral and regional contributions divided per region and sector

Sustainable forest management and integrated water management are important themes for climate adaptation. Besides support to developing countries on mitigation and adaptation, an additional effort is also made in relation to preventing deforestation. In support of the REDD initiative (Reducing Emissions from Deforestation and Forest Degradation), the Netherlands contributed €15 million, for the period 2008-2012, to the World Bank's Readiness Fund of the Forest Carbon Partnership Facility (FCPF).

	Mitigation						Adaptation			
Recipient Region	Energy	Transport	Forestry / Environment	Agriculture	Water / CZM	Other	Capacity building (Forestry / Environment)	Capacity building (Agriculture)	Water and CZM	Other (incl. Energy, Transport)
2009										
World-wide	40,069	0	6,215	0	0	22,500	1,895	0	1,257	491
Africa	9,662	0	3,469	0	0	0	100	0	0	0
Asia	12,365	0	393	0	552	460	202	387	5,612	0
Latin America	0	0	3,134	0	0	27	1,094	119	197	41
2010										
World-wide	32,072	0	3,739	0	0	22,500	2,430	0	1,501	390
Africa	10,765	0	8,084	50	0	0	100	0	0	0
Asia	5,983	0	314	0	0	402	288	43	2,449	0
Latin America	0	0	3,721	102	0	14	1,597	102	174	21
2011										
World-wide	49,172	222	10,435	0	300	29,360	2,494	400	1,437	8,324
Africa	21,465	0	7,504	1,107	2	0	100	880	2	3,612
Asia	19,533	0	503	0	1	1,467	830	14	5,013	0
Latin America	0	0	4,119	122	0	0	891	0	775	0
2012										
World-wide	35,804	106	14,016	0	492	24,195	7,188	21,063	2,807	10,060
Africa	20,297	0	5,477	106	0	3,200	2,760	1,657	228	250
Asia	3,743	0	24	893	1,596	983	585	1,205	7,180	0
Latin America	0	0	4,035	81	0	0	2,289	393	0	0
Total (x1,000)	**260,932**	**328**	**75,181**	**2,461**	**2,943**	**105,109**	**24,845**	**26,262**	**28,634**	**23,189**

Table 7.8: Bilateral and worldwide financial contributions within ODA, relating to the implementation of the Convention in 2009-2012 (€ 1000)

Note: The supported projects have been categorised using OECD-DAC CRS-codes:

Category:	*crs-code:*
Energy	*230*
Transport	*210*
Forestry and Environment	*312 and 410*
Agriculture and Rural Developmen	*311 and 430*
Water and Coastal Zone Management	*410 plus various water-related projects with other crs-codes*
Other	*various codes including 150 and 740*

7.3.3 *Financial resources, including under Article 11 of the Kyoto Protocol*

Under the Treaty, developed countries must meet their targets through national measures, but the Kyoto Protocol offers the option to use additional market-based mechanisms to meet these targets. These are mainly the Clean Development Mechanism and Joint Implementation projects.

To buy carbon credits under the Clean Development Mechanism, the Dutch Ministry of Infrastructure spent. € 151 million between 2005 and 2008 and for the period 2009-2012 € 132,6 million. The Ministry of Economic Affairs purchased carbon credits under Joint Implementation.for € 53,4 million between 2005 and 2008 and for the period 2009-2012 € 109,1 million.

In total, the Netherlands contracted 33.2 million tonnes of carbon credits from CDM-projects, 17.1 million tonnes from JI-projects, 3 million tonnes of carbon credits from Latvia (Green Investment Scheme) and 2.2 million tonnes from participation in Carbon Funds (PCF) in order to realise its obligations under the Kyoto Protocol.

By 31th July 2013 in total 55.5 Mton CO2 were under contracts for additional market based mechanisms; of these 45.0 Mton credits were delivered by that date. It is expected that by the end of the Kyoto period between 48.3 and 49.0 credits will be delivered.

New and additional resources are mentioned in paragraph 7.1.

7.4 (D) Activities relating to technology transfer

The Netherlands promotes the transfer of technology through various channels, e.g. through:

- EU programmes and mechanisms;
- participation in IEA programmes;
- bilateral or multilateral programmes and schemes.

These include regional cooperation, cooperation with developing countries, and promotion of private sector involvement. Examples (non-exhaustive) are given below.

Actions to support institutions and frameworks for the development and transfer of technologies

- The EU's Environmental Technologies Action Plan (ETAP), succeeded by the Eco-innovation Action Plan (EcoAP) in 2011[69], helps to improve the development and wider use of eco-technologies, including climate-friendly technologies.
- The EU's emissions trading scheme (EU ETS)[70], launched in 2005, helps to improve development, deployment, and diffusion of a broad range of mitigation technologies. It is linked with CDM and JI markets, which are important mechanisms for technology transfer to developing countries and economies in transition.
- The Netherlands participates, for example, under the framework of official development assistance (ODA), in activities relating to human and institutional capacity building in a wide range of developing countries (see previous sections).

Actions to encourage effective participation by the private sector

- The EU ETS, linked to the CDM and JI markets, is designed specifically to provoke private sector actors to take action, including through the development and transfer of climate technologies.

[69] http://ec.europa.eu/environment/ecoap/index_en.htm
[70] http://ec.europa.eu/environment/climat/emission/index_en.htm

- The Global Energy Efficiency and Renewable Energy Fund (GEEREF)[71] focuses on energy efficiency and renewable energy projects in developing countries and economies in transition.
- The Innovation Relay Centre (IRC)[72] network. This enables cooperation with organisations in third countries that, for example, result in technology transfer agreements with developing countries concerning energy and environment.

Actions to promote collaborative R&D and deployment of technologies for mitigation and adaptation

- Participation in the multi-annual EU Framework Programme for R&D.
- The European Energy Technology Platforms (ETPs)[73], set up to define common strategic research agendas at European level, which should mobilise a critical mass of national and European public and private resources. Examples of ETPs include solar PV, Biofuels, Zero-emission fossil fuel plants, Solar, Thermal, and Wind.
- Participation in international collaborative R&D partnerships on new energy technologies, operated as so-called Implementing Agreements under the International Energy Agency (IEA). The Netherlands is involved in many of these agreements, e.g. for hybrid and electric vehicles, energy conservation in buildings, renewable energies, advanced fuel cells, bioenergy, clean coal sciences, demand-side management, district heating and cooling, hydrogen technologies, solar PV systems, solar heating, and wind energy.
- Bilateral or multilateral projects with developing countries. Examples include bilateral MOUs for cooperation in the field of environment and sustainable construction with China, various R&D cooperation projects between Dutch universities, knowledge institutions and partnerships, on a broad range of environmental issues (water, renewable energy, agriculture, etc.).
- The Energising Development (EnDev) programme is being financed by six donors, among which the Netherlands. The principal executor is the German GIZ, while AgNL provides its cooperation. The projects in the table are all financed by EnDev and involve only limited earmarking. Dutch funds are preferably channelled to Africa and Indonesia. DGIS contributes 72 million euros to the total basket of EnDev-phase 2 (approximately 38% of the total). Table 7.9 provides an overview of the projects.
- The Dutch contribution is funded from the 500 million euros of the PREP programme.
- At DGIS, DME is responsible for the PREP programme as well as for the EnDev contribution it provides.

Technology cooperation	Nature of agreement	Nature of cooperation	Financing and available budgets in EUR 1,000	Country involvement
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves and rural electrification through small and pico-PV systems	12,064	Bangladesh
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves	4,000	Benin
Energising Development,	Bilateral	Rural electrification	7,160	Benin

[71] http://geeref.com/
[72] http://www.innovationrelay.net/
[73] http://cordis.europa.eu/technology-platforms/home_en.html

access to modern energy services		through grid densification and pico-PV systems		
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves and rural electrification through grid densification, and small and pico-PV systems	9,400	Bolivia
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves	3,500	Burkina Faso
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves and rural electrification through small and pico-PV systems	1,500	Burundi
Energising Development, access to modern energy services	Bilateral	Rural energy promotion via domestic biogas	2,000	Cambodia
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves and rural electrification through hydro-power and small and pico-PV systems	9,900	Ethiopia
Energising Development, access to modern energy services	Bilateral	Promotion of grid-based productive use of electricity	1,650	Ghana
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves and rural electrification through small and pico-PV systems and hydro-power	4,130	Honduras
Energising Development, access to modern energy services	Bilateral	Rural energy promotion via domestic biogas	1,150	Indonesia
Energising Development, access to modern energy services	Bilateral	Rural electrification through hydro-power and community PV grids	9,000	Indonesia
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves and rural electrification through small and pico-PV systems	6,800	Kenya
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves and rural electrification through small and pico-PV systems	990	Liberia
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves	300	Madagascar
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves	250	Malawi

Energising Development, access to modern energy services	Bilateral	Rural electrification through community PV grids	2,850	Mali
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves and rural electrification through grid densification, hydro-power, and small and pico-PV systems	10,800	Mozambique
Energising Development, access to modern energy services	Bilateral	Rural electrification through grid densification and hydro power	4,740	Nepal
Energising Development, access to modern energy services	Bilateral	Rural electrification through hydro power and small PV systems	4,140	Nicaragua
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves and rural electrification through grid densification, hydro-power, and small and pico-PV systems	11,350	Peru
Energising Development, access to modern energy services	Bilateral	Rural electrification through hydro-power and small and pico-PV systems	12,490	Rwanda
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves and rural electrification community grid PV	8,500	Senegal
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves and rural electrification through pico-PV systems	2,041	Tanzania
Energising Development, access to modern energy services	Bilateral	Promotion of improved biomass stoves and rural electrification through hydro-power and small and PV systems	6,000	Uganda
Energising Development, access to modern energy services	Bilateral	Rural energy promotion via domestic biogas	3,740	Vietnam

Table 7.9: Bilateral and multilateral projects with developing countries

Technology transfer may encompass both hardware (equipment) and software (know-how) on environmentally sound technologies. The Dutch support in relation to the transfer of technology is mostly in the form of support programmes relating to the private sector (encompassing hard and soft technologies). As of 2009, the Dutch support programme is called PSI (Private Sector Investment Programme) and is administered by EVD. PSI is a Dutch government programme that supports innovative investment projects in emerging markets in Africa, Asia, Central and Eastern Europe, and Latin America. A PSI project is an investment project, implemented by a Dutch (or foreign) company in cooperation with a local company, in one of the eligible developing countries. If this investment meets the criteria, it can be eligible for a PSI grant, which consists of a financial contribution to the

costs of the investment. PSI consists of two components: PSI Regular applies to 45 countries in Africa, Asia, Central and Eastern Europe, and Latin America. The contribution for a project in one of these countries is 50% of the project budget, to a maximum contribution of € 750,000. The contribution under PSI Plus amounts to 60% of the project budget, up to a maximum contribution of € 900,000. For both components, the maximum project budget is €1.5 million.

An example of PSI is the establishment of the solar panel production facility of Ubbink East Africa in Kenya. This project is highly innovative. Before the project, there was no production of solar modules in East Africa and all systems were imported. The project involves a high element of technology transfer and training and will benefit urban and rural households. It contributes to policy changes to towards a more favourable investment climate for local producers of solar energy applications, and a further deepening of the solar system producer and consumer market. Since the start of the project, the production plant has been set up successfully, the production has been ISO certified, and Ubbink has further increased its range to include larger panels up to 220 Watts.

The tables below present selected projects or programmes that promote practicable steps to facilitate and/or finance the transfer of, or access to, environmentally sound technologies.

Project / Programme title:			
Promoting Renewable Energy Programme (PREP)			
Purpose:			
To enable developing countries to develop and implement policies supporting renewable energy with a focus on poverty reduction.			
Recipient country:	**Sector:**	**Total funding:**	**Years in operation**
African countries Indonesia	Energy	€500 million	2008-2014
Description:			
The following lines of action are taken in order to achieve the objective: 1. Direct investments in renewable energy installations; 2. Ensuring the sustainability of biomass production for energy purposes; 3. Influencing policy of important actors in the field of energy; 4. Capacity development in the field of renewable energy.			
Indicate factor which led to project's success:			
So far, political commitment by the Dutch government has been the main driver for the start-up of this programme. Implementation has just started.			
Technology transferred:			
Renewable energy technology.			
Impact on greenhouse gas emissions:			
Positive.			

Table 7.10 PREP Programme

Project / Programme title: Access to Energy Fund (AEF), FMO (Finance for Development)			
Purpose: Promoting renewable energy.			
Recipient country:	**Sector:**	**Total funding:**	**Years in operation**
FMO is targeting at least 75% of the total AEF capital for Sub-Saharan Africa and/or Least Developed Countries and a maximum of 25% in other emerging markets.	Energy	€100 million	2006-2017
Description: The AEF is a vehicle initiated by the Dutch government and FMO to make it possible to fund private sector projects that create sustainable access to energy services.			
Indicate factor which led to project's success: Providing financial leverage for renewable energy projects. The AEF can provide equity financing up to an amount that is the lesser of €10 million or 75% of a total transaction amount. Subordinated debt/senior loans can be made in the amounts of the lesser of €20 million or 75% of total transaction. The fund can offer longer grace periods and longer tenors often necessary to get such projects off the ground. The AEF can also play a role in the development of new projects by providing grants.			
Technology transferred: By providing financing for projects involved in the generation, transmission or distribution of energy, the Fund hopes to ultimately connect 2.1 million people in developing countries by 2015.			
Impact on greenhouse gas emissions: Positive.			

Table 7.11 AEF/FMO

Project / Programme title: Asia Biogas Programme			
Purpose: Introduction of renewable energy and alleviating poverty			
Recipient country:	**Sector:**	**Total funding:**	**Years in operation**
Vietnam, Bangladesh, Cambodia, Lao PDR	Energy	€12.9	2005-2013
Description: Introduction of biogas technology for cooking and heating at household level.			
Indicate factor which led to project's success: Strong integral approach of technology transfer, capacity building and awareness and institutional support.			
Technology transferred: By the end of 2012, more than 500,000 households worldwide have been equipped with biogas plants, supported by SNV (of which 182,781 in the four countries of the Asia biogas programme).			
Impact on greenhouse gas emissions: Positive.			

Table 7.12 Asia Biogas Programme

Project / Programme title: Africa Biogas Partnership Programme			
Purpose: Introduction of renewable energy and alleviating poverty			
Recipient country:	**Sector:**	**Total funding:**	**Years in operation**
Burkina Faso, Ethiopia, Tanzania, Uganda, and Kenya	Energy	€29.9 million	2008-2013
Description: Introduction of biogas technology for cooking and heating in 70,000 households.			
Indicate factor which led to project's success: Strong integral approach of technology transfer, capacity building and awareness and institutional support.			
Technology transferred: In cooperation with Hivos, SNV's biogas activities have been expanded to include Africa. The Partnership aims to install 70,000 biogas systems in five African countries. By 2013, the programme has reached 35,000 installed domestic biogas systems. During the period 2009-2012, expenditures totalled €21 million euros.			
Impact on greenhouse gas emissions: Positive.			

Table 7.13 Africa Biogas Partnership Programme

As of 2011, the Netherlands will support the 'Disaster Risk Reduction and Climate Change Adaptation Alliance', a co-operation that includes the Red Cross, Wetlands International, CARE, and Cordaid (€40 million in total, of which 10% is currently allocated to climate change). In addition, in the programme of the Ecosystem Alliance of IUCN, BothEnds, and Wetlands International (€39 million), climate change formed an integral part of the design and implementation (currently set at a conservative 40% allocation). The programme aims to improve rural livelihoods and ecosystem management and integrates adaptation to climate change

Project / Programme title: Disaster Risk Reduction and Climate Change Adaptation Alliance			
Purpose: Adapt to climate changes and reduce disaster risks.			
Recipient country:	**Sector:**	**Total funding:**	**Years in operation**
37 countries	General Environmental Protection	€1.26 million	2005-2009
Description: The overall objective of the Alliance 'partners for resilience' is to reduce the impact of natural hazards on vulnerable communities.			
Indicate factor which led to project's success: Strong and capable network, building on the experience of the Red Cross/Red Crescent Climate Centre and the expertise of Wetlands International, Cordaid, and CARE.			
Technology transferred: The Climate Centre already supports national unions in 37 developing countries to analyse risks and implications of climate change and to develop enhanced disaster management plans. The network of the Alliance focuses on Ethiopia, Kenya, Mali, Uganda in Africa; Guatemala and Nicaragua in Latin America; and Indonesia, India, and the Philippines in Asia. the Alliance will help 750,000 to 1,000,000 vulnerable community members to strengthen their resilience and consequently, sustain their development.			
Impact on greenhouse gas emissions: None.			

Table 7.14 Preparedness for Climate Change programme

Technology transfer and international cooperation through flexible mechanisms
During the period 1992-1997, the Netherlands participated in the Activities Implemented Jointly (AIJ) pilot phase, where a variety of project types were implemented covering different mitigation technologies. These projects were hosted by Annex-I, as well as by non-Annex-I countries, and have contributed to both the development of CDM and JI programmes and technology transfer. Since the introduction of AIJ in 1995, the Netherlands has funded 25 AIJ projects in 14 countries. All projects involved a transfer of environmentally friendly technology and know-how.

The Netherlands then became involved in technology transfer via CDM and JI. In the years 2002 and 2003, framework contracts have been signed with the Rabobank, the International Finance Corporation (IFC), the International Bank for Reconstruction and Development (IBRD), the European Bank for Reconstruction and Development (EBRD), and the regional development bank for the Andes (CAF) to purchase carbon credits from CDM- and JI-projects in the period 2002-2009, with delivery of these carbon credits in the period 2006-2013. CDM- and JI-projects have stimulated the transfer and deployment of technologies in these projects, for example on high-efficiency power plants, cogeneration, renewable energy, harnessing of landfill waste gases, etc.

In addition to the mechanisms, in 2009, the Netherlands purchased carbon credits via International Emissions Trading, in particular via Green Investment Schemes (GIS). The profits from the sale of these carbon credits have been used to finance environmental and sustainable activities in Latvia, which contributed and is currently still contributing to a lower GHG economy in the long term.

Technology transfer for adaptation
For the Netherlands, some essential lessons learned in relation to technologies for adaptation include the need to build a solid knowledge base and the need for a more cross-sectoral and more integrated approach. Some of the barriers consist of the lack of supportive policies, cost/benefit analyses, and the non-availability of local/regional climate data. Furthermore, from the outcomes of activities completed under the Nairobi Work Programme, a number of gaps in present knowledge and evidence for best practise have been identified. Technologies for adaptation include 'hard' technologies, such as drought-resistant crop varieties, seawalls, and irrigation technologies, or 'soft' technologies, such as crop rotation patterns. Many technologies have both hard and soft characteristics, and a successful adaptation action would typically combine the two. There is also a continuing need to build better human capacity/skills for implementing and developing technologies in relation to understanding climate information and predictions (spatial analysis skills, satellite imagery etc.). Some examples of climate adaptation/technologies-related foreign support are:

- *Catalysing Acceleration of Agricultural Intensification for Stability and Sustainability.* In Rwanda, the Netherlands is providing assistance through the Strategic Alliance for Agricultural Development in Africa (SAADA). As part of the CATALIST project, the University of Wageningen is implementing a research project on the Nile delta's vulnerability to climate change, and assessing the options for economic sectors and water management strategies and relevant technologies.
- *Consultative Group International Agricultural Research (CGIAR).* The priorities of CGIAR research are reducing hunger and malnutrition by producing more and better food through genetic improvement, sustaining agriculture biodiversity, both *in situ* and *ex situ*, promoting opportunities for economic development and through agricultural diversification and high-value commodities and products, ensuring sustainable management and conservation of water, land and forests and improving policies and facilitating institutional innovation.
- *Climate Monitoring for Africa.* This yields data that are essential for the description of the climate, detection of climate change, improvements of climate models, and development of climate scenarios, both on global and regional scales, and for adaptation measures. The ongoing work will be capacity building for the climate monitoring in Africa.

Development and enhancement of endogenous capacities by developing countries
As described in the programmes throughout this Chapter, capacity building and institutional strengthening is an important element of Dutch programmes. Further examples are given in Chapter 6 (e.g. on cooperation and capacity building with developing countries for water management) and Chapter 8 (cooperation in research and development). Not only in developing countries but also with economies in transition, capacity-building actions are implemented, for example, through so-called G2G[74] projects with Croatia (on ETS), Romania (on inventories and projections), Turkey (on Long-Term Agreements with industry etc.

7.5 (E) Information under Article 10 of the Kyoto Protocol

The information on activities, actions, and programmes undertaken to meet commitments under Article 10 have already been described in various parts of this National Communication (see also the summary table in Annex II). A brief summary:

Cost-effective programmes to improve quality of inventories/national systems (a)
This is described in Chapter 3.C (3.3.). Besides national programmes, the Netherlands also participates in the EU Monitoring Mechanism working groups, workshops, and studies on the exchange of experiences and further improvement of inventory aspects, and in G2G projects, for example with Romania, where further exchange of experiences is implemented.

Domestic and regional programmes (b)
These are described in Chapter 4 (e.g. 4.3) and Chapter 6 (on adaptation).

Transfer of technology (c)
This is described in the previous section.

Research and systematic observation (d)
This is described extensively in Chapter 8 and the annexes 8.1 and 8.2.

Education and training and public awareness (e)
Chapter 9 describes the actions in the Netherlands.

[74] http://www.senternovem.nl/KEI/31_projecten/index.asp (in Dutch only)

8 RESEARCH AND SYSTEMATIC OBSERVATIONS

8.1 (A) General policy on research and systematic observation

General policy and funding
Research activities in the Netherlands cover the themes: climate system, impact and policy support, and implementation studies. These activities are characterised by:

- intensive participation in international and European programmes; the Netherlands Organisation for Scientific Research (NWO) and the Royal Netherlands Academy of Arts and Sciences (KNAW) coordinate Dutch contributions to the international research arena;
- clustering into a large national research programme of Knowledge for Climate, funded under framework BSIK/FES.

The Ministry of Infrastructure and Environment (I&M) is the leading department on adaptation to climate change and supports research on climate-proofing the Netherlands, and supports research on water and infrastructure; the Ministry of Economic Affairs focuses on nature, agriculture, and fisheries, as well as on innovation, energy infrastructure, emissions from industrial sectors, and land use.

With regard to systematic observation, the Netherlands actively participates in the various fields of climate-related monitoring, both nationally and within European and global programmes. An integrated national programme for the implementation of the Netherlands contribution to GCOS has not yet been established. However, steps are being taken to develop and implement such a strategy.

Cooperation in scientific and technical research/exchange of data
Cooperation is assured through clustering nationally and internationally. The national research programmes actively seek private-sector participation and facilitate the dialogue between stakeholders from scientific, policy, and private sectors. To overcome barriers to the exchange of data and information, the national research programmes closely coordinate their communication and research activities.

The research community in the Netherlands participates in a few European Joint Programming Initiatives for climate: JPI Climate, Facce (agriculture), Oceans and Water. These initiatives aim at aligning various fields of climate research activities in the different countries. They have been supportive in framing the content of Horizon 2020, the new European research programme. JPI's are supported by the Dutch government.

Monitoring activities on systematic observation and GCOS in the Netherlands are firmly embedded in international programmes such as the Framework programmes, on a European level, and GEOSS, on a global level. We also see international cooperation at the individual project level, e.g. developing Earth and NASA missions, and data-retrieval methods. Data are exchanged internationally and submitted to numerous databases around the world.

Results from the international, European, and national research programmes are made available to the international community through reports and (online) publications. These results can often be obtained free of charge or at low cost.

8.2 (B) Research

8.2.1 Cooperation in European research

Many of the leading Dutch institutions participate in research projects under the EU's 7th Framework Programmes for Research and Innovation (FP). The synergy and cooperation between European projects and the national research programmes reinforce the crucial international dimension to Dutch

research activities. The most relevant research projects and networks financed by the EU's 7th Framework Programmes and other programmes.Programmes in which the Netherlands contribute are: Development of Climate Services, Climate Modelling, Seasonal / Decadal Prediction, Process Studies, and Satellite Services. These projects are Integrated Project, Network Activities, Infrastructure Programmes, and Transnational Access Programmes. Dutch institutions also anticipate vigorous participation in the new EU-Horizon 2020 programme.

The EU-programme InGOS, Integrated non-CO2 Greenhouse Gas Observing System[75] coordinated by ECN and involving 34 partners from 15 countries. This programme integrates the observing capacity of Europe on non-CO_2 greenhouse gases. The infrastructure project will work on standardising the measurements, strengthening the existing observation sites into supersites, capacity building in new member states, and preparing for integration of the network with other networks already in place or currently being set up (e.g. ICOS).

8.2.2 Cooperation beyond the European domain

The Netherlands' research on climate change is well embedded in, acknowledged by and co-steered within three large international scientific programmes in the field of global change research: the International Geosphere Biosphere Programme (IGBP), the World Climate Research Programme (WCRP), and the International Human Dimensions Project (IHDP). The Royal Netherlands Meteorological Institute (KNMI) participates in IGBP and (through its WMO membership) in WCRP.

Extensive support is also given to the work of the Intergovernmental Panel on Climate Change (IPCC). KNMI coordinates the Netherlands' contributions to the IPCC. Research for Working Groups II and III is mainly carried out by Wageningen University and the Netherlands Environmental Assessment Agency (PBL). Seventeen Dutch scientists contribute as (lead) authors to the 5th IPCC assessment report, while the Environmental Assessment Agency (PBL) has made the head of the Technical Support Unit for the Synthesis Report. The Netherlands also hosts a number of international programmes that specifically aim at technology transfer and international cooperation (see chapter 7). The Netherlands is chairing the Belmont Forum, a high-level group of world's major and emerging funders of global environmental change research and international science councils. It aims to accelerate international research by aligning and coordinating the participants' research programmes.

8.2.3 National research programmes

General
National research programmes add to, and support, international research programmes. The national research activities in the Netherlands include:

- Research programme through NWO
- Research programmes for national adaptation / mitigation
- Research programmes supported by various ministries

Below we describe the programmes in some more detail.

Beyond the programmes described below, the Netherlands is an active participant in the Joint Programming Initiative for Food, Agriculture and Climate Change (JPI-FACCE), a EU-programme aiming at aligning national research programmes in this area and advising EU Member States and the European Commission on research needs. In this respect, JPI FACCE has spawned an ERA-net on Climate Smart Agriculture in 2013.

Research programmes through NWO
Within the NWO theme Water and Climate, climate scientists, hydrologists, oceanographers, civil engineers, information technologists, chemists, and fluid mechanics experts are working together on

[75] http://www.ingos-infrastructure.eu/

research issues centred around water.[76] The Dutch government has designated nine top economic sectors that are the most important to the Netherlands, in which it is a world leader, and in which the government will make targeted investments in coordination with private industry and research institutes. Research within the NWO theme Water and Climate generates knowledge that is important for the top sector Water. This top sector includes the three clusters of Water Technology, Delta Technology, and Maritime Technology / Research. Dutch knowledge and expertise in the area of these three clusters ranks among the best in the world. The activities of the top sector Water and the priority areas of the NWO theme Water and Climate are closely aligned.

The Netherlands Polar Programme funds scientific research into and in the polar regions. On behalf of the Netherlands, the programme contributes to solutions for fundamental scientific and socio-political issues, such as the consequences of climate change. As a signatory to the Antarctica Treaty, the Netherlands is also obliged to carry out scientific research in Antarctica. One of the focal points of the Netherlands Polar Programme is the construction of a Dutch research facility on the Antarctic Peninsula.[77]

Integrated Research in the NWO Theme Sustainable Earth and the National Programme Knowledge for Climate is part of the NWO Theme Sustainable Earth and is being realised under the auspices of the National Partnership for Sustainable Earth research (NPDA), whose members include the NWO, Knowledge for Climate Foundation, Energy research programmes, and several larger and smaller institutes that direct research in the field of sustainability and the Earth.

Feedbacks in the Climate System is a programme that aims to generate knowledge focused on quantifying uncertainties in the climate system, and in particular for the development of this system in the longer term until the year 2200. Knowledge of the climate system is vital for the development of policy based on scientifically supported scenarios of climate change. Useful predictions and scenarios can only be modelled if the many gaps in knowledge that exist with respect to the complex climate system are filled. Although climate research is interdisciplinary by its very nature, it has to date strongly focused on the physical and chemical processes involved and representations of these in climate models.

The Open Programme funded under NWO strives to be a breeding ground for innovation and talent. Proposals are not related to a theme or ambition. The Open Programme's aim is to promote innovative scientific research of a high quality across the entire breadth of the earth and life sciences. The earth and life sciences research domain covers geology, the seas, the atmosphere, living organisms in the biosphere, and the interactions between and within these facets.[78]

The National programme on Sea and Coastal Research (ZKO) [79] aims to facilitate collaboration between various research institutes in this field. Research focuses on strengthening the understanding and knowledge of coastal development, the role of biogeochemical cycles and particle flows in relation to water quality, the capacity for a sustainable yield of the ecosystem, changes in biodiversity, the influence of seas and oceans on climate change, and the effects of climate change on the marine system. This understanding can provide a basis for possible predictions. The ZKO programme is divided into three sub programmes, chosen by geographical location (Coastal Zone and Wadden Sea, North Sea, Oceans).

Furthermore, there are some internationally oriented programmes for which the first calls for proposals were launched recently. Urbanizing Deltas of the World[80] aims to contribute to global water safety, water and food security, and sustainable economic development in river deltas worldwide. Increasing

[76] http://www.nwo.nl/en/our-ambitions/Collaboration+in+themes/Water+and+Climate/about+this+theme
[77] http://www.nwo.nl/en/research-and-results/programmes/Netherlands+Polar+Programme
[78] http://www.nwo.nl/en/funding/our-funding-instruments/nwo/free-competition/alw/open-programme.html
[79] http://www.nwo.nl/en/research-and-results/programmes/The+National+Ocean+and+Coastal+Research+Programme%E2%80%AC/background
[80] http://www.nwo.nl/en/research-and-results/programmes/Urbanising+Deltas+of+the+World

pressure and climate changes in these areas demand more effective and efficient responses. A second international, merely DFID-funded programme, is directed at Conflict and Cooperation in the management of Climate Change[81] with the objective to strengthen the evidence of the impact of climate change and climate change policies on conflict or cooperation in developing countries.

National research programmes on climate change issues (adaptation / mitigation)
Knowledge for Climate (FES-KvK) is aimed at the short and medium term (up to 2050) with a focus on developing adaptation strategies for hotspots in the Netherlands (e.g. Schiphol Airport, Rotterdam harbour, lowland rivers) and international hotspots (e.g. New Orleans, California, two river delta areas in South East Asia, and projects in Sub-Saharan Africa). A central role in the programme is reserved for the Climate Knowledge Facility, which consists of a model platform and a research platform. In the model platform, support will be given for the development and use of the new global climate model EC-Earth, for a regional climate model for the surroundings of the Netherlands, and for a range of impact models. The results of these models provide the quantitative information required for effective adaptation. Within the model platform, problems will be handled that are relevant for all hotspots in the programme. This may include local-level issues, methodological issues, and the weak links in climate and impact models. A total of € 50 million has been made available for the programme from the Dutch government's Economic Enhancement Fund (FES). Through shared projects, for example, cooperation with other research is organised to avoid overlap and to gain mutual benefits. The website[82] provides more information and examples of projects.

Knowledge for Climate subsidises research in three phases, the first phase focusing on the most urgent needs for knowledge. The main components of the second phase are long-term studies that generate more in-depth knowledge where linkage between generic and area-specific questions plays a central role. In order to promote cohesion of the programme, a total of eight themes were selected, which will determine the adaptation agenda.
• Water safety at national and regional level
• Freshwater supply at national and regional level
• Climate-proofing rural areas
• Climate-proofing urban areas
• Infrastructure and networks
• Improving climate projections and the set of instruments used for modelling
• Governance of adaptation

During the third phase, the hotspots will need to combine the results from the various research lines in order to develop adaptation strategies.

Knowledge for Climate will end its operations in 2014. In order to anchor the results of the research nationally and internationally and over a longer period, the new initiatives are being developed. The Delta Alliance (DA) brings together (river) deltas in the world to foster the establishment of collective research agendas / programmes and the exchange of knowledge. The Climate Adaptation Services makes knowledge and tools available for stakeholders that can be used to plan for adaptation strategies and measures.

The Delta Programme[83]. The Delta programme was initiated in 2010 to address the issue of keeping the Netherlands attractive to both live and work in for future generations. For 2014, the agenda covers the development of new standards for flood risk management in accordance with the April 2013 policy letter from the Minister for Infrastructure and the Environment,[84] elaborating on the 2012 parliamentary decision.[85]

[81] http://www.nwo.nl/en/funding/our-funding-instruments/wotro/cocoon---conflict-and-cooperation-in-the-management-of-climate-change/cocoon---conflict-and-cooperation-in-the-management-of-climate-change.html
[82] http://www.klimaatonderzoeknederland.nl/templates/dispatcher.asp?page_id=25223002
[83] http://www.rijksoverheid.nl/onderwerpen/deltaprogramma
[84] Parliamentary document 33400 J, no. 19.
[85] Van Veldhoven-Lucas motion, Parliamentary document 27625, no. 262

More specific R&D programmes, supported by various ministries
Various Ministries have Policy-Support Research, including studies stipulated from questions from the Ministries, where appropriate in consultation with other organisations:

- the studies for I&M (Infrastructure and Environment) are clustered within a scientific assessment and policy analysis programme on climate change issues;
- for EZ (Economic Affairs), the studies are included in the Knowledge Basis (KB) research programme, which provides basic funding to the Wageningen University and Research Centre. KB research thematically focuses on developing expertise that can support medium-term governmental policies in the green-blue domain on aspects of :
  a) mitigation, including increasing societal pressure to achieve a transition to climate-neutral agriculture and food production, production and use of biofuels, and efforts to maximise net effects on emissions, and knowledge in the area of emissions and absorption of greenhouse gases from land use. These include analysis of relevant biophysical processes, management and improving monitoring techniques;
  b) adaptation of agriculture and fisheries to actual (and expected) climate change and rising sea levels, as well as nature conservation, questioning the policy on species (and Natura 2000), and on dealing with the risks of new diseases and pests in both agriculture and nature;
  c) impact of climate change and international climate policy on the dynamics of international markets for raw bio produce, and hence the nature and profitability of companies in this sector.
- A number of ministries work together in the energy transition, an interdepartmental programme of four ministries: Economic Affairs; Infrastructure and Environment; Foreign Affairs; and Finance. The interdepartmental programme management initiates, 'pulls', and 'powers' energy transition; it ensures effective interdepartmental policy compatibility; stimulates a dialogue between the national government and society; and promotes connection and visibility of Energy Transition activities. Within Energy Transition platforms, innovative business people, trendsetting companies, knowledge institutes, and creative non-governmental organisations (NGOs) work together on central Energy Transition themes. Each platform, with a non-governmental chairperson, plays a stimulating role to get the market moving and to find new ways to realise sustainable initiatives. Altogether, seven themes have been defined on which Energy Transition should focus in order to realise a sustainable energy supply. These have been chosen because they offer the Netherlands considerable economic opportunities and are feasible for this country. A platform has been set up for each theme: 1) New Gas and Clean Fossil Fuels, 2) Sustainable Mobility, 3) Bio-based Raw Materials, 4) Chain Efficiency, 5) Sustainable Electricity, 6) Built Environment , and 7) Greenhouse as Energy Source (in horticulture).

8.3. (C) Systematic observations

The Netherlands actively participates in the various fields of climate-related monitoring, both nationally and within European and global programmes, including atmospheric climate observation systems, including those measuring atmospheric constituents; ocean climate observation systems; and terrestrial climate observation systems. Here, we summarize the ground-based observations, ocean observations, and satellite observations and briefly discuss an integration effort.

8.3.1 Ground-based observations

Systematic observations of many climate parameters are carried out in a network of over 40 observation stations spread out over the Netherlands and the continental shelf attributable to the Netherlands. These observations are enhanced by special observational programmes carried out at CESAR[86].

[86] http://www.cesar-observatory.nl/

CESAR
The Cesar Observatory is located in the western part of the Netherlands (51.971° N, 4.927° E) in a polder 0.7 m below mean sea level. At the site, a large set of instruments is operated to study the atmosphere and its interaction with the land surface.

The Cesar site is used for a) Monitoring of long term tendencies in atmospheric changes, b) Studies of atmospheric and land surface processes for climate modelling, c) Validation of space-borne observations, d) The development and implementation of new measurement techniques, and e) Training of young scientists at post-doc, PhD, and master level.

Three universities and five major research institutes collaborate in Cesar [KNMI, TUDelft, WUR, TNO, ECN, ESA, UU, RIVM]. It is the focal point of experimental atmospheric research in the Netherlands and is internationally connected through EU-funded research and transnational access programmes.

CESAR is one of the selected stations for the GCOS Reference Upper-Air Network, GRUAN[87]. CESAR, through GRUAN, provides long-term, highly accurate measurements of the atmospheric profile, complemented by ground-based state of the art instrumentation, to constrain and calibrate data from more spatially-comprehensive global observing systems (inc. satellites and current radiosonde networks), in order to fully characterize the properties of the atmospheric column and their changes. GRUAN is envisaged as a network of 30-40 high-quality, long-term, upper-air observing stations, building on existing observational networks. GRUAN builds on, but is not confined to, the larger GCOS Upper Air Network (GUAN).

CESAR, through ICOS,[88] contributes to a European effort to understand and predict the global carbon cycle. The aims of the Integrated Carbon Observation System [ICOS] are to a) provide the long-term observations required to understand the present state and b) predict future behaviour of the global carbon cycle and greenhouse gas emissions, and c) to monitor and assess the effectiveness of carbon sequestration and/or greenhouse gases emission reduction activities on global atmospheric composition levels, including attribution of sources and sinks by region and sector.

CESAR, through ACTRIS [89] participates in an integrated project for measuring policy-relevant parameters. ACTRIS (Aerosols, Clouds, and Trace gases Research InfraStructure Network) is a European Project aiming at integrating European ground-based stations equipped with advanced atmospheric probing instrumentation for aerosols, clouds, and short-lived gas-phase species. ACTRIS will have the essential role of supporting the accumulation of new knowledge as well as policy issues on climate change, air quality, and long-range transport of pollutants.

[87] http://www.wmo.int/pages/prog/gcos/index.php?name=GRUAN
[88] http://www.icos-infrastructure.eu/
[15] http://www.actris.net/

Paramaribo
Paramaribo[90] station was established in 1999, under a grant from the Foundation for Netherlands Scientific Research (NWO), as a joint initiative of KNMI and the Meteorological Service of Surinam (MDS). Here, there is a programme to measure ozone profiles and ozone columns at regular intervals through the troposphere and stratosphere. The programme was supported for several years by the EU-programme STAR but is now fully funded by KNMI. There is considerable synergy with other research groups, notably with several German groups that take their observations at the same location.

Other
Climate / Synoptic station observations in the Netherlands are communicated with the Regional Basic Synoptic Network and the Regional Basic Climate Network of the World Meteorological Organisation (WMO).[91]

A special Particulate Matter [PM] measurement programme is in place to monitor the regional variations in aerosol concentration run by the Dutch Institute for Health and Environment (RIVM)[92]

8.3.2 Ocean-based observations, ARGOS

The Dutch effort of systematic oceanic observations are bundled in the ARGOS[93] programme. Argos is a global array of 3,000 free-drifting profiling floats that measures the temperature and salinity of the upper 2000 m of the ocean. This allows, for the first time, continuous monitoring of the temperature, salinity, and velocity of the upper ocean, with all data being relayed and made publicly available within hours after collection. The Netherlands supports 7 floats.

8.3.3 Satellite-based observations

Satellite records are comprehensive enough now that systematic long-tem records can be obtained. Under the auspices of EUMETSAT, the Netherlands participates in a number of Satellite Application Facilities (SAFs[94]) with the express aim of developing high quality operational products to be used for weather and climate purposes. The specific SAFs in which the Netherlands participates through KNMI are the Climate Monitoring SAF, The Ocean, Sea and Ice SAF, the Ozone and Atmospheric Chemistry SAF, and the Numerical Weather Prediction SAF.

The Netherlands also participates vigorously in ESA's CCI initiative. To respond to the need for climate-quality satellite data, the European Space Agency (ESA) has set up the ESA Climate Change Initiative or CCI[95]. The aim of the programme is to realize the full potential of the long-term global Earth Observation archives that ESA, in cooperation with its member states, has established over the last thirty years, as a significant and timely contribution to the ECV (Essential Climate Variables) databases required by United Nations Framework Convention on Climate Change (UNFCCC).

The goal is to provide stable, long-term, satellite-based ECV data products for climate modellers and researchers. The ECVs will be derived from multiple satellite data sets (not just ESA but all sources via international collaboration) and include specific information on the errors and uncertainties of the data set. Comprehensive information will also be provided on calibration and validation, long-term algorithm maintenance, data procurement, and reprocessing. The Climate Change Initiative will bring together European expertise covering the full range of scientific, technical, and development specialisations available within the European Earth Observation community, and will establish lasting

[90] http://www.knmi.nl/samenw/paramaribo/
[91] http://www.wmo.int/pages/prog/www/ois/rbsn-rbcn/rbsn-rbcn-home.htm
[92] http://www.rivm.nl/bibliotheek/rapporten/680704018.html
[93] http://www.argo.ucsd.edu/index.html
[94] http://www.eumetsat.int/website/home/Satellites/GroundSegment/Safs/index.html
[95] http://www.esa-cci.org/

and transparent access for global climate scientific and operational communities to its results. The contributions to the CCI initiative of the Netherlands are though the themes Aerosol, Cloud and Ozone (all through KNMI), Greenhouse Gases (SRON), and Land Cover (WUR).

Since 1995, KNMI is involved with reprocessing and data supply of atmospheric composition using the satellite (instruments) of GOME / SCHIAMACHY / GOME2 / OM I[96].

Furthermore, the Netherlands has the lead in developing a new satellite system (TROPOMI) that will probe the atmospheric composition with unsurpassed resolution and accuracy.

8.3.4 Integration: GCOS

An integrated national programme for implementing the Netherlands' contribution to GCOS has not yet been established. However, steps are being taken to develop and implement such a strategy: the Netherlands intends to organise a national conference in 2014 to coordinate a strategy in bundling all climate observations carried out by Dutch Institutes. The summary of this initiative will be crystallised into a roadmap for implementing a GCOS contribution.

[96] http://www.temis.nl/

9 EDUCATION, TRAINING AND PUBLIC AWARENESS

9.1 General policy towards education, training, and public awareness

Introduction
This chapter describes governmental activities in the Netherlands regarding education, training, and public awareness on climate change. It also describes actions by other parties, such as NGOs, as well as actions undertaken to cooperate in, and promote, international development and the implementation of education and training programmes.

Websites
The government publishes extensive information on climate change policies and plans on various websites. Important websites, both from the government and from other organisations, are mentioned throughout this communication. The website of the Dutch government[97] contains a dossier on climate change, which explains the causes and nature of climate change and the consequences for the Netherlands. It also describes international and national climate policy, provides links to other relevant websites, and publishes press releases. Visitors may address questions to the ministry. During relevant periods, such as the Netherlands' presidency of the EU (second half of 2004), special press releases covering the latest issues are published on the website. In general, the dossiers on the former VROM website were consulted around 600 times a week. Issues such as energy, energy savings, and climate change are among those most frequently consulted. At present, most governmental information on environmental and climate issues is found on the following websites. [1]

General policy of the Dutch government
The Ministry of Infrastructure and the Environment (I&M) is responsible for coordinating national climate policy, the reduction of non-CO_2 greenhouse gases, the Clean Development Mechanism, for energy savings in transport, and for adapting Dutch water management to climate change. The Ministry of Economic Affairs (EZ) is responsible for industrial energy savings, renewable energy and Joint Implementation, and for energy savings in agriculture and LULUCF (land use, land use change and forestry). The Ministry of the Interior (BZK) bears the responsibility for sustainable building and energy efficiency in residential and non-residential buildings. The ministries implement activities in education, training, and public awareness in their respective fields of responsibility. In the approach taken, we may distinguish between activities responding to *general elements and needs* of climate change and related actions and activities responding to more *specific needs* of target groups of policies and measures. The latter in general are specifically designed as integrated part of the related policy measures.

The interdepartmental Dutch climate change programme has set ambitious targets. Communication is crucial in achieving changes. The *general* communication approach includes various steps:

- To inform and raise awareness among the relevant target groups (raising the sense of urgency, avoiding misconceptions, etc.);
- offer specific options for action, relevant and suitable for the target groups (e.g. the money saved by energy-saving options, energy labels, etc.);
- provide inspiring examples;
- Demonstrate the exemplary function of the government (e.g. sustainable product procurement, etc.).

[97] www.rijksoverheid.nl; www.government.nl
http://www.government.nl/issues/environment/climate-change
http://www.government.nl/issues/energy/sustainable-energy
http://www.government.nl/issues/energy/energy-in-the-future
http://www.government.nl/issues/energy/green-deal
http://www.government.nl/issues/environment/biofuels
http://www.rijksoverheid.nl/onderwerpen/duurzaam-bouwen-en-verbouwen

General trends in public awareness on climate change
In the Netherlands there is a significant public awareness of climate change. A number of surveys - carried out for the ministry of I&M (or others) rather frequently - confirm a high level of awareness: e.g. Wissels omzetten: 21e eeuw vraagt om robuust milieubeleid, PBL Netherlands Environmental Assessment Agency, 2013 [98] and Omgevingsbeeld Duurzaamheid en Milieu 2012, Ministry of I&M, 2013 (Dutch), a survey into the awareness, knowledge, attitude, and behaviour (practice) of the general public). More surveys and an overview is available at [99] and [4].
However, the actual deeper understanding ('the big picture') and involvement differs among the various segments of the public. These types of surveys do form a basis for (learning and adapting) a better understanding of the specific information needs and for the national communication approach on climate change issues. The significant awareness level is also illustrated by the frequent attention that the media are paying to climate change. For instance, in 2013, the documentary TV series "de klimaatjagers" (climate hunters) reports on the effects of climate change in different parts of the world.

Public access to environmental information
Public access to environmental information that is available from the government, including data on greenhouse gas emissions and energy use, has been further strengthened as a result of the Treaty of Aarhus being implemented into Dutch law. Detailed data on greenhouse gas emissions in the Netherlands are available to the public on the website of the emissions registration project (ER) [100] while broader information on climate and the environment is available on websites.[101]

The government also publishes extensive information on climate change policies and plans on various websites. Important websites, both from the government (see above) and from other organisations are mentioned throughout this communication. Since the end of 2008, I&M also maintains a special website for the climate change-related campaign [102], in cooperation with MilieuCentraal (see also section 9.5).

9.2 Primary, secondary, and higher education

Education and training are aspects of the work carried out by the intermediary organisations, e.g. NL Agency (AgentschapNL), Rijkswaterstaat, and MilieuCentraal. For example, the MilieuCentraal website includes a subsection for pupils at the levels of primary and secondary education. Also under the SMOM subsidy programme, which ended in 2010, some projects concern educational projects. These may be aimed at all educational levels, from primary schools to universities. Examples are given in the next sections.

Learning for Sustainable Development - Duurzaam Door
The Dutch Intergovernmental Programme 'Duurzaam Door' and its predecessors
'Learning for Sustainable Development' & 'Environmental Education', which was established in 2004, stimulates learning processes for sustainable development. The target group contains both youngsters and adults.
The programme promotes and enhances the inclusion of climate change issues in school curricula and in teacher training programmes. It does so by supporting networks of organisations in the field of education and teachers, publications, projects, etc. Furthermore, it stimulates 'social learning' by facilitating the cooperation between professionals, (local) government officials, and other participants in decision-making processes for the resolution of problems, carefully balancing the interests of people, nature & environment, and the economy. In the period 2008-2011, a number of projects and actions were developed, targeting education, local and regional government, companies etc.[103]

[98] http://www.pbl.nl/node/57074
[99] http://www.scp.nl/Onderzoek/Bronnen/Beknopte_onderzoeksbeschrijvingen/Continu_onderzoek_burgerperspectieven_COB
[100] www.emissieregistratie.nl,
[101] www.rivm.nl; www.knmi.nl; www.pbl.nl
[102] www.beterklimaat.nl
[103] http://www.lerenvoorduurzameontwikkeling.nl/content/learning-sustainable-development-2008-2011

From 2013, the start of the new program Duurzaam Door, energy is one of the leading topics. Knowing and establishing regional networks and trying to work together on (inter)national policies is the main focus of the DuurzaamDoor program. The Dutch policy for the top sector Energy is an important policy document in this regard. Projects include working with the formal education sector on e.g. Energetic Schools: Local governments, schools and environmental organisations working together to save energy in schools. A concrete example is the publication produced by the organisation Sustainable Educational Training for Primary Schools (Duurzaam PABO) by the end of 2012, in which these UNECE elements were presented in a practical way for use in primary schools. [104]

But both civil society and the business sector are also involved in programmes and activities to promote energy literacy.

The programme DuurzaamDoor is the Netherlands focal point for the UNESCO Decade for Education on Sustainable Development (2005-2014). The programme cooperates with governments in Croatia, Montenegro, and Georgia on this issue. Within the framework of G2G projects, the programme works together with NGO-partners in India and participates in EU networks.

Examples from the DuurzaamDoor programme [105]:
"Ten Opportunities for Dynamic Public Servants", an inspiring booklet with 10 things public servants should think about and act upon in their professional everyday work. Opportunity 1: Be Curious.
18 multi-stakeholder projects, within the topic Energy, ranging from 'Sustainable village' to 'Clean-tech, the battle, a debating competition for secondary schools on clean technology and the green economy.' [106]

9.3 Public information campaigns

9.3.1 Local Climate Agenda 2011- 2014

The transition to structural sustainable energy use and supply must above all be achieved at the local level. Therefore, close cooperation is needed between the municipal, provincial, and water authorities. Each has its own part to play: authorities should complement each other, share knowledge, and act transparently towards the private sector. That is why the Local Climate Agenda is a joint initiative bringing together representatives of local authorities and central government. The Ministry of Infrastructure and the Environment coordinated the activities establishing the Agenda in 2011, together with nine climate ambassadors (representing the municipal, provincial, and water authorities) and their working groups. Over 135 local and regional governments have signed up to the agenda. Local authorities that join the Local Climate Agenda obtain access to the network and its knowledge infrastructure while promising to promote sustainable initiatives as well as inspire and connect societal actors. The changing role of the government from initiator to facilitator of local initiatives is a key building block of the agenda.

[104] http://www.plado.nl/
[105] *http://www.duurzaamdoor.nl*

[106] *http://www.nme.nl//content/succesverhalen-nme?thema=energie&provincie=*

Example: LochemEnergie

Lochem Energy is a local energy cooperative in the east of the Netherlands. It is a prime example of a joint venture involving entrepreneurs and local residents, with minimal support from the municipal authorities. The aim is to have over 60% of local households running on sustainable and locally generated energy by 2020. Steps have been taken towards solar energy and wind farms, the large-scale introduction of smart grids, the broad participation of the general public and the business community in purchasing green energy, and in energy-saving measures. LochemEnergie shows that change is possible. Within a few weeks, the cooperative had over 600 households willing to join and within a year, it had formulated concrete business plans. Returns on investments are to be reinvested in the local community and projects that yield economic, social, and environmental benefits.

The local climate agenda as well as more examples can be found on [107].

Local climate policy covers a broad front: the built environment, sustainable mobility, corporate responsibility, renewable energy, and climate-neutral towns and regions. These themes form the core structure of the Local Climate Agenda. They are based on the local situation and draw inspiration from best practices. The ministry supports a knowledge-exchange structure around these themes. For each priority, actions have been identified for both local authorities and the central government. The central government aims to facilitate and strengthen initiatives of local authorities by bringing stakeholders together and removing obstacles. For instance, to reduce energy use in existing buildings, local authorities offer insulation schemes for private homes. The central government supports these efforts through the 'Blok voor Blok'[108] programme, which refits entire housing blocks to make them more energy-efficient.

Information on CO2-footprints of municipalities and regions can be found in a databank.109 Moreover, already in existence for quite a number of years, the association 'Klimaatverbond' is an active network of local and provincial authorities that cooperate in projects and exchange information to support and strengthen local climate-related policies. The group maintains a website 110 that contains information on projects and activities such as the 'Energy Battle' between municipalities. The Minister of I&M supports the Klimaatverbond with the organisation of the annual 'children's climate summit' (Kinderklimaattop).[111]

9.3.2 Campaigns for the general public

'Beter klimaat'-campaign 2008 + 2009

In 2008, the former ministry of VROM started the campaign 'Nederland gaat voor een beter klimaat'. This campaign had the task to show that behaving in a sustainable manner was normal for a government and many companies. Since the end of 2008, I&M also maintains a special website for the climate change-related campaign112, in cooperation with MilieuCentraal (see section 9.5). This campaign ended in the fall of 2009.

The Energieweter campaign 2010 + 2011

The 'EnergieWeter' [113] campaign was launched in 2010. This campaign shows the cost-savings in euros for low-energy appliances on a yearly basis. This campaign is a cooperation between I&M and the business community.

---

[107] http://www.rwsleefomgeving.nl/onderwerpen/lokaal_klimaatbeleid/lokale-klimaatagenda/
[108] http://www.agentschapnl.nl/subsidies-regelingen/blok-voor-blok
[109] http://www.klimaatmonitor.databank.nl/
[110] www.klimaatverbond.nl
[111] http://www.rijksoverheid.nl/regering/bewindspersonen/wilma-mansveld/nieuws/2013/06/24/mansveld-neemt-jongerenadvies-over-klimaatbeleid-in-ontvangst.html
http://www.jongerenvertegenwoordigers.nl/info/door_wie_worden_jongerenvertegenwoordigers_gesteu[n]
[112] www.beterklimaat.n[l]
[113] www.energieweter.nl

The Week of the energy bill (2013, Milieucentraal)
The Week of the Energy Bill gives attention to easily saving energy in the home. Less energy consumption provides a lower energy bill and a better environment. This campaign runs from 14 to 20 October 2013. The Week of the Energy Bill is an initiative of the independent organisations MilieuCentraal, Vereniging Eigen Huis, de Nederlandse Woonbond, VvE Belang, Vastgoed Belang, VACpunt Wonen, and the Ministry of the Interior.

The HIER campaign (2007 – the present)
In the 'Hier' (Dutch for 'Here') climate campaign, 40 organisations (mostly NGOs such as WWF/ WNF, Red Cross, Oxfam Novib) work together to counter the negative effects of climate change through activities such as coordinated consumer campaigns, raising awareness, joint communication efforts, and political lobbying. The campaign is supported by the Dutch government (MinI&M), both financially and through cooperation. The business community is also involved.

- HIER campaign
  The solution to the climate problem comes within arm's length as the public, consumers, and businesses feel part of the solution. HIER therefore supports all steps in the right direction and is the initiator of a multitude of initiatives. For example: HIER is the driving force behind campaigns such as Climate Street Party HIER. HIER created 'Daar ben ik', manages the CO2 Performance Ladder, and published the book 'Help, my igloo melts'. The environmental NGOs that participate in the campaign have divided up the consumer options among themselves. The Netherlands Society for Nature and Environment, for instance, has presented a top-ten list of energy-efficient products to choose from (refrigerators, TVs, cars etc. [114], while the WWF has introduced the most economical cars, etc.
- HIER as climate expert
  HIER is committed to a carbon-neutral Netherlands and is committed to an effective contribution to the Dutch approach to international climate problem. Its Program Director therefore acts as the Chairman of the Reflection Group Energy, Chairman of the Central Committee of Experts of the CO2 performance ladder, and program director of Foundation for Climate Friendly Procurement and Business (SKAO).
- HIER as connective agent
  No one can solve the climate problem by himself or herself and HIER therefore believes strongly in collaboration. We therefore collaborate with consumers, businesses, and society. Companies can be important partners in protecting the climate. Companies and organisations that provide climate-friendly products or services may join the Climate Campaign HIER. Joint communication builds upon the various climate adaptation projects. These are key-projects to convince the general public and decision-makers that climate change is not an abstract long-term environmental problem, but increasingly a major social problem, one that has impacts at home and all over the world. Building on this growing sense of urgency, the role of environmental NGOs is to show consumers how to make the right choices. Further information:[115]

Adaptation: The Netherlands Live with Water [116]
The climate change projections for the Netherlands reflect an increased risk of coastal and river flooding.It was acknowledged in 2000 that the current water management system based on technological solutions is inadequate and that more space needs to be made for water. It was also recognised that citizens do not sufficiently recognise and acknowledge the potential problems

[114] www.topten.info
[115] http://www.hier.nu/
[116] http://www.knmi.nl/cms/content/14172/campagne_verkeer_en_waterstaat_nederland_leeft_met_water

associated with water. Consequently, 'The Netherlands Live with Water' public-awareness campaign was launched in 2003.

The campaign emphasises the need to store water along both the main national and regional water management systems during times of excessive rainfall or high levels of river discharge. It also promotes the actions that individuals can do themselves to help reduce the threat of flooding. The campaign has used the Netherlands' favourite weather presenter as their spokesperson. Independent reviewers have assessed the campaign as being an effective awareness-raising approach. This campaign went on until 2011.[117]

Parallel with the Netherlands Live with Water campaign was the 'Plan Forward' (denk vooruit) campaign, which focused on the risk awareness of the public.

Plan Forward (Denk Vooruit 2011 and NL-Alert in 2012 and 2013)
This campaign focused on the importance for Dutch civilians of being prepared for emergency situations (e.g. Floods). During 2011, the focus was on NL-Alert (Cell Broadcast system). As a result of this campaign, the Dutch civilians have become acquainted with the existence of NL-Alert. NL-Alert is a new warning system with which government can warn the public by mobile phone.

From 2011 onwards, communications to the civilian people focused on different water projects in relation to climate change: e.g. Ruimte voor de Rivier, het Hoogwaterbeschermingsprogramma, de Maaswerken, Kaderrichtlijn Water en Ruimte en Klimaat (ARK), and events such as World Water Day.

From 2014, communication will focus on the Delta Decisions to be presented by the Delta Programme Commissioner. The reason is a new vision on water safety and the availability of enough fresh water in the future in the Netherlands.

9.4 Training programs, including exchange of personnel

The 'Learning for Sustainable Development' programme (see 9.2) encompasses also training. The programme also targets professionals (public servants, etc.) to strengthen 'the learning government' in developing, implementing, and improving sustainable development-related policies. This is done through publications and by creating a better environment for 'learning and improving' and for structural embedding in decision-making processes e.g. through networks of governmental, knowledge, and social/environmental interest organisations.

Training is also an integrated aspect of the work carried out by the intermediary organisations NL Agency (AgentschapNL) and MilieuCentraal. For example, informational material and training to increase energy efficiency are provided to companies under the framework of the Long-Term Agreements. For the eco-drive programme (Het Nieuwe rijden), driver training was organised in driving licence courses on efficient driving, etc.[118] .

Various Dutch universities and institutes offer training and other professional education programmes for domestic and foreign students and professionals in climate change, mitigation, and adaptation related topics, e.g.[119]. The Netherlands Environmental Assessment Agency (Planbureau voor de Leefomgeving, PBL) contributes to improving the quality of political and administrative decision-making by conducting outlook studies, analyses, and evaluations about climate change. PBL publishes

[117] http://www.grabs-eu.org/membersArea/files/the_netherlands.pdf
[118] http://www.hetnieuwerijden.nl/; http://www.truckvandetoekomst.nl/; http://www.rwsleefomgeving.nl/onderwerpen/lokaal_klimaatbeleid/; http://www.rwsleefomgeving.nl/onderwerpen/broeikasgassen/publicaties/
[119] http://www.knmi.nl/faq/index.php?o=Klimaatverandering.

studies and essays within an international context. By organising symposia, they inform and educate Dutch professionals. [120]

9.5 Resource and information centres

As part of their activities in education, training, and raising public awareness, the ministries involved in climate policy also commission intermediary organisations to implement certain tasks. To improve efficiency and prevent overlap, several of these organisations merged into two new organisations in 2005, i.e. NL Agency and MilieuCentraal. NL Agency focuses on professional parties, such as industry, local governments, and companies. MilieuCentraal concentrates on consumers. Both organisations are described below. Further communication activities are implemented under the framework of the 'Climate changes spatial planning' programme through the Platform Communication on Climate Change. NGOs also perform information services (see next section). The most relevant activities are described further on in this chapter.

NLAgency (AgentschapNL)[121] is an agency under the Dutch Ministry of Economic Affairs. It implements programmes for various ministries on innovation, energy and climate, as well as the environment and spatial planning. Clustering knowledge, NL Agency aims to strengthen the economy through sustainable development and innovation. Examples of the many programmes that NL Agency carries out include innovation support programmes, renewable energy programmes, Long-Term Agreements with the industry to increase energy efficiency, the reduction programme for non-CO_2 greenhouse gases, and many energy transition/innovation programmes for a sustainable energy economy. Education, training, and raising public awareness form an integrated part of its activities. The activities, training, information, and general website mainly target professional parties in many sectors of society. NL Agency also hosts the website of the National Inventory Entity (NIE) http://www.agentschapnl.nl/subsidies-regelingen/national-inventory-entity (on behalf of I&M). Its main aim is to provide information on the National System for monitoring, on the (trends in) greenhouse gas emissions in the Netherlands, and on climate policy, as reported in the National Inventory Reports and National Communications, respectively. This site also makes available much of the relevant background information.

MilieuCentraal [122] is an independent organisation that provides consumers with practical and reliable information on the environment. The quality of this information is assured via a review process, whereby information from various sources is gathered and various experts are consulted. MilieuCentraal hosts a website and a call centre. It initiates communication campaigns, usually in cooperation with other organisations, which are aimed directly at consumers. The organisation also conducts public surveys on environmental issues. MilieuCentraal maintains the website [123] (consumer and energy), following an initiative by the Ministry of Economic Affairs. This website aims to provide consumers with independent and reliable information on renewable energy, energy savings, and selecting an energy supplier. In parallel, the campaign 'Knowing by measuring' has started, which aims to improve public knowledge of energy savings.

'Climate changes spatial planning' and *'Knowledge for Climate'*, two major R&D programmes (see also Chapter 8) together operate a website on research results [124] . The communication activities aim to increase the knowledge of climate research, including the consequences of climate change and possible adaptation measures, for politicians, policy makers, industry, non-governmental organisations, the media, and the general public. It also aims to stimulate the dialogue between politicians, government officials, industry, and the transfer of knowledge by bringing together parties

[120] http://www.pbl.nl/en/dossiers/Climatechange
[121] *www.AgentschapNL.nl*
[122] www.milieucentraal.nl
[123] http://www.energie-nederland.nl/consument-en-energie/
[124] http://www.klimaatonderzoeknederland.nl/templates/dispatcher.asp?page_id=25223002

that may offer, or need, knowledge on climate change. Activities include publishing fact sheets, brochures, and summaries of scientific reports.

In addition, more targeted programmes are often supported by websites that provide important resource information for the relevant target groups. Examples include the programme 'More with Less' for the housing and buildings sector (see Chapter 4), supported by a website with resource information for both tenants, homeowners (corporations), and suppliers in the sector.[125]

9.6 Involvement and support of non-governmental organisations

Government support to NGOs
The Ministry of I&M further contributes to education, training, and raising public awareness through the subsidy programme entitled Social Organisations and the Environment (SMOM), already described in earlier National Communications. The scheme focused on environmental projects and programmes by non-profit organisations, enabling these organisations to take the initiative, while also providing I&M with better 'insight' into, and information on, relevant developments in society. All environmental issues are eligible for subsidy and I&M strives to achieve an even distribution across all environmental issues and organisations. Several projects on climate change are approved each year. Examples of projects are given on the website. [126] Projects have different character and include e.g. support to communication campaigns on global sustainability issues (e.g. with the foundation Both Ends) and awareness projects with children (e.g. cool! Climate after School project, which raises awareness with children and parents after school time, using e.g. energy boxes, group discussions etc.).

9.7 New Delhi and Doha work programme on Article 6 of the UNFCCC

The previous sections also describe activities and efforts taken to implement the (amended) New Delhi work program, integrated in the Dutch communication approach on climate change. As a new work programme on Article 6 was agreed in Doha (Decision 15/CP.18, Doha work programme on Article 6 of the Convention), this will be taken into consideration while developing future education, training, and awareness actions on climate change.
A few special aspects may be further highlighted:

International development and implementation of education and training (Kyoto Protocol Art.10)
The previous sections also include activities aimed at international education and training and capacity building. As mentioned e.g. in section 9.4., various Dutch universities and institutes offer training and other professional education programmes for foreign students and professionals in climate change, mitigation, and adaptation-related topics. In addition, universities offer MSc degrees for foreign students e.g. in sustainable energy technology or environmental sciences.
Examples for foreign students and professionals include e.g. postgraduate courses and training in the field of water management, flood risk management, energy management, and cleaner energy, climate change adaptation in agriculture, and natural resources management.
To improve the international awareness for these courses and training, a website [127] is available providing an overview of courses, available support, and practical information for studying in the Netherlands. The site also contains actual information on available courses; e.g. for 2013:

- the Mena Scholarship and Programme

[125] http://www.meermetminder.nl/home
[126] http://www.AgentschapNL.nl/smom
[127] http://www.studyinholland.nl/

    - Climate change governance: adaptation and mitigation as institutional change processes at Wageningen UR Centre for Development Innovation
    - Climate Change Impacts and Adaptation: Analysis and Monitoring Techniques for Climate Change at University of Twente
- NFP courses
    - Urban Management Tools for Climate Change (IHS) at Erasmus University Rotterdam
    - IWRM as a tool for adaptation to climate change at UNESCO-IHE Institute for Water Education
    - Assessment of the Effect of Climate Change on Agro-ecological Systems Using Optical and SAR Remote Sensing and GIS at University of Twente

Nuffic is a non-profit organisation that supports internationalisation in higher education, research, and professional education and manages a number of programmes to improve the knowledge and skills for individuals and organisations in developing countries. Their website [128] presents an overview for programmes like NICHE, NPT (closed), NFP and NFP Tailor-Made Training programme (TMT), and StuNed. These programmes pay special attention to Sub-Saharan Africa, gender, and the needs of the labour market. In 2012, the programme "Science without Borders Holland" was set up through the cooperation between Nuffic and the Brasilian orgnisation CNPq. On the website [129] , information is presented for Brasilian students on Dutch courses. In September 2012, a first group of 165 Science without Borders (SwB) scholarship holders started a study in a broad range of topics. The majority of the students will follow a twelve-month study programme at bachelor's level. At the end of 2012, the programme was opening a call at the PhD and postdoc level.
Nuffic also manages Netherlands Education Support Offices (NESO's) in a number of countries, such as in China, South Korea, Vietnam, Indonesia, and Mexico. Additional (scientific) institutes are operational in Morocco, Turkey, and Syria.

Youth
Most of the education programmes mentioned above are aimed at youth, as are various communication campaigns. To stimulate further involvement and participation of youth in policy processes, various other actions are taken both by NGOs and by the government. Some examples:
The Dutch government stimulates the participation of young people within the UNFCCC framework and their involvement in the climate policy development and implementation. The Dutch UN youth representatives were members of the Dutch Climate Change negotiation team and as such developed several actions such as 'we are part of the solution' during COPs, most recently that in Doha. Together with other youth organisations, they provided input for the Klimaatagenda 2013 (2013 Climate Agenda).
A number of youth organisations (like Jongeren Mileu Actief, de Nationale Jeugdraad, Studenten voor Morgen, and Global Power Shift) have been active over the years to inform and to activate young people on topics such as climate change, sustainable consumption, etc. For the year 2013, these organisations work together in a common action 'Klimaatestafette 2013' (2013 Climate Relay Race) intended to influence the Climate change negotiations in Warsaw. [130]

[128] http://www.nuffic.nl
[129] http://swbholland.org/en/doutorado.php
[130] http://www.jongenduurzaam.nl/projecten/klimaatestafette/

REFERENCES

Chapter 1

-

Chapter 2

[1] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=37296ENG&D1=0,52-53,55,57-58,68&D2=0,10,20,30,40,50,60-62&LA=EN&HDR=G1&STB=T&VW=T

[2] KNMI, 2011, De Bosatlas van het Klimaat (Dutch Climate Atlas), Noordhoff Uitgevers Groningen / KNMI, ISBN 978 9001 120894 (on the web: www.klimaatatlas.nl)

[3] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=37595ENG&D1=131-148&D2=0&D3=39,44,49,54,59,64,69,74,79,84,89,94,99,104,109,114,119&LA=EN&HDR=T&STB=G1,G2&VW=T

[4] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=37595ENG&D1=159-173&D2=0&D3=4,9,14,19,24,29,34,39,44,49,54,59,64,69,74,79,84,89,94,99,104,109,114,119&LA=EN&HDR=T&STB=G1,G2&VW=T

[5] http://statline.cbs.nl/StatWeb/publication/default.aspx?DM=SLEN&PA=81117ENG&D1=21%2c89&D2=1%2c11%2c21%2c31%2c41-43&LA=EN&HDR=G1&STB=T&CHARTTYPE=3&VW=G

[6] http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=37741NR&D1=3&D2=0,3&D3=a&HDR=T&STB=G1,G2&CHARTTYPE=3&VW=T

[7] http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=70846NED&D1=30,58,62&D2=0-1&D3=0&D4=a&HDR=G1,G2&STB=T,G3&VW=T

[8] http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=37570HVV&D1=0-5&D2=0&D3=0&D4=2,7,12-14&HDR=T,G2,G3&STB=G1&CHARTTYPE=1&VW=G

[9] http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=37798HVV&D1=0-5&D2=0&D3=0&D4=2,7,12-14&HDR=T,G2,G1&STB=G3&CHARTTYPE=1&VW=G

[10] http://www.cbs.nl/NR/rdonlyres/090445AD-E1CB-4147-A404-0C36F02DF112/0/2013c174pub.pdf

[11] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=81810ENG&D1=0&D2=0-1,5,41&D3=16,101,118,135&LA=EN&HDR=G2&STB=G1,T&VW=T

[12] http://www.milieuennatuurcompendium.nl/indicatoren/nl0204-Afvalproductie-en-wijze-van-verwerking.html?i=1-4

[13] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=37263ENG&D1=15&D2=0&D3=4,9,14,19,24,29,34,39,44,49,54,59,64,69,74,79,l&LA=EN&HDR=G2&STB=G1,T&VW=G

[14] http://www.compendiumvoordeleefomgeving.nl/indicatoren/nl0556-Energielabels-woningen.html?i=9-53

[15] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=80783ENG&D1=0&D2=a&D3=0&D4=0,5,10-13&LA=EN&HDR=G2,G3&STB=T,G1&VW=G

[16] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=80408ENG&D1=3-5&D2=12,17,22,27-34&LA=EN&HDR=T&STB=G1&CHARTTYPE=1&VW=G

[17] http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=80408eng&D1=0-2,35-36&D2=12,17,22,27,32-34&LA=EN&HDR=T&STB=G1&VW=T

Chapter 3

[20] www.nlagency.nl/nie

[23] https://extranet.unfccc.int/registry-systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx

[25] https://extranet.unfccc.int/registry-systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx

[26] http://www.emissieautoriteit.nl

[27] https://ets-registry.webgate.ec.europa.eu/euregistry/NL/index.xhtml

[28] http://www.emissieautoriteit.nl/english/public-information-kyoto

[29] https://www.emissieautoriteit.nl/emissierechten/eu-register/gebruiksbepalingen

[30] https://ets-registry.webgate.ec.europa.eu/euregistry/NL/index.xhtml

[31] https://extranet.unfccc.int/registry-systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx

[32] https://extranet.unfccc.int/registry-systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx

[33] https://extranet.unfccc.int/registry-systems/All%20Documents/Forms/EU%20Common%20Readyness%20Information.aspx

Chapter 4

[34] www.rijksoverheid.nl,

[35] www.energieakkoordser.nl/~/media/files/energieakkoord/overzicht-belangrijkste-maatregelen-energieakkoord.ashx

[36] www.pbl.nl/sites/default/files/cms/publicaties/pbl-2013-uitgangspunten-referentiepad-evaluatie-SER-energieakkoord-1214.pdf

[37] www.hetnieuwerijden.nl

[38] http://ec.europa.eu/clima/policies/finance/international/faststart/index_en.htm

Chapter 5

[39] NC-5

[40] www.rivm.nl/bibliotheek/digitaaldepot/E10004.pdf

[41] www.ecn.nl/docs/library/report/2012/e12039.pdf

[42] www.rijksoverheid.nl/documenten-en-publicaties/kamerstukken/2012/05/25/voorjaarsnota-2012.html

[43] www.energieakkoordser.nl/~/media/files/energieakkoord/overzicht-belangrijkste-maatregelen-energieakkoord.ashx

[44] www.pbl.nl/sites/default/files/cms/publicaties/pbl-2013-uitgangspunten-referentiepad-evaluatie-SER-energieakkoord-1214.pdf

[45] As stated earlier, the proposed reduction of fiscal benefits for work-related travel were eventually decided against in the House of Representatives.

[46] www.wbcsdcement.org/pdf/tf1/Table_of_contents.pdf

[47] The use of credits has been limited to about 10% of the 2008-2012 allocation.

www.pbl.nl/publicaties/nederland-voldoet-aan-de-kyoto-verplichting-uitstoot-broeikasgassen

[49] http://www.iioa.org/conferences/intermediate-2004/pdf/wilting.pdf

[50] http://www.google.nl/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&ved=0CDEQFjAA&url=http%3A%2F%2Fwww.cpb.nl%2Fsites%2Fdefault%2Ffiles%2Fpublicaties%2Fdownload%2Fworldscan-model-international-economic-policy-analysis.pdf&ei=8e-

[51] www.ecn.nl/docs/library/report/1995/95005.pdf

[52] www.ecn.nl/publicaties/author/41901

[53] www.ecn.nl/publicaties/author/41901

[54] www.ecn.nl/publicaties/author/41901

Chapter 6

[55] http://www.deltacommissaris.nl/english/topics/delta_scanerio

[56] Hermans et al. 2010

[57] http://www.pbl.nl/

[58] *http://books.google.nl/books/about/Aanpassing_aan_klimaatverandering.html?id=po7EkQEACAAJ&redir_esc=y*

[59] http://www.klimaatlandschappen.nl

[60] www.infopuntnatuurbranden.nl

[61] www.klimaatbuffers.nl

[62] www.atlasleefomgeving.nl

Chapter 7

[64] http://africabiogas.org/

[65] http://www.climatecentre.org/

[66] http://www.oecd.org/dac/stats/49187939.pdf

[67] http://unfccc.int/resource/docs/natc/netnc4.pdf

[69] http://ec.europa.eu/environment/ecoap/index_en.htm

[70] http://ec.europa.eu/environment/climat/emission/index_en.htm

[71] http://geeref.com/

[72] http://www.innovationrelay.net/

[73] http://cordis.europa.eu/technology-platforms/home_en.html

[74] http://www.senternovem.nl/KEI/31_projecten/index.asp (in Dutch only)

Chapter 8

[75] http://www.ingos-infrastructure.eu/

[76] http://www.nwo.nl/en/our-ambitions/Collaboration+in+themes/Water+and+Climate/about+this+theme

[77] http://www.nwo.nl/en/research-and-results/programmes/Netherlands+Polar+Programme

[78] http://www.nwo.nl/en/funding/our-funding-instruments/nwo/free-competition/alw/open-programme.html

[79] http://www.nwo.nl/en/research-and-results/programmes/The+National+Ocean+and+Coastal+Research+Programme%E2%80%AC/background

[80] http://www.nwo.nl/en/research-and-results/programmes/Urbanising+Deltas+of+the+World

[81] http://www.nwo.nl/en/funding/our-funding-instruments/wotro/cocoon---conflict-and-cooperation-in-the-management-of-climate- change/cocoon---conflict-and-cooperation-in-the-management-of-climate-change.html

[821] http://www.klimaatonderzoeknederland.nl/templates/dispatcher.asp?page_id=25223002

[83] http://www.rijksoverheid.nl/onderwerpen/deltaprogramma

[84] Parliamentary document 33400 J, no. 19.

[85] Van Veldhoven-Lucas motion, Parliamentary document 27625, no. 262

[86] http://www.cesar-observatory.nl/

[87] http://www.wmo.int/pages/prog/gcos/index.php?name=GRUAN

[88] http://www.icos-infrastructure.eu/

[89] http://www.actris.net/

[90] http://www.knmi.nl/samenw/paramaribo/

[91] http://www.wmo.int/pages/prog/www/ois/rbsn-rbcn/rbsn-rbcn-home.htm

[92] http://www.rivm.nl/bibliotheek/rapporten/680704018.html

[93] http://www.argo.ucsd.edu/index.html

[94] http://www.eumetsat.int/website/home/Satellites/GroundSegment/Safs/index.html

[95] http://www.esa-cci.org/

[96] http://www.temis.nl/

Chapter 9

[97] www.rijksoverheid.nl; www.government.nl
http://www.government.nl/issues/environment/climate-change
http://www.government.nl/issues/energy/sustainable-energy
http://www.government.nl/issues/energy/energy-in-the-future
http://www.government.nl/issues/energy/green-deal
http://www.government.nl/issues/environment/biofuels
http://www.rijksoverheid.nl/onderwerpen/duurzaam-bouwen-en-verbouwen

[98] http://www.pbl.nl/node/57074

[99] http://www.scp.nl/Onderzoek/Bronnen/Beknopte_onderzoeksbeschrijvingen/Continu_onderzoek_burgerperspectieven_COB

[100] www.emissieregistratie.nl,

[101] www.rivm.nl; www.knmi.nl; www.pbl.nl

[102] www.beterklimaat.nl

[103] http://www.lerenvoorduurzameontwikkeling.nl/content/learning-sustainable-development-2008-2011

[104] http://www.plado.nl/

[105] *http://www.duurzaamdoor.nl*

[106] *http://www.nme.nl//content/succesverhalen-nme?thema=energie&provincie*=

[107] http://www.rwsleefomgeving.nl/onderwerpen/lokaal_klimaatbeleid/lokale-klimaatagenda/

[108] http://www.agentschapnl.nl/subsidies-regelingen/blok-voor-blok

[109] http://www.klimaatmonitor.databank.nl/

[110] www.klimaatverbond.nl

[111] http://www.rijksoverheid.nl/regering/bewindspersonen/wilma-mansveld/nieuws/2013/06/24/mansveld-neemt-jongerenadvies-over-klimaatbeleid-in-ontvangst.html

111
http://www.jongerenvertegenwoordigers.nl/info/door_wie_worden_jongerenvertegenwoordigers_gesteu[n]

[112] www.beterklimaat.nl

[113] www.energieweter.nl

[114] www.topten.info

[115] http://www.hier.nu/

[116] http://www.knmi.nl/cms/content/14172/campagne_verkeer_en_waterstaat_nederland_leeft_met_water

[117] http://www.grabs-eu.org/membersArea/files/the_netherlands.pdf

[118] http://www.hetnieuwerijden.nl/; http://www.truckvandetoekomst.nl/;
http://www.rwsleefomgeving.nl/onderwerpen/lokaal_klimaatbeleid/;
http://www.rwsleefomgeving.nl/onderwerpen/broeikasgassen/publicaties/

[119] http://www.knmi.nl/faq/index.php?o=Klimaatverandering.

[120] http://www.pbl.nl/en/dossiers/Climatechange

[121] *www.AgentschapNL.nl*

[122] www.milieucentraal.nl

[123] http://www.energie-nederland.nl/consument-en-energie/

[124] http://www.klimaatonderzoeknederland.nl/templates/dispatcher.asp?page_id=25223002

[125] http://www.meermetminder.nl/home

[126] http://www.AgentschapNL.nl/smom

[127] http://www.studyinholland.nl/

[128] http://www.nuffic.nl

[129] http://swbholland.org/en/doutorado.php

[130] http://www.jongenduurzaam.nl/projecten/klimaatestafette/

GLOSSARY

CHEMICAL COMPOUNDS

C_2F_6	Perfluoroethane (hexafluoroethane)
CF_4	Perfluoromethane (tetrafluoromethane)
CFCs	Chlorofluorocarbons
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2-eq.	Carbon dioxide equivalent (in this report using a GWP-100)
CTC	Carbon tetrachloride (tetrachloromethane)
FICs	Fluoroiodocarbons
HFCs	Hydrofluorocarbons
HCFCs	Hydrochlorofluorocarbons
MCF	Methyl Chloroform (1,1,1-Trichloroethane)
NMVOC	Non-Methane Volatile Organic Compounds
N_2O	Nitrous oxide
NOx	Nitrogen oxide (NO and NO_2), expressed as NO_2
PFCs	Perfluorocarbons
SF_6	Sulphur hexafluoride
SO_2	Sulphur dioxide
VOC	Volatile Organic Compounds (may include or exclude methane)

UNITS

Gg	Giga gramme (10^9 gramme)
GJ	Giga Joule (10^9 Joule)
ha	hectare
kton	kilo ton (= 1,000 metric ton = 1 Gg)
kW	kilo Watt (1000 Watt)
mld	1,000 million
mln	million
Mton	Mega ton (= 1,000,000 metric ton = 1 Tg)
MWe	Mega Watt electricity (10^6 Watt)
Nm^3	Normal cubic metre (volume of gas at 10^5 Pa and 20^{o}C)
Pg	Peta gramme (10^{15} gramme)
PJ	Peta Joule (10^{15} Joule)
TJ	Tera Joule (10^{12} Joule)
Tg	Tera gramme (10^{12} gramme)
US$	US Dollar
€	Euro

ABBREVIATONS

A

AAU	Assigned Amount Units
Argo	Array for Real-time Geostrophic Oceanography
AIJ	Activities Implemented Jointly
ALW	Earth and Life Sciences; NWO research theme
ARK	Adaptatie Ruimte en Klimaat (National Programme for Spatial Adaptation to Climate Change)
ASTAE	Asia Sustainable Technology and Alternative Energy
AVV	Adviesdienst Verkeer en Vervoer (Transport Research Centre)

B

BLOW	Intergovernmental Netherlands wind energy agreement
BEES(/A)	Order governing combustion plants emission requirements (Besluit Emissie-Eisen Stookinstallaties)
BSIK	Subsidy scheme for the knowledge infrastructure (Besluit Subsidies Investeringen Kennisinfrastructuur)

C

CAF	Regional Development Bank for the Andes
CBS	Netherlands Statistics (Centraal Bureau voor de Statistiek)
CCPM	Common and Coordinated Policies and Measures (of EU)
CD4CDM	Capacity Development for the Clean Development Mechanism
CDM	Clean Development Mechanism
CER	Certified Emission Reductions Unit
CERUPT	Certified Emission Reduction Unit Procurement Tender
CESAR	Cabauw Experimental Site for Atmospheric Research
CHP	Combined Heat and Power (Cogeneration)
CoP	Conference of the Parties (to the Climate Change Convention)
CPB	Central Planning Bureau
CRF	Common Reporting Format
CROW	Information and Technology Platform for Transport, Infrastructure and Public Space

D

DECC	UK Department of Energy and Climate Change
DES	Data Exchange Standards
DGIS	Directoraat-Generaal Internationale Samenwerking (Development Cooperation)

E

EC	European Commission/European Community
ECA&D	European Climate Programme and Dataset
ECN	Netherlands Energy Research Centre (Energie Centrum Nederland)
EDF	European Development Fund
EDGAR	Emission Database for Global Atmospheric Research
EHS	National Ecological Network (Ecologische Hoofdstructuur)
EIA	Energie Investerings Aftrek (Energy investment Allowance)
EINP	Energy Investeringsaftrek Non-Profit Organisaties (Energy investment tax deduction for non-profit sectors)
ENINA	Task Force on Energy, Industry and Waste Management
EPA	Energie Prestatie Advies (Energy performance advice)
EPA	Environmental Protection Act
EPBD	Energy Performance of Buildings Directive
EPC	Energy performance coefficient

EPN	Energy performance Standard (Energie Prestatie Norm)
EPR	Energie Premie Regeling (Energy premium rebate)
ER	Emissions Registration
ER	European Renaissance scenario
ERU	Emission Reduction Unit
ESA	European Space Agency
ESF	European Science Foundation
ESFRI	European Strategy Forum for Research Infrastructures
ESMAP	Energy Sector Management Assistance Programme
ETP	Energy Technology Platform
EU	European Union
EU-ETS	European Union Greenhouse Gas Emission Trading System
EUMETNET	European Organisation for the Exploitation of Meteorological Network
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
EZ	Ministry of Economic Affairs (Ministerie van Economische Zaken)

F

F-gases	Fluorinated greenhouse gases (HFCs, PFCs, SF_6)
FAO	Food and Agriculture Organisation of the United Nations
FCPF	The Forest Carbon Partnership Facility
FINESSE	Financing Energy Services for Small Scale Energy Users
FLUXNET	Global Terrestrial Network – Carbon
FP	Framework Programme (EU research fund)
FTP	File Transfer Protocol

G

GCOS	Global Climate Observing System
GDP	Gross Domestic Product
GE	Global Economy (scenario)
GEF	Global Environmental Facility
GGD	National Health Authority (Gemeentelijke Gezondheidsdiensten)
GHG	GreenHouse Gas
GIS	Green Investment Schemes
GNI	Gross National Income
GOME	Global Ozone Monitoring Experiment
GOOS	Global Ocean Observing System
GPS	Global Positioning System
GRETA	Cooperation scheme that developed the Greenhouse Gas Registry for Emissions Trading Arrangements
GSN	GCOS Surface Network
GTN-G	Global Terrestrial Network - Glaciers
GTN-P	Global Terrestrial Network - Permafrost
GTOS	Global Terrestrial Observing System
GUAN	GCOS Upper Air Network
GWP	Global Warming Potential

H

HDD	Heat Degree Day
HYDE	Hundred Year Database of the Environment

I

IBRD	International Bank for Reconstruction and Development
ICAO	International Civil Aviation Organisation
ICSU	International Council for Science
IEA	International Energy Agency

I&M	Ministry of Infrastructure and the Environment (Ministerie van Infrastructuur en Milieu)
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IGBP	International Geosphere-Biosphere Programme
IGOS	Integrated Global Observing Strategy
IHDP	International Human Dimensions Programme (of Global Environmental Change)
IMAU	Institute for Marine and Atmospheric Research
IMO	International Maritime Organisation
IOC	Intergovernmental Oceanographic Commission of UNESCO
IPCC	Intergovernmental Panel on Climate Change
IPO	Association of Provincial Authorities (Interprovinciaal overleg)
ITL	Independent Transaction Log

J

JI	Joint Implementation

K

KADO	Cabinet's Approach to Sustainable Development (Kabinetsbrede aanpak Duurzame Ontwikkeling)
KPI	Key Performance Indicator
KNAW	Royal Netherlands' Academy of Arts and Sciences
KNMI	Royal Netherlands Meteorological Institute (Koninklijk Nederlands Meteorologisch Instituut)
KvK	Knowledge for Climate (Kennis voor Klimaat)
KvR	Climate Changes Spatial Planning (Klimaat voor Ruimte)

L

LTA's	Long Term Agreements
LDC	Least Developed Countries
LDCF	Least Developed Countries Fund
LEI	Agricultural Economics Institute (Landbouw Economisch Instituut)
LPG	Liquefied Petroleum Gas
LTA	Long-Term Agreement
LULUCF	Land-use, Land-Use Change and Forestry

M

MATRA	Social Transformation Eastern Europe Programme
MDG	Millenium Development Goal
MEPC	(IMO) Marine Environment Protection Committee
MFS	Co-financing System
MIA-Water	Maatschappelijke Innovatie Agenda Water
MILIEV	Milieu en Economische Verzelfstandiging (ORET MILIEV is a development and environment related export transactions programme)
MJA	Long Term Agreement (LTA) (Meerjaren afspraak)
MJV	Annual Environmental Report (Milieujaarverslag)
MPE	Environmental Quality of Electricity Production (Milieukwaliteit Elektriciteits-productie)

N

NASA	National Aeronautics and Space Administration
NBW	Nationaal Bestuursakkoord Water
NC	National Communication
NCAP	Netherlands Climate Assistance Programme

NCCSAP	Netherlands Climate Change Studies Assistance Program
NCPIP	National Climate Policy Implementation Plan
NEa	Dutch Emissions Authority (Nederlandse Emissie Autoriteit)
NEPP	National Environmental Policy Plan
NGO	Non-Governmental Organisation
NIE	National Inventory Entity (Single National Entity under Kyoto Protocol)
NIOZ	Netherlands Institute for Sea Research
NIR	National Inventory Report
NMP	National Environmental Policy Plan
NMVOC	Non-Methane Volatile Organic Compounds
NRP-CC	National Research Programme on Climate Change
NWO	Netherlands Organisation for Scientific Research (Nederlandse Organisatie voor Wetenschappelijk Onderzoek)
NWP	Nairobi Work Programme

O

OCW	Ministry of Education, Arts and Science
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OMI	Ozone Monitoring Instrument
ORET	Programma Ontwikkelingsrevelante Export Transacties (Development-Related Export Transactions). Predecessor of ORIO (see below)
ORIO	Facility for Infrastructure Development (Ontwikkelingsrelevante Infrastructuur-ontwikkeling)

P

PfCC	Preparedness for Climate Change
PREP	Promoting Renewable Energy Programme
PSO	Programme of Eastern European cooperation
PSOM	Programme for Stimulation of Upcoming Markets
PV	Photovoltaic

Q

QA	Quality Assurance
QC	Quality Control
QUELRC	Quantified Emission Limitation and Reduction Commitment

R

REDD	Reducing Emissions from Deforestation and Forest Degradation
RIVM	National Institute of Public Health and the Environment (Rijksinstituut voor Volksgezondheid en Milieu)
ROB	Reduction Programme for non-CO_2 greenhouse gases (Reductieprogramma Overige Broeikasgassen)
R&D	Research & Development
RMNO	Advisory Council for Research on Spatial Planning, Nature and the Environment
RMU	Removal Units

S

SAF	Satellite Application Facilities
SBI	Subsidary Body for Implementation
SCCF	Special Climate Change Fund
SCER	Steering Committee for the Emissions Registrations project
SCIAMACHY	Scanning Imaging Absorption Spectrometer for Atmospheric Cartography
SDE	Stimulation of Sustainable Energy Production (Stimulering Duurzame Energieproductie)

SE	Strong Europe (scenario)
SLOK	Stimulating Local Climate Initiatives (Stimulering Lokale en Regionale Klimaatinitiatieven)
SNV	Netherlands Development Organisation
SMEC	Second Memorandum on Energy Conservation
SOOP	Ship of Opportunity Programme
SRON	Space Research Organisation Netherlands

T

TNO	Netherlands Organisation for Applied Scientific Research
TMF	Thematic Co-Financing

U

UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
URC	UNEP Risø Centre
UU-IMAU	Utrecht University-Institute for Marine and Atmospheric Research
UvW	Dutch Association of Regional Water Authorities (Unie van Waterschappen)

V

VAMIL	Arbitrary Depreciation of Environmental Investments
VER	Verified Emission Reductions
VNG	Vereniging Nederlandse Gemeenten (Association of Netherlands Municipalities)
VOS	Volunteer Observing Ship
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)

W

WCRP	World Climate Research Programme
WFD	Water Framework Directive
WHO	World Health Organization
WMO	World Meteorological Organisation
WUR	Wageningen University and Research centre
WWF	World Wildlife Fund
WWW	World Weather Watch of WMO

ANNEX I Summary tables on emission trends

GREENHOUSE GAS SOURCE AND SINK CATEGORIES (CO_2)	Base year (Gg)	1990 (Gg)	1995 (Gg)	2000 (Gg)	2005 (Gg)	2010 (Gg)	2011 (Gg)
1. Energy	**151.037,75**	**151.037,75**	**162.557,87**	**162.397,68**	**168.728,37**	**174.753,77**	**160.850,98**
A. Fuel Combustion (Sectoral Approach)	149.860,15	149.860,15	161.599,50	161.708,72	167.055,53	172.758,96	159.313,54
1. Energy Industries	52.501,43	52.501,43	61.416,34	63.629,75	67.312,52	66.236,95	62.061,15
2. Manufacturing Industries and Construction	33.008,39	33.008,39	28.840,37	27.344,92	27.405,89	27.226,98	25.744,29
3. Transport	25.993,57	25.993,57	29.166,05	32.395,25	34.639,76	34.662,49	34.900,18
4. Other Sectors	37.791,04	37.791,04	41.664,63	37.755,60	37.322,06	44.305,46	36.253,25
5. Other	565,72	565,72	512,10	583,19	375,30	327,09	354,67
B. Fugitive Emissions from Fuels	1.177,60	1.177,60	958,36	688,96	1.672,84	1.994,80	1.537,44
1. Solid Fuels	402,67	402,67	516,87	421,71	598,54	972,43	637,15
2. Oil and Natural Gas	774,93	774,93	441,49	267,24	1.074,30	1.022,37	900,30
2. Industrial Processes	**7.881,69**	**7.881,69**	**7.937,88**	**7.353,89**	**7.050,10**	**6.472,11**	**6.576,50**
A. Mineral Products	1.171,53	1.171,53	1.732,89	1.410,71	1.446,82	1.253,72	1.295,31
B. Chemical Industry	3.744,48	3.744,48	4.005,66	4.076,89	3.745,83	3.881,70	3.408,51
C. Metal Production	2.661,20	2.661,20	1.908,06	1.519,38	1.476,39	997,54	1.547,97
D. Other Production	72,48	72,48	22,37	48,97	33,45	29,07	18,83
E. Production of Halocarbons and SF_6							
F. Consumption of Halocarbons and SF_6							
G. Other	232,00	232,00	268,91	297,94	347,59	310,08	305,89
3. Solvent and Other Product Use	316,44	316,44	242,29	169,28	134,80	154,53	122,56
4. Agriculture							
A. Enteric Fermentation							
B. Manure Management							
C. Rice Cultivation							
D. Agricultural Soils							
E. Prescribed Burning of Savannas							
F. Field Burning of Agricultural Residues							
G. Other							
5. Land Use, Land-Use Change and Forestry[(2)]	**2.999,07**	**2.999,07**	**2.850,22**	**2.924,60**	**3.013,54**	**2.991,77**	**3.265,12**
A. Forest Land	-2.350,44	-2.350,44	-2.493,53	-2.477,85	-2.567,09	-2.685,33	-2.433,87
B. Cropland	122,34	122,34	126,26	129,19	160,81	164,06	164,70
C. Grassland	4.484,94	4.484,94	4.529,62	4.563,16	4.431,04	4.473,92	4.482,37
D. Wetlands	80,46	80,46	85,02	88,45	125,64	131,18	134,85
E. Settlements	458,61	458,61	482,59	500,43	763,17	807,80	816,60
F. Other Land	20,00	20,00	22,06	23,61	25,23	26,82	27,13
G. Other	183,15	183,15	98,20	97,62	74,74	73,32	73,32
6. Waste	**IE,NA,NO**	**IE,NA,NO**	**IE,NA,NO**	**IE,NA,NO**	**IE,NA,NO**	**IE,NA,NO**	**IE,NA,NO**
A. Solid Waste Disposal on Land	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
B. Waste-water Handling							
C. Waste Incineration	IE	IE	IE	IE	IE	IE	IE
D. Other	NA	NA	NA	NA	NA	NA	NA
7. Other *(as specified in Summary 1.A)*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
Total CO_2 emissions including net CO_2 from LULUCF	**162.234,95**	**162.234,95**	**173.588,26**	**172.845,45**	**178.926,81**	**184.372,18**	**170.815,16**
Total CO_2 emissions excluding net CO_2 from LULUCF	**159.235,89**	**159.235,89**	**170.738,03**	**169.920,85**	**175.913,27**	**181.380,41**	**167.550,04**
Memo Items:							
International Bunkers	**38.897,84**	**38.897,84**	**42.982,73**	**52.431,45**	**64.988,72**	**53.354,55**	**58.665,16**
Aviation	4.540,46	4.540,46	7.584,14	9.749,35	10.875,58	10.168,31	10.447,85
Marine	34.357,38	34.357,38	35.398,58	42.682,10	54.113,14	43.186,24	48.217,31
Multilateral Operations	IE	IE	IE	IE	IE	IE	IE
CO_2 Emissions from Biomass	4.001,86	4.001,86	4.541,99	6.207,01	8.898,28	12.679,64	13.059,05

Table 1.1 Emission Trends CO_2 (In Gg)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES (CH_4)	Base year (Gg)	1990 (Gg)	1995 (Gg)	2000 (Gg)	2005 (Gg)	2010 (Gg)	2011 (Gg)
1. Energy	114,67	114,67	123,79	83,13	80,97	118,67	115,00
A. Fuel Combustion (Sectoral Approach)	34,84	34,84	44,30	43,49	43,75	83,23	78,08
1. Energy Industries	2,78	2,78	3,82	4,39	5,97	5,45	5,03
2. Manufacturing Industries and Construction	2,76	2,76	2,74	3,03	2,64	2,62	2,51
3. Transport	7,56	7,56	5,56	3,64	2,67	2,21	2,19
4. Other Sectors	21,68	21,68	32,13	32,37	32,44	72,92	68,32
5. Other	0,05	0,05	0,05	0,06	0,04	0,03	0,03
B. Fugitive Emissions from Fuels	79,83	79,83	79,49	39,64	37,21	35,44	36,92
1. Solid Fuels	1,59	1,59	1,60	1,06	1,12	1,01	0,99
2. Oil and Natural Gas	78,24	78,24	77,89	38,58	36,09	34,43	35,93
2. Industrial Processes	**14,14**	**14,14**	**14,14**	**14,19**	**14,84**	**13,85**	**13,40**
A. Mineral Products	NO	NO	NO	NO	NO	NO	NO
B. Chemical Industry	12,13	12,13	12,13	12,33	13,07	12,15	11,71
C. Metal Production	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO
D. Other Production							
E. Production of Halocarbons and SF_6							
F. Consumption of Halocarbons and SF_6							
G. Other	2,01	2,01	2,01	1,86	1,77	1,69	1,69
3. Solvent and Other Product Use							
4. Agriculture	**509,80**	**509,80**	**505,82**	**451,26**	**429,61**	**454,54**	**437,06**
A. Enteric Fermentation	364,44	364,44	353,99	313,33	303,56	316,65	311,66
B. Manure Management	145,36	145,36	151,83	137,93	126,05	137,89	125,41
C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO
D. Agricultural Soils	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NA
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	NO	NO	NO	NO	NO	NO	NO
G. Other	NA	NA	NA	NA	NA	NA	NA
5. Land Use, Land-Use Change and Forestry	**0,03**	**0,03**	**0,03**	**0,03**	**0,03**	**0,03**	**0,04**
A. Forest Land	0,03	0,03	0,03	0,03	0,03	0,03	0,04
B. Cropland	NA,NE	NA,NE	NA,NE	NA,NE	NA,NE	NA,NE	NA,NE
C. Grassland	NE	NE	NE	NE	NE	NE	NE
D. Wetlands	NE	NE	NE	NE	NE	NE	NE
E. Settlements	NE	NE	NE	NE	NE	NE	NE
F. Other Land	NE	NE	NE	NE	NE	NE	NE
G. Other	NE	NE	NE	NE	NE	NE	NE
6. Waste	**585,80**	**585,80**	**514,99**	**399,90**	**241,28**	**171,81**	**161,27**
A. Solid Waste Disposal on Land	571,95	571,95	500,08	385,73	228,03	161,13	150,77
B. Waste-water Handling	13,79	13,79	11,48	10,50	10,03	9,70	9,48
C. Waste Incineration	IE	IE	IE	IE	IE	IE	IE
D. Other	0,06	0,06	3,43	3,67	3,23	0,97	1,02
7. Other *(as specified in Summary 1.A)*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
Total CH_4 emissions including CH_4 from LULUCF	**1.224,43**	**1.224,43**	**1.158,77**	**948,52**	**766,73**	**758,90**	**726,77**
Total CH_4 emissions excluding CH_4 from LULUCF	**1.224,40**	**1.224,40**	**1.158,74**	**948,49**	**766,70**	**758,86**	**726,74**
Memo Items:							
International Bunkers	1,06	1,06	1,24	1,48	1,76	1,45	1,60
Aviation	0,22	0,22	0,36	0,46	0,52	0,48	0,50
Marine	0,84	0,84	0,88	1,02	1,25	0,96	1,10
Multilateral Operations	IE	IE	IE	IE	IE	IE	IE
CO_2 Emissions from Biomass							

Table 1.2 Emission trends CH4 (in Gg)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES (N_2O)	Base year	1990	1995	2000	2005	2010	2011
	(Gg)	(Gg)	(Gg)	(Gg)	(Gg)	(Gg)	(Gg)
1. Energy	**1,06**	**1,06**	**1,63**	**1,79**	**1,85**	**1,97**	**1,96**
A. Fuel Combustion (Sectoral Approach)	1,06	1,06	1,63	1,79	1,85	1,97	1,96
1. Energy Industries	0,45	0,45	0,54	0,63	0,78	0,84	0,83
2. Manufacturing Industries and Construction	0,10	0,10	0,08	0,07	0,07	0,10	0,09
3. Transport	0,33	0,33	0,84	0,93	0,84	0,86	0,88
4. Other Sectors	0,14	0,14	0,14	0,13	0,13	0,15	0,13
5. Other	0,03	0,03	0,03	0,03	0,02	0,02	0,02
B. Fugitive Emissions from Fuels	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO
1. Solid Fuels	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
2. Oil and Natural Gas	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO
2. Industrial Processes	**22,90**	**22,90**	**22,86**	**22,07**	**20,56**	**3,21**	**3,63**
A. Mineral Products	NO	NO	NO	NO	NO	NO	NO
B. Chemical Industry	22,89	22,89	22,85	22,04	20,53	3,17	3,59
C. Metal Production	NO	NO	NO	NO	NO	NO	NO
D. Other Production							
E. Production of Halocarbons and SF_6							
F. Consumption of Halocarbons and SF_6							
G. Other	0,01	0,01	0,02	0,03	0,03	0,04	0,04
3. Solvent and Other Product Use	0,73	0,73	0,64	0,44	0,25	0,09	0,10
4. Agriculture	**38,23**	**38,23**	**37,41**	**30,24**	**25,58**	**22,88**	**22,10**
A. Enteric Fermentation							
B. Manure Management	3,81	3,81	3,76	3,26	2,97	3,24	3,39
C. Rice Cultivation							
D. Agricultural Soils	34,42	34,42	33,65	26,98	22,61	19,64	18,70
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	NO	NO	NO	NO	NO	NO	NO
G. Other	NA	NA	NA	NA	NA	NA	NA
5. Land Use, Land-Use Change and Forestry	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**
A. Forest Land	0,00	0,00	0,00	0,00	0,00	0,00	0,00
B. Cropland	NA,NE	NA,NE	NA,NE	NA,NE	NA,NE	NA,NE	NA,NE
C. Grassland	NE	NE	NE	NE	NE	NE	NE
D. Wetlands	NE	NE	NE	NE	NE	NE	NE
E. Settlements	NE	NE	NE	NE	NE	NE	NE
F. Other Land	NE	NE	NE	NE	NE	NE	NE
G. Other	NE	NE	NE	NE	NE	NE	NE
6. Waste	**1,56**	**1,56**	**1,58**	**1,58**	**1,57**	**1,56**	**1,59**
A. Solid Waste Disposal on Land							
B. Waste-water Handling	1,55	1,55	1,45	1,44	1,44	1,45	1,47
C. Waste Incineration	IE	IE	IE	IE	IE	IE	IE
D. Other	0,00	0,00	0,14	0,15	0,13	0,11	0,11
7. Other *(as specified in Summary 1.A)*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
Total N_2O emissions including N_2O from LULUCF	**64,47**	**64,47**	**64,13**	**56,13**	**49,82**	**29,70**	**29,37**
Total N_2O emissions excluding N_2O from LULUCF	**64,47**	**64,47**	**64,13**	**56,13**	**49,81**	**29,70**	**29,37**
Memo Items:							
International Bunkers	**0,31**	**0,31**	**0,34**	**0,41**	**0,51**	**0,42**	**0,46**
Aviation	0,04	0,04	0,06	0,08	0,09	0,09	0,09
Marine	0,27	0,27	0,28	0,33	0,42	0,34	0,38
Multilateral Operations	IE	IE	IE	IE	IE	IE	IE
CO_2 Emissions from Biomass							

Table 1.3 Emission trends N_20 (in Gg)

GREENHOUSE GAS SOURCE AND SINK CATEGORIES (F-gasses)	Base year[1)]	1990	1995	2000	2005	2010	2011
	(Gg)	(Gg)	(Gg)	(Gg)	(Gg)	(Gg)	(Gg)
Emissions of HFCs - (Gg CO_2 equivalent)	**6.018,69**	**4.432,03**	**6.018,69**	**3.891,67**	**1.512,48**	**2.259,88**	**2.132,84**
HFC-23	0,49	0,38	0,49	0,21	0,02	0,03	0,01
HFC-32	0,00	NO	0,00	0,01	0,02	0,03	0,02
HFC-41	IE,NO	NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO
HFC-43-10mee	IE,NO	NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO
HFC-125	0,00	NO	0,00	0,06	0,09	0,14	0,13
HFC-134	IE,NO	NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO
HFC-134a	0,04	NO	0,04	0,16	0,34	0,41	0,41
HFC-152a	0,02	NO	0,02	0,02	0,00	0,00	0,00
HFC-143	IE,NO	NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO
HFC-143a	0,00	NO	0,00	0,08	0,08	0,12	0,12
HFC-227ea	IE,NO	NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO
HFC-236fa	IE,NO	NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO
HFC-245ca	IE,NO	NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO
Unspecified mix of listed HFCs - (Gg CO_2 equivalent)	187,14	NO	187,14	780,76	299,76	470,43	602,41
Emissions of PFCs - (Gg CO_2 equivalent)	**1.937,82**	**2.264,48**	**1.937,82**	**1.580,60**	**265,34**	**208,86**	**182,85**
CF_4	0,24	0,28	0,24	0,16	0,01	0,01	0,01
C_2F_6	0,04	0,05	0,04	0,04	0,00	0,00	0,00
C_3F_8	NO	NO	NO	NO	NO	NA,NO	NA,NO
C_4F_{10}	NO	NO	NO	NO	NO	NA,NO	NA,NO
c-C_4F_8	NO	NA,NO	NO	NO	NO	NA,NO	NA,NO
C_5F_{12}	NO	NO	NO	NO	NO	NA,NO	NA,NO
C_6F_{14}	NO	NO	NO	NO	NO	NA,NO	NA,NO
Unspecified mix of listed PFCs - (Gg CO_2 equivalent)	37,03	18,26	37,03	193,35	178,19	151,16	100,67
Emissions of SF6 - (Gg CO_2 equivalent)	**286,78**	**218,28**	**286,78**	**295,33**	**240,00**	**184,10**	**146,63**
SF_6	0,01	0,01	0,01	0,01	0,01	0,01	0,01

Table 1.4 Emission trends F gasses (in Gg) [1)] Base year for F gasses is 1995

GREENHOUSE GAS EMISSIONS	Base year[1)]	1990	1995	2000	2005	2010	2011
CO_2 emissions including net CO_2 from LULUCF	162.234,95	162.234,95	173.588,26	172.845,45	178.926,81	184.372,18	170.815,16
CO_2 emissions excluding net CO_2 from LULUCF	159.235,89	159.235,89	170.738,03	169.920,85	175.913,27	181.380,41	167.550,04
CH_4 emissions including CH_4 from LULUCF	25.712,96	25.712,96	24.334,10	19.918,85	16.101,28	15.936,83	15.262,25
CH_4 emissions excluding CH_4 from LULUCF	25.712,42	25.712,42	24.333,53	19.918,23	16.100,60	15.936,10	15.261,51
N_2O emissions including N_2O from LULUCF	19.986,29	19.986,29	19.880,66	17.399,05	15.442,67	9.207,58	9.105,36
N_2O emissions excluding N_2O from LULUCF	19.986,24	19.986,24	19.880,61	17.398,99	15.442,61	9.207,51	9.105,29
HFCs	6.018,69	4.432,03	6.018,69	3.891,67	1.512,48	2.259,88	2.132,84
PFCs	1.937,82	2.264,48	1.937,82	1.580,60	265,34	208,86	182,85
SF_6	286,78	218,28	286,78	295,33	240,00	184,10	146,63
Total (including LULUCF)	**216.177,49**	**214.848,99**	**226.046,30**	**215.930,95**	**212.488,59**	**212.169,43**	**197.645,09**
Total (excluding LULUCF)	**213.177,82**	**211.849,32**	**223.195,45**	**213.005,67**	**209.474,30**	**209.176,86**	**194.379,16**

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year[1)]	1990	1995	2000	2005	2010	2011
1. Energy	153.773,92	153.773,92	165.663,58	164.698,77	171.002,40	177.856,01	163.872,14
2. Industrial Processes	23.520,99	22.192,49	23.566,18	20.261,49	15.752,68	10.409,25	10.444,88
3. Solvent and Other Product Use	541,19	541,19	439,85	306,94	212,99	181,19	154,50
4. Agriculture	22.557,40	22.557,40	22.220,10	18.849,29	16.951,38	16.638,47	16.028,63
5. Land Use, Land-Use Change and Forestry	2.999,67	2.999,67	2.850,85	2.925,28	3.014,29	2.992,57	3.265,93
6. Waste	12.784,32	12.784,32	11.305,74	8.889,18	5.554,85	4.091,93	3.879,01
7. Other	NA	NA	NA	NA	NA	NA	NA
Total (including LULUCF)[(5)]	**216.177,49**	**214.848,99**	**226.046,30**	**215.930,95**	**212.488,59**	**212.169,43**	**197.645,09**

Table 1.5 Emission trends (Summary) (in $C0_2$ equivalents) [1)] Base year for F gasses is 1995

ANNEX II SUMMARY OF REPORTING OF THE SUPPLEMENTARY INFORMATION UNDER ARTICLE 7, PARAGRAPH 2, OF THE KYOTO PROTOCOL IN THE NC6

Information reported under Article 7, paragraph 2	**NC6 section**
National systems in accordance with Article 5, paragraph 1	3.3. (C) Description of the National System
National registries	3.4. (D) National Registry
Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17	5.4. (C) Supplementarity relating to the mechanisms pursuant to Articles 6, 12 and 17
Policies and measures in accordance with Article 2	4.4. (C) Policies and measures and their effects
Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures	4.3. (B) Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures
Information under Article 10	
Art 10a	3.3. (C) Description of the National System
Art 10b	4.3. (B) Domestic and regional programmes and/or legislative arrangements and enforcement and administrative procedures and 6.3 (C) Adaptation measures
Art 10c	7.4. (D) Activities relating to technology transfer
Art 10d	8. Research and Systematic Observation and Annex 8.3. (C) Systematic observations
Art 10e	9. Education, Training and Public Awareness
Financial resources (Annex II only)	7.1. (A) Provision of new and additional resources 7.2. (B) Assistance to developing countries that are particularly vulnerable to climate change 7.3. (C) Provision of financial resources under article 11 of the Kyoto Protocol

ANNEX CHAPTER 5

Table 5.1.Key variables projections

	Units	Historic values			projected with current policy				projected with current and planned policy			
		2000	2005	2010	2015	2020	2025	2030	2015	2020	2025	2030
General economic parameters												
1a. Gross Domestic Product	Millions of Euro2000	417960	446282	480470	507974	560965	600799	646185	507974	560965	600799	646185
1b. Gross domestic product growth rate	%	3,9%	2,0%	1,6%	1,8%	2,1%	1,4%	1,5%	1,8%	2,1%	1,4%	1,5%
2a. Population	x1000	15.864	16.306	16.575	16.941	17.229	17.488	17.688	16.941	17.229	17.488	17.688
2b. Population growth rate and base year value	%	0,8%	0,2%	0,5%	0,2%	0,3%	0,2%	0,2%	0,2%	0,3%	0,2%	0,2%
3. International coal import prices	Euro2000/GJ	2,39	2,10	2,22	2,48	2,59	2,68	2,75	2,48	2,59	2,68	2,75
4. International oil import prices	Euro2000/GJ	5,30	6,75	8,60	11,24	12,49	13,46	14,23	11,24	12,49	13,46	14,23
5. International gas import prices	Euro2000/GJ	3,67	4,07	4,74	6,49	7,09	7,67	8,12	6,49	7,09	7,67	8,12
Carbon price	Euro2010/ton	0	12,25	15,92	10,13	12,00	24,00	36,00	10,13	12,00	24,00	36,00
Energy sector												
6. Total gross inland consumption	PJ	2640,4	2690,9	2682,6	2702,6	2722,5	2641,2	2597,3	2669,8	2656,9	2529,2	2447,6
6a. - Liquid Fuels (fossil)	PJ	718,7	750,1	734,5	768,7	802,9	784,2	774,0	763,1	791,7	755,8	725,7
6b. - Solid Fuels (fossil)	PJ	254,6	257,6	243,5	345,1	446,7	381,7	347,0	298,5	353,5	316,9	298,6
6c. - Gaseous Fuels	PJ	1509,3	1496,2	1545,1	1409,2	1273,4	1273,6	1242,4	1403,1	1261,2	1207,4	1156,5
6d. - Biomass	PJ	49,2	79,9	111,1	123,8	136,5	167,5	194,9	156,8	202,4	221	233,9
6e. - Nuclear (IEA definition for energy calc.)	PJ	40,5	41,3	38,4	40,5	42,5	42,5	42,5	40,5	42,5	42,5	42,5
6f. Net electricity import (-+)	PJ	68,1	65,9	10,0	15,2	20,5	-8,3	-3,4	7,8	5,7	-14,4	-9,6
Total gross electricity generation by fuel type	GWhe	91639	104000	112944	118569	124194	129667	129556	119139	125333	128389	128250
7. - Liquid Fuels (fossil)	GWhe	4778	3361	3639	3388,9	3139	3278	3167	3305,6	2972	3389	3250
8. - Solid Fuels (fossil)	GWhe	24083	25972	23722	33416,7	43111	35111	30472	28000,0	32278	27472	24583
9. – Gaseous Fuels	GWhe	55222	62694	69972	61250,0	52528	60222	58917	60666,7	51361	54028	52250
10. – Renewable	GWhe	2819	7208	10236	15076,4	19917	25486	31333	21729,2	33222	37931	42500
11. Nuclear (IEA definition for energy calc.)	GWhe	3722	3722	4028	4027,8	4028	4028	4028	4027,8	4028	4028	4028
12. - Other	GWhe	1014	1042	1347	1409,7	1472	1542	1639	1409,7	1472	1542	1639
Energy demand by sector	PJ	3021,7	3110,8	3045,8	3072,9	3100,0	3074,1	3036,8	3052,4	3059,0	2998,2	2942,0
13. Energy Industries	PJ	920,5	1005,8	992,0	990,9	989,9	948,7	892,0	976,3	960,6	890,1	828,2
13a. Liquid Fuels (fossil)	PJ	189,7	184,3	117,3	141,0	164,7	154,7	144,3	140,2	163,1	148,2	130,9
13b. Solid Fuels (fossil)	PJ	244,2	246,9	233,7	314,9	396,1	326,2	293,9	268,4	303	261,3	245,6
13c. Gaseous Fuels	PJ	440,1	499,6	562,2	459,0	355,8	374,8	343,7	458,3	354,4	331,7	298,6
13d. Renewables	PJ	6,0	33,7	40,4	35,6	30,8	50,5	67,6	69,0	97,6	106,4	110,6
13e. Nuclear (IEA definition for energy calc.)	PJ	40,5	41,3	38,4	40,5	42,5	42,5	42,5	40,5	42,5	42,5	42,5
14. Industry	PJ	718,5	726,9	652,9	703,0	753,1	761,1	769,2	702,4	752,0	761,3	769,3
14a. Liquid Fuels (fossil)	PJ	100,0	110,5	129,2	149,9	170,5	158,0	156,4	150,1	171,0	163,4	158,7
14b. Solid Fuels (fossil)	PJ	83,2	94,6	84,0	116,8	149,7	163,3	167,6	116,7	149,5	163,5	167,6

	Units	Historic values			projected with current policy				projected with current and planned policy			
		2000	2005	2010	2015	2020	2025	2030	2015	2020	2025	2030
14c. Gaseous Fuels	PJ	315,2	281,0	241,3	232,5	223,8	217,2	211,9	231,2	221,1	211,7	207,1
14d. Renewables	PJ	0,6	0,9	2,6	11,6	20,6	41,5	54,4	11,6	20,6	41,5	54,4
14e. Electricity	PJ	124,1	128,6	124,0	128,4	132,7	124,1	121,2	129,3	134,5	125,7	124,5
14f. Heat (from CHP)	PJ	95,4	111,3	71,9	63,9	55,8	57,0	57,7	63,7	55,4	55,5	57,0
15. Commercial (Tertiary)	PJ	487,2	477,1	491,3	513,8	536,3	544,5	555,1	513,5	535,8	551,9	564,3
15a. Liquid Fuels (fossil)	PJ	46,1	39,2	32,5	39,9	47,2	48,5	49,8	39,9	47,2	48,5	49,8
15b. Solid Fuels (fossil)	PJ	1,0	0,3	0,1	0,3	0,5	0,5	0,5	0,3	0,5	0,4	0,4
15c. Gaseous Fuels	PJ	295,7	300,0	334,4	328,0	321,6	310,1	312,9	324,5	314,7	296,3	283,4
15d. Renewables	PJ	6,4	6,7	15,1	26,8	38,4	55,4	67,8	30,8	46,5	73,0	93,6
15e. Electricity	PJ	107,6	113,0	95,1	97,6	100,1	90,1	88,6	92,8	90,5	78,5	75,1
15f. Heat	PJ	30,5	17,9	14,1	21,3	28,4	40,0	35,5	25,3	36,5	55,1	62,0
16. Residential	PJ	445,3	421,2	418,5	393,9	369,3	366,5	365,3	393,3	368,0	367,0	367,0
16a. Liquid Fuels (fossil)	PJ	3,6	3,8	4,4	3,5	2,6	2,5	2,3	3,5	2,6	2,5	2,3
16b. Solid Fuels (fossil)	PJ	0,2	0,2	0,2	0,1	0,0	0,0	0,0	0,1	0,0	0,0	0,0
16c. Gaseous Fuels	PJ	355,8	320,4	312,6	284,6	256,7	249,4	244,6	284,2	255,7	246,3	239,5
16d. Renewables	PJ	0,3	1,0	1,7	4,2	6,6	9,4	12,3	4,7	7,6	13,0	18,4
16e. Electricity	PJ	78,5	87,2	88,9	90,1	91,3	92,4	92,7	89,1	89,4	90,6	90,4
16f. Heat	PJ	6,8	8,6	10,7	11,4	12,1	12,9	13,4	11,7	12,7	14,7	16,4
17. Transport	PJ	450,2	479,7	491,2	471,3	451,4	453,3	455,2	466,9	442,6	427,9	413,2
17a. Gasoline	PJ	177,7	180,6	184,0	167,0	149,9	142,2	134,4	164,6	145,2	128,9	112,5
of which biofuels	PJ	0	0	5,6	9,8	13,9	13,2	12,5	9,6	13,5	12,0	10,5
17b. Diesel	PJ	241,0	277,0	282,6	269,2	255,7	258,4	261,0	266,8	251,0	245,6	240,1
of which biofuels	PJ	0	0	3,96	13,4	22,8	23,0	23,2	13,2	22,4	21,8	21,3
17c. Jet Kerosene	PJ				0,0				0,0			
17d. Other liquid fuels	PJ	25,7	16,3	13,9	10,6	7,4	6,6	5,9	10,5	7,0	5,8	4,5
17e. Gas (fossil)	PJ	0,0	0,0	0,5	3,1	5,8	7,5	9,3	3,1	5,6	6,8	7,9
17f. Electricity	PJ	5,9	5,8	6,2	8,0	9,8	15,6	21,4	8,8	11,3	19,1	26,9
17g. Renewables	PJ	0,0	0,0	4,0	13,4	22,8	23,0	23,2	13,2	22,4	21,8	21,3
Weather parameters												
18a. Heating Degree Days	Annual HDD	2928	2861	2797	2762	2727	2661	2595	2762	2727	2661	2595
18b. Cooling Degree Days	Annual CDD	86	95	99	104	109	120	130	104	109	120	130
Industry sector (for industrial sectors contributing significantly to the national total for the base or target year)												
19. Gross value-added total industry, Bio Euro (EC95) 2000	billions of Euro2000			52,9	58,5	64,7	68,2	72,1	58,5	64,7	68,2	72,1
22a. Chemical industry	production index			100	111,9	126,0	132,0	138,6	111,9	126,0	132,0	138,6
22b. Refineries	production index			100	105,9	113,4	112,4	111,4	105,9	113,4	112,4	111,4
22c. Printing industry	production index			100	104,9	116,6	124,2	132,5	104,9	116,6	124,2	132,5
22d. Food and drink	production index			100	104,5	111,1	116,5	122,4	104,5	111,1	116,5	122,4
22e. Wood processing	production index			100	109,6	115,1	115,9	117,0	109,6	115,1	115,9	117,0
22f. Rubber and plastic	production index			100	111,0	122,4	124,9	127,7	111,0	122,4	124,9	127,7
22g. Basic metals	production index			100	104,5	110,6	114,4	120,4	104,5	110,6	114,4	120,4
22h. Pulp and paper	production index			100	112,5	130,6	139,5	149,4	112,5	130,6	139,5	149,4
22i. Building materials	production index			100	111,6	118,1	120,4	123,4	111,6	118,1	120,4	123,4

	Units	Historic values			projected with current policy				projected with current and planned policy			
		2000	2005	2010	2015	2020	2025	2030	2015	2020	2025	2030
22j. Metal products	production index			100	110,8	119,8	123,6	127,7	110,8	119,8	123,6	127,7
22k. Other production	production index			100	108,7	120,4	126,9	134,7	108,7	120,4	126,9	134,7
24a. Growth of Passenger person kilometres (all transport modes in absolute figures)	billion passenger km	180,7	188,2	191,2	196,7	206,1	208,8	211,6	196,7	207,35	211,90	216,46
24b. Total kilometres by passenger cars, Mpkm	billion vehicle km	91,2	96,9	101,3	105,1	110,7	113,4	116,1	105,1	111,9	116,4	120,9
25a. The growth of freight tonne kilometres (all transport modes in absolute figures)	million tonne km	94,8	103,9	96,1	107,5	119,0	126,8	134,7	107,5	119,0	126,8	134,7
25b. Road freight transport, Mtkm	million tonne km	48,9	54,9	50,0	55,1	60,2	64,0	67,7	55,1	60,2	64,0	67,7
Built environment (in residential and commercial or tertiary sector)												
26. Gross value-added — services, Bio Euro (EC95)	Value (EUR billion)			320	336	376	405	439	336	376	405	439
29. Average floor space per dwelling	m2 / dwelling	106	107	107	107	107	107	107	107	107	107	107
30. Average Floor space per employee	m2/FTE		133	132	133	134	136	138	133	134	136	138
31a. The number of dwellings	1000 dwellings	6.590	6.859	7.172	7.426	7.680	7.925	8.099	7.426	7.680	7.925	8.099
31b. Number of employees in the tertiary sector	1000 FTE		3481	3770	3852	4050	4064	4086	3852	4050	4064	4086
Agriculture sector												
33. Total Cattle	1000 heads	4070	3799	3976	3844	3711	0	3599	3843,5	3711	0	3599
33a. Dairy cattle	1000 heads	1504	1433	1479	1477	1475		1418	1477	1475		1418
33b. Non-dairy cattle	1000 heads	2566	2366	2497	2367	2236		2181	2367	2236		2181
34. sheep	1000 heads	1308	1363	1130	1130	1130		1117	1130	1130		1117
35. swine	1000 heads	13118	11312	12255	11264	10273		9423	11264	10273		9423
36. poultry	1000 heads	53078	48418	56500	57800	59099		61610	57800	59099		61610
37a. broilers	1000 heads	53439	46772	46871	47125	47378		48231	47125	47378		48231
37b. rabbit and mink	1000 heads	641	745	1001	1001	1001		911	1001	1001		911
37c. horses (including non-agriculture hores)	1000 heads	418	433	441	441	441		445	441	441		445
37d. goat	1000 heads	179	292	353	353	353		374	353	353		374
38a. grassland	Hectares	1161219		1161219	1161219	1161219		1161219	1161219	1161219		1161219
38b. arable land	Hectares	932943		932943	932943	932943		932943	932943	932943		932943
39. Fertilizer used (synthetic & manure)	kt Nitrogen	647,2	541,5	512,9	501	488,9		497,6	501	488,9		497,6
40. enteric fermentation - dairy cattle	t CO2-equivalent / 1000 heads	2520,5	2653,3	2702,0	2779	2856,2		3003,0	2779	2856,2		3003,0
41. enteric fermentation - non-dairy cattle	t CO2-equivalent / 1000 heads	771,4	757,8	738,4	730	721,2		700,2	730	721,2		700,2
42. enteric fermentation - sheep	t CO2-equivalent / 1000 heads	167,9	167,9	167,9	168	167,9		169,9	168	167,9		169,9
43. manure management - dairy cattle	t CO2-equivalent / 1000 heads	704,7	797,0	894,0	905	917,0		831,7	905	917,0		831,7

	Units	Historic values			projected with current policy				projected with current and planned policy			
		2000	2005	2010	2015	2020	2025	2030	2015	2020	2025	2030
44. manure management - non-dairy cattle	t CO2-equivalent / 1000 heads	147,6	136,5	157,2	150	142,6		146,2	150	142,6		146,2
45. manure management - sheep	t CO2-equivalent / 1000 heads	4,2	3,8	3,4	3,4	3,4		3,3	3,4	3,4		3,3
46. manure management - swine	t CO2-equivalent / 1000 heads	98,1	95,7	86,8	83	80,2		87,4	83	80,2		87,4
47. manure management - poultry	t CO2-equivalent / 1000 heads	2,1	0,9	0,5	0,5	0,4		0,4	0,5	0,4		0,4
48. fertilizer use & crops												
48a. synthetic	kg N2O-N/kg N	0,013	0,013	0,013	0,013	0,013		0,013	0,013	0,013		0,013
48b. manure	kg N2O-N/kg N	0,00870	0,00868	0,00867	0,00867	0,00867		0,00867	0,00867	0,00867		0,00867
Waste sector												
49. Municipal solid waste generation	kt	13,5		10,3	10,5	11,0			10,5	11,0		
50. The organic fraction (DOC) of municipal solid waste	%	36%		43%	43%	44%			43%	44%		
51. Municipal solid waste disposed to landfills	%	51%		26%	25%	23%			25%	23%		
52. Municipal solid waste disposed incinerated	%	37%		61%	63%	65%			63%	65%		
53. Municipal solid waste disposed composted	%	12%		13%	12%	12%			12%	12%		
54. Municipal solid waste disposed to landfills	kt	6,95	0	2,7	2,6	2,5	0	0	2,6	2,5	0	0

Table 5.2 Climate and energy policy

		Reference Projection energy and emissions 2010-2020			Updated reference Projection 2012	
Sector	**Measure**	**Reference (not Clean & Efficient)**	**Current policy (V)**	**Including planned policy (VV)**	**Current policy**	**Current + planned policy**
General	MIA (Environment Investment Rebate) / Vamil (Arbitrary depreciation of environmental investments)	X	X (adjustment)		X	
General	Energy Investment Allowance (EIA)	X	X (higher budget)	X (higher budget)	X	
General	Local Climate Agenda		Supportive		X	
General	Incentives policy on local Climate initiatives (SLOK)		Supportive		X	
General	Heating Expertise Centre (NEW)		Supportive		X	
General	Innovations Agenda		Supportive		Ceased	
General	European CO_2-Emission Trading Scheme (EU-ETS)	X	X		X	
General	Energy tax		X		X	
General	Green Deals				X	X
Transport	Decree on biofuels in road transport		X		Ceased	
Transport	Regulations on Renewable Energy in Transport (successor to Decree on biofuels in road transport)				X	
Transport	Renewable Energy Directive (RED)			X	X	
Transport	Adjusted Fuel Quality Directive (98/70/EC)		X		X	
Transport	Innovative bio-fuels tender scheme		X		Ceased	

		Reference Projection energy and emissions 2010-2020			Updated reference Projection 2012	
Sector	**Measure**	**Reference (not Clean & Efficient)**	**Current policy (V)**	**Including planned policy (VV)**	**Current policy**	**Current + planned policy**
Transport	Subsidy Programme for Petrol stations with Alternative Fuels		X		X	
Transport	Market introduction Driving on Natural Gas		X		Ceased	
Transport	Fiscal greening (conform Tax Plan 2008 en 2009)		X		X	
Transport	Fiscal greening (conform Tax Plan 2010)			X	X	
Transport	Fiscal greening (conform Tax Plan 2011)				X	
Transport	Fiscal greening (conform Tax Plan 2012, including elaboration of 'AutoBrief')				X	
Transport	Kilometre pricing			X	Ceased	
Transport	EU-norm CO_2-emissions of new passenger vehicles		X (130 g/km in 2015)	X (95 g/km in 2020)	X (130 g/km in 2015)	X (95 g/km in 2020)
Transport	Car tyre low rolling resistance scheme (EC/661/2009)		X	X (labelling)	X	
Transport	EU-norm CO_2-emissions new delivery vans			X	X (175 g/km in 2017	X (147 g/km in 2020)
Transport	Renewable purchasing policy		X		X	
Transport	Testing grounds ("proeftuinen") for renewable mobility (electric cars)		X		X	
Transport	Testing grounds ("proeftuinen") for renewable mobility (hydrogen etc.)			X	X	
Transport	Renewable logistics programme		X		X	
Transport	Innovative busses tender scheme		X		Ceased	

		Reference Projection energy and emissions 2010-2020			Updated reference Projection 2012	
Sector	**Measure**	**Reference (not Clean & Efficient)**	**Current policy (V)**	**Including planned policy (VV)**	**Current policy**	**Current + planned policy**
Transport	Dutch national ecodriving programme 'Het Nieuwe Rijden' (phases 1 to 3)	X				
Transport	Dutch national ecodriving programme 'Het Nieuwe Rijden' (phase 4)		X		Ceased	
Transport	Efficient Navigation (voortvarend besparen)		X		Ceased	
Transport	Encouraging the use of bicycles			X	Ceased	Ceased
Transport	Smart working smart travelling platform		X		X	
Transport	Long Term Agreement on energy efficiency by Dutch Railways (NS)		X	X (continued)	X	
Transport	Sector agreement on mobility, logistics and infrastructure: Sustainability on the Move				X	
Transport	Increase maximum speed on Dutch highways from 120 km/h to 130 km/h					X
Transport	EEDI/SEEMP sea-going vessels				X	
Transport	Smart Travel budget					X
Industry	Long term agreement on energy-efficiency ETS-businesses (MEE)		X	X	X	
Industry	Benchmarking Covenant	X				
Industry	Long term agreements (MJA) on energy efficiency	X (MJA2)	X (MJA3)		X (MJA3)-	
Industry	Opt in N_2O nitric acid industry in ETS		X		X	

		Reference Projection energy and emissions 2010-2020			Updated reference Projection 2012	
Sector	**Measure**	**Reference (not Clean & Efficient)**	**Current policy (V)**	**Including planned policy (VV)**	**Current policy**	**Current + planned policy**
Energy	Eco Design Directive		X	X (expanding scope)	X	X
Energy	Energy labelling		X		X	X (expansion)
Energy	Coal covenant (Kolen convenant)	X				
Energy	MEP (Environmental Quality of Electricity Production)	X				
Energy	Stimulation of Sustainable Energy Production (SDE)		X	X (reforming funding)		
Energy	Stimulation of Sustainable Energy Production + (SDE+)				X	
Energy	Congestion management			X		X
Energy	Carbon Capture and Storage (CCS)		X (small-scale demo's)	X (large-scale demos)	X (demos by Buggenum, K12, forerunner ROAD)	X (demos ROAD, Pegasus, Air Liquide)
Energy	Heating infrastructure subsidy (CHP)			X		
Energy	Safety net scheme CHP (vangnet regeling WKK)			X		
Agriculture and horticulture	Covenant (i.e., Innovation and Action programme) Clean and Efficient Agricultural sectors		X		X	
Agriculture and horticulture	Innovation contracts					X
Greenhouse horticulture	Glasshouse Horticulture and Environmental Covenant	X			Ceased	

		Reference Projection energy and emissions 2010-2020			Updated reference Projection 2012	
Sector	**Measure**	**Reference (not Clean & Efficient)**	**Current policy (V)**	**Including planned policy (VV)**	**Current policy**	**Current + planned policy**
	(GLAMI),					
Greenhouse horticulture	Continuation of agreements Greenhouse as a Source of Energy		X		X	
Greenhouse horticulture	Proof-of-principle (part of agreements on Greenhouse as a Source of Energy)				X	
Greenhouse horticulture	Market introductions of energy innovations scheme (MEI)		X (budget to 2020)			X
Greenhouse horticulture	Investments in energy efficiency scheme (IRE)		X			X
Greenhouse horticulture	Energy networks scheme			X		
Greenhouse horticulture	Geothermal energy guarantee facility			X (to 2020)	X	X (optimisation)
Greenhouse horticulture	Internal CO_2 equalisation system for Greenhouse cultivation (CO2 kosten vereveningssysteem)			X		X
Agriculture and horticulture	Annual small sector work programmes		X		X	
Agriculture and horticulture	Demonstration projects Clean and Efficient		X		X	
Agriculture and horticulture	Innovation programme Collaborating on Innovation (including New Challenges)				X	
Agriculture and horticulture	Precision agriculture innovation programme				X	
Agriculture and horticulture	Low-Emissions animal feed innovation programme				X	

		Reference Projection energy and emissions 2010-2020			Updated reference Projection 2012	
Sector	**Measure**	**Reference (not Clean & Efficient)**	**Current policy (V)**	**Including planned policy (VV)**	**Current policy**	**Current + planned policy**
Agriculture and horticulture	Bio-based Economy innovation programme		X		X (Innovation contract Bio-based Economy)	
Agriculture and horticulture	Small Business Innovation Research programme (SBIR)	X (once-only tender)	X		X	
Agriculture and horticulture	Farmers and climate programme (boerenklimaat.nl)				X	
Agriculture and horticulture	Unique Chances Programme (UKP)		X		Ceased	
Agriculture and horticulture	Networks in practice subsidy scheme				X	
Agriculture and horticulture	Environmentally friendly measures subsidy scheme				X	
Built environment	Energy Performance Standard (EPN) and the Spring Agreement	X	X (stricter enforcement of rules)	X (increased stricter enforcement of rules)	X (EPC from 0.6 for homes)	X (further tightening up, to 0.4 in 2015) X (tightening up utility building 50% in 2015)
Built	Exemplary role of the			X	X	

		Reference Projection energy and emissions 2010-2020			Updated reference Projection 2012	
Sector	**Measure**	**Reference (not Clean & Efficient)**	**Current policy (V)**	**Including planned policy (VV)**	**Current policy**	**Current + planned policy**
environment	Government Buildings Agency (RGD)					
Built environment	More with Less Agreement		X	X	X (no more u-building)	
Built environment	Crisis subsidy package on Energy efficiency		X (only education)	X (expanding to include health care and care liaison offices)	Ceased	
Built environment	Customised advice subsidy (maatwerkadvies)		Supportive		Ceased	
Built environment	More with Less Encouragement Premium		Supportive		Ceased	
Built environment	Green projects scheme		Supportive		X	
Built environment	Energy efficiency credit guarantee		Supportive		Ceased	
Built environment	VAT reduction on insulation		X		X	
Built environment	HR++ glass subsidy		X		Ceased	
Built environment	Renewable heating subsidy scheme		X		Ceased	
Built environment	Agreement with housing associations		X		X	
Built environment	Adjustment in Home Evaluation system			X	X	
Built environment	Enforcing the Environmental Management Act				X	
Built environment	Block-by-block approach				X	

Table 5.3 Air policy

		Reference Projection 2010			Actualisation Reference Projection 2012	
Scale	**Measure**	**Reference (not Clean & Efficient)**	**Current policy (V)**	**Including planned policy (VV)**	**Current policy**	**Including planned policy**
Global	IMO requirements from 2008 for sea-going vessels		X		X	
European policy	Euro-norms for passenger cars and delivery vans up to and incl. Euro-6		X		X	
	Euro-norms for heavy duty vehicles up to and incl. Euro-VI		X		X	
	Revised fuel quality directive for inland shipping and Mobile equipment		X		X	
Dutch policy	Encouraging soot-filters new diesel-fuelled vehicles		X		Ceased	
	Retrofit subsidy scheme for light and heavy duty vehicles (soot-filters, SRP and SRV)		X		Ceased	
	Soot-filters for new taxis and delivery vans subsidy scheme (STB)		X		Ceased	
	Encouraging clean local transport such as busses and waste collection trucks		X		Ceased	
	Encouraging the sale of Euro IV/V heavy duty vehicles 2005-2009		X		Ceased	
	Differentiation diesel tax according to sulphuric content		X		Ceased	

		Reference Projection 2010			Actualisation Reference Projection 2012	
Scale	**Measure**	**Reference (not Clean & Efficient)**	**Current policy (V)**	**Including planned policy (VV)**	**Current policy**	**Including planned policy**
	Limiting BPM (tax on passenger cars and motorbikes)		X		X	
	Limiting MRB (vehicle road tax) advantage due to commercial registration number		X		X	
	Increasing diesel tax by 3 eurocents per litre in 2008		X		X	
	Agreement limiting fine dust emissions of light duty vehicles		X		Ceased	
	Fiscal benefit of soot-filters diesel-fuelled passenger cars rounded off		X		Ceased	
	Encouraging Euro-6 passenger cars as of Jan 2011 (Tax Plan 2010)		X		X	
	Subsidising diesel engines for inland shipping (VERS)		X		Ceased	
	NO_x and SO_2 emissions control areas in the North Sea[1)]				X (SO_2)	X (NO_x)
	Soot filters for Mobile Equipment subsidy scheme (SRMW)		X		Ceased	
	Encouraging Euro-VI trucks and busses		X		X	
	Encouraging Euro-VI delivery vans and taxis					X
	Dry-dock electricity Schiphol		X		X	
	Flexibilising NRMM				X	

		Reference Projection 2010			Actualisation Reference Projection 2012	
Scale	**Measure**	**Reference (not Clean & Efficient)**	**Current policy (V)**	**Including planned policy (VV)**	**Current policy**	**Including planned policy**
	Directive					
	Application of fixed electricity connection and pre-conditioned air provision at Schiphol as of 2010		X		X	
	Limiting Schiphol's growth (implementing advice Alderstafel medium-long range)					X
	Agreements with refineries about ceiling for SO_2 (16 million kg)		X		X	X (tightening up to 14.5 million kg)
	Agreements with power production companies about ceiling for SO_2 (13.5 million kg in 2010 to 2020)		X		X	
	Fine dust target for the industry					X
	Stricter prestation standard for NO_x-emission trading from 40 to 37 g NOx/GJ in 2013		X		X	
	Abolishing NO_x-emission traiding as of 2013					X
	Stricter emissions requirements of medium to large combustion plants (BEMS) as of 1 April 2010		X	X	X	
	Air scrubbers in stables of intensive cattle breeders (general subsidy + subsidy scheme focusing on cleaning up poultry farms)		X		X[2]	
	Accommodation Resolution –		X		X	

		Reference Projection 2010			Actualisation Reference Projection 2012	
Scale	**Measure**	**Reference (not Clean & Efficient)**	**Current policy (V)**	**Including planned policy (VV)**	**Current policy**	**Including planned policy**
	low-emission stables obligatory in intensive cattle farming as of 2013					
	Imposing low-emissions – prohibition on using trailing suction dredger on sandy ground as of 2012		X			

Source: GCN (2011)

[1] Only relevant for GCN (air quality). For NEC emissions at sea are not included.

[2] Effect estimate of subsidy scheme depends on the availability of monitoring statistics on the provision of subsidies and the implementation of air purifiers.

Table 5.4 Greenhouse gases, excluding emissions from LULUCF

V=current policy, VV=current and planned policy

[Mton CO_2-equivalents]	V 2020	V 2030	VV 2020	VV 2030
Carbon dioxide				
Total	186.0 (166.4-195.5)	173.7	176.8 (156.6-187.5)	160.5
Built environment	25.9 (23.6-28.2)	24.6	25.5 (23.0-27.6)	22.6
Consumers	14.7 (13.3-15.9)	13.6	14.7 (13.3-15.8)	13.3
Commercial/tertiary sector	11.2 (9.4-13.1)	10.9	10.8 (8.8-12.7)	9.3
Industry/energy	118.4 (101.7-124.9)	108.7	110.7 (93.3-118.3)	101.2
Transport	34.5 (32.1-37.6)	34.1	33.8 (31.2-37.1)	30.8
Agriculture	7.1 (5.7-8.3)	6.3	6.9 (5.4-8.0)	5.8
Non-CO_2-greenhouse gases				
Total	25.8 (20.1-32.3)	24.0	25.8 (19.9-32.4)	24.0
Agriculture	15.8 (10.3-21.2)	15.2	15.8 (10.3-21.2)	15.2
Other sectors	10.0 (7.5-13.3)	8.8	10.0 (7.5-13.2)	8.8
Total greenhouse gases				
Total	211.8 (190.8-223.5)	197.7	202.7 (181.2-215.4)	184.5

Source: PBL and ECN

Table 5.5 Non-CO_2 greenhouse gases

V=current policy, VV= current and planned policy

[Mton CO_2-equivalents]	2010	V 2020	V 2030	VV 2020	VV 2030
Methane (CH_4)	16.8	14.0	12.3	14.0	12.3
Agriculture	9.4	9.0	8.5	9.0	8.5
Waste disposal	4.3	2.0	0.9	2.0	0.9
Energy sector	0.7	0.6	0.5	0.6	0.5
Laughing gas (N_2O)	9.4	9.3	9.3	9.3	9.3
Agriculture	7.1	6.8	6.7	6.8	6.7
Industry	1.0	1.3	1.3	1.3	1.3
HFKs	2.3	2.0	1.9	2.0	1.9
PFKs	0.2	0.3	0.3	0.3	0.3
SF_6	0.2	0.3	0.3	0.3	0.3
Total non-CO_2-greenhouse gases	28.9	25.8	24.0	25.8	24.0

Source: Emission Registration (ER) and PBL

Table 5.6 Nitrogen Oxide (NOx)

V=current policy, VV=current and planned policy

Nitrogen oxide (kilotons)	2010	V 2020	V 2030	VV 2020	VV 2030
Industry, Energy, Refineries & Waste disposal	66.5	65.8 (54.2-70.0)	64.5	59.4 (49.3-68.0)	58.2
Transport NEC	164.4	95.6 (63.7-142.2)	77.4	96.9 (65.2-142.9)	78.8
Agriculture	18.3	11.6 (10.5-12.7)	12.2	11.2 (10.1-12.2)	12.2
Consumers	12.7	5.8 (4.7-9.2)	5.1	5.7 (4.6-9.1)	5.0
Commercial/ tertiary sector and Construction	14.0	6.5 (5.4-9.1)	6.9	6.3 (5.2-8.9)	6.2
Total NEC	275.9	185.2 (144.7-237.0)	166.1	179.5 (142.1-233.9)	160.4

Source: Emission Registration (ER) and PBL

Table 5.7 Sulphur Oxides

V=current policy, VV=current and planned policy

Sulphur oxides (kilotons)	2010	V 2020	V 2030	VV 2020	VV 2030
Industry, Energy, Refineries & Waste disposal	31.9	36.7 (26.6-44.5)	33.7	33.8 (25.4-41.9)	31.7
Transport NEC	1.2	0.3 (0.3-0.4)	0.3	0.3 (0.3-0.4)	0.3
Agriculture	0.0	0.1 (0.1-0.1)	0.1	0.1 (0.1-0.1)	0.1
Consumers	0.6	0.3 (0.3-0.4)	0.3	0.3 (0.3-0.4)	0.3
Commercial/tertiary sector and Construction	0.1	0.0 (0.0-0.0)	0.0	0.0 (0.0-0.0)	0.0
Total NEC	33.9	37.4 (27.3-45.3)	34.4	34.5 (26.0-42.7)	32.4

Source: Emission Registration (ER) and PBL

Table 5.8 Ammonia

V=current policy, VV=current and planned policy

Ammonia (kilotons)	**2010**	**V 2020**	**V 2030**	**VV 2020**	**VV 2030**
Industry, Energy, Refineries & Waste Disposal	2.0	2.0 (1.7-2.4)	2.1	2.0 (1.7-2.4)	2.1
Transport NEC	2.5	2.5 (0.6-6.7)	2.4	2.5 (0.7-6.8)	2.4
Agriculture	105.2	92.4 (61.1-126.7)	92.7	92.4 (61.2-127.0)	92.7
Consumers	9.0	9.3 (6.6-12.1)	9.6	9.3 (6.6-12.1)	9.6
Commercial/tertiary sector and Construction	3.1	3.1 (2.2-4.0)	3.1	3.1 (2.2-4.0)	3.1
Total NEC	121.8	109.4 (76.8-147.4)	109.9	109.4 (77.3-147.4)	109.9

Source: Emission Registration (ER) and PBL

Table 5.9 Non-methane volatile organic substances

V=current policy, VV=current and planned policy

Non-methane volatile organic substances (kilotons)	**2010**	**V 2020**	**V 2030**	**VV 2020**	**VV 2030**
Industry, Energy, Refineries & Waste disposal	49.9	50.2 (43.0-57.4)	49.3	50.2 (43.1-57.5)	49.3
Transport NEC	37.9	27.5 (19.1-36.0)	25.5	27.5 (19.3-35.9)	25.5
Agriculture	2.0	2.0 (2.0-2.0)	2.0	2.0 (2.0-2.0)	2.0
Consumers	32.6	37.2 (34.5-40.1)	45.6	37.2 (34.5-40.1)	45.6
Commercial/tertiary sector and Construction	28.2	32.3 (30.6-34.2)	35.7	32.3 (30.6-34.2)	35.7
Total NEC	150.6	149.1 (136.4-162.4)	158.0	149.1 (136.5-162.4)	158.0

Source: Emission Registration (ER) and PBL

Table 5.10 Fine dust (PM10)

V=current policy, VV=current and planned policy

Fine dust (PM_{10}) (kilotons)	**2010**	**V 2020**	**V 2030**	**VV 2020**	**VV 2030**
Industry, Energy, Refineries & Waste disposal	8,5	8.6 (6.8-10.4)	8.5	8.5 (6.8-10.3)	8.5
Transport NEC	9.2	5.9 (3.2-10.4)	5.6	5.9 (3.3-10.3)	5.7
Agriculture	6.1	6.8 (1.5-12.2)	6.8	6.8 (1.5-12.1)	6.8
Consumers	3.1	3.1 (2.9-3.4)	3.2	3.1 (2.9-3.4)	3.2
Commercial/tertiary sector and Construction	2.2	2.6 (2.0-3.2)	2.8	2.6 (2-3.2)	2.8
Total NEC	29.1	27.0 (20.1-36.0)	26.8	26.9 (20.1-35.7)	26.9

Source: Emission Registration (ER), PBL and ECN

Table 5.11 Fine dust (PM2,5)

V=current policy, VV=current and planned policy

Fine dust ($PM_{2.5}$) (kilotons)	**2010**	**V 2020**	**V 2030**	**VV 2020**	**VV 2030**
Industry, Energy, Refineries & Waste disposal	4.0	4.1 (3.3-4.9)	3.8	4.0 (3.3-4.8)	3.8
Transport NEC	7.0	3.2 (3.2-3.2)	2.8	3.2 (3.2-3.2)	2.9.0
Agriculture	0.6	0.6 (0.3-0.9)	0.6	0.6 (0.3-0.9)	0.6
Consumers	3.1	3.1 (2.9-3.3)	3.2	3.1 (2.9-3.3)	3.2
Commercial/tertiary sector and Construction	0.6	0.7 (0.6-0.8)	0.7	0.7 (0.6-0.8)	0.7
Total NEC	15.3	11.7 (10.8-12.6)	11.1	11.7 (10.8-12.6)	11.2

Source: Emission Registration (ER), PBL and ECN

COLOFON / CREDITS

This is a publication of the Ministry of Infrastructure and the Environment (I&M)
Directorate General of the Environment

Address for visitors: Plesmanweg 1-6, The Hague
Postal Address: PO Box 20901, 2500 EX The Hague
The Netherlands

www.government.nl/ministries/ienm

Preparation:

Ministry of Infrastructure and the Environment (I&M)
Ministry of Economic Affairs (EZ)
Ministry of Foreign Affairs (BuZa)
Ministry of the Interior and Kingdom Relations (BZK)
NLAgency (AGNL)
Statistics Netherlands (CBS)
Netherlands Environmental Assessment Agency (PBL)
Royal Netherlands Meteorological Institute (KNMI)
Wageningen University and Research Centre (WUR)

December 2013