CECILIA 2050

OPTIMAL EU CLIMATE POLICY

Choosing Efficient Combinations of Policy Instruments for Low-carbon development and Innovation to Achieve Europe's 2050 climate targets

Country report: the Netherlands

WP 1 – Taking stock of the current instrument mix

Contribution to Deliverable 1.2: Review of the existing instrument mix at EU level and in selected Member States

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0 Executive summary

Climate policy in the Netherlands was first articulated in the National Environmental Policy Plan of 1989. One of its consequences was the introduction of the Regulatory Energy Tax in 1996. The Kyoto Protocol gave a big push to further policy development. The Climate Policy Implementation Plan (Ministry of VROM, 1999) set out how the Dutch government planned to meet its obligations under the Kyoto Protocol. The introduction of the EU ETS in 2005 significantly changed the playing field as policies and targets became more legally binding.

In this report we have tried to give an overview of the Dutch policy approach to greenhouse gas mitigation. To this end, we distinguish between four policy 'landscapes'. We have populated these 'landscapes' with a sample of policy instruments that were selected from a long list. The aim of the sampling was to achieve a balanced sample of instrument 'types' across different sectors in each landscape.

Within these policy landscapes, policy instruments usually interact in a positive way to achieve their goals. For example, within the policy landscape of energy efficiency and energy consumption, energy taxes and positive incentives for energy-saving technologies mutually support each other in many instances. A negative interaction may occur when energy taxes make community renewable energy schemes financially less attractive for their participants.

Between the policy landscapes, interactions occur between the EU ETS and policy instruments that promote energy efficiency and energy saving and policy instruments that promote the supply and use of renewable energy. Because of the cap on total emissions from the ETS sectors in the EU, instruments that directly or indirectly reduce emissions of specific firms in the ETS sector will not automatically also reduce emissions for the total ETS sector in the EU. While such instruments (promoting energy saving or renewable energy) may still be valuable, their (cost-) effectiveness may have to be re-evaluated. In some cases, e.g. the promotion of small CHP plants by fiscal incentives, net CO_2 emissions may even increase.

In terms of 'optimality', the current policy mix is probably not effective enough in stimulating renewable energy to meet medium-term targets and in achieving the emissions reductions that are likely to be necessary in 2030 and beyond. The policy mix is not cost-effective in the sense that marginal abatement costs are equalized across all measures and sectors. Whether the policy mix is (more) cost-effective in a dynamic sense remains to be seen. The political support for climate policies is still relatively high in the Netherlands. If policies must be tightened to meet Europe's 2050 climate targets, important questions remain on the international competitiveness of energy-intensive industries (including greenhouse horticulture in the Netherlands) and the effects on energy bills of poorer households.

1 Description of policy landscapes

1.1 Classification of the instruments previously selected into policy landscapes

The objective of this report (and report series) is to perform an initial 'stock-take' of the climate policy instrument mix at the EU-Level and a representative group of Member States – the United Kingdom, Germany, France, Spain, Italy, the Netherlands, Poland and the Czech Republic. An initial list of up to 50 instruments from each country and EU-level was created, from which up to 15 key instruments for each state covering a broad selection of the economy, instrument type and objectives were selected for further analysis. Please refer to the Taxonomy of Instruments, developed under Task 1.1 of CECILIA 2050, for a full description of instrument classification. For each report, the selected instruments were categorised into policy 'landscapes', described below.

(1) **Carbon Pricing:** this includes policies that price CO_2 emissions or otherwise change the relative prices of fuel use, depending on the carbon intensities of fuels. Apart from the obvious candidates (carbon taxes and emissions trading) this would also include the reform or removal of fossil fuel subsidies;

(2) **Energy Efficiency and Energy Consumption:** this includes measures targeted at either increasing the efficiency of the energy sector, including power generation / combustion processes, transmission of energy (heat, electricity) and end-use efficiency, or at reducing overall energy consumption (demand-side management, energy saving, sufficiency);

(3) **Promotion of Renewable Sources of Energy:** this includes policies aimed at increasing the share of energy from renewable sources (solar, wind, hydro, biomass, geothermal);

(4) **Non-Carbon Dioxide Greenhouse Gases:** this covers policies geared at reducing non-CO_2 greenhouse gas emissions, typically from sectors other than the energy sector. It may include emissions like methane emissions from landfills or animal husbandry, N_2O emissions from agriculture, or greenhouse gas emissions from chemical industries (SF6, NF3, HFC etc.)

The list of instruments for the Netherlands, along with their landscape classifications may be seen in Table 1, below. This report describes each instrument based on a set of tabulated information found in Annex 1, and an attempt at assessing their individual 'optimality', based on the concept developed for use in the CECILIA 2050 project also developed in Task 1.1, is provided. Descriptions of interactions between instruments within each landscape are also provided, based on tables found in Annex 2. The categories and methods of interaction are based on best practice in instrument interaction assessment, and are completed in pairs against a single key instrument, or when important interactions between non-key instruments are present.

The resulting optimality of each landscape based on instruments and their interaction are then assessed, followed by interactions between each landscape and, finally, an analysis of the optimality of the climate policy mix as a whole in each country and at the EU-level is provided.

Climate policy in the Netherlands was first articulated in the National Environmental Policy Plan of 1989. One of its consequences was the introduction of the Regulatory Energy Tax in 1996. The Kyoto Protocol gave a big push to further policy development. The Climate Policy

Implementation Plan (Ministry of VROM, 1999) set out how the Dutch government planned to meet its obligations under the Kyoto Protocol. The introduction of the EU ETS in 2005 significantly changed the playing field as policies and targets became more legally binding. The biggest challenges for the Netherlands are its relatively large energy-intensive industry sector and its small share of energy from renewable sources.

Table 1 Policy instruments and policy landscapes

	Policy Landscapes			
Policy Instrument	**Carbon Pricing**	**Energy Efficiency and Energy Consumption**	**Promotion of Renewable Sources of Energy**	**Non-Carbon Dioxide GHGs**
EU ETS	✓	✓	✓	✓
Decree on Greenhouse Horticulture		✓		
Energy Investment Allowance		✓	✓	
Energy Performance Coefficient/Standard		✓		
Energy Tax		✓		
Emission Standards for New Passenger Cars		✓		
Energy Label for Passenger Cars		✓		
SDE Subsidy for Renewable Energy			✓	
Green Investment		✓	✓	
Subsidy for Energy Research (EOS)		✓	✓	
Biofuel Obligation			✓	
Priority for Renewable Electricity			✓	
Green Certificates/ Guarantees of Origin			✓	
Methane Emissions from Bioenergy				✓
N_2O Emissions from the Production of Nitric Acids				✓

1.2 Detailed description of instruments within each policy landscape

This section describes elements of each policy instrument of Table 1. The purpose of the description is twofold: 1) to provide input to the analysis of policy interactions in Section 2 of this report, and 2) to evaluate each selected instrument in the light of the definition of the concept of optimality provided in task 1.1 of CECILIA2050. The analysis of interactions follows the framework set out by Konidari and Mavrakis (2006). These authors identify potential interactions with respect to objectives, target groups, implementation network and rules-influencing mechanisms. In our description we pay attention to these elements, and also identify instrument type and degree of bindingness from a legal perspective. The description of these elements is preceded by a brief description of the background of the instrument, including the history of its adoption, its objectives, and its general *modus operandi*.

The policy instruments are grouped together in policy landscapes (following the classification of Table 1). Each policy landscape is introduced by a brief presentation of the Dutch government's main objectives, targets and policies with respect to that landscape.

1.2.1 Carbon Pricing

The Dutch government follows the EU's targets of greenhouse gas emissions reduction in 2020. The EU ETS is the main policy instrument that prices CO_2 emissions or otherwise changes the relative prices of fuel use, depending on the carbon intensities of fuels. Other policy instruments might include specific fossil fuel taxes such as the coal tax but these were not included in the final selection of instruments.

EU ETS

The EU Emissions Trading Scheme was set up as a policy response to the obligations that the EU and its Member States had agreed upon in the Kyoto Protocol. It was the belief of the Commission that Emissions Trading, both internally within the Community and externally with other industrialised countries, would help reduce the cost to the Community of respecting its commitments (EC, 2000).

Directive 2003/87 sets rules for a system of trade in greenhouse gas emission allowances in order to fulfil the obligations of the Community regarding the Kyoto Protocol to reduce the emissions of greenhouse gases in a cost-effective and efficient manner by 8% in the period 2008–2012, relative to 1990. Directive 2004/101 adjusts Directive 2003/87 in order to integrate the project-based flexibility mechanisms of the Kyoto Protocol (JI and CDM) with the EU ETS. Directive 2009/29 contains far-reaching adjustments and extensions for the emissions trading system for the period after 2012.

Given the extent of the legislative changes required, the time period for the implementation of the Directive into Dutch law was extraordinary short. The Directive demanded that the transposition would be completed before the 1th of January 2004. Just like all other Member States, the Netherlands did not succeed to meet this demand. The necessary legislative changes were, however, implemented before the start of the first commitment period, 1 January 2005.

The adjustments in Dutch law regarded a new chapter 16 in the Environmental Management Act, major changes in chapters 2 and 18, and minor changes in chapters 8, 19, 20 and 21 of that Act. The changes in chapter 2 regarded the creation of the Netherlands Emissions Authority (NEa in Dutch) that is responsible for the issuing of emission licenses and permits, the verification of emission accounts, the maintenance of an emissions' trading register, and the enforcement of the system. Chapter 16 of the Environmental Management Act creates the legal basis of emissions trading. Chapter 16 also contains a dynamic reference to Directive 2003/87, so that changes in this Directive will be automatically implemented (unless it is decided otherwise). Other related Directives have also been implemented in Dutch law.

The EU ETS is a cornerstone of the European Union's policy to combat climate change and its key tool for reducing industrial greenhouse gas emissions cost-effectively. The first - and still by far the biggest - international system for trading greenhouse gas emission allowances, the EU ETS covers more than 11,000 power stations and industrial plants in 31 countries, as well as airlines. Currently, the EU ETS covers the emissions of:

- Carbon dioxide (CO_2) from
    - Power and heat generation
    - Energy-intensive industry sectors including oil refineries, steel works and production of iron, aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids and bulk organic chemicals
    - Commercial aviation
- Nitrous oxide (N_2O) from production of nitric, adipic, glyoxal and glyoxlic acids
- Perfluorocarbons (PFCs) from aluminium production

Participation in the EU ETS is mandatory for companies operating in these sectors, but in some sectors only plants above a certain size are included. Governments can exclude certain small installations from the system if fiscal or other measures are in place that will cut their emissions by an equivalent amount.

In the Netherlands, the EU ETS currently covers about 530 installations. For the commitment period 2008–12, the Netherlands used the opt-in possibility granted by the Directive (Art. 24) for N_2O emissions from nitric acid plants.

Commercial aviation, flights to and from non-ETS countries, are covered in principle, but as a goodwill gesture the European Commission has proposed deferring the scheme's application to these for 2012 to allow time for agreement on a global framework for tackling aviation emissions to be reached in the autumn of 2013.

The Ministry of Infrastructure and Environment is the competent authority for the EU ETS in the Netherlands. The practical administration of the instrument is in the hands of the Netherlands Emissions Authority (NEa).

In 2013, the third trading period for the EU ETS starts and continues to 2020. In this trading period, the allocation of emissions permits is centralized at the EU level (Directives 2009/29/EC and 2010/634/EU). The total amount of emissions permits decreases throughout the trading period. National allocation plans are replaced by European decisions on the allocation of permits across installations on the basis of 'benchmarks' or historical emission levels. In addition, a large share of permits (about 60%) will be auctioned.

According to recent evaluations of energy and climate policy in the Netherlands, the EU ETS achieved an emissions reduction of 0.1 to 0.5MtCO_2 per year over the period 2005-2009. Administrative costs for companies have been estimated at € 7–15 million per year and administrative costs for the government at € 3 million per year. The cost effectiveness of the EU ETS, in terms of abatement cost per tonne of CO_2 emissions avoided, was estimated to be between € 13–16/tCO_2 (Faber et al., 2012; Netherlands Court of Audit, 2011), which is relatively good. Due to the low prices of the allowances in recent years, the impact of the EU ETS on innovation, and therefore its dynamic efficiency, are less than was hoped for.

The effectiveness of the EU ETS in reducing global emissions depends on the share of domestic emission reductions that is offset by an increase in foreign emissions, the so-called 'carbon leakage'. There is not yet enough empirical evidence for a quantitative estimate of carbon leakage. A recent *ex-post* assessment study suggested a high rate of leakage for the first commitment period (Aichele and Felbermayr, 2012).

With respect to equity, the EU ETS has been criticized for generating high 'windfall profits' for participating firms due to the generous allocation of free allowances, while poor households suffer because of the increase in their energy bills. Adjustments in the EU ETS in the third trading period have, among other things, the objective to reduce windfall profits and to generate more government revenues.

1.2.2 Energy Efficiency and Energy Consumption

Decree on Greenhouse Horticulture

In 1997 a number of public and private parties concluded an agreement on greenhouse horticulture and the environment that entailed targets on energy use, the use of minerals (phosphorus and nitrogen) and pesticides by the sector (hereafter: the GLAMI agreement). The objectives of the GLAMI agreement were to integrate the obligations of various environmental Acts; to bring clarity about environmental regulations in the longer term (2010); to allow the farmer some flexibility in the implementation of the environmental targets; and to simplify procedures (Platform Duurzame Glastuinbouw, 2010). One of the aims of the GLAMI agreement was to combine several environmental targets into one integrated regulatory instrument: the Governmental Decree on Greenhouse Horticulture (*Besluit Glastuinbouw*) that was put into force in the year 2002. The Decree translated the sector targets of the GLAMI agreement to individual farms. For the energy domain, the Decree set maximum annual standards for the use of energy (natural gas) per unit of product, for flowers, plants, and vegetables (tomatoes, peppers, cucumbers, etc.). Because natural gas is the only source of primary energy the standards also implicitly set standards for CO_2 emissions. Initially, the GLAMI partners envisaged that the Decree would set relatively lax standards on energy use and that it would be possible for farmers to opt-out of the Decree's obligations on the basis of an agreed (and ambitious) environmental business plan. Partly due to a lack of interest of the farmers for this construction, the final Decree did not contain such an opt-out clause. The Decree did, however, allow the farmers some flexibility in the implementation of the standards because they were able to temporarily exceed the standards of one the environmental domains (energy, minerals, pesticides) if they compensated this in the other domains (van der Jagt, 2006). With the advent of the EU ETS Directive, the energy- and climate -related obligations of the Decree lost importance. The largest greenhouse horticulture enterprises

directly participated in the EU ETS; other enterprises formed a domestic CO_2-equalisaton system under the auspices of the Dutch Horticultural Board.

The Decree on Greenhouse Horticulture (2002) is a legally binding obligation for greenhouse horticultural enterprises (defined in Art. 2), administered by the then Ministry of Public Housing, Spatial Planning and the Environment (VROM), the Ministry of Transport and Public Works and the then Ministry of Agriculture, Nature and Food Quality.[1] Its goal is to realise the environmental targets that were agreed upon in the GLAMI agreement. This includes a target on energy-efficiency that is an increase of energy-efficiency (energy use per unit of product) in 2010 of 65% in comparison to 1980. The GLAMI agreement also contains a cap on total CO_2 emissions of 6.5MtCO_2 in 2010 for a total area of 10,500 ha. The cap could be maximally expanded 7.1MtCO_2 if the area would increase to 11,500 ha. Further increases of the area would not lead to a larger cap. The CO_2 cap was a collective cap and was not allocated to individual farms.

The Decree sets standards for about 10,000 greenhouse horticultural enterprises. These enterprises have to report their annual use of energy, minerals and pesticides before May 1 of the proceeding year to the responsible authorities (prescription 1.1.2 of Annex 1). Compliance to the Decree is compulsory by law. The Decree was discontinued on 1 January 2013 when it was transposed to the more general Decree on Activities (*Activiteitenbesluit*) of the Environmental Management Act that contains general environmental rules for enterprises.

In theory, the effectiveness and efficiency of the Decree can partly be inferred from evaluations of the GLAMI agreement. The 'official' *ex-post* evaluation of the GLAMI agreement was positive about its effectiveness. The stated objectives of the GLAMI agreement in terms of energy-efficiency and CO_2 emissions had been met in 2010 (Platform Duurzame Glastuinbouw, 2010). Earlier assessments had, however, cast doubt on whether the GLAMI agreement had really had any additional effect on developments in energy-efficiency that would have happened in the absence of the agreement or the Decree. The Netherlands Court of Audit was unable to find any additional effect on energy-efficiency of the GLAMI agreement up to 2002 (Netherlands Court of Audit, 2003). This assessment has been criticised for its methodology and data (ten Cate et al., 2003), but since then no credible assessment has been carried out (Faber et al., 2012). In this respect, it should be noted that energy-efficiency in the sector was also promoted by other policy instruments such as fiscal incentives (see, e.g. Energy Investment Allowance (Section 0) and Green Investment (Section 0)) and subsidies, although it can be argued that the GLAMI agreement was instrumental in expanding the scope of these instruments to cover energy-efficiency investments in greenhouse horticulture (van der Jagt, 2006).

The acceptance of the GLAMI agreement and the Decree of Greenhouse Horticulture by the sector is related the fear of losing the special position of the sector with respect to the (regulating) energy tax. The sector benefits from a reduced tax rate. Energy-efficiency agreements, such as in GLAMI, are seen as a good strategy to keep the special energy tax rates (Lemmens, 2005). Another positive point for the acceptance of the Decree is its flexibility

[1] In 2010 the Ministry of VROM and the Ministry of Transport and Public Works merged into the Ministry of Infrastructure and Environment (I&M); The Ministry of Agriculture, Nature and Food Quality and the Ministry of Economic Affairs merged into the Ministry of Economic Affairs, Agriculture and Innovation (ELI). In 2013, this latter Ministry was renamed Ministry of Economic Affairs.

with respect to goal achievement, although the flexibility in the Decree is less than initially envisaged by the GLAMI agreement.

Energy Investment Allowance (EIA)

A tax allowance for energy investments (EIA) was announced in the Third Energy Policy Document of 1995 that described the policy plans of Government to attain a "more sustainable energy system" (Ministry of Economic Affairs, 1995). The EIA was officially introduced in the tax laws of 1997, with the aim of increasing the return on investments in energy savings and renewable energy, especially for small and medium enterprises and for enterprises that fall under a multiannual agreement on energy-efficiency (MJA-e) or an integrated environmental accord (IMT) (Aalbers et al., 2007). The EIA allows firms to deduct 41% of their expenses on eligible energy saving and renewable energy investments from their company profits. The financial advantage depends on the specific tax rate, but is usually about 10% of the investment.

The EIA promotes investments in energy savings and renewable energy of firms in all sectors. The EIA has a fixed budget that is determined annually. For the year 2013 the total budget is € 151 million (NL Agency, 2013a). The EIA has an Annex with a list of means of production and technologies for which the tax allowance can be requested. The 2013 list includes about 160 technologies; it is subdivided in technologies for commercial buildings, processes, means of transport, renewable energy, and energy advice. This list is annually updated. The compliance period of the instrument is one year; each year an official adjustment of the legal act is announced (with a new budget and a list of eligible technologies). The EIA is a regulation of the Ministry of Economic Affairs and the Ministry of Finance. The administration of the instrument is with NL Agency (*Agentschap NL*), an agency of the Ministry of Economic Affairs.

The EIA is regarded as a successful policy instrument, relatively well-used by small and medium enterprises, and increasingly used for investments in renewable energy. The expectation is therefore that the instrument will be continued in the foreseeable future.

According to a recent evaluation of energy and climate policy in the Netherlands, the EIA (in combination with another fiscal instrument that allows arbitrary depreciation of certain environmental investments) would achieve an emissions reduction of 2MtCO_2 per year at an average social cost of € 8/tCO_2, which is relatively very cost-effective (Faber et al., 2012). It should be noted, however, that it is very difficult to determine the effectiveness and cost-effectiveness of single tax instruments in Dutch energy and climate policy, because of the interactions with many similar and overlapping policy instruments. A full *ex post* evaluation of the EIA instrument (Aalbers et al., 2007) paid a great deal of attention to the interactions between the EIA and eleven other instruments that broadly addressed the same market failures (Environmental Externalities, Bounded Rationality, and Imperfect Capital Market). The evaluation concluded that it is not possible to evaluate the effectiveness and efficiency of the EIA in isolation, especially since the introduction of the EU ETS (Aalbers et al., 2007).

Energy Performance Coefficient/Standard (EPC/EPN)

The Energy Performance of Buildings Directive in 2003 obliged all the European Member States to implement energy regulations based on the concept of energy performance. The aim of energy performance regulations in the building sector is to reduce energy consumption in

new buildings caused by heating, hot water production, lighting, cooling and ventilation. The energy performance standard limits the energy consumption of a building to a certain maximum level. The energy performance calculation allows the user to choose a set of energy features and to trade off between these features (e.g. higher insulation level for poorer heating system efficiency, or vice versa), as long as the energy performance standard is met (Beerepoot and Beerepoot, 2007). When the standards of the Dutch energy performance policy were introduced, there was an explicit expectation of the take-off of innovative energy techniques such as solar boilers (Beerepoot et al., 2007). This expectation has not been met yet.

EPC/EPN's target is to reduce energy consumption in buildings by limiting this consumption to a maximum level. This level is expressed in an energy performance standard that is measured by an energy performance coefficient (EPC). For new residential houses, the EPC is 0.6.[2] For utility buildings, the EPC depends on the type of use. The Energy Performance of Buildings Directive is transposed into Dutch law through the Decree on Energy Performance of Buildings, which is based on Article 120 of the Housing Act. NL Agency is the competent body for monitoring and verifying compliance.

In the Netherlands, energy performance standards for residential and commercial buildings have been regularly updated and tightened since the mid 1970's. As a result, the average use of natural gas for heating per house has declined by more than 35% over the period 1980–1996.[3] Menkveld et al. (2010) suggest that the current EPC/EPN standards increase building costs between €1,000 and €4,000 per house. On the basis of a sample of 350 energy performance permits for new residential buildings over the period 1996-2003, Beerepoot et al. (2007) conclude that the policy in its current shape will not contribute to the diffusion of really new innovation in energy techniques for residential buildings in the Netherlands. There has been no overall evaluation of the effectiveness and efficiency of the standards (Faber et al., 2012).

The European guidelines for the energy performance of buildings have been updated in 2010. As of 2013, the new performance standards entail, *inter alia*, that new buildings will be almost energy-neutral after 2020. The (little) energy that is still used must be of renewable sources. As of 2013, existing buildings that are renovated will also be subject to energy performance standards.

Energy Tax

The introduction of a regulatory energy tax in the Netherlands in 1996 was the result of a compromise. In 1992 the Wolfson Committee had advocated the introduction of a CO_2/energy tax at the EU level, but, if that would not be possible, a tax for small users at the Dutch level. While the Ministry of Economic Affairs was initially against an energy tax, even if it was restricted to small users, the 'small users' proposal of the Wolfson Committee was finally

[2] The EPC is calculated on the basis of structural characteristics of a building (including size and composition, insulation, technical information on heating, ventilation and sanitation, and availability of solar boilers and/or panels (Bouw-Energie, 2013)

[3] Natural gas is the dominant source of heating in the Netherlands; substitution possibilities are very limited. Therefore the 35% reduction in the use of natural gas may be considered absolute.

adopted in law in 1995 and implemented in 1996 (de Jong, 2005). The explanatory memorandum of the Act contains a detailed account of the political developments regarding an EU CO_2/energy tax and concluded that its adoption was not very likely in the foreseeable future. Therefore, a Dutch regulatory energy tax was proposed on electricity, natural gas, and some minor lubricants. The tax contains a digressive rate structure, so that it falls predominantly on small users (households and firms). Rates decrease for annual consumption exceeding 5,000 m^3 of gas and 10,000 kWh of electricity. The tax scheme was changed a few times. Initially, 'green' electricity was exempted from the tax. As this mainly led to imports of 'green' electricity from abroad and not to additional Dutch generation, this exemption was abolished in 2004. An alternative instrument was employed to promote the generation of green electricity (first the MEP, later succeeded by SDE (See Section 0)). In 2003, the energy tax was brought in line with the obligations of the EU Energy Taxes Directive (2003/96/EC). This was possible through some minor technical adjustments. The Dutch government used Article 17 of the Directive to exempt energy-intensive firms for energy taxes above a certain threshold energy use (10 million kWh) if these firms participated in the EU ETS or in multiannual energy-efficiency agreements with the Dutch authorities. Initially, greenhouse horticulture was exempted from energy taxes because of concern for its international competitiveness.[4] After the 2003 adjustments to the energy tax, the exemption was abolished but greenhouse horticulture is granted a reduced rate for its gas consumption on the grounds that it already invests significantly in energy-saving technology in the context of a negotiated agreement between the sector and the government (the GLAMI covenant, see Section 0 above) (EC, 2007). The use of gas as a feedstock is exempted from taxation. Another notable exemption is the electricity that a home owner generates in or on his own house (the electricity is generated "behind the meter"; the most common example is solar panels on the roof). Because of the adjustment to EU rules, the official name of the tax changed from regulatory energy tax (*Regulerende Energiebelasting REB*) to energy tax (*Energiebelasting EB*).

Table 2 Dutch energy tax rates in 2013 (excl. VAT)[5]

Electricity*	€/kWh	Natural gas	€/ m3
0-10,000 kWh	0.1165	0-5,000 m3	0.1862
10,000-50,000 kWh	0.0424	5,000-170,000 m3	0.1862
50,000- 10 million kWh	0.0113	170,000 – 1 million m3	0.0439
> 10 million kWh (non-commercial)	0.0010	1 million – 10 million m3	0.0160
> 10 million kWh (commercial)	0.0005	> 10 million m3	0.0115

*) for each electricity connection a fixed discount of € 318.62 is applied.

[4] The energy tax is part of the fiscal reform to "green" taxes: it promotes a shift from labour taxes to taxes on polluting activities. It was expected that for most firms the tax reduction of labour would more or less compensate for the increase in energy taxes. This was not expected for greenhouse horticulture, however. Hence the fear for disproportionate adverse effects on competitiveness.

[5] A complete overview of energy tax rates from 1996 to 2013 is provided in Annex IV.

The goal of the (regulatory) energy tax is to promote energy saving and thereby reducing the emissions of CO_2. Another goal is to contribute to the greening of national taxation by shifting the tax burden from labour to environmentally polluting activities (Ministry of Finance, 1995). The tax applies to all users of electricity, gas and some minor lubricants. The tax rate is digressive, and energy-intensive firms pay a very low rate above a certain level of consumption. The tax is levied by the Ministry of Finance. Energy companies play a role in the collection of the taxes via the energy bills.

The yield of the Dutch energy tax was € 4.2 billion in 2010. This was about ten times as high as the yield in 1996 (PBL, 2013c). According to a recent evaluation of energy and climate policy in the Netherlands, the energy tax would achieve an emissions reduction of 0.4–0.8 $MtCO_2$ per year at an average social cost of € 3.5/tCO_2 (Faber et al., 2012). The low effect is a direct result of the low rate of the tariff for large commercial users.

The energy tax is highest for small users (Table 2). Figure 1 shows the cumulative distribution of energy tax revenues across energy users, from the highest taxed energy to the lowest. The first quartile of energy users (incl. households and agriculture) pays almost 50% of total energy taxes. The last quartile (including heavy industry) pays less than 5% of total energy taxes. This is not always considered as being fair. It also negatively affects the effectiveness of the tax in reducing energy consumption and CO_2 emissions and it also negatively affects its cost effectiveness for the simple fact that not all energy uses (and indirectly associated CO_2 emissions) face the same marginal tax. The near-exemption of energy-intensive firms was, however, a necessary condition for the political feasibility of the tax at the time of its implementation.

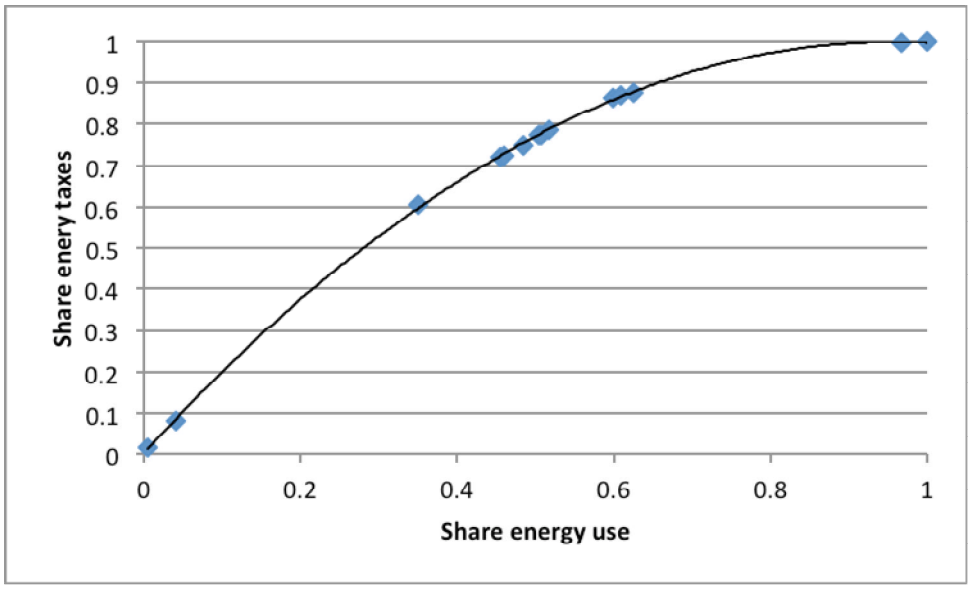

Figure 1 Unequal distribution of energy taxes (own calculations based on CBS Statline)

Emission Standards for New Passenger Cars

The goal of EU Regulation 443/2009 is the attainment of the EU target of average CO_2 emissions of new cars of 120 g/km in 2012. The Regulation itself limits the maximum allowable average emissions to 130 g/km in 2015. The standard applies to the average of all new cars of

a car-maker that are registered in the EU in one calendar year. The remaining 10 g/km (that are needed to reach the target of 120 g/km) are expected to be realised by technological improvements or by the use of biofuels (see Biofuel Obligation). The Regulation envisages an average CO_2 emission of 95 g/km of new cars in 2020. Because of its legal nature, the Regulation is directly applicable in the Netherlands.

Emissions standards for new passenger cars are related to the Community strategy to reduce CO_2 emissions from passenger cars and improve fuel economy (EC, 1995). This strategy for passenger cars was based on four pillars: voluntary commitments to reduce average emissions from new vehicles; consumer information, through the labelling of all new cars; the development of a system to monitor CO_2 emissions from new cars; and the use CO_2 emissions as the basis for future reforms of car taxes. The strategy recommended an improvement of fuel economy of 25% by the year 2005. The Council approved the strategy in 1996 and stipulated that the car industry should be primarily responsible for reaching the targets, preferable through a voluntary agreement with the Commission. In subsequent years, the Commission negotiated an agreement with the European Automobile Manufacturers Association (ACEA) that was reached in 1998. The target in this agreement was an average CO_2 emission of 140 g/kg for cars that would be sold in 2008. Similar agreements were reached with car manufacturer associations in Korea and Japan. There was a lot of critique on these agreements, especially from the European Parliament that criticised the lack of enforcement of these voluntary agreements. After the Commission had noted in 2006 that the developments in the voluntary agreements were not going fast enough, the Commission proposed binding regulations in 2007, that that were elaborated in Regulation 443/2009.

The Regulation is administered by Ministry of Infrastructure and Environment. The Netherlands uses a mix of instruments to promote the market penetration of fuel-efficient cars. In 2006, the sales tax on cars and motor vehicles (BPM) was made dependent on the energy label of the car. Cars with labels A and B get a discount, while cars with labels D and G get an extra charge. In 2008, an additional CO_2 charge was added to the sales tax for cars with very high fuel consumption. In addition, the road tax was lowered for fuel-efficient cars (diesel: CO_2 < 95g/km; petrol: CO_2 < 110g/km). Finally, changes were made in the fiscal regime for fuel-efficient business cars.

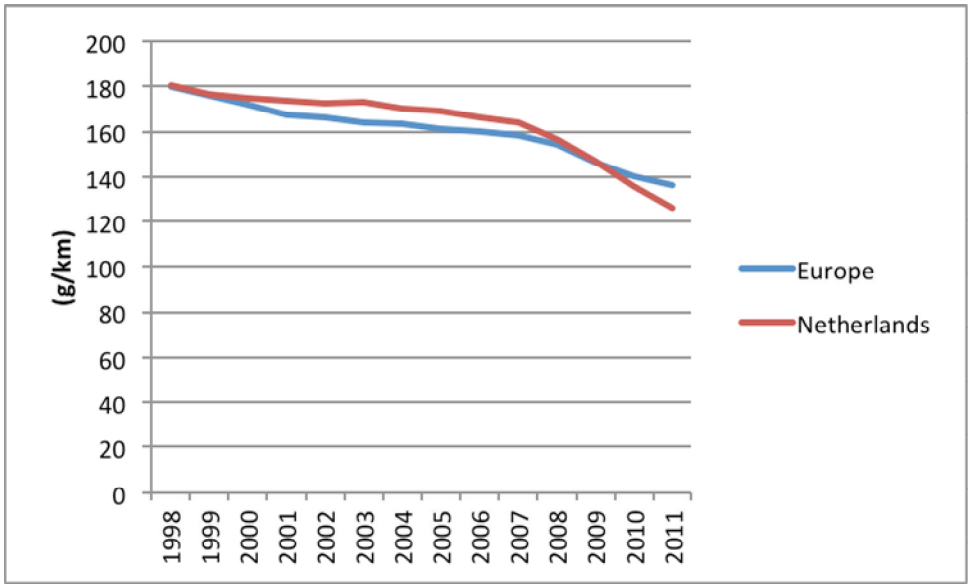

Figure 2 CO_2 emissions of new passenger cars (g/km) Source: (PBL, 2013a)

According the Netherlands Environmental Assessment Agency (PBL) the emissions from new passenger cars have decreased considerably in recent years, especially since 2008. The decrease in the Netherlands is faster than in the EU on average (Figure 2). The average emission-intensity in 2011 (126 g/km) was already below the EU standard for 2015 (130 g/km). According to PBL this is due to both EU policies and the Dutch fiscal incentives.

According to a recent evaluation of energy and climate policy in the Netherlands, the emission standards for new cars are expected to achieve an emissions reduction in 2020 of 1.9 to 6.3MtCO_2 per year. The cost effectiveness is uncertain: ex ante evaluation studies estimate the social cost per ton of CO_2 avoided between – € 150 to + € 150 (Faber et al., 2012).

Energy Label for Passenger Cars

Directive 1999/94/EC sets rules for the availability of consumer information on fuel economy and CO_2 emissions in respect of the marketing of new passenger cars. The Directive has been transposed to Dutch law through the Decree on the labelling of energy use of passenger cars that entered into force in 2001. The Decree mandates car sellers to meet the obligations of Directive 1999/94/EC with respect to the availability and content of consumer information on the energy use of passenger cars. Violations of the prescriptions are punishable in the context of the Act on Economic Offences. The Decree is being maintained by the Economic Inspection Agency (FIOD-ECD), an agency of the Ministry of Finance.

The Energy Label is related to the Community strategy to reduce CO_2 emissions from passenger cars and improve fuel economy (EC, 1995) that was discussed in the previous section on Emission standards for new passenger cars (see Section 0 above).

The Energy Labels contains information on fuel use (litre/km), relative fuel economy for cars within the same size-group (A to G), and CO_2 emissions (g/km). The labels are usually well displayed on the cars in the showroom[6] and are informative for potential buyers (Figure 3).

[6] According to my own experience.

Figure 3 The Dutch energy label for cars

A study that evaluated the Energy Label in combination with a differentiation of the sales tax (BPM) predicted a small reduction of CO_2 emissions in 2020 of about 0.1–0.2MtCO_2 per year. The cost effectiveness is probably high: a recent evaluation study reports *negative* social costs of –€150/tCO_2 (Faber et al., 2012).

1.2.3 Promotion of Renewable Sources of Energy

SDE Subsidy for Renewable Energy Generation

The production and use of electricity from renewable sources are promoted by various policy instruments in the Netherlands. 'Green' electricity can benefit from various subsidies and fiscal incentives (e.g. EIA and Green Investment). In 2003, a new policy instrument was introduced; the Environmental Quality Electricity Generation (MEP in Dutch). The MEP offered compensation to the generators of renewable energy who supply their energy to the Dutch grid and also to operators of Combined Heat-Power (CHP) plants. The MEP was financed by the electricity sector. The MEP was so popular that it overspent its budget and had to be closed for new applications in 2006. The MEP was succeeded by a new subsidy instrument in 2008: the subsidy for renewable energy generation (SDE). The SDE is broader than the MEP because it also subsidises green gas. In 2011 the SDE was replaced by the SDE+. An important difference is that SDE+ is financed by a surcharge on energy bills, while the SDE was financed by the government.

The objective of the SDE+ is to achieve the objective for the share of renewable energy in the Netherlands that has been agreed in the European context. In the Netherlands 14% of gross final energy consumption must originate from renewable sources by 2020. Recently, the current government increased this target to 16% (PBL, 2012). The SDE+ compensates the difference between the costs of generating grey energy and renewable energy for 5, 12 or 15 years depending on the technology. The SDE is a subsidy on top of the returns that the

producer receives from the sale of renewable energy to market. The SDE+ is accordingly a feed-in premium regulation. The amount of the subsidy depends on the quantity of renewable energy produced. The SDE+ has a limited budget; it operates on a "first come first served" basis. Producers with the lowest production cost per GJ of renewable energy can apply first and accordingly have the best chance of a subsidy (NL Agency, 2012).

SDE+ distinguishes between basic rates (€/GJ), correction rates (€/GJ) and basic energy prices (€/GJ). For every technology there is a maximum on the amount of full-capacity hours that are eligible for the SDE+ subsidy. The technology-specific subsidy is calculated as the basic rate minus the (year-specific) correction rate, which is based on the off-site market price of energy for the specific technology. The correction rate can never fall below the basic energy price; hence the maximum subsidy per GJ (basic rate minus basic energy price) is fixed. The total maximum subsidy is fixed by the maximum on the amount of full-capacity hours.

For 2013, the basic rates for renewable energy can go up to:

- € 0.15 per kWh for renewable electricity;
- € 1.035 per Nm^3 green gas;
- € 41.7 per GJ renewable heat;

These are maximum amounts.[7] The SDE+ subsidy window is opened for applications in six phases, with often increasing rates. This is done to stimulate the most cost-effective projects.

Table 3 SDE subsidies for wind energy*

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Basic energy price	Prelim. correc-tion rate	Max duration
	Basic rates (€/kWh) and full-capacity hours between brackets						€/kWh	€/kWh	years
Wind on land < 6MW	0.0875 *(2640)*	0.1000 *(2240)*	0.1125 *(1920)*	0.119 *(1760)*	0.119 *(1760)*	0.119 *(1760)*	0.054	0.055	15
Wind on land ≥ 6 MW	0.0875 *(2880)*	0.1000 *(2880)*	0.1125 *(2504)*	0.116 *(2400)*	0.116 *(2400)*	0.116 *(2400)*	0.054	0.055	15
Wind in lake	0.0875 *(2560)*	0.1000 *(2560)*	0.1125 *(2560)*	0.1375 *(2560)*	0.153 *(2560)*	0.153 *(2560)*	0.054	0.055	15
Wind at sea	0.0875 *(3200)*	0.1000 *(3200)*	0.1125 *(3200)*	0.1375 *(3200)*	0.1625 *(3200)*	0.1875 *(3200)*	0.054994	0.055570	15

* the wind factor (1.25) is included in the rates

Source: NL Agency (2013b)

[7] But the basic rate for wind energy can be higher because of the application of a wind factor (1.25) to compensate for loss of subsidy in years with low average winds. The full-capacity hours are reduced by a factor of 0.8.

The 2013 technology list includes 39 technologies in the categories biomass, geothermal, water, wind, and solar. In 2012, SDE+ subsidised 234 projects for a total of € 1.7 billion. The budget for 2013 is € 3 billion.

The SDE+ is an instrument of the Ministry of Economic Affairs. The practical administration of the instrument is in the hands of its executive agency NL Agency.

The rather complicated set-up of the SDE+ instrument is intended to let producers compete for the most cost-effective renewable energy solutions. The set-up also helps to avoid windfall profits that are not uncommon in renewable energy promotion systems in other countries.

The SDE+ does not shield the renewable energy producers from all market risks. In years when the market price of energy falls below the basic energy price, the SDE+ subsidy does not cover the entire gap between the basic rate and the market price in that year. Hence, there is a downside risk for investors in renewable energy.

An *ex ante* evaluation study of the SDE+ predicted a reduction of annual CO_2 emissions of 2.2Mt, for a relatively unfavourable cost-effectiveness of € 90–200/tCO_2 (Faber et al., 2012; Jansen et al., 2011). A critical review of Dutch renewable energy policies by Rabobank (van der Elst and Bosch, 2012) argued that the SDE and SDE+ instruments had not been very effective. Furthermore it argued that without a change in the policy approach, SDE+ would not achieve the renewable energy target in 2020. Some reasons that the review gave for the relative ineffectiveness of the SDE+ were the relatively large share of subsidised projects that failed to be realised (e.g. because of the failure to get permits for wind mills) and the heavy reliance on biomass projects with little innovation potential (van der Elst et al., 2012). The large share of biomass projects gives reason to doubt the *dynamic* efficiency of the SDE+ instrument.

Green Investment

Green Investment is a fiscal facility with which the government stimulates environmental-friendly investments by private investors since 1995. Eligible investment projects are innovative projects with limited profitability and/or high economic risk in the areas of sustainable energy, nature conservation, nature development and organic agriculture.

The objective of Green Investment is the protection of the environment, including forests and the natural environment. Green Investment aims to realise this objective by incentivising private investors to invest in these projects, thereby addressing the market failure that often prevents innovative projects and technologies to enter the market (Ministry of VROM, 2007).

The fiscal advantage of Green Investment was 2.5% of the investment (a combination of a tax rebate of 1.3% and a wealth tax exemption on up to € 55,145 of savings which means an addition 1.2% of tax advantage). Given this fiscal advantage, the investor is willing to accept 1.7% less financial return on his or her savings/investments. Financial intermediates (banks) claim on average 0.8% of the fiscal advantage. Owners of investment projects pay approximately 0.8% less interest to the banks for loans in the context of Green Investment. This makes it easier to finance innovative, environmentally-friendly, but less profitable projects.

At the end of 2005, total invested capital in Green Investment was € 5 billion, of which 45% was invested in Green Label (energy-efficient) greenhouses for horticulture, 19% in renewable

energy, 8% in sustainable buildings, and the rest in city district heating, protection of the natural environment, organic agriculture and “other”.

The aim of the instrument Green Investment is broadly to protect the environment, including forests and the natural environment. The instrument is administered by the Ministry of Finance.

An evaluation of the instrument in 2007 concluded that the goals of Green Investment with respect to the involvement of the financial sector, the private investor, and the availability of capital had been realised. The administrative costs of Green Investment are very low (Ministry of VROM, 2007). No information on the effectiveness and cost-effectiveness of Green Investment with respect to greenhouse gas mitigation has been found.

The tax rebate on Green Investment has changed since 2011. The tax rebate is gradually reduced to zero in 2014. Although the wealth tax exemption on Green Investment remains intact, this will make the instrument less attractive to investors.

Subsidy for Energy Research (EOS)

The program for energy research (EOS) subsidised research on affordable, reliable and clean energy. The main objective of the program was to promote the application of new energy technologies at a large scale. The program had five focal points:

- Energy-efficiency in industry and agriculture
- Biomass
- New gas/clean fossil
- Built environment
- Generation and grids

The program was active in the period 2005–2010. Its total budget was € 255 million; the largest part was spent on research related to the built environment. An *ex-post* evaluation of the program concluded that the subsidies had been effectively used, i.e. for the purposes they were intended for. No information was given about its effectiveness and cost-effectiveness (de Visser et al., 2012).

The program was administered by NL Agency on behalf of the Ministry of Economic Affairs.

The Ministry of Economic Affairs continues to subsidise energy research in its ‘Top Sectors’ policy. The new research policy focuses on research that produces results that are very near market introduction. In 2012, the government contributed € 166 million to research in the sector energy; in 2013 the government’s contribution is € 154 million. In comparison to 2010, the total government subsidy to energy research has halved.

Biofuel Obligation

In a communication in 2001 (EC, 2001), the EU Commission proposed a set of measures to promote the use of biofuels as alternative fuels for road transportation. The policy has the dual objective to increase energy security in the Community and to reduce global CO_2 emissions, particularly in relation to the Kyoto Protocol commitments. The measures were adopted in Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport. In particular, the Biofuel Directive obliged the Member States to set indicative

targets for the share of biofuels that was offered for sale in their markets and ensure that these targets would be met. As a reference for these indicative targets the Directive posited shares of 2% in 2005 and 5.75% in 2010 (as a share of the total energy content of the total supply of petrol and diesel). In 2010, Directive 2003/30/EC was replaced by Directive 2009/28/EC that integrates the promotion of biofuels in transport fuels with the promotion of electricity from renewable sources.

The Dutch implementation of the Biofuels Directive was rather slow. Only in 2007, the Act on Biofuels for Road Transportation was put into force. It contained the indicative targets that the European Commission had asked for. Due to the debate on the sustainability of biofuels that had arisen, especially since the Gallagher review (Gallagher, 2008), these targets were reduced to 3% in 2009 and 4% in 2010. In December 2009, a Decree brought the Dutch Act on Biofuels for Road Transportation in conformity with the new EC Directive (2009/28/EC).

The Biofuel Obligation mandates license holders of the excise goods petrol and diesel to offer for sale a specific share of biofuels as transportation fuels. The Act falls under the Ministry of Infrastructure and Environment. License holders have a yearly reporting obligation.

The supply of biomass as a source for biofuels in the Netherlands is limited. Therefore, the Netherlands has to import a large share of biomass to meet its obligations. A big challenge is to ensure the sustainability of biomass production, also taking into account the effects of indirect land use changes (ILUC). The Dutch authorities have made an agreement with industry on a system of reporting on the origin and sustainability aspects of biomass. In 2011 the Dutch Institute for Normalisation (NEN) developed the NTA 8080 certificate for biomass that is issued by the firm Quality Services Certification. In 2011, the first certificates were issued to Dutch companies.

The Decree has an opt-in possibility for suppliers of green gas and electricity to cars. These suppliers of 100% green energy can get ‘biotickets’ which they can sell to regular oil companies that can use these tickets for compliance with the Biofuel Obligation.

According to a recent evaluation of energy and climate policy in the Netherlands, the Biofuel Obligation would achieve an emissions reduction of 1MtCO_2 per year at an average social cost of € 150/tCO_2. The authors note, however, that this evaluation has not taken all emissions along the production chain of biofuels into account. They suggest that including all emissions (also those due to ILUC) would reduce the effectiveness and cost-effectiveness of the instrument (Faber et al., 2012). With respect to its feasibility, much depends on the credibility of the sustainability claims of the (imported) biomass.

Priority for Renewable Energy

Directive 2009/28/EC on the promotion of the use of energy from renewable sources obliges Member States to make such arrangements that energy from renewable sources has priority access to the grid and that renewable energy installations have priority in the dispatch system.

In the Netherlands, access to the grid is guaranteed for both ‘green’ and ‘grey’ generators. Green generators have priority in congestion management, where conventional production is first reduced, then CHP and biomass-generated production, and finally solar-PV and wind. Currently, the balancing costs to avoid congestion on the grid (€ 30–47 million in 2009) are paid by the end users of electricity.

The Netherlands proposed a change of system whereby the balancing costs would be borne by all generators in the balancing market, *excluding* the generators of renewable electricity who would therefore have a cost advantage. This proposal was, however, rejected by the European Commission on the basis on transparency and non-discrimination criteria (Verhagen, 2012).

The aim of the Priority for Renewable Energy is to promote the generation of renewable electricity. The Ministry of Economic Affairs is responsible for the Regulation. The administration of the Regulation is in the hands of the Transmission Systems Operator (TenneT) which is an executive agency of the Ministry.

No information on the effectiveness and cost-effectiveness of this instrument with respect to greenhouse gas mitigation has been found. The administrative feasibility is high. Technical difficulties may arise when the share of intermittent renewable electricity on the grid would exceed a certain share.

Green Certificates/Guarantees of Origin

Experiments with green certificates (or green labels) for renewable electricity started in the Netherlands in the 1990s on a voluntary basis. The liberalisation of the electricity market in the early 2000s caused changes in the degree and nature of commitments to renewable energy of energy companies and authorities (Plumb and Zamfir, 2009). In 2001, a new Regulation on green certificates was issued that had its legal basis in the Electricity Act of 1998. Suppliers of green electricity had to redeem certificates in this system in order to prove that they have acquired the proofs of origin for a certain volume of RES-E and for this volume, their customers were exempt from the energy tax (see Section 0 above) (van der Linden et al., 2004).

Meanwhile, at the European level Directive 2001/77/EC was adopted with the aim to promote renewable energy generation and use within the common market. (Directive 2001/77/EC was subsequently repealed and replaced by Directive 2009/28/EC). The Directive obliged the Member States to set up a system of 'Guarantees of Origin' that allowed producers/sellers of renewable energy to prove that their electricity is really of renewable origin. In 2004, the Netherlands changed their system of Green Certificates into the EU system of Guarantees of Origin.

Renewable energy can be certified by the Transmission Systems Operator (TenneT) through its subsidiary CertiQ. The responsible authority can open an account for electricity generators, suppliers, traders, or buyers, to book the Guarantees of Origin if the necessary proof of origin is submitted. The Ministry of Economic Affairs is the responsible government authority. Member States of the EU have agreed to mutually recognize each other's Guarantees of Origin.

Green electricity is a big success among consumers in the Netherlands. The share of households that buys green electricity was 50% in the first half of 2012. In the first half of 2011 the share was with 57% at its historic high. A large part of this demand is, however, met by buying Guarantees of Origin from abroad, e.g. from hydropower companies in Norway. In contrast to a number of other European countries, the Guarantees of Origin are not linked to Renewable Obligations for electricity suppliers.

While a formal evaluation of the instrument could not be found, we suspect that given the way the instrument is implemented in the Netherlands, its effectiveness up to now will be rather limited. One electricity company recently started a promotion campaign in which it guarantees that the green electricity that it sells is at least for 80% of Dutch origin (Essent, 2013). If this kind of promotion turns out to be successful, the effectiveness of the Guarantees of Origin might increase.

1.2.4 Non-Carbon Dioxide Greenhouse Gas Emissions

Reduction of Methane Emissions from Bioenergy

Dutch policy with respect to non-CO_2 greenhouse gases (methane (CH_4), nitrous oxide (N_2O) and F-gases (HFC's, PFC's and SF6)) took form in the Reduction Program Other Greenhouse Gases (ROB), which ran from 1999 to 2012.

At the end of the 1990's several studies suggested that there was a cost-effective potential of reductions of non-CO_2 greenhouse gases. In the Policy Plan on Climate Change of 1999 the reduction of non-CO_2 greenhouse gases was given an important role in achieving domestic reduction targets. The target was to reduce non-CO_2 greenhouse gases by 35MtCO_2-eq per year in the period 2008-2012.

The ROB program is executed by NL Agency on behalf of the Ministry of Infrastructure and Environment and supported by the Ministry of Economic Affairs. The ROB program for agro-sectors aims to develop knowledge on the emissions of methane and nitrous oxides from agricultural activities and technical measures to reduce these emissions that are easy to implement and are cost-effective on the farm. It has financed many feasibility and demonstration projects on the generation of bioenergy from manure.

An evaluation of the ROB program concluded that it had contributed to the knowledge about the volume of emissions from the sector and stimulated the market penetration of anaerobic digestion plants that convert mixtures of animal manure and plant material (e.g. maize) into sustainably generated electricity and fertilizer. It is difficult, however, to distinguish the effect of the ROB from the effects of other policy instruments such as the Energy Investment Allowance (EIA) or the Subsidy for Renewable Energy Generation (SDE+), and autonomous investments in anaerobic digesters for the generation of bio energy (Harmelink et al., 2006).

The actual growth of the number of digesters on animal farms has been less than expected at the start of the ROB program (Faber et al., 2012). This is caused by the somewhat disappointing financial performance of digesters, especially the smaller ones. The main bottlenecks seem to be legal restrictions on allowed input substrates, high costs of disposing of the solid concentrate (digestate) after digestion (due to manure disposal legislation), low subsidy rates from the predecessor of SDE+ (MEP), and limited scope for utilising produced heat from the CHP plant in which the biogas is used (Peene et al., 2011).

According to a recent evaluation of energy and climate policy in the Netherlands, the actual emissions reductions because of the stimulation of bioenergy are very modest and that the cost effectiveness is probably low: estimates range from € 60–80/tCO_2 to € 215–239/tCO_2 (Faber et al., 2012). The Reduction of Methane Emissions from Bioenergy therefore contributed little to the overall emission reduction target of the ROB program.

Reduction of N_2O Emissions from the Production of Nitric Acid

In the period 1999–2004 the ROB used information and technology support instruments to 1) create public support for additional policy on the reduction of N_2O emissions from the production of nitric acids and to generate knowledge on emission levels and emission reduction measures; 2) to initiate research for knowledge enhancement; and 3) to initiate research and demonstration projects to enhance knowledge on reduction techniques (Harmelink et al., 2006)

For the creation of public support a Commission was established with representatives from NL Agency (then: SenterNovem), the Ministries, provincial authorities, and the nitric acid industry. One of the Commission's achievements was its work on emissions monitoring that revealed that the sector's emissions had been grossly overestimated for a long time. The sector's appetite for reduction measures was low until a test in an Austrian factory showed the good performance of a catalyst converter. This technique was included in the 2007 BAT Reference Document (BREF) "Anorganic chemistry" of the IPPC. The Commission has successfully lobbied with government for an opt-in in the EU ETS of nitric acid plants as of 2007 (Harmelink et al., 2006).

The ROB subsidised € 2.3 million in 14 research projects. Total investments of these research projects were estimated at € 4.7 million. It is not clear to what extent this research has contributed to the development of the Austrian catalyst converter. Parallel research trajectories were followed in various countries. To some extent, additional research in the Netherlands was needed to adopt the catalyst converter to the characteristics of individual plants (Harmelink et al., 2006).

Emissions of N_2O from nitric acid plants fell from 7MtCO_2-eq in 2000 to 1MtCO_2-eq in 2009 and this is almost entirely due to technical emission reduction measures. The success can be explained by the combination of a proven abatement technology and the incentive to implement this technology offered by the EU ETS (Faber et al., 2012).

1.3 Identification of interactions of instruments within each policy landscape

1.3.1 Carbon Pricing

As only one policy instrument was identified in the landscape 'Carbon Pricing' there are no interactions within this landscape. Interactions between the EU ETS and policy instruments in the other landscapes are discussed below.

1.3.2 Energy Efficiency and Energy Consumption

Objectives

Apart for the EU ETS, the objectives of the policy instruments in this landscape all refer to carbon mitigation and energy savings, without a very clear hierarchy. Additional objectives in this landscape are cost-effectiveness, and, in the case of the energy tax, fiscal reform by shifting the tax burden from labour to environmentally polluting activities. The objective of green investment is the protection of the environment, including forests and the natural

environment, which is broader than carbon mitigation/energy saving, but not contradictory to it. In some cases (Decree on Greenhouse Horticulture, but also more generally in multi-annual agreements on energy efficiency), an additional objective of the participating firms is to be able to maintain favourable energy tax rates. A concrete objective for policy instruments in this landscape other than the EU ETS is to contribute to the target for CO_2 emissions for the non-ETS sectors in 2020.

Scope and Coverage

Policy instruments in this landscape include both market-based instruments (taxes, subsidies, fiscal incentives) and regulations in the form of performance standards. All sectors are covered in principle, but there is a substantial difference between the approaches towards small and large energy users. The energy tax is targeted to small energy users (households, firms, non-profit organisations). Although larger users are not exempt, their *marginal* rates are close to zero. Large industrial users are covered by the EU ETS. Fiscal facilities (EIA, Green Investment, and also arbitrary depreciation for environmental investments (VAMIL)) are available for all firms (large and small), provided that they use the means of production that are eligible for support under these schemes. There is little overlap between policy instruments for the industry, energy, and agricultural sectors on the one hand and the transport and housing sectors on the other hand. Most instruments focus on energy use and therefore indirectly on CO_2 emissions. EU ETS focuses on CO_2 emissions directly.

Functioning and Influencing Mechanisms

There are obvious interactions between the EU ETS and the Energy Tax on the one hand and fiscal facilities and subsidies for energy savings (EIA, Green Investment) on the other hand, as the EU ETS and the Energy Tax make investments to save energy more attractive. There are also positive interactions between the fiscal incentives and subsidies for energy saving and the Decree on Greenhouse Horticulture, as the fiscal incentives and subsidies eased the implementation of the Decree. The Subsidy for Energy Research (SEO) may have created a wider supply of affordable energy-efficiency measures, thereby also increasing the effectiveness of the fiscal incentives and subsidies for energy saving and the ease of implementation of the Decree on Greenhouse Horticulture.
An interaction has been noticed between Green Investment and the Energy Performance Coefficient/Standard. The energy performance standards in Green Mortgages (an element of Green Investment) have preceded the legal standards. The market demand generated by Green Mortgages created supply of houses with a high energy performance and this in its turn made it possible to strengthen legal requirements. This interaction can be seen as a virtuous cycle (Ministry of VROM, 2007).

Implementation Network / Administrative infrastructure

There is a clear and well-integrated implementation network and administrative infrastructure for the policy instruments in this landscape. The Ministry of Economic Affairs has the main responsibility for promoting energy efficiency in industry. The Ministry is supported by the Ministry of Finance (Energy Tax, Green Investment, Energy Label), and the Ministry of Infrastructure and Environment (EPC/EPN, Emission Standards for New Passenger Cars),

Many regulations with respect to energy efficiency and energy saving are administered by NL Agency, an agency of the Ministry of Economic Affairs. Enforcement is carried out by government inspection services, provincial and local authorities. Taxes and fiscal facilities are administered, monitored and enforced by the Tax Service.

1.3.3 Promotion of Renewable Sources of Energy

Objectives

The objectives in this policy landscape are carbon mitigation and energy security, without a very clear hierarchy. A very concrete objective is to meet the European target for the share of renewable energy in gross final energy consumption in 2020, which is 14% for the Netherlands. The present Dutch government has a more ambitious target of 16% in 2020.

Scope and Coverage

The policy instruments in this landscape target the energy supply sectors, particularly electricity and gas. SDE+ also targets firms in agriculture and industry to generate their own electricity and heat. The Biofuel Obligation targets the oil companies.

Functioning and Influencing Mechanisms

In theory, the EU ETS makes the promotion of renewable energy (SDE+) easier and more (cost) effective. Because of the low carbon prices in recent years, the interaction has probably not been very strong. The Subsidy for Energy Research (SEO) may have created a wider supply of affordable renewable energy technologies, thereby increasing the effectiveness of instruments that promote the generation of renewable energy. Other interactions are possible between EIA and Green Investment and SDE+ and between Priority for Renewable Electricity and SDE+. Instruments that reduce the costs of generating, distributing or using renewable energy make the SDE+ instrument more (cost-) effective.

Implementation Network / Administrative Infrastructure

The Ministry of Economic Affairs is responsible for the key policy instruments in this landscape. The Ministry is supported by the Ministry of Finance (Green Investment), and the Ministry of Infrastructure and Environment (Biofuel Obligation). Most regulations are administered by NL Agency. The electricity grid operator (TenneT) administers the policy instruments Priority for Renewable Energy and Green Certificates.

1.3.4 Non-Carbon Dioxide Greenhouse Gas Emissions

The reduction of non-carbon dioxide greenhouse gas emissions was carried out by the Reduction Program Other Greenhouse Gases (ROB) which ran from 1999 to 2012. The ROB program was executed by NL Agency on behalf of the Ministry of Infrastructure and Environment and supported by the Ministry of Economic Affairs. The policy instruments from the programme were well-integrated and focused on different sub-sectors of the economy.

1.4 Description and evaluation of policy landscapes in the light of the concept of optimality developed in task 1.1

This section discusses and evaluates the policy landscapes in the light of the concept of optimality that was developed in the CECILIA2050 project. The major elements of optimality are effectiveness, cost-effectiveness and feasibility. To evaluate effectiveness, we compare recent projections of energy and CO_2 emissions in the Netherlands to 2020 and 2030 with European and Dutch policy targets. The projections are based on macroeconomic and energy market projections and include current and planned energy and climate policies (Verdonk and Wetzels, 2012). The evaluation of cost-effectiveness and feasibility are more qualitative.

1.4.1 Carbon Pricing

The EU ETS is a cornerstone of EU's policies to combat climate change in a cost-effective manner. The cost effectiveness of the EU ETS over the period 2005–2009 was estimated to be between € 13–16/tCO_2, which is relatively good. The main criticism on the EU ETS at present is that its allowance prices are too low to give incentives to innovation. Therefore, there is some doubt on the dynamic efficiency of the EU ETS. The administrative costs for companies and the government are relatively high, but the overall acceptance of the policy instrument with firms and the general public seems sufficient. Negative for the public acceptance of the EU ETS are the recurrent reports of fraud and criminal activities in emissions trading (NEa, 2010).

1.4.2 Energy Efficiency and Energy Consumption

The rate of energy savings, expressed as the difference between actual consumption of energy and projected energy consumption without energy-saving policies, was 1.1% per year in the Netherlands over the period 2000–2010 (Gerdes and Boonekamp, 2012). The present Dutch government has no formal target with respect to energy saving. There is a non-binding EU target to reduce energy consumption by almost 1% per year over the period 2006–2016 (PBL, 2013b). Considering greenhouse gas emissions, the Dutch projections of energy and emissions (Verdonk et al., 2012) expect that with current (proposed) policies emissions from non-ETS sectors decrease from 105MtCO_2-eq in 2010 to 100(99)MtCO_2-eq in 2020, which is below the emissions ceiling that was agreed for the Netherlands. For 2030, however, projected emissions with current or proposed policies exceed the emissions ceiling that is likely to be in accordance with a target of 40% reduction with respect to 1990 (Verdonk et al., 2012). An evaluation of energy and climate policies of the Netherlands in the period 1989–2012 suggests that especially after 2005 investments in energy saving have been limited and that, overall, climate policy could have been more cost-effective if more emphasis had been given to energy saving. (Faber et al., 2012)

In a study that investigated the contribution of policy instruments to increase annual energy savings from 1% to 2%, Daniëls et al. (2006) recommended stricter standards in the built environment (EPC/EPN) and in transport (Emission standards for new passenger cars); and tax incentives for energy-intensive industry, greenhouse horticulture, and the energy sector. A marginal energy tax of € 5/GJ is considered necessary, which is far above the present *marginal* rates for large users of about € 0.14/GJ to € 0.37/GJ for electricity and gas,

respectively. In this ambitious policy package, subsidies and fiscal incentives would also remain necessary.

Hence, in energy savings policies in the Netherlands there is a clear trade-off between effectiveness and cost-effectiveness on the one hand and political feasibility on the other hand. The compromise that was reached in the early 1990s between those in favour and those against an energy tax, to (nearly) exempt large industrial users from the tax for reasons of international competitiveness, has made the tax politically possible, but has compromised its effectiveness and cost-effectiveness. Attempts to intensify energy savings (e.g. from 1% to 2% per year) with the current policy mix necessarily have to re-evaluate the original dilemma.

It is possible that higher CO_2 allowance prices in the EU ETS would stimulate energy savings in industry. Higher CO_2 allowance prices may, however, also intensify the attention for the 'double taxation' problem as electricity users are taxed for their use and also face higher electricity prices because of the effects of the EU ETS on the cost of electricity production.

Policies that have promoted energy-efficiency and energy savings in the Netherlands have led to a small energy savings sector with 5,700 full-time jobs in 2008, generating value added of € 430 million.[8] The energy savings sector has a positive trade balance: exports of € 280 million and imports of € 212 million in 2008 (van Rossum et al., 2011).

1.4.3 Promotion of Renewable Sources of Energy

In 2010, the share of renewable energy in gross final energy consumption in the Netherlands was 4%. The European target for the Netherlands for 2020 is 14%.The present Dutch government has a target of 16% in 2020. Dutch projections of energy and emissions (Verdonk et al., 2012) expect that with current (proposed) policies the share of renewable energy in 2020 will not exceed 8 (11)%. With current (proposed) policies, the share in 2030 will not exceed 13 (16)%. This suggests that the current policy mix to promote renewable sources of energy in the Netherlands is not effective. While, the policy instruments (especially the feed-in premium scheme, are designed to be as cost-effective as possible, the scheme has been criticized for promoting those sources of renewable energy (especially biomass for co-firing) for which expected future cost reductions are limited, i.e. the scheme may have limited dynamic efficiency (van der Elst et al., 2012).

Policies that have promoted renewable sources of energy created 11,600 full-time jobs in 2008, generating value added of € 1,280 million. The renewable energy sector has a trade deficit: exports of € 1,526 million and imports of € 2,020 million in 2008. Exports include solar PV technology; imports include biomass and wind turbines from Germany and Denmark (van Rossum et al., 2011).

1.4.4 Non-Carbon Dioxide Greenhouse Gas Emissions

Non-CO_2 greenhouse gases for industry and waste decreased by almost 60% between 1990 and 2010: from 30.2MtCO_2-eq to 12.4MtCO_2-eq. This was mainly due to a reduction of landfill waste, but the ROB program has also contributed. The ROB program also prepared the nitric

[8] These numbers are exclusive of insulation activities in construction.

acid sector for its opt-in in the EU ETS. The ROB program in the sectors industry and waste was cost-effective and it offered participating firms sufficient flexibility in reducing emissions.

The reduction of non-CO_2 greenhouse gases for agriculture has been less successful. Methane (CH_4) emissions only decreased by 2% between 1990 and 2010. They decreased because of the reduction of cattle due to milk quotas, but they recently increased due to the strong expansion of CHP in greenhouse horticulture. Emissions of N_2O decreased by 40% over the period 1990-2010, mainly due the Dutch manure policies. The ROB program was not very successful in the reduction of non-CO_2 greenhouse gas emissions from agriculture, in part because of the relatively low penetration of anaerobic digesters on animal farms.

2 Description and initial evaluation of the overall instrument mix

2.1 Identification and description of the main interactions between policy landscapes

This section identifies the main interactions between policy instruments within and between policy landscapes, focusing on (1) objectives and sub-objectives; (2) scope or coverage; (3) functioning and influencing mechanisms of the main instruments used; and (4) administrative implementation. A full description of interactions based on the methodology of Konidari and Mavrakis (2006) is given in Annex 2.

Objectives

The objectives of the policy instruments in the policy landscapes seem to be complementary and often mutually reinforcing.

Scope and coverage

Policy instruments in the policy landscapes cover all sectors of the economy. The electricity sector is subject to carbon pricing and to the promotion of renewable sources of energy. The policy instruments in these landscapes tend to reinforce each other. Energy-intensive industry is subject to carbon pricing, energy-efficiency and energy saving. Policy instruments in these policy landscapes interact, as we will describe below. Other industry is mainly subject to policy instruments from energy-efficiency and energy saving. Agriculture, households and transport are mainly subject to policy instruments from energy-efficiency and energy saving. A small part of agricultural firms is covered by the EU ETS and some are subject to instruments that promote sources of renewable energy (e.g. green gas). Households are indirectly affected by carbon pricing, as will be discussed below. The policy landscape of non-carbon dioxide emissions reduction has little overlap with the other policy landscapes.

Functioning and influencing mechanisms

The largest and most studied interactions between policy instruments are those between the EU ETS and instruments that promote energy-efficiency and energy saving and renewable energy, respectively. For the Netherlands, such interactions have been studied by, among

others, Sijm and van Dril (2003), Aalbers et al. (2007), and CPB (2013). The first observation of these studies is that because of the fixed cap on total CO_2 emissions from the ETS sectors in Europe, energy savings or increases in the share of renewable energy *in these sectors* will not result in additional CO_2 reductions for the EU as a whole. Because of the cap, total emissions are fixed for the ETS sector (i.e. in 2020 21% below the emissions level in 2005). Additional measures in the ETS sector may only have an impact on the location or timing of the emissions. These measures will however reduce the demand for emission allowances and thus have a negative effect on carbon prices. The second observation is that the EU ETS increases costs of electricity supply, thereby, to the extent that additional costs are passed-on to consumers, increasing electricity prices. The following interactions have been identified:

- EU ETS – SDE+ Because of the fixed cap on EU ETS emissions in Europe, SDE+ subsidies that promote wind and solar energy will not decrease overall CO_2 emissions, but may have a negative effect on the price of carbon allowances. The SDE+ provides incentives for innovation with regard to solar and wind technologies, but the decreasing CO_2 allowance price in the EU ETS provides negative incentives to overall energy innovation. The effect of SDE+ subsidies that promote green gas on CO_2 emissions depends on where the gas is used: within or outside of the ETS sector. If the gas is used within the ETS sector, there will be no effect on CO_2 emissions (because of the cap); if it is used outside the ETS sector, it will reduce CO_2 emissions.
- EU ETS – EIA: EIA has been widely used to subsidise small-scale CHP, for example in greenhouse horticulture. Because of the fixed cap on EU ETS emissions, the electricity that is generated by small-scale CHP does not lead to a reduction of CO_2 emissions, but may lead to a lower CO_2 price and hence a lower innovation incentive. Because more gas is used in CHP than in an ordinary boiler (because the CHP produces both heat and electricity), total CO_2 emissions increase.
- EU ETS – Energy tax: Consumers and small businesses are subject to high (marginal) energy taxes and are also subject to electricity price increases due to the EU ETS. This has been called double regulation or double taxation. This double taxation is not a problem when the CO_2 prices are low as in the present situation, but may become a political problem when these prices rise. The interaction between EU ETS and the Energy Tax may stimulate the demand for energy-saving measures in houses and for solar panels on roofs.

A negative interaction that has been identified is the one between the energy tax and the promotion of community renewable energy initiatives. Haanemaaijer et al. (2013) note that civil society organisations consider the present tax regime for the generation of solar energy to be restrictive. This is because the tax benefit applies only to individual households that wish to have solar panels installed on the roofs of their homes; the same does not apply to organisations, such as housing associations (Haanemaaijer et al., 2013; Bosman and Muller, 2012). In this case, there is a negative interaction between the energy tax and the promotion of renewable energy.

Implementation network / administrative infrastructure

The implementation network and administrative infrastructure of climate and energy policy measures in the Netherlands seems relatively efficient. NL Agency has a prominent role in the

administration of many climate and energy regulations from different Ministries and has benefited from 'learning-by-doing' and economies of scale.

2.2 Summary discussion of the combination of policy landscapes (the overall instrument mix) against each one of the elements of the concept of optimality

Economic Efficiency

The first push for climate policy in the Netherlands was given by the first Dutch National Environmental Policy Plan of 1989 that labelled "climate change" as one of its policy themes. In the first decade, climate policy remained modest, both with respect to its policy instrument mix (that was largely based on incentives for energy savings that were already in place) and with respect to the amount of resources that was allocated to this policy. Climate policy got a new impetus with the adoption and subsequent ratification of the Kyoto Protocol. The Climate Policy Implementation Plan (Ministry of VROM, 1999) set out how the Dutch government planned to meet its obligations under the Kyoto Protocol. In the run-up to the first commitment period of the Kyoto Protocol, the number of policy instruments and related government expenditures grew fast. Government expenditures stabilised around 2003 at € 1–1.5 billion per year (Faber et al., 2012).

As was mentioned before, the policy instrument mix was initially inherited from energy efficiency and energy savings policies that had been in place since the oil crises of the 1970s. The instruments were predominantly voluntary and based on positive incentives, with a notable exception in the form of the introduction of the Regulating Energy Tax of 1996. In the late 1990s and early 2000s much effort was invested in negotiated agreements on energy efficiency with energy-intensive sectors of industry. The introduction of the EU ETS in 2005 significantly changed the playing field as policies and targets became more legally binding.

The Netherlands has a small share of renewable energy in total energy consumption. Policies to promote the share of renewable energy were mostly in the form of positive incentives, such as MEP subsidies to producers of renewable energy and operators of CHP plants. Later, this instrument was replaced by SDE and SDE+ that were meant to provoke more competition between suppliers of renewable energy and between alternative technologies.

The policy instrument mix has further expanded because of EU policies, for example in the areas of energy-efficiency of housing and appliances, energy labelling schemes, emission standards for cars, and biofuel obligations in transport.

The current policy mix is not cost-effective from a static perspective. This can be simply observed from the rather wide spread of costs per ton of carbon dioxide emission avoided. A lack of static cost-effectiveness can potentially be justified by arguments of dynamic efficiency. In this argument, the more expensive measures today would have the potential of the largest cost reductions in the future. This argument is often made to justify for example the support of currently expensive sources of renewable energy. Whether Dutch policies are dynamically cost-effective in this sense is as yet an open question.

Environmental Effectiveness

A recent baseline projection of energy and emissions (Verdonk et al., 2012) suggests that the current policy mix will fail to meet the renewable energy targets in 2020 and will also not achieve the emissions reductions that are likely to be necessary in 2030 and beyond. The current policy mix therefore seems to lack effectiveness in view of the challenges it faces.

Instrument Mix Feasibility

The governance and administration of Dutch climate policies is relatively clear and efficient. While their focus and priorities may sometimes slightly differ, the key Ministries – Infrastructure and Environment, Economic Affairs, and Finance – cooperate well in this policy area. Some specialised agencies (NL Agency, NEa) play key roles and have gained a lot of experience in managing various regulations.

The effects of the EU ETS and other policy instruments on international competitiveness are still poorly understood. While potentially adverse effects might be dismissed by reference to the currently low carbon prices, there is some evidence that suggests that the rate of carbon leakage because of the Kyoto Protocol is actually larger than previously predicted (Aichele et al., 2012).

It is well known that energy taxation always runs the risk of posing a disproportionate burden on the poor. In the Netherlands, the interaction of the energy tax and the EU ETS results in 'double taxation' of households. Depending upon future developments vis-a-vis the carbon price and it effect on electricity prices, this 'double taxation' may pose an increasing burden on households and small to medium-sized firms.

3 Conclusions

In this report we have tried to give an overview of the Dutch policy approach to greenhouse gas mitigation. To this end, we distinguished between four policy 'landscapes':

(1) Carbon pricing: including policies that price CO_2 emissions or otherwise change the relative prices of fuel use, depending on the carbon intensities of fuels.

(2) **Energy efficiency and energy consumption:** including measures targeted at either increasing the efficiency of the energy sector, including power generation / combustion processes, transmission of energy (heat, electricity) and end-use efficiency, or at reducing overall energy consumption (demand-side management, energy saving, sufficiency);

(3) **Promotion of renewable sources of energy:** including policies aimed at increasing the share of energy from renewable sources (solar, wind, hydro, biomass, geothermal);

(4) **Non-carbon dioxide greenhouse gases:** this covers policies geared at reducing non-CO_2 greenhouse gas emissions, typically from sectors other than the energy sector.

Key instruments within these landscapes were identified. The key instrument in 'Carbon pricing' is the EU ETS, which is in fact the only instrument the directly puts a price on carbon emissions. Key instruments in energy efficiency and energy saving include the energy tax and various subsidies and fiscal incentives. It also increasingly includes norms and standards, often of European origin. The key instrument in the promotion of renewable energy is the

SDE+ feed-in premium scheme that seeks to promote renewable energy in a cost-effective way. The key instrument in the policy landscape of non-carbon dioxide greenhouse gases is the ROB program that aimed to generate awareness and knowledge on measures to reduce non-CO_2 greenhouse gases from agriculture and industry.

Within these policy landscapes, policy instrument usually interact in a positive way to achieve their goals. For example, within the policy landscape of energy efficiency and energy saving, energy taxes and positive incentives for energy-saving technologies mutually support each other in many instances. A negative interaction may occur when energy taxes make community renewable energy schemes financially less attractive for their participants.

Between the policy landscapes, interactions occur between the EU ETS and policy instruments that promote energy efficiency and energy saving and policy instruments that promote the supply and use of renewable energy. Because of the cap on total emissions from the ETS sectors in the EU, instruments that directly or indirectly reduce emissions of specific firms in the ETS sector will not automatically also reduce emissions for the total ETS sector in the EU. While such instruments (promoting energy saving or renewable energy) may still be valuable, their (cost-) effectiveness may have to be re-evaluated. In some cases, e.g. the promotion of small CHP plants by fiscal incentives, net CO_2 emissions may even increase.

In terms of 'optimality', the current policy mix is probably not effective enough in stimulating renewable energy to meet medium-term targets and in achieving the emissions reductions that are likely to be necessary in 2030 and beyond. The policy mix is not cost-effective because marginal abatement costs are not equalised across all measures and sectors. Whether the policy mix is (more) cost-effective

in a dynamic sense remains to be seen. The political support for climate policies is still relatively high in the Netherlands. If policies must be tightened to meet Europe's 2050 climate targets, important questions remain on the international competitiveness of energy-intensive industries (including greenhouse horticulture in the Netherlands) and the effects on energy bills of poorer households.

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Annex I: Table for the description of instruments

	EU ETS	Decree on Greenhouse Horticulture	Energy Investment Allowance	Energy Performance Coefficient/Standard	Energy Tax
Instrument category	ETS	Command and Control	Tax	Command and Control	Tax
Instrument subcategory	Cap-and-Trade	Performance standard	Negative tax on environmentally-friendly activities	Building codes and standards	Taxes on inputs or outputs of a production process
Level of governance	EU	National	National	EU	National
Degree of bindingness	Mandatory	Mandatory	Voluntary	Mandatory	Mandatory
Objectives					
Goal(s)	Greenhouse gas mitigation in a cost-effective manner; Meeting Kyoto Protocol targets	Allocate targets of GLAMI agreement to individual farmers; includes targets on energy-efficiency	To attain “a more sustainable energy system”	To reduce energy consumption in buildings caused by heating, hot water production, lighting, cooling and ventilation	Promote energy savings and thereby reducing the emissions of CO_2; Greening of national taxation by shifting the tax burden from labour to environmentally polluting activities
Type of target	Cap on total emissions per installation	GJ/ha per crop or crop group		Energy performance norm	
GHG Scope					
GHGs covered	Carbon dioxide, per fluorocarbons, nitrous oxide	Carbon dioxide	Carbon dioxide	Carbon dioxide	Carbon dioxide
Direct/indirect emissions	Direct	Indirect	Indirect	Indirect	Indirect
Primary/final energy	Primary	Final	Primary and final	Final	Final
Opt-in/opt-out					

Sectoral scope					
Sectors of economy	Energy supply, industrial, transport (aviation)	Food and agriculture	Energy supply, industrial, food and agriculture	Households, consumers and buildings	Economy-wide
Covered entities	Installations	Greenhouse horticultural farms	Means of production	Houses	Final users of gas and electricity and some minor lubricants
Covered sites	All energy producers and energy-intensive sectors as defined in EU ETS. In the Netherlands more than 530 installations are covered.	Greenhouse horticultural farms and arable farms with more than 2500 m^2 of greenhouse, except farms that produce mushrooms or chicory	Firms	New houses	All final users of electricity, gas, and some minor lubricants
Capacity thresholds entities/sites	Combustion installations with rated thermal input above 20MW, specific thresholds for each sector	More than 2500 m^2 of greenhouse	The minimum investment eligible for tax deduction is € 2.300		There is a rebate of € 318.62 per electricity connection per year
Opt-in/opt-out for sectors	The Netherlands has requested an opt-out for the greenhouse horticulture sector in 2011.				
Opt-in/opt-out for entities					
Opt-in/opt-out for sites	In 2008-12 opt-in for nitric acid plants	Since 2009 sites that fall under the EU ETS are exempt from the energy-efficiency targets of the Decree			City heating systems; feedstock; electricity generators; 50% discount for churches and other institutions aimed at the common good.
Implementation network					
Competent	EU institutions, National	National Parliament	National Parliament	EU Institutions,	National Parliament

bodies for adopting instrument	Parliament			National Parliament	
Competent body for setting-up instrument	Ministry of Infrastructure & Environment	Ministry of Economic Affairs (formerly: Ministry of Agriculture)	Ministries of Finance and Economic Affairs	Ministry of the Interior and Kingdom Relations	Ministry of Finance
Competent body to administer instrument	Netherlands Emissions authority (NEa)	A specialized body (UO IMT)	NL Agency	NL Agency developed tools for monitoring and enforcement	Energy companies collect tax in energy bill
Competent body for registration of participating entities	Netherlands Emissions authority (NEa)	UO IMT	NL Agency	Municipalities (on request for environment license)	Ministry of Finance, Tax service
Competent body for Monitoring & verifying compliance	Netherlands Emissions authority (NEa)	UO IMT, Ministry of Economic Affairs and its Inspection Agencies, Province, Municipalities	Ministry of Finance, Tax Service	Municipalities	Ministry of Finance, Tax service
Competent body for enforcement of compliance	Netherlands Emissions authority (NEa) and Public Prosecution Service	Ministry of Economic Affairs and its Inspection Agencies, Province, Municipalities	Ministry of Finance, Tax Service	Municipalities	Ministry of Finance, Tax service
Rules & influencing mechanisms					
Market arrangements					
Non-obligatory for eligible parties					
Number of participants	> 530 installations in the Netherlands	Approx. 5000 (in 2012)			

Market flexibility					
Trading participants					
Unit type and name	Allowance, Aviation Allowance				
Nature of unit	1 Ton CO2eq				
Lifetime of unit	8 years, but can be replaced by new ones (Art. 13)				
Banking provisions	Allowed between years in each period and between periods				
Borrowing provisions	Allowing between years of each period				
Financing					
Cost-recovery	Possible via price increases of electricity or products				
Revenues raised	Increasingly substantial through auctioning, particularly from 2013 onwards				
Eligible technologies	Scope defined in terms of industrial activities rather than technologies	None specified	Specified in yearly adjusted technology list	Scope defined in performance standards	Not applicable
Technological parameters					
Opt-in/opt-out	None provided				
Treatment of additionality	Not relevant				

Timing					
Operational?	Yes	No	Yes	Yes	Yes
Operational changes foreseen?	Possible Increase of ambition in cap, possible introduction of carbon price floor, possible withdrawal of allowances by Commission/MS, introducing more sectors and gases, further limits in access to international credits	Since 1 January 2013 the Decree was transposed to the more general Decree on Activities	No	No	No, but in 2004 the tax was brought in line with the EU Energy Taxes Directive (2003/96/EC)
Compliance period(s)	2005-2007, 2008-2012, 2013-2020, 2020-2028?	2002-2013	1997-	2006-	1996-
Future continuation	Yes	In the Decree of Activities	Yes	Yes	Yes
Compliance					
Monetary penalties	Yes, EUR100 per ton CO2eq emitted and not covered by an allowance				
Naming and shaming	Yes (Art.16.2)				
Administrative liability	Yes (Art.16) (penalties should be effective, proportionate, and dissuasive)	Through provisions of Environmental Management Act; the authorities have focused on enforcing the reporting obligation and have been lenient in enforcing the standards, except for “notorious offenders”	Through provisions of the Personal Income Tax Act 2001	Through provisions of the Housing Act 1991	Through provisions of Environmental Taxes Act 1994
Civil liability					

	Emissions Standards for New Passenger Cars	Energy Label for Passenger Cars	SDE Subsidy for Renewable Energy	Green Investment	Subsidy for Energy Research (EOS)
Instrument category	Command and Control	Information	Techsupport	Techsupport	Techsupport
Instrument subcategory	Performance standard	Environmental labeling programs	Financial measures (subsidies)	Policies to remove financial barriers to acquiring green technology	Public and private RD&D funding
Level of governance	EU	EU	National	National	National
Degree of bindingness	Mandatory	Mandatory	Voluntary	Mandatory	Mandatory
Objectives					
Goal(s)	Reduce CO_2 emissions from passenger cars and improve fuel economy	Reduce CO_2 emissions from passenger cars and improve fuel economy	Promotion of the use of energy from renewable sources	Protection of the environment, including forests and the natural environment	Promotion of research on affordable, reliable and clean energy
Type of target			Share of renewables in gross final energy in 2020		
GHG Scope					
GHGs covered	Carbon dioxide	Carbon dioxide			
Direct/indirect emissions	Direct	Direct	Indirect	Indirect	Indirect
Primary/final energy	Final	Final	Primary	Primary and final	Primary and final
Opt-in/opt-out					
Sectoral scope					
Sectors of economy	Transport	Transport	Energy supply	Economy-wide	Economy-wide

Covered entities	New cars registered in EU	New cars	Installations		
Covered sites	Car makers/importers	Car sellers	Energy supply plants		
Capacity thresholds entities/sites	Temporary exception possible for small and independent manufacturers (< 10.000 cars per year)				
Opt-in/opt-out for sectors					
Opt-in/opt-out for entities					
Opt-in/opt-out for sites					
Implementation network					
Competent bodies for adopting instrument	EU institutions	EU institutions	National Government	National government	National Government
Competent body for setting-up instrument	EU Commission	Ministry of Finance	Ministry of Economic Affairs	Ministry of Finance	Ministry of Economic Affairs
Competent body to administer instrument	Ministry of Infrastructure and Environment	FIOD-ECD (Economic Inspection Agency)	NL Agency	Ministry of Finance	NL Agency
Competent body for registration of participating entities	Ministry of Infrastructure and Environment	FIOD-ECD	NL Agency	Ministry of Finance	NL Agency
Competent body for Monitoring & verifying compliance	Ministry of Infrastructure and Environment	FIOD-ECD	NL Agency	Ministry of Finance	NL Agency

Competent body for enforcement of compliance	European Commission	FIOD-ECD in combination with Public Prosecution Service		Ministry of Finance	Ministry of Economic Affairs
Rules & influencing mechanisms					
Market arrangements					
Non-obligatory for eligible parties					
Number of participants					
Market flexibility					
Trading participants					
Unit type and name					
Nature of unit					
Lifetime of unit					
Banking provisions					
Borrowing provisions					
Financing					
Cost-recovery					
Revenues raised					
Eligible					

technologies					
Technological parameters					
Opt-in/opt-out					
Treatment of additionality					
Timing					
Operational?	Yes	Yes	Yes	Yes	No
Operational changes foreseen?	Further tightening of standard to 95g/km in 2020		No, in 2011 SDE was replaced by SDE+. SDE+ is financed by surcharge on energy bills		
Compliance period(s)	2007-	2001-	2008-	1995-	2005-2010
Future continuation	Yes		Yes	Partly, tax rebate ends in 2014, exemption on wealth tax remains intact	No, energy research is now subsidized by the program “Top Sectors”. In comparison to 2010, total government subsidy to energy research has halved
Compliance					
Monetary penalties	€ 20/gCO_2 in 2012 to €95/gCO_2 2015				
Naming and shaming					
Administrative liability	Regulation 443/2009		Through the Framework Act EZ Subsidies 1996	Through provisions of the Personal Income Tax Act 2001	
Civil liability					

	Biofuel Obligation	Priority for Renewable Electricity	Green Certificates/Guarantees of Origin	Methane Emissions from Bioenergy	N_2O Emissions from the Production of Nitric Acids
Instrument category	Command and Control	Command and Control	Techsupport	Information	Information
Instrument subcategory	Prohibition or mandating of certain products or practices	Prohibition or mandating of certain products or practices	Green certificates	Information campaigns, education and training	Information campaigns, education and training
Level of governance	National	National	EU	National	National
Degree of bindingness	Mandatory	Mandatory	Mandatory	Voluntary	Voluntary
Objectives					
Goal(s)	Promote the use of biofuels in transport	Promotion of the use of energy from renewable sources	Promotion of the use of energy from renewable sources	Reduce emissions of non-CO_2 greenhouse gases	Reduce emissions of non-CO_2 greenhouse gases
Type of target	Minimum share of renewable energy in petroleum and diesel (4% in 2010).	Share of renewables in gross final energy in 2020	Share of renewables in gross final energy in 2020	Mt CO_2-eq.	Mt CO_2-eq.
GHG Scope					
GHGs covered	Carbon dioxide	Carbon dioxide	Carbon dioxide	CH_4	N_2O
Direct/indirect emissions	Indirect	Indirect	Indirect	Direct	Direct
Primary/final energy	Final	Final	Primary		
Opt-in/opt-out					
Sectoral scope					
Sectors of economy	Transport	Energy supply	Energy	Food and agriculture	Industry

Covered entities	Annual sale of petrol and diesel	Transmission System Operator (TSO)			
Covered sites	License holders of the excise goods petrol and diesel	TSO	Generators, suppliers, traders, buyers of green electricity	Animal Farms	Nitric Acid plants
Capacity thresholds entities/sites					
Opt-in/opt-out for sectors					
Opt-in/opt-out for entities	Opt-in for suppliers of green gas and electricity (biotickets)				
Opt-in/opt-out for sites					
Implementation network					
Competent bodies for adopting instrument	EU institutions, National Parliament	EU institutions, National Parliament	EU institutions, National Parliament	National Parliament	National Parliament
Competent body for setting-up instrument	Ministry of Infrastructure and Environment	Ministry of Economic Affairs	EU Commission	Ministry of Infrastructure and Environment	Ministry of Infrastructure and Environment
Competent body to administer instrument	Ministry of Infrastructure and Environment	Transmission Systems Operator (TenneT)	Transmission System Operator (TenneT)	NL Agency	NL Agency
Competent body for registration of participating entities	Ministry of Infrastructure and Environment/ (NEa?)		CertiQ (a subsidiary of TenneT)	NL Agency	NL Agency
Competent body for Monitoring & verifying	Ministry of Infrastructure and Environment and its inspection services	FIOD-ECD (Economic Inspection Agency)	Transmission System Operator (TenneT)	NL Agency	NL Agency

compliance					
Competent body for enforcement of compliance	Ministry of Infrastructure and Environment and its inspection services	FIOD-ECD (Economic Inspection Agency)	Ministry of Economic Affairs	Ministry of Infrastructure and Environment	Ministry of Infrastructure and Environment
Rules & influencing mechanisms					
Market arrangements					
Non-obligatory for eligible parties					
Number of participants					
Market flexibility					
Trading participants					
Unit type and name					
Nature of unit					
Lifetime of unit					
Banking					

provisions					
Borrowing provisions					
Financing					
Cost-recovery					
Revenues raised					
Eligible technologies					
Technological parameters					
Opt-in/opt-out					
Treatment of additionality					
Timing					
Operational?	Yes	Yes	Yes	No, the program Reduction of Other Greenhouse Gases (ROB) ended in 2012	No, the program Reduction of Other Greenhouse Gases (ROB) ended in 2012
Operational changes foreseen?	No	No, although the Netherlands proposed a change of system whereby grid balancing costs would be borne by all generators of fossil fuels. This proposal was rejected by the Commission			--
Compliance period(s)	2007-	2009-	2004-	1999-2012	1999-2012
Future	Yes	Yes	Yes	No	No

continuation					
Compliance					
Monetary penalties					
Naming and shaming					
Administrative liability	Through provisions of the Environmental Management Act	Through the provisions of the Electricity Act 1998	Through the provisions of the Electricity Act 1998.		
Civil liability					

Annex II: Types of interactions between instruments

	Type of policy interaction	Description
Energy Efficiency and Energy Consumption		
EU-ETS / EIA	different	Interaction between a tradable market and a tax instrument
Degree of bindingness	m-v	Mandatory EU ETS and voluntary tax incentives
Objectives	p-p	Both instruments aim to reduce CO_2 emissions, EIA also aims at energy savings.
Scope	os-pa	Sector EU ETS is subset of EIA sector
Implementation network	d-r	Different authorities
Rules and influencing mechanisms	r	EU ETS "cap" nullifies CO_2 impact of EIA investments in ETS sector

	Type of policy interaction	Description
Energy Efficiency and Energy Consumption		
EU-ETS / Energy Tax	different	Interaction between a tradable market and a tax instrument
Degree of bindingness	m-m	Mandatory EU ETS and mandatory energy tax
Objectives	p-p	Both instruments aim to reduce CO_2 emissions, Energy Tax also aims at

		energy savings.
Scope	os-pa	Sector EU ETS is subset of EIA sector
Implementation network	d-r	Different authorities
Rules and influencing mechanisms	r	Double taxation for small energy users

	Type of policy interaction	Description
Energy Efficiency and Energy Consumption		
EPC / Green Investment	different	Interaction between a performance standard and a tax instrument
Degree of bindingness	m-v	Mandatory EPC and voluntary tax incentive
Objectives	p-p	Both instruments aim to reduce CO_2 emissions and promote energy savings.
Scope	p-pa	Partially overlapping for houses
Implementation network	d-r	Different authorities
Rules and influencing mechanisms	r	Green Mortgages (under Green Investment) paved the way for stricter energy performance standards (EPC) for houses

	Type of policy interaction	Description
Energy Efficiency and Energy Consumption		
EIA/Decree Greenhouse	different	Interaction between a tax instrument and a

Horticulture		performance standard
Degree of bindingness	v-m	Voluntary tax incentive and mandatory Decree
Objectives	p-p	Both instruments aim to reduce CO_2 emissions, and promote energy savings.
Scope	os-pa	Sector Greenhouse Horticulture is subset of EIA sector
Implementation network	p-r	Partially overlapping (Ministry of Economic Affairs)
Rules and influencing mechanisms	r	EIA was used to meet energy targets under Decree

	Type of policy interaction	Description
Promotion of Renewable Sources of Energy		
SDE+/Priority for Renewable Energy	different	Interaction between a subsidy and a regulatory instrument
Degree of bindingness	v-m	Voluntary subsidy and mandatory regulation
Objectives	p-p	Both instruments aim to promote renewable energy and reduce CO_2 emissions
Scope	i-i	Indirect interaction
Implementation network	p-r	Partially overlapping (Ministry of Economic Affairs)
Rules and influencing mechanisms	r	Priority rules incease for demand for renewable energy produced with SDE+ subsidy

	Type of policy interaction	Description
Promotion of Renewable Sources of Energy		
EU ETS/SDE+	different	Interaction between a tradable market and a subsidy instrument
Degree of bindingness	m-v	Mandatory EU ETS and voluntary subsidy
Objectives	p-p	Both instruments aim to reduce CO_2 emissions and promote renewable energy
Scope	i-i	Indirect interaction
Implementation network	d-r	Different authorities
Rules and influencing mechanisms		EU ETS could make renewable energy more attractive if it raises electricity price

Promotion of Renewable Sources of Energy	Type of policy interaction	Description
Energy Efficiency and Energy Consumption		
SDE+/Energy Tax	different	Interaction between a subsidy and a tax
Degree of bindingness	v-m	Voluntary subsidy and mandatory tax
Objectives	p-p	Both instruments aim to reduce CO_2 emissions and promote energy saving. SDE+ also promotes renewable

		energy
Scope	i-i	Indirect interaction
Implementation network	d-r	Different authorities
Rules and influencing mechanisms	r	SDE+ promotes renewable energy and Energy Tax taxes its use. Disincentive for local renewable energy initiatives.

Annex III: List of legal instruments with original Dutch name and English translation

English translation	Dutch name	Source
Decree on Greenhouse Horticulture	Besluit Glastuinbouw	Stb 2002, nr. 109
Decree on Activities	Activiteitenbesluit	Stb 2007, nr. 415
Environmental Management Act	Wet Milieubeheer	Stb 1979, nr. 442
Implementation Decree Energy Investment Allowance	Uitvoeringsbesluit Energie Investeringsaftrek	Stcr 2000, nr. 249
Income Taxes Act	Wet Inkomstenbelasting	Stb 2000, nr. 215
Decree on Energy Performance of Buildings	Besluit energieprestatie gebouwen	Stb 2006, nr. 608
Housing Act	Woningwet	Stb 1991, nr. 439
Implementation Decree Taxes on Environmental Basis	Uitvoeringsbesluit belastingen op milieugrondslag	Stb 1994, nr. 948, last change Stb 2009, nr. 615
Decree Biofuels for Road Transportation	Besluit biobrandstoffen wegverkeer	Stb 2006, nr. 524
Decree on labelling of energy use of passenger cars	Besluit etikettering energiegebruik personenauto's	Stb 2000, nr. 475, changed by Stb 2009, nr. 540
Electricity Act	Elektriciteitswet	Stb 1998, nr. 427
Regulation on Guarantees of Origin for Sustainable Electricity	Regeling garanties van oorsprong duurzame elektriciteit	Stcr 2003, nr. 242
Regulation Green Certificates	Regeling groencertificaten Elektriciteitswet 1998	
Green Investment	Groen beleggen	Infob 2002, 7
Framework Act EZ Subsidies	Kaderwet EZ subsidies	Stb 1996, nr. 180

Annex IV Energy tax rates (€cnt) 1996-2013 (excluding VAT)

	1996-8	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Natural gas (m^3)[1)]																
0-800	0	0	0	12.03	12.40	12.85	14.29	14.94	15.07	15.31	15.54	15.80	16.29	16.39	16.67	18.62
800-5000	4.32	7.25	9.45	12.03	12.40	12.85	14.29	14.94	15.07	15.31	15.54	15.80	16.29	16.39	16.67	18.62
5000-170,000	4.32	4.74	5.19	5.62	5.79	6.00	7.27	10.19	12.38	13.42	13.62	13.85	14.11	14.19	14.43	18.62
170,000-1 mln	0	0.32	0.70	1.04	1.07	1.11	2.27	3.11	3.40	3.72	3.78	3.84	3.91	3.93	4.00	4.39
1mln – 10 mln	0	0	0	0	0	0	1.13	1.15	1.16	1.18	1.20	1.22	1.24	1.25	1.27	1.60
> 10 mln 1)	0	0	0	0	0	0	0.75	0.76	0.77	0.78	0.79	0.80	0.82	0.82	0.83	1.15
Natural gas for horticulture (m^3)																
0-5000	0	0	0	0	0	0	n.a	n.a	1.39	1.41	1.43	1.46	1.48	1.49	1.52	2.99
5,000-170,000	0	0	0	0	0	0	n.a	n.a	2.21	2.24	2.28	2.32	2.36	2.38	2.42	2.99
170,000-1 mln	0	0	0	0	0	0	n.a	n.a	1.85	1.88	1.91	1.94	1.98	1.99	2.02	2.22
1 mln – 10 mln	0	0	0	0	0	0	n.a	n.a	1.16	1.18	1.20	1.22	1.24	1.25	1.27	1.60
> 10 mln	0	0	0	0	0	0	n.a	n.a	0.78	0.78	0.79	0.80	0.82	0.82	0.83	1.15
Electricity (kWh)[2)]																
0-800	0	0	0	5.83	6.01	6.39	6.54	6.99	7.05	7.16	7.27	10.85	11.14	11.21	11.40	11.65
800-10,000	1.34	2.25	3.72	5.83	6.01	6.39	6.54	6.99	7.05	7.16	7.27	10.85	11.14	11.21	11.40	11.65
10,000-50,000	1.34	1.47	1.61	1.94	2.00	2.07	2.12	2.63	3.43	3.69	3.75	3.98	4.06	4.08	4.15	4.24
50,000- 10 mln	0	0.10	0.22	0.59	0.61	0.63	0.65	0.86	0.94	1.02	1.04	1.06	1.08	1.09	1.11	1.13
> 10 mln	0	0	0	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
> 10 mln (EU ETS)[3)]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green electricity[3)]																
0-5000	0	0	0	0	0	3.49	4.30									
> 5000	0	0	0	0	0	0	0									

1) Mean gas consumption per household in 2013 was 1560 m^3

2) Rebate per electricity connection; €318.62 in 2009-2013; € 199.00 in 2007-2008; € 181.00 in 2004.

3) Since 2013 the exemption of energy-intensive industries that are in a negotiated agreement on energy-efficiency is changed into a rebate scheme, but this has not yet been approved by the European Commission.

4) Since 2005 green electricity and fossil electricity have the same tax rate