Council of the European Union

**Brussels, 27 November 2017**
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**CLIMA 325**
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**COMPET 819**
**TRANS 519**
**ENV 993**
**ECOFIN 1042**
**RELEX 1030**
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**COVER NOTE**

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| From: | Secretary-General of the European Commission, signed by Mr Jordi AYET PUIGARNAU, Director |
| date of receipt: | 24 November 2017 |
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**COMMISSION STAFF WORKING DOCUMENT**

**Energy Union Factsheet The Netherlands**

***Accompanying the document***

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE, THE COMMITTEE OF THE REGIONS AND THE EUROPEAN INVESTMENT BANK**

**Third Report on the State of the Energy Union**

{COM(2017) 688 final} - {SWD(2017) 384 final} - {SWD(2017) 385 final} - {SWD(2017) 386 final} - {SWD(2017) 387 final} - {SWD(2017) 388 final} - {SWD(2017) 389 final} - {SWD(2017) 390 final} - {SWD(2017) 391 final} - {SWD(2017) 392 final} - {SWD(2017) 393 final} - {SWD(2017) 394 final} - {SWD(2017) 395 final} - {SWD(2017) 396 final} - {SWD(2017) 397 final} - {SWD(2017) 398 final} - {SWD(2017) 399 final} - {SWD(2017) 401 final} - {SWD(2017) 402 final} - {SWD(2017) 404 final} - {SWD(2017) 405 final} - {SWD(2017) 407 final} - {SWD(2017) 408 final} - {SWD(2017) 409 final} - {SWD(2017) 411 final} - {SWD(2017) 412 final} - {SWD(2017) 413 final} - {SWD(2017) 414 final}

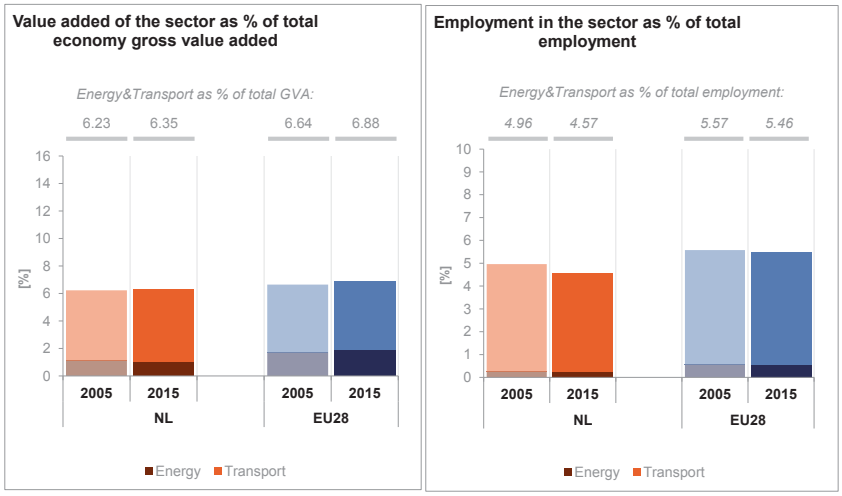
# The Netherlands

*Energy Union factsheet*[1]

## Macro-economic implications of energy activities

Energy and transport are key sectors for the overall functioning of the economy as they provide an important input and service to the other sectors of the economy. Together the activity in these two sectors[2] accounted for 6.3% of the total value added of the Netherlands in 2015. Similarly, their share in total employment[3] was 4.6% of total employment in 2015, of which 4.3% in the transport sector and 0.3% in the energy sector.

The decarbonisation of the energy and transport sectors will require significant investments and economic activity beyond the remit of these sectors themselves. The energy transition implies a structural shift in economic activity. Energy-related investment and jobs will in part migrate from traditional fossil fuel based activities towards construction, equipment manufacturing and other services related to the deployment of low carbon and clean energy technologies. At the moment, the efforts related to the low-carbon and clean energy transition in sectors beyond energy can only be partially quantified and are therefore not included in this analysis.




*(source: Eurostat)*

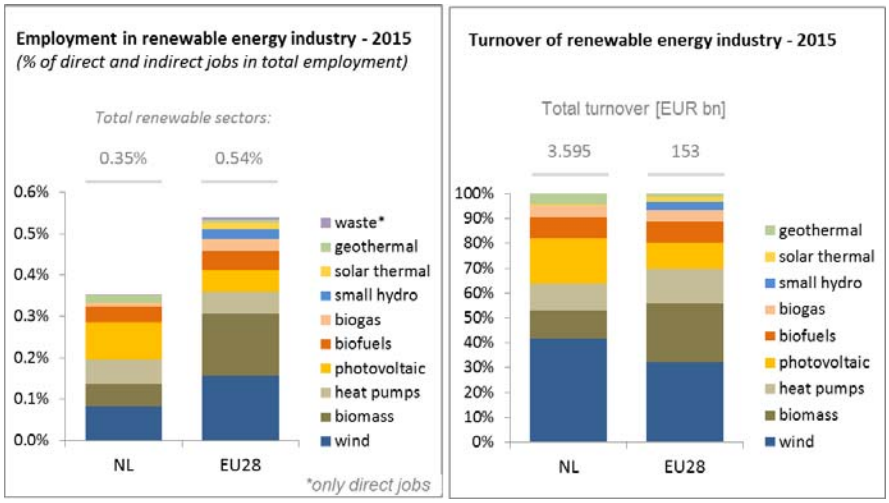
In the case of renewable energy sector, both the direct as well as the indirect effects on employment are being estimated. According to EurObserv'ER, in 2015, the share of direct and indirect renewable energy related employment in total employment of the economy in the Netherlands was at about

1 The indicators used in this country factsheet largely build on indicators developed for the Commission Staff Working Document "Monitoring progress towards the Energy Union objectives – key indicators" (SWD(2017) 32 final) https://ec.europa.eu/commission/sites/beta-political/files/swd-energy-union-key-indicators_en.pdf

2 Gross value added and employment in NACE sectors D-Electricity, gas, steam and air conditioning supply and H-Transportation and storage

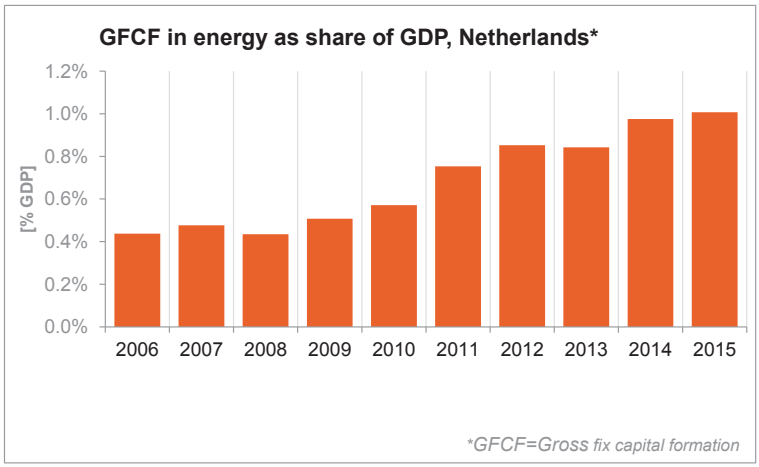
3 National accounts, Eurostat

0.35%, below the EU average of 0.54%. The turnover of the renewable energy industry in the same year was estimated at around EUR 3.6 billion, the biggest part being attributed to the wind (EUR 1.5 billion) followed by photovoltaic (EUR 660 million), biomass (EUR 400 million) and heat pumps (EUR 390 million) industries.




*(source: EC based on Eurobserv'Er and Eurostat)*

An indication of the level of investments in the energy sector in the Netherlands is given by the Gross fixed capital formation (GFCF)[4]. These investments, in the electricity and gas sectors, which are taken as reference sectors, have been on an increasing trend since 2008. They represented around 1% of the country's GDP in 2015, higher than in the pre-crisis period.

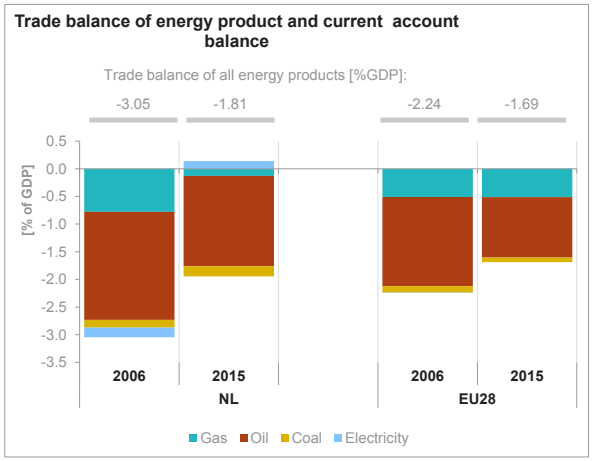



*(source: Eurostat)*

In terms of trade, the Netherlands is net exporter of electricity and a net importer of fossil fuels (based on gas trade data reported as non-confidential and disseminated publicly) and different sources of biomass. However, national statistics suggest there have been gas surpluses in both 2006

[4] Gross fixed capital formation consists of resident producers´ acquisitions, less disposals, of fixed tangible or intangible assets. This covers, in particular, machinery and equipment, vehicles, dwellings and other buildings. It also includes foreign direct investment (FDI). Steam and air conditioning supply are also included in the figures mentioned above as Eurostat reports electricity, gas, steam and air conditioning supply together.

and 2014 (see Occasional Papers 196/2014). The trade deficit in energy products has fallen from about 3% of GDP in 2006 to 1.8% in 2015. The largest decrease is accounted for by petroleum products. Furthermore, during the same period, the trade deficit for electricity (0.2%) has turned into a surplus of 0.1%.

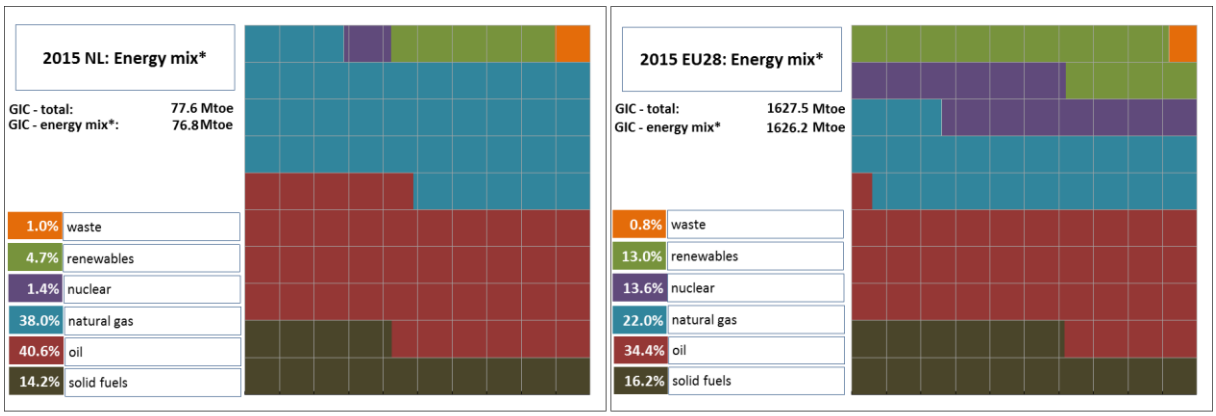



*(source: Eurostat, based on gas trade data reported as non-confidential and disseminated publicly)*

## Energy security, solidarity and trust

### Energy Mix

In comparison to the average energy mix in the EU, the energy mix of the Netherlands has a much higher share of natural gas usage (38% vs 22%) and a, albeit less pronounced, higher share of oil products (40.6% vs 34.4%) in gross inland consumption of primary products. Conversely, nuclear power (1.4% v 13.6%) and renewables (4.7% vs 13%) have a lower relative importance in the Dutch energy mix than elsewhere in the EU. The Netherlands has one nuclear power plant at Borsele, which is currently scheduled to close in 2033.

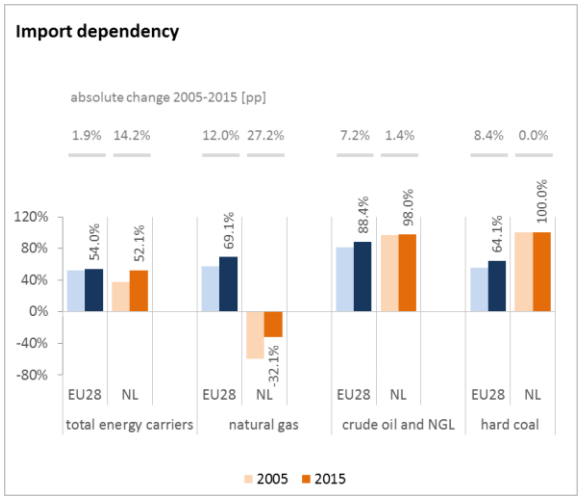



**energy mix as share share in GIC-excluding electricity and derived heat exchanges , GIC=gross inland consumption*

*(source: ESTAT)*

## Import dependency and security of supply

Although currently comparatively low, energy import dependency is expected to increase. With net import dependency amounting to around 52% of domestic demand, the Netherlands has an overall average energy import dependency. Nevertheless the Netherlands is highly dependent on imports of crude oil and hard coal. Gas production has started to decrease and will continue to do so in the coming years as a result of production ceilings set for the Groningen field (due to earthquakes) and lower production levels at other small gas fields following natural depletion. According to the International Energy Agency, the Netherlands is expected to become a net importer of gas by 2025.




2015: Top non-EU suppliers for main energy carriers*

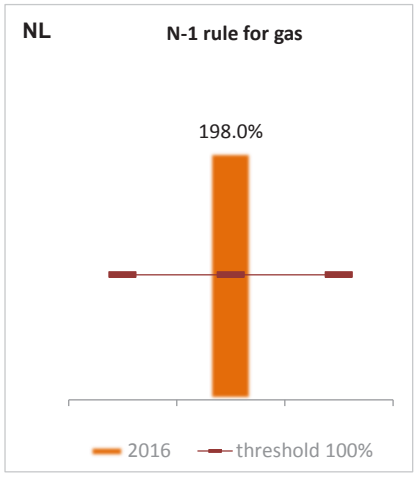
| Natural gas | | Crude oil and NGL | | Hard coal | |
|---|---|---|---|---|---|
| NL | EU28 | NL | EU28 | NL | EU28 |
| Norway 56.3% | Russia 37.3% | Russia 26.2% | Russia 28.8% | Colombia 31.9% | Russia 29.1% |
| Russia 21.1% | Norway 32.8% | Norway 16.0% | Norway 12.4% | Russia 22.9% | Colombia 24.3% |
| | Algeria 10.7% | Nigeria 9.4% | Nigeria 8.3% | United States 20.1% | United States 16.0% |

*share in total imports for the MS and in total non-EU imports for the EU28

*(source: ESTAT)*

Imports of uranium and nuclear fuels are not included in Eurostat's energy balances. However, the Netherlands is a major supplier of uranium enrichment services through the Urenco site at Almelo. The three European Urenco sites (in the Netherlands, Germany and the UK) account for circa 30% of global enrichment capacity whereas the Netherlands has only one nuclear power plant at Borsele.

The Netherlands complies (easily) with the N-1- gas requirement. Security of supply is facilitated through the large indigenous production that, moreover, does not depend on one single production facility. Indeed, the largest Groningen field is divided into over 20 facilities, and additional national production is delivered through more than 236 so-called “small fields.” Notwithstanding the down-scaling of the annual Groningen production, the measures that are taken assure that under peak and/or emergency situations maximum required production capacity will still be available.

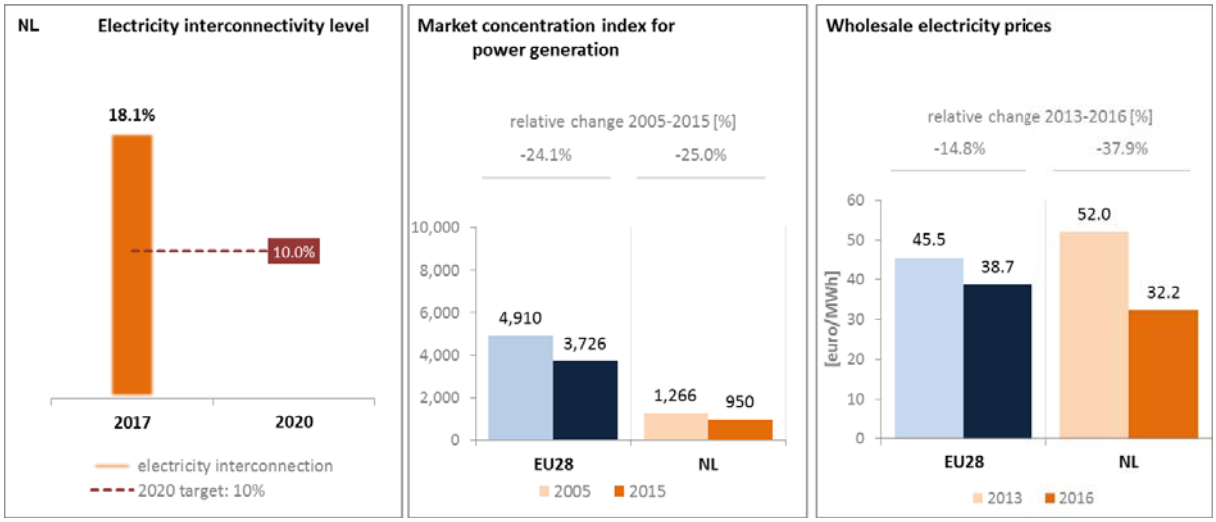



*(source: gas coordination group)*

# 1. Internal market

## 1.1.1. Interconnections and wholesale market functioning

### Electricity




*(source: EC services based on ENTSOE)* *(source: EC services based on ESTAT)* *(source: EC services based on Platts and European power exchanges)*

The Netherlands is currently interconnected with Germany, Belgium, the UK and Norway. The interconnection level[5] for electricity is 18% in January 2017 for the Netherlands, which is above the 2020 target.

The Netherlands currently has two Projects of Common Interest in electricity to increase interconnection capacity: Denmark — Netherlands interconnection between Endrup (DK) and Eemshaven (NL) (currently known as "COBRAcable"); and Germany — Netherlands interconnection between Niederrhein (DE) and Doetinchem (NL).

The COBRA cable will have a capacity of approx. 700 MW, will be around 325 kilometres long, and will run from Eemshaven (the Netherlands) to Endrup (Denmark) via the German sector of the North Sea. The cobra cable may, in a later stage, also connect new offshore wind farms to the cable and is NL most important PCI, related to the North Sea cooperation. Two onshore converter stations – one in the Netherlands and one in Denmark – are needed to connect them to the existing grids. Work on-shore on the COBRA cable has started in both the Netherlands and in Denmark last year. In the Netherlands the works on the subsea cable have started in January 2017.

Even though the Netherlands has an interconnection rate of 18%, there are occasional cases of congestion preventing Dutch wholesale prices to respond when wholesale prices in Germany drop as a result of high renewables penetration. The second PCI on the list will contribute to resolving this issue.

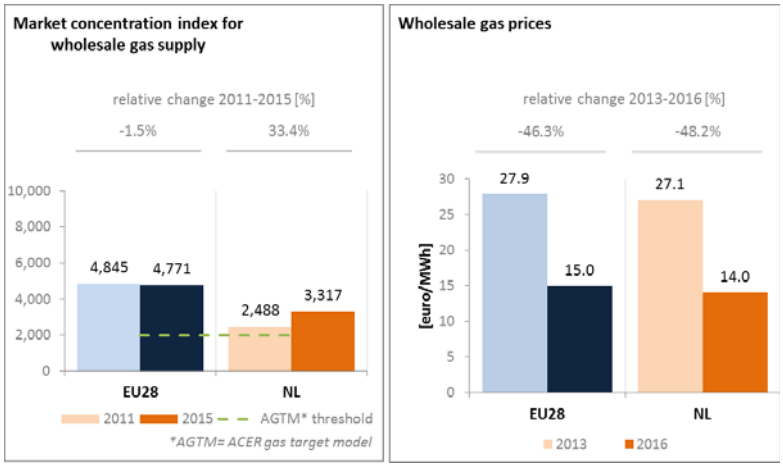
[5] The interconnectivity level is calculated as a ratio between import interconnection and net generation capacities of the country (i.e. the 2017 value is the ratio between simultaneous import interconnection capacity [GW] and net generating capacity [GW] in the country at 11 January 2017, 19:00 pm as resulted from ENTSO-E Winter Outlook 2016/2017)

The concentration of Dutch power generation market is low, indicated a vigorous competition. Wholesale electricity prices are in line with the EU average after they converged (downwards) towards the EU average in recent years.

### 1.1.2. Gas

For gas, no expansion investments are required to accommodate demand for transportation capacity. This is consistent with the converging wholesale prices observed at the Northwest European hubs and the low congestion levels. There are currently no gas PCIs in the Netherlands. However, the Netherlands developed a strategy to become Europe's 'gas roundabout', and to diversify supply sources (LNG, countries of origin).

Concentration in the Dutch wholesale gas supply market gas market is relatively low, below the EU average. Due to pro-market policy-making the Dutch gas hub TTF has developed into the most liquid gas hub in the EU, and has below average gas prices.



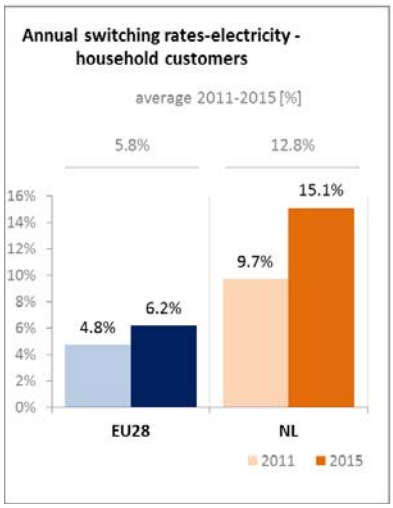

*(source: ACER for the left graph and EC services based on Platts, gas hubs, ESTAT for the right graph)*

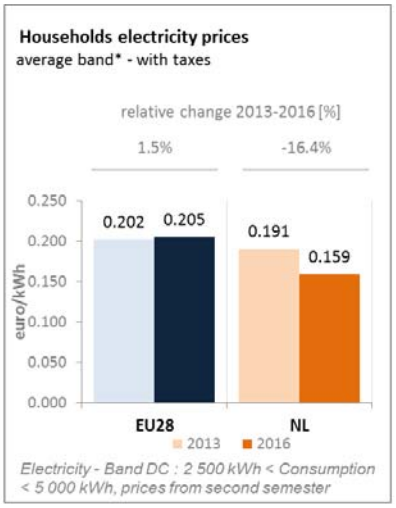
## 1.2.Retail electricity and gas markets

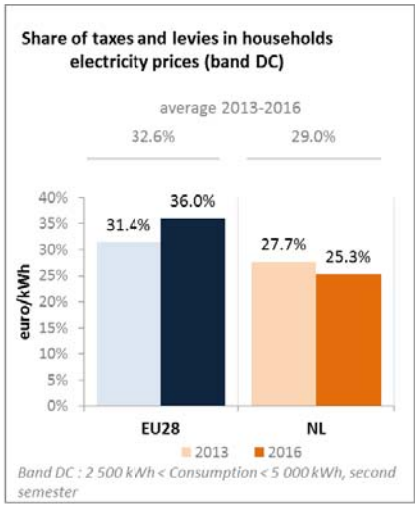
### 1.2.1.Electricity

In 2016, household electricity prices in the Netherlands were at 15.9 euro cents per kWh, below the EU average. Between 2013 and 2016, average band retail electricity prices for households decreased, but to a lesser extent than the wholesale prices. This was in spite of a 2.5 percentage point decrease in taxes and levies.

The Netherlands has the second highest electricity switching rates in the EU (15% in 2015 and 16.4% in 2016) and consumer satisfaction in electricity services is well above the EU average. With an ongoing national smart meter deployment programme, the Netherlands has also seen a sharply increased deployment of smart meters, 21.8% of household customers having smart meters in 2015.



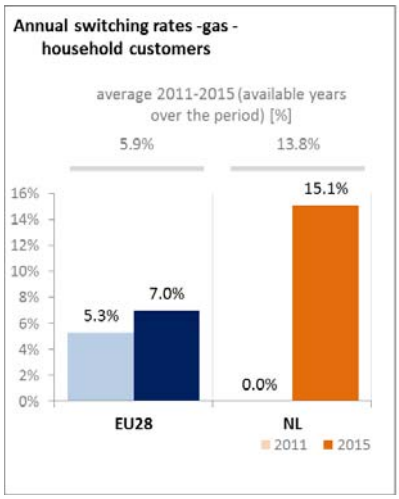




*(source: ACER)* *(source: Eurostat)* *(source: Eurostat)*

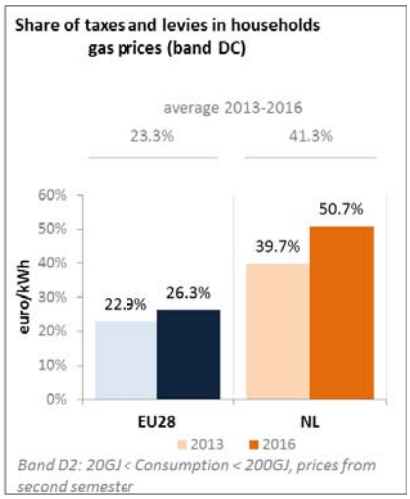
### 1.2.2.Gas

The Netherlands has one of the highest gas switching rates in the EU, at 15%, suggesting strong consumer engagement in the market. Between 2013 and 2016, average band retail gas prices for households decreased by 5 euro cents per kWh. Nevertheless, in 2016, household gas prices in the Netherlands were over 25% above the EU average at 8.1 euro cents per kWh, which can be explained by a higher share of taxes and levies.

Almost 30% of household customers in the Netherlands had gas smart meters in 2015, by far the highest of any Member State.



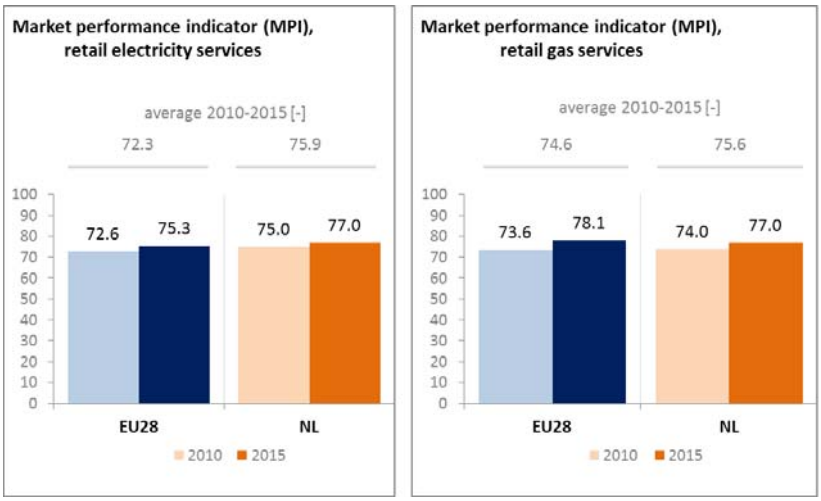





*(source: ACER)* *(source: Eurostat)* *(source: Eurostat)*

### 1.2.3. Market performance indicators

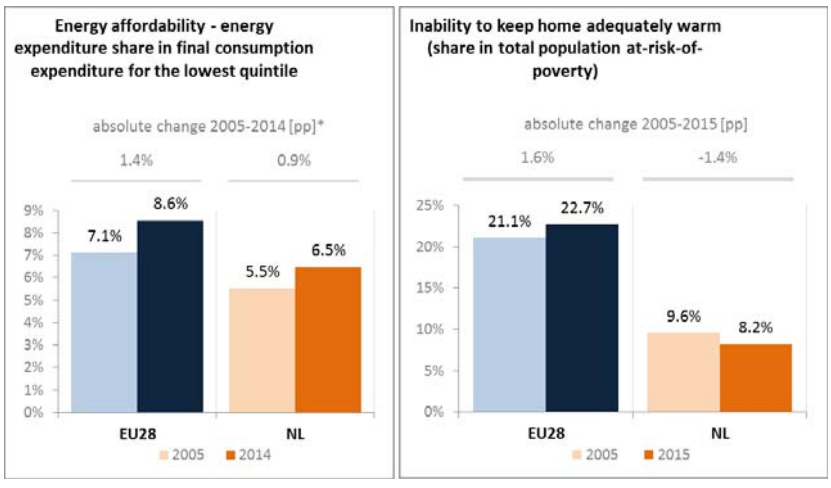
According to the periodical survey of the European Commission, Netherlands consumers are close to the EU average with regards to consumers' satisfaction with electricity and gas services.




*(source: DG JUST survey)*

## 1.3. Energy affordability

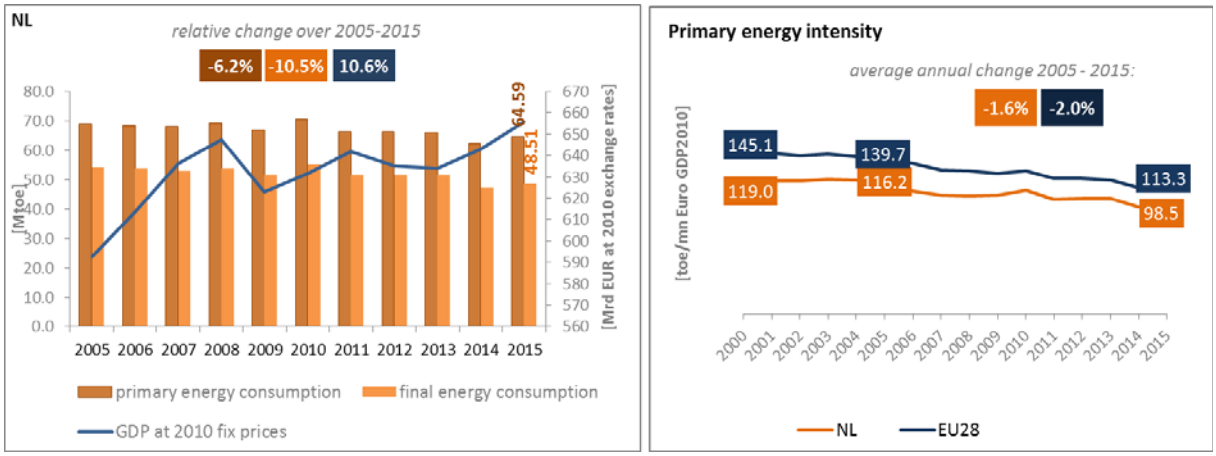
Energy affordability is understood as consumers' ability to pay for their energy needs without this negatively impacting their comfort and livelihood. Affordability can be measured by looking at how much people in the lowest income bracket have to pay for their energy needs (or, in other words, by calculating the share of energy expenditure in total household expenditure for the quintile of population with the lowest income). In the Netherlands, the share of energy in total household expenditures of this quintile of the population was 6.5% in 2013/2014, well below the EU28 average of 8.6%. In 2015 in the Netherlands, 8% of citizens below the at-risk-of poverty threshold consider that they are unable to keep their home adequately warm, a decrease of 1.5 points from 2005. This can at least partially be explained by the rapidly improving efficiency of residential buildings.




*(source: ad-hoc data collection of DG ENER based on HBS with the support of Eurostat and national statistics)*

## Energy efficiency and moderation of demand

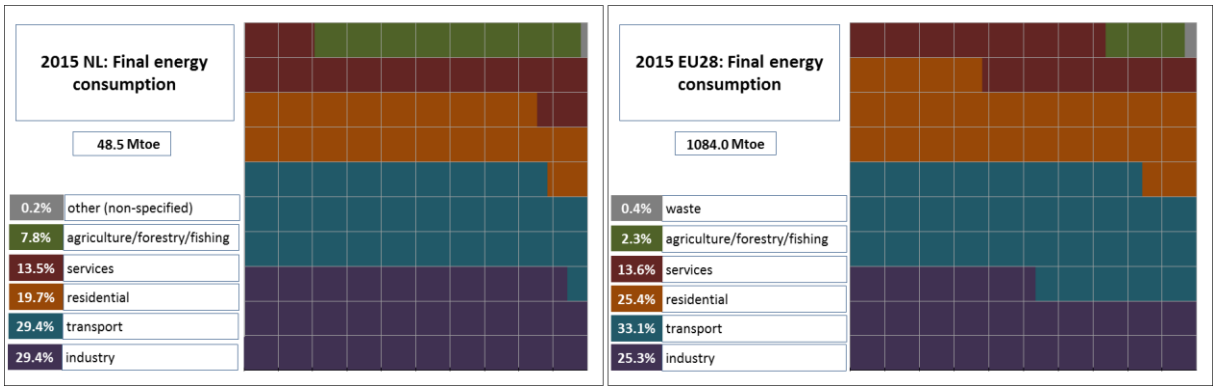
The Netherlands' 2020 energy efficiency target is 60.7 Mtoe expressed in primary energy consumption (52.2 Mtoe expressed in final energy consumption). The Netherlands is on track to meet the target of 1.5% energy efficiency savings on an annual basis (Art. 7) and has to keep its efforts to ensure the targets are met, given that the latest available data show a slight increase in their energy consumption trends.




*(source: Eurostat)*

Primary energy intensity of the Dutch economy as a whole has decreased from 2005, while remaining below the EU average. Between 2005 and 2015, the primary energy intensity of the economy (expressed by the ratio of primary energy consumption over GDP) has decreased annually by 1.6 %. This is lower than the EU average of 2 % annual change.

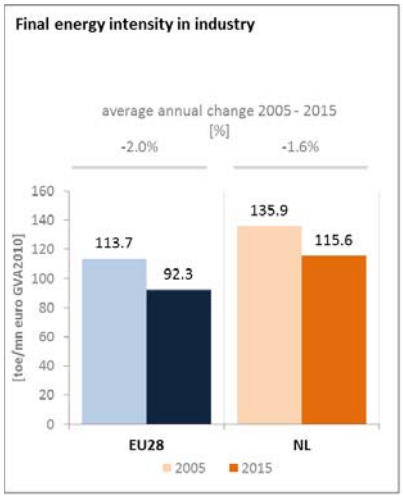
Overall, the split of final energy consumption by sector in the Netherlands is similar with the one at the EU level. Nevertheless, the share of energy consumption in agriculture (horticulture) is notably higher than for the EU as a whole (7.8% vs 2.3%) but is declining and the share of energy consumption in the residential sector is slightly lower than at the EU average (19.7% vs. 25.4%).

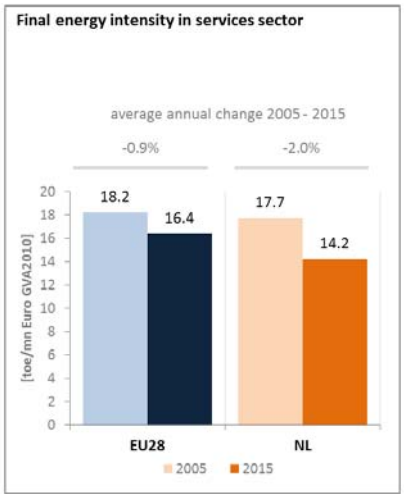


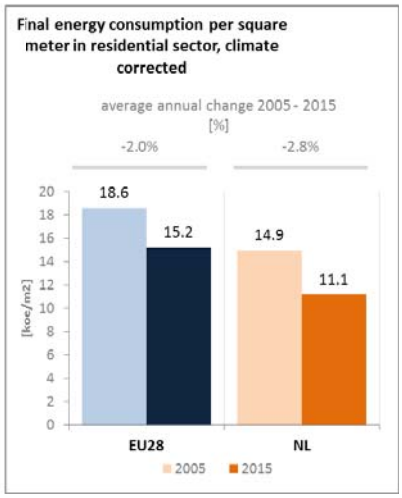

*(source: Eurostat)*

Although a significant (final) energy intensity reduction has been recorded in the industrial sector, i.e. about 14.9% between 2000 and 2015, this is less than the average energy intensity reduction in the EU28 over the same period (i.e. 18.8%). The energy intensity in industry also remains above EU average.

The specific energy consumption per square meter in the residential sector is below EU average and decreased by almost 1 p.p. faster than the EU average over the 2005-2015 period. This is mainly due to improved housing insulation and increased roll-out of energy efficient household appliances.



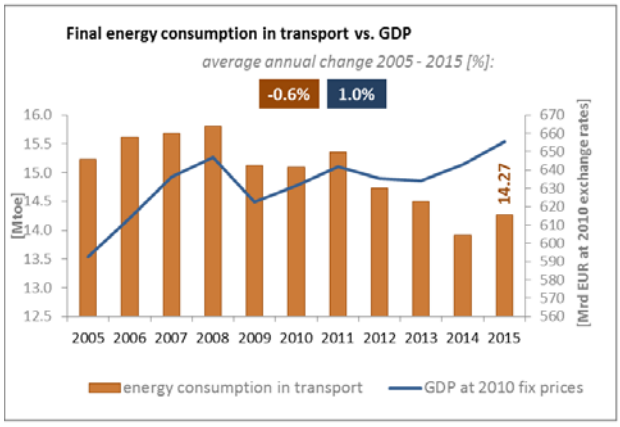



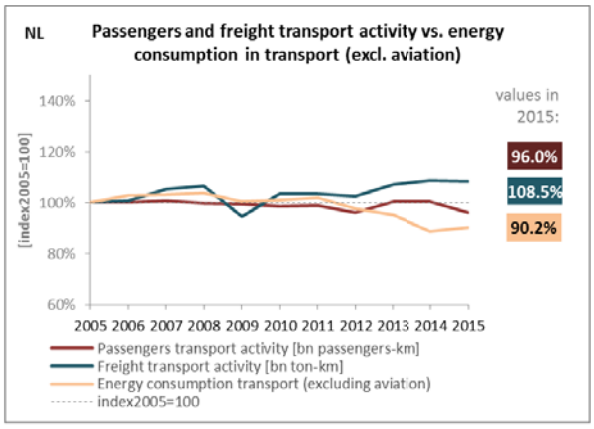




*(source: Eurostat)* *(source: Eurostat)* *(source: Odyssee database)*

**Energy in transport**

Between 2005 and 2015 in the Netherlands, the final energy consumption in transport recorded an average annual reduction of 0.6 %, while GDP increased annually by 1 %. This occurred in a context of increase of freight transport activity (except 2009, a year of economic recession), i.e. 8.5% between 2005 and 2015. Regarding transport performance, the Netherlands report the highest use of inland waterways in freight transport, given the existence of a network of navigable rivers and canals in the country.

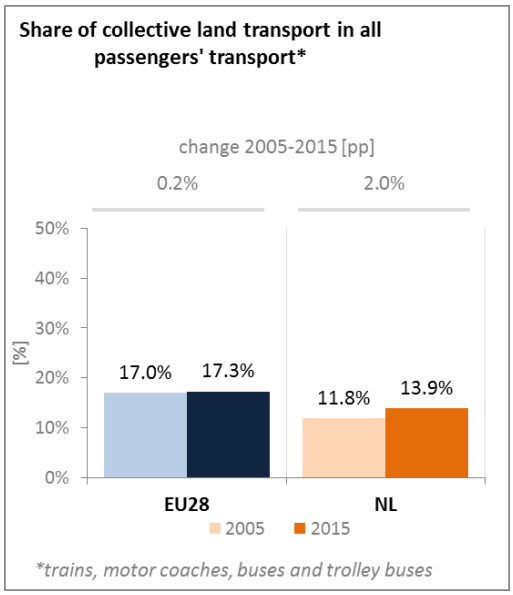



*passengers transport activity=Private cars + bus + rail + tram & metro*
*freight transport activity=road+rail+inland waterways+pipeline*

*(source: Eurostat)* *(source: Eurostat and DG MOVE pocketbook)*

The share of collective land transport in all passengers' transport increased between 2005 and 2015 by 2 percentage points (from 11.8% to 13.9%) indicating a higher use of collective transport means (including trains, motor coaches, buses and trolley buses) in the Netherlands. This share is below the EU average (of 17.3% in 2015).




*(source: Eurostat)*

The Netherlands is characterised by a high density of population and a detailed network of roads, canals and transport infrastructure in general. It is also a typical cycling country in the EU.

The Netherlands is leading the Member States in the transition towards automated mobility. Automated mobility is believed to have a very important potential in terms of energy efficiency and more rational use of our resources. To that end, they organised in April 2016 a dedicated ministerial meeting where the Amsterdam Declaration on automated mobility[6] was adopted. Several pilot projects are running and they are very active with field operational tests. The Dutch have a comprehensive perspective in the way that they not only look at road vehicles (cars, busses and trucks), but equally ships, inland vessels and drones.

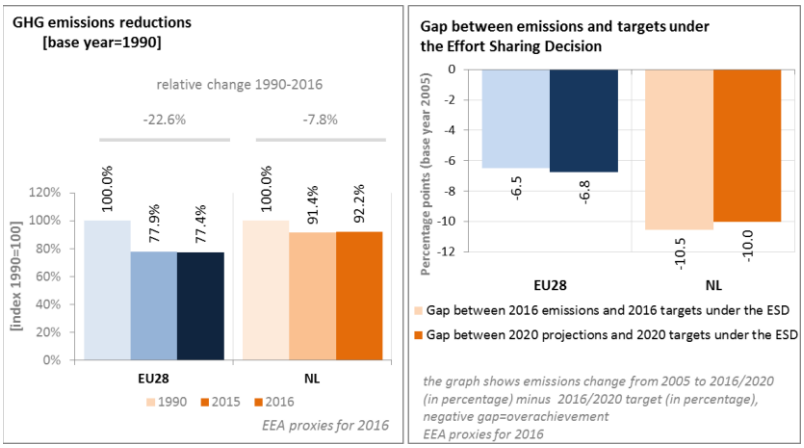
The Netherlands has been investing a lot in additional road infrastructure (notably the widening of the A2 highway connecting Amsterdam to Utrecht). This has so far resulted in a better flow of the road traffic and decreased congestion and thus less wasted emissions. There are no road tolls in the Netherlands. An attempt to introduce a highway toll was made in 2010, but it has since then been discarded.

## Decarbonisation of economy

### GHG emissions

In 2016, GHG emissions in the Netherlands were around 8% below 1990 levels, which is a lower reduction than the EU average of -22%. The Netherlands committed to a non-ETS target of a 16 % reduction in emissions by 2020 compared to 2005 levels. Non-ETS emissions were reduced by 20% between 2005 and 2016. According to the latest national projections submitted to the Commission and taking into account existing measures, the 2020 target is expected to be met by a margin of 10 percentage points.

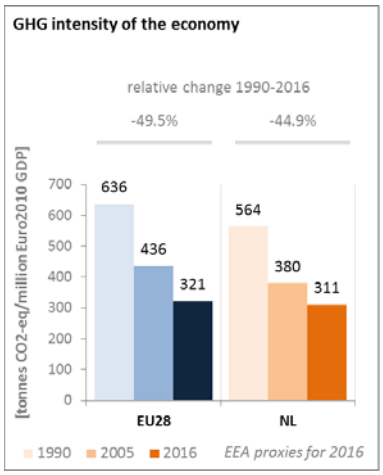
6 https://english.eu2016.nl/documents/publications/2016/04/14/declaration-of-amsterdam

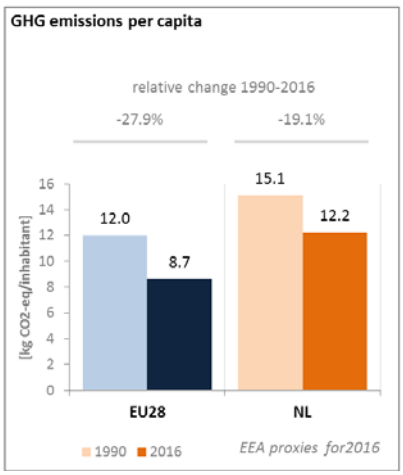



*(source: EC and EEA)*

According to EEA estimates, the GHG intensity of the Netherlands' economy was below the EU average, decreasing at a similar pace since 1990. In 2016, the GHG emissions per capita in the Netherlands were 40% above the EU average, increasing from around 25% above the EU average in 1990.

In 2015, the largest sectors in terms of GHG emissions were the energy sector (more than 1/3 of the total GHG emissions) followed by industry (18%), transport (16%) and agriculture, forestry and fishery (15%).



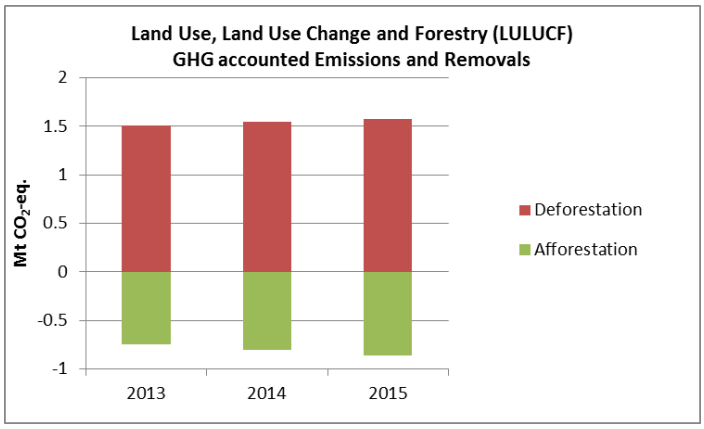




| Largest Sectors of GHG Emissions in 2015 | NL | EU28 |
|---|---|---|
| Energy/power industry | 36.4% | 30.9% |
| Transport | 16.0% | 21.0% |
| Industry | 18.2% | 19.9% |
| Agriculture (incl. forestry & fishery) | 14.9% | 12.0% |
| Residential & Commercial | 12.5% | 12.8% |
| Waste | 1.7% | 3.2% |
| Other | 0.2% | 0.2% |

*(source: EC and EEA)*

Preliminary accounts under the Kyoto Protocol for the Netherlands show overall emissions of 0.7 Mt $CO_2$eq. as an annual average in the period 2013-2015. For comparison, the annual average of the EU-28 accounted for removals of 119.0 Mt $CO_2$eq. The Netherlands is one of four EU Member States which show overall emissions in this preliminary accounting exercise and the only Member State with no accounted data for Forest Management.

Removals by Afforestation are lower than emissions by Deforestation. Overall, there is a decreasing trend in emissions, mainly due to increasing removals by Afforestation over the course of the three-year period. This trend is partly compensated by slightly increasing emissions by Deforestation.



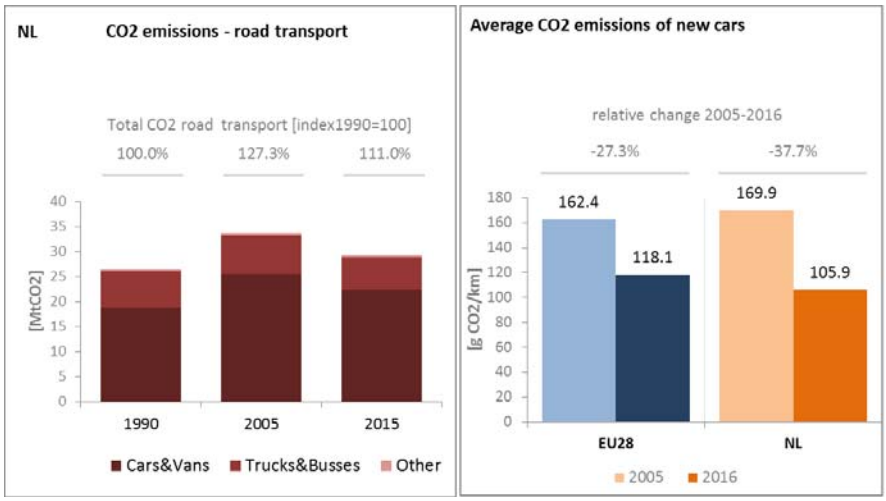

*Note: Forest Management credits are capped and presented as yearly averages when the total Forest Management credits of the considered period exceed the simulated cap over the same period.*

*(source: EC and EEA)*

### $CO_2$ emissions in transport and alternative fuelled vehicles

The average $CO_2$ emissions of new cars in the Netherlands were in 2016 below the EU average, and decreased considerably between 2005 and 2016 by 37.7%[7] (compared to 27.3% reduction for the EU average). This is notably the result of tax incentives in the transport sector.

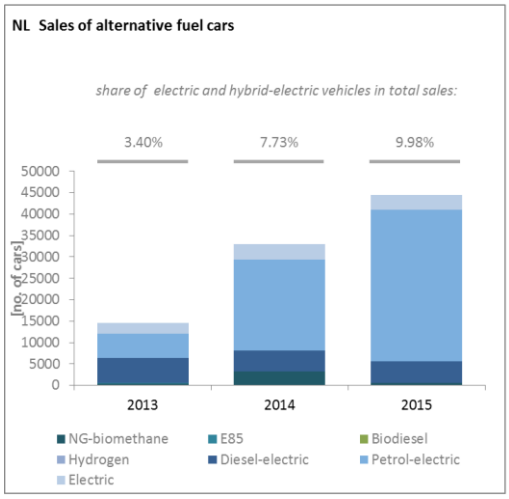
EU legislation sets mandatory $CO_2$ emission reduction targets for new cars and vans. By 2021, the fleet average to be achieved by all new cars is 95 $gCO_2$/km. For new vans, the fleet average is set at 147 $gCO_2$/km by 2020.

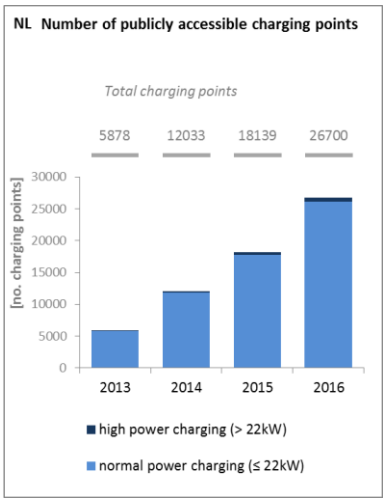



*(source: European Environment Agency)*

The number of electric charging points in the Netherlands has more than quadrupled from 2013 to 2016, from 5 878 to 26 700 units, the highest number of charging points in the EU in 2016. The sale of alternative fuel vehicles is also among the highest in the EU.

[7] It should be noted that these figures refer to test cycle CO2-performance and not to observed real-world CO2-performance of new vehicles.




*(European Environment Agency)* *(European Alternative Fuels Observatory)*

National Policy Frameworks under Directive 2014/94/EU on alternative fuels infrastructure have to establish targets, objective and measures for the development of the market of alternative fuels in the transport sector and the deployment of the relevant infrastructure. The Netherlands has submitted its National Policy Framework as requested under article 3 of the Directive 2014/94/EU.

A detailed assessment of the Dutch National Policy Framework in terms of its compliance with the requirements of Directive 2014/94/EU on alternative fuels infrastructure, its contribution to achievement of long-term energy and climate objectives of the Union and coherence of its targets and objectives in terms of cross-border continuity has been published as part of the Communication on Alternative Fuels Action Plans (COM(2017)652) and the related staff working document SWD(2017)365.

### 1.4. Adaptation to climate change

Dutch adaptation policy has two components: the 2016 National Climate Adaptation Strategy "Adapting with Ambition" (December 2016) and the 2012 Delta Programme. The Adaptation Strategy is complementary to the Delta Programme. It describes how climate change will affect life in the Netherlands, drawing particular attention to those effects which are likely to have significant impact in the years ahead, such as water management, health, agriculture and forestry, recreation, infrastructure and energy.

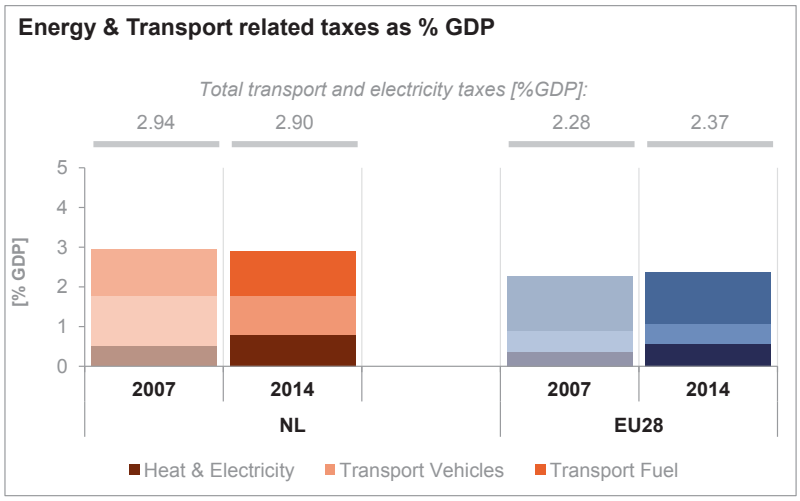
The next step is to produce a Climate Adaptation Implementation Programme, publication of which is scheduled for the end of 2017.

The Delta Programme involves many measures for adaptation. The aim is to ensure that flood risk management, freshwater supply, and spatial planning will be climate-proof and water-resilient by 2050, in the face of increasing weather extremes. The 'DeltaPlan for Spatial Adaptation' (DSA) has been established. Following the Delta Decision on Spatial Adaptation, it will specifically follow a territorial approach.

The Monitoring and Evaluation framework for climate change adaptation is under development.

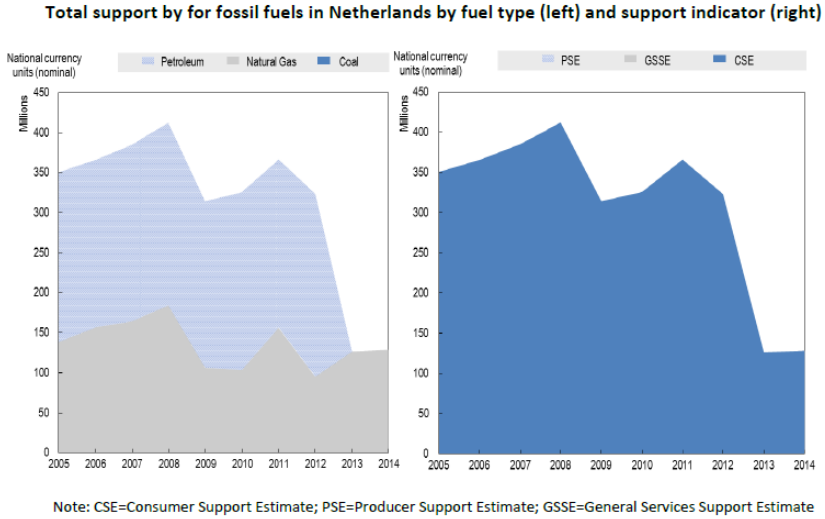
### 1.5. Taxes on energy and transport and fossil fuel subsidies

The overall tax burden on energy and transport in the Netherlands amounts to 2.9%, around 0.5 p.p. higher than the EU average. It is particularly the tax burden on transport vehicles that is higher, while fuel taxation is slightly below the EU-average. Taxation of heat and electricity is somewhat above the EU-average, and has also shown an increase since 2007. The tax burden on vehicles and transport fuels has in contrast fallen since 2007. Both the registration and the circulation tax for cars in the Netherlands consider CO2 emissions in their rates. Overall, revenues from environmental taxation are higher in the Netherlands than in the majority of Member States.




*(source: Eurostat)*

Fossil fuel subsidies decreased sharply in the Netherlands after 2013, when the differentiated tax scheme for diesel according to its uses was terminated. This happened because the policy was environmentally harmful, and implementation of the policy was costly as monitoring diesel use by activity was expensive. Netherlands currently only provides consumption tax concessions for natural gas and electricity used in heating the buildings of non-profit organisations.



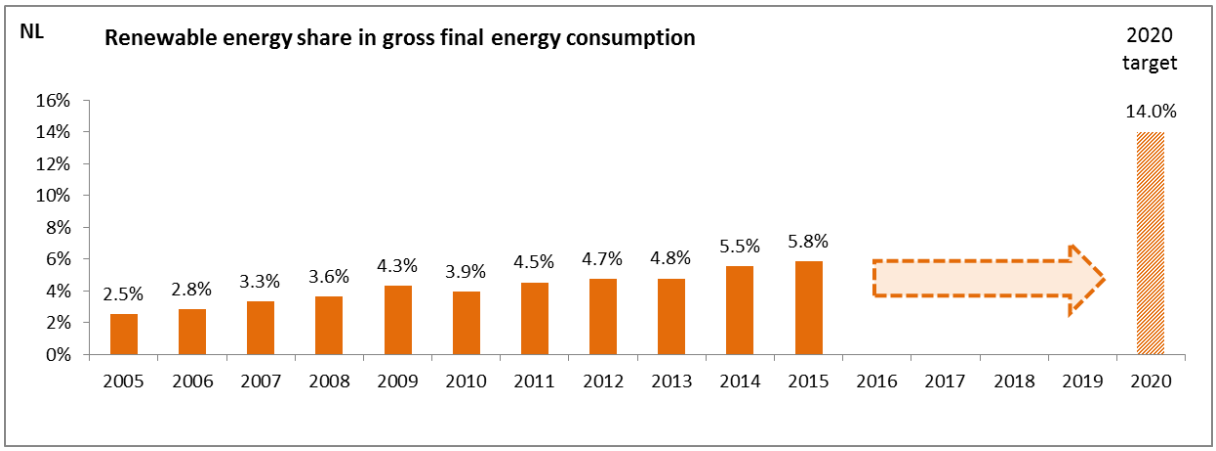
*(source: OECD Inventory of Support Measures for Fossil Fuels 2015)*

### 1.6. Renewable energy

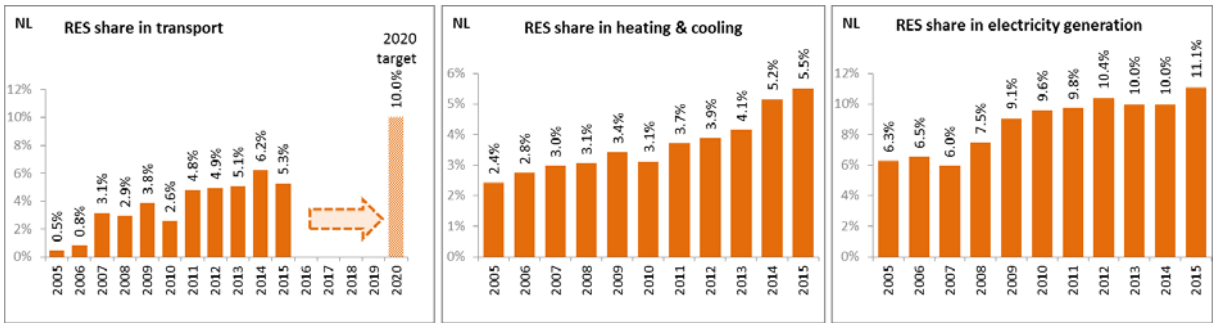
The Netherlands is the only Member State that did not reach its 2013/2014 indicative RED trajectory of 5.9% in gross final energy consumption. With a 5.84% renewable energy share in gross final energy consumption in 2015, the Netherlands is also expected to miss its 2015/2016 indicative RED trajectory of 7.6%. While the National Energy Outlook 2016 projected an acceleration of the increase in the renewable energy share towards 2020, it is still uncertain if the Netherlands will fully deliver on the 2020 target without additional efforts. At the same time, the national target of 16% renewable energy in 2023 agreed upon in the National Energy Agreement is expected to be met.

Following the results of the National Energy Outlook and the evaluation of its National Energy Agreement in October 2016, the government has proposed an acceleration of its plans to support renewables in 2017. These measures include, amongst others, an increased budget for their main support scheme (SDE+) for renewables from EUR 2.5 billion in 2015 to EUR 9 billion in 2016 to 12 billion in 2017. The 2016 tender has supported 2.3 GW of additional renewable energy projects, and the first tender round of this support scheme in 2017 has supported 3.2 GW of renewable energy projects. Following the successful separate tendering processes for 1380 MW of offshore wind, the government has also proposed additional tenders for offshore wind before 2020, and an extension of new policy support initiative for small renewable heat projects (ISDE) that has been opened in 2016. Furthermore, the Netherlands has put all of the necessary elements in place to facilitate to reduce administrative barriers.

Finally, the government published its 'Energy Agenda 2050', which is their proposal to achieve the 2050 that were previously set out by the "national energy outlook" and the 'national energy agreement'. The energy agenda is based on the premise to achieve the EU target of 14% RES in 2020 and the national target of 16% in 2023. Use of the cooperation mechanisms under the Renewables Directive could be considered as a way to help achieving the 2020 renewable energy target, if necessary.

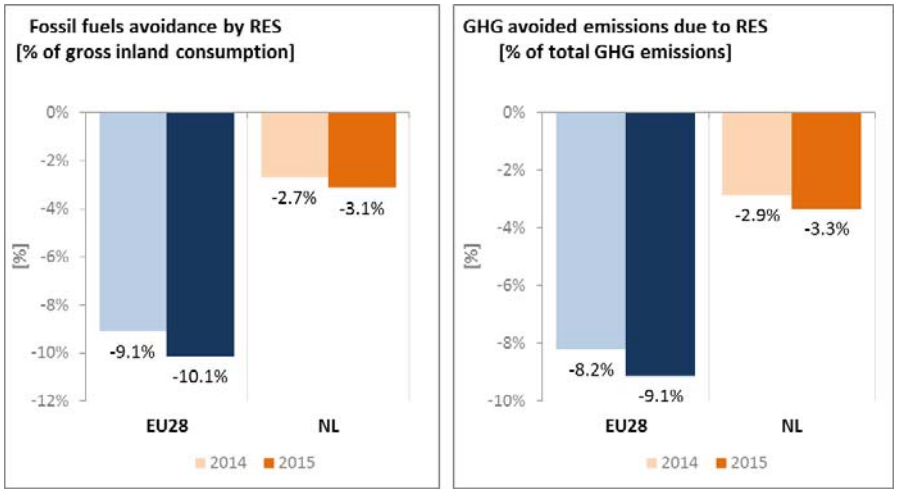



*(source: Eurostat-SHARES)*




*(source: Eurostat-SHARES)*

It is estimated that as comparing to 2005, the Netherlands avoided in 2015 about 3.1 % of the fossil fuel in gross inland consumption and about 3.3 % of GHG emissions at national level due to the deployment of the renewable energy systems. [8] This is considerably lower than the EU-28 average, which for fossil fuel and GHG emission avoidance stood at 10.1 % and 9.1 % respectively.




*(source: EEA)*

## 1.7. Contribution of the Energy Union to better air quality

Since the introduction of the 'National Air Quality Cooperation Program'[9] in 2009, the Dutch authorities have reported an average reduction of $PM_{10}$ and $NO_2$ concentrations of 0,8 µgr/year and 0,6 µgr/year respectively[10]. Nevertheless, air quality in the Netherlands continues to give cause for concern. For the year 2013, the European Environment Agency estimated that about 11,530 premature deaths were attributable to fine particulate matter ($PM_{2.5}$) concentrations and over 1,820 to nitrogen dioxide ($NO_2$) concentrations[11].

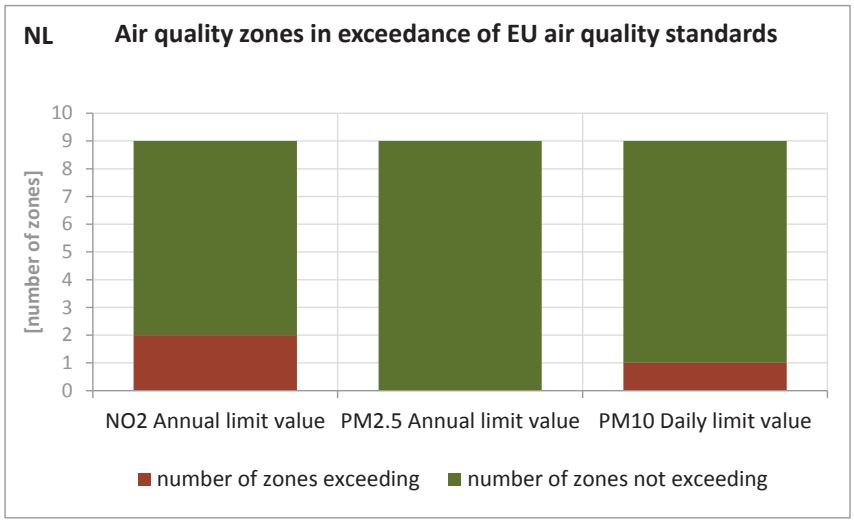
[8] Avoided GHG emissions mentioned here have a theoretical character as these contributions do not necessarily represent 'net GHG savings per se' nor are they based on life-cycle assessment or full carbon accounting.

[9] In Dutch: Nationaal Samenwerkingsprogramma Luchtkwaliteit (NSL), https://www.government.nl/topics/environment/air-quality/measures-to-tackle-air-pollution

[10] European Environment Agency (EEA), Air quality in Europe – 2016 report, Annex 1

[11] European Environment Agency, 2016, Air Quality in Europe – 2016 Report, table 10.2. The report also includes details as regards the underpinning methodology for calculating premature deaths.

For both pollutants the Netherlands reported exceedances of the binding EU air quality standards[12]. For the year 2015, the Netherlands reported exceedances of the limit value for $PM_{10}$ in 1 out of the 9 air quality zones in the Netherlands while exceedances of the limit value for $NO_2$ were reported in 2 of the 9 zones as shown in the figure below[13].




*(source: EEA)*

There are indications that the health-related external costs from air pollution in the Netherlands are more than EUR 13 billion/year (income adjusted, 2010), which includes the intrinsic value of living a healthy life without premature death as well as the direct costs to the economy such as healthcare costs and lost working days due to sickness caused by air pollution[14].

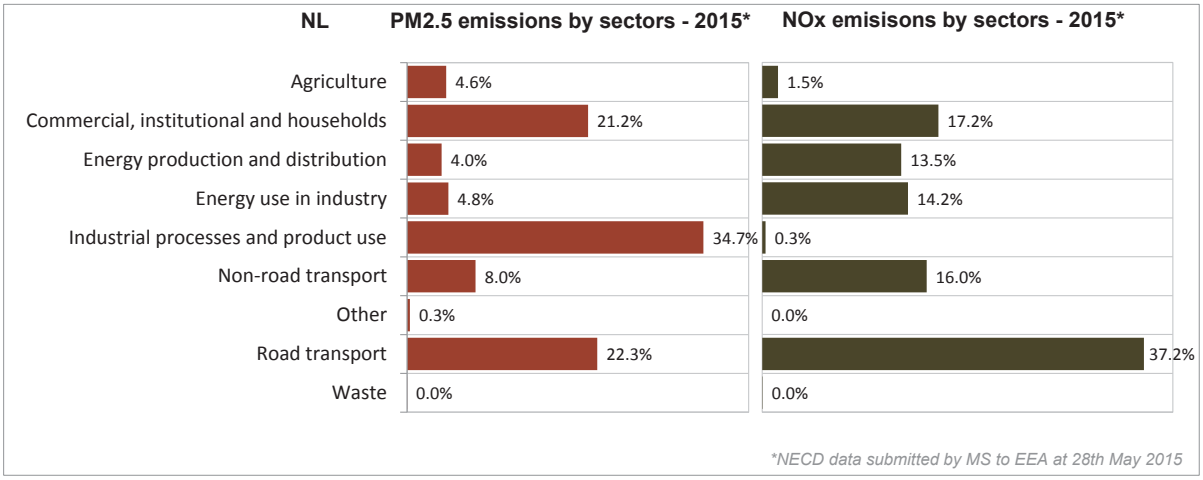
The Energy Union can substantially contribute to addressing these air quality problems through measures reducing emissions of both GHG and air pollutants such as PM and nitrogen oxides ($NO_x$) from major contributing sectors such as (road) transport, energy production, industry and residential heating (e.g. stoves and boilers) as shown in the figure below[15].

[12] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe, OJ L 152, 11.6.2008, p.1-44

[13] Compliance data as reported by the Member States as part of their official annual air quality report for the calender year 2015 (available on the European Environment Agency's (EEA) Eionet/Central Data Repository), http://cdr.eionet.europa.eu/nl/eu/aqd

[14] See also the EU Environmental Implementation Review Country Report for the Netherlands, SWD(2017)52 final of 3.2.2017

[15] National emission data as reported by the Member States to the EEA (available on the EEA's Eionet/Central Data Repository), http://cdr.eionet.europa.eu/nl/eu/nec_revised




*(Source: EEA. This table reflects only sources of primary $PM_{2,5}$ emissions.)*

# Research, innovation and competitiveness

## 1.8. Research and innovation policy

In the 2013 Energy Agreement for Sustainable Growth, the Dutch government committed to an ambitious level of public investment on clean energy research and innovation (R&I), most notably in the demonstration phase of the technology cycle, giving a strong boost to investments in this field. The following ambitions of the Energy Agreement for Sustainable Growth form the core of the Dutch government's public funding commitments up to 2020:

- A grant programme for demonstration projects with considerable export potential in the area of energy innovation. Under this programme, launched in 2014, Dutch companies may receive up to EUR 6 million per project to demonstrate new sustainable energy technologies and energy efficiency innovations.
- Investments in offshore wind energy projects demonstrating innovative techniques aimed at achieving a cost reduction of 40% through process innovation.
- A financial allocation of EUR 50 million per year during 2016-2019 from the Stimulation of Sustainable Energy Production (SDE+) operating fund for energy innovation aimed at making renewable energy production in the Netherlands more cost-effective.
- Additional public funding made available for innovative energy efficiency projects in the built environment, with a view to accelerating the cost-effective adoption of energy efficiency technologies.

Furthermore, funding will be maintained at more or less current levels for activities in the following areas: (a) Fundamental research on clean energy technologies; (b) Public funding for clean energy technologies in collaboration with the private sector and knowledge institutions; (c) Applied research into energy innovation.

The Netherlands is a very active contributor to the ongoing work of the Strategic Energy Technologies (SET) Plan. It participates in eleven (out of fourteen) temporary working groups for the

implementation of the integrated SET Plan, and leads the one dedicated to offshore wind and co-leads the one dedicated to carbon capture and storage/use.

Regarding the Horizon 2020 programme, The Netherlands has so far received 7.2% of the EU contribution devoted to the 'secure, clean and efficient energy' part of the programme. As of September 2017, 277 participations from Dutch organisations have been awarded over EUR 131 million in Horizon 2020 energy projects. This includes a grant of almost EUR 3.5 million to the Energy Research Centre of the Netherlands for its participation in project STEPWISE (CO2 capture), and five grants totalling over EUR 9.6 million to Dutch beneficiaries participating in project PROMOTION (offshore transmission networks).

The Netherlands joined the Mission Innovation[16] initiative as a fully-fledged member in November 2016, during the Conference of Parties in Marrakesh (COP22). As a result, it has committed to doubling funding of the main programs of clean energy R&I[17] from a base-line level of EUR 100 million per year[18] to EUR 237 million in 2020. This funding will be dedicated to research, development and demonstration programs supporting renewable energy technologies (including offshore and onshore wind), energy-efficiency technologies, carbon capture and storage, and other crosscutting technologies.

## 1.9. Investments and patents in the Energy Union R&I priorities

In 2015, public (national) investments in the Energy Union R&I priorities reached EUR 181 million, having increased by 18% compared to 2014. The largest share of these investments (41%) was attracted by the Renewables R&I priority of the Energy Union, followed by the Smart Systems priority (21%). In the period 2007-2015, the maximum annual public investment was EUR 350 million, reported in 2010. In 2014, the most recent year for which data for most Member States are available, public investment per GDP in the Netherlands was lower than the EU average.

Private investment in the Energy Union R&I priorities in 2013 was estimated at EUR 846 million (5% of the private R&I investment in Energy Union R&I priorities in the EU). The focus was on Efficient Systems, which received 37% of these investments, followed by the Smart System priority with a share of 28%.

In 2013, the latest year for which complete patent[19] statistics are available, 141 companies and research organisations based in the Netherlands filed 298 patents in low-carbon energy technologies (5% of the EU total). The focus was on Smart System (38%), followed by Renewables and Efficient system (23% each).

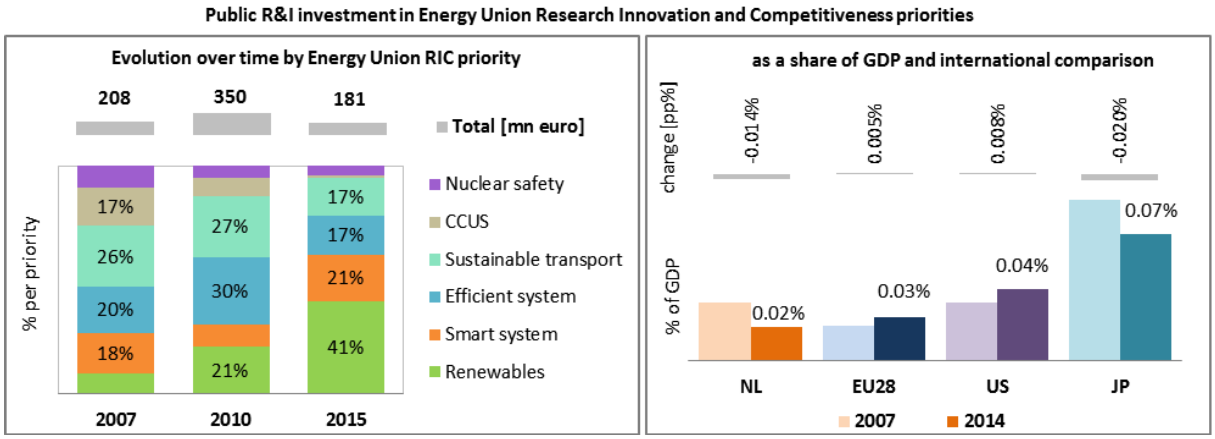
In 2013, private R&I investments and patents in Energy Union R&I priorities were higher than the EU average when normalised by GDP and by population respectively. In the period 2007-2013, both private R&I investments and the number of patents in Energy Union R&I priorities increased on average by 6% and 15% per year, similarly to the respective indicators at EU level.

16 http://mission-innovation.net/

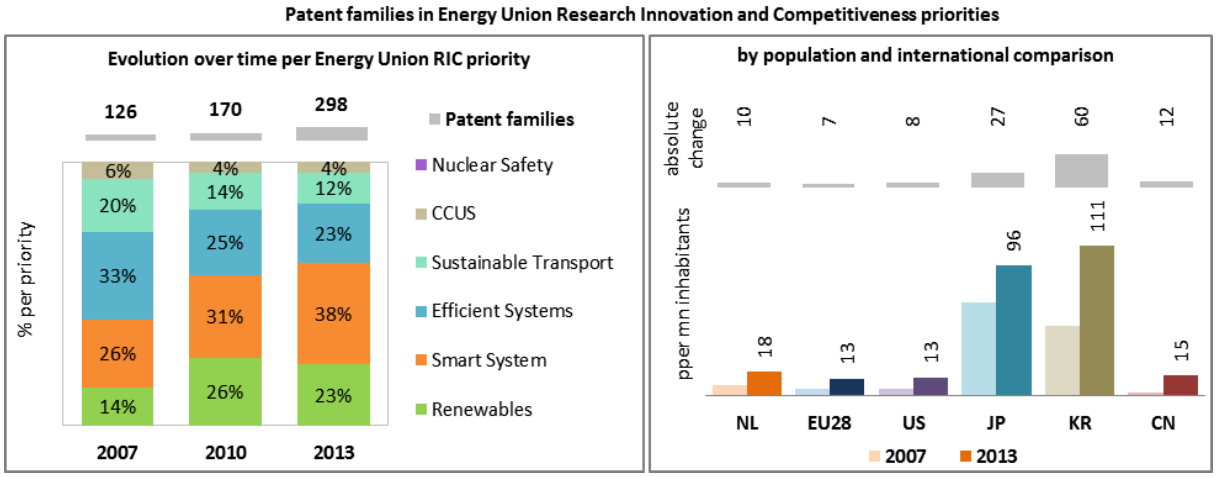
17 Programmes funded by the Ministry of Economic Affairs and the Ministry of the Interior and Kingdom Relations

18 average annual financing during 2013-2015

19 In the context of this document, the term 'patent' refers to patent families, rather than applications, as a measure of innovative activity. Patent families include all documents relevant to a distinct invention (e.g. applications to multiple authorities), thus preventing multiple counting. A fraction of the family is allocated to each applicant and relevant technology.




*Note: The international comparison (right) is shown for 2014 (The Netherlands had reported EUR 132 million). Reporting at EU level for 2015 is not as complete, and very few countries have reported for 2016.*

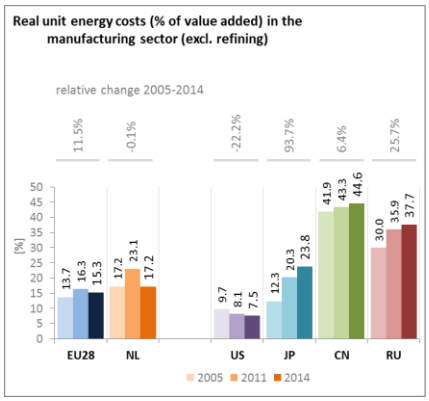


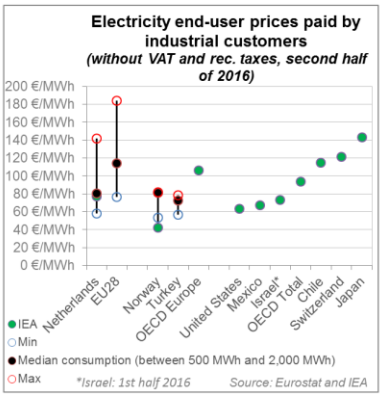

*(Data sources: Public investment as available in the International Energy Agency RD&D Statistics database[20] for codes relevant to Energy Union RIC priorities. Patent data based on the European Patent Office PATSTAT database[21]. Private investment as estimated by JRC SETIS. Detailed methodology available from the JRC[22].)*

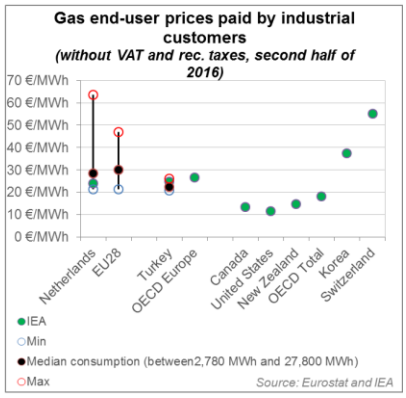
## 1.10.Competitiveness

In 2014, the real unit energy costs (RUEC) in the Netherlands 23(17.2) were above those at the EU average (15.3), more than double than those in the US but below those in Japan, Russia and China. The electricity prices paid by industrial customers in the Netherlands are below the EU and OECD averages but still higher than e.g. in the United States and Mexico. Conversely, gas prices for industrial consumers are around the EU average but above OECD average.

[20] http://www.iea.org/statistics/RDDonlinedataservice/
[21] https://www.epo.org/searching-for-patents/business/patstat.html#tab1
[22] https://setis.ec.europa.eu/related-jrc-activities/jrc-setis-reports/monitoring-ri-low-carbon-energy-technologies
[23] This indicator measures the amount of money spent on energy sources needed to obtain one unit of value added.

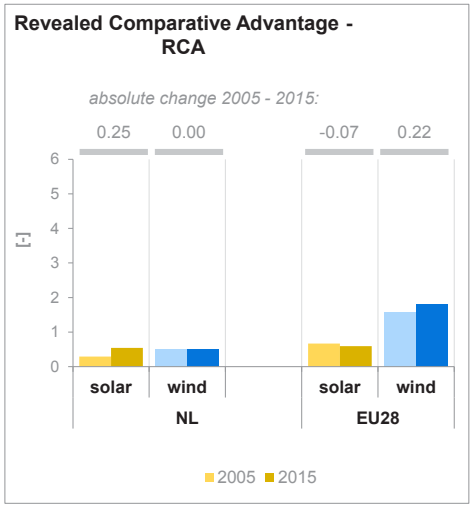


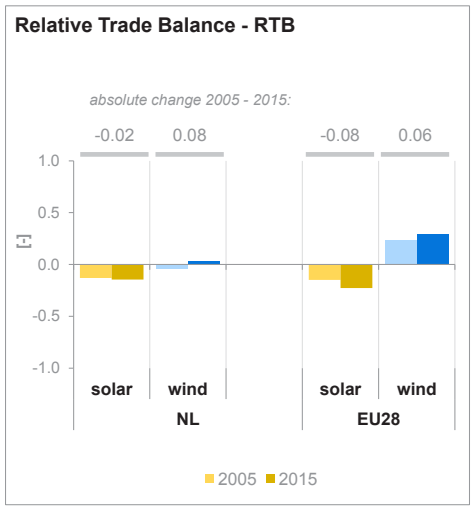




*(source: ECFIN)* *(source: ESTAT and IEA)*

Regarding the competitiveness in renewable energy, the Netherlands are not specialised in either wind or solar energy as indicated by revealed comparative advantage indicators[24] below 1. No progress has been made in the wind sector since 2005, despite a meteorological advantage. In terms of solar energy the comparative advantage has improved since 2005 but remains below one. The relative trade balance[25] shows that the Netherlands are a net exporter of wind components, in particular power electronics, yet considerably below the EU average. Like the EU28, the Netherlands are a net importer of solar energy equipment.




*(source: UN comtrade)*

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24 The RCA index for product "i" is defined as follows: $RCA_i = \frac{\frac{X_{j,i}}{\sum_i X_{j,i}}}{\frac{X_{w,i}}{\sum_i X_{w,i}}}$ where X is the value of exports, and j is the country and w is the reference group, the World economy. 2005 refers in the text to the indicator average over the 2000-2009 period, while 2015 represents the average over the 2010-2016 period. The same applies for the RTB indicator - see below.

25 The RTB indicator for product "i" is defined as follows: $RTB_i = \frac{X_i - M_i}{X_i + M_i}$ where $X_i$ is the value of product's "i" exports and $M_i$ imports.

## Regional and local cooperation

The Netherlands is a member of the Pentalateral Energy Forum, which was created in 2005 by Energy Ministers from Benelux, Germany and France in order to promote collaboration on cross-border exchange of electricity and natural gas. Supported by the European Commission, it further develops the regional electricity and gas market as part of the single European market. The Netherlands also participates in the German-led round-table on market developments.

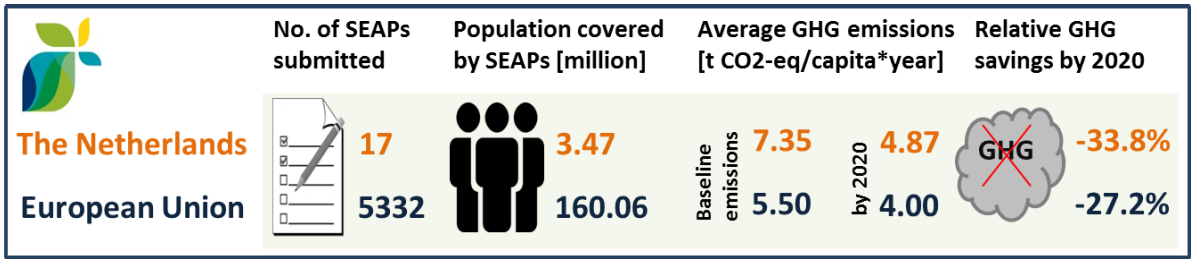
Regional cooperation on infrastructure development is necessary to optimise the identification of regional infrastructure priorities and to coordinate cross-border investments. The Netherlands is member of three Regional Groups which have been established under the TEN-E Regulation: Northern Seas Offshore Grid, North South Electricity Interconnections in Western Europe, and North South Gas Interconnections in Western Europe.

During the Netherlands Presidency of the Council of the EU in 2016, large steps were taken to promote regional cooperation around the North Seas, resulting in the Political Declaration on Energy Cooperation between 10 North Seas Countries, as signed in June 2016. The cooperation, driven by a High level group and various working groups, focuses primarily on the cost-effective deployment of offshore wind generation, but also refers to interconnection and market integration in its objectives.

European Territorial Cooperation – 'Interreg' – under EU cohesion policy provides further opportunities for cross-border, transnational and interregional cooperation, including in the Energy Union areas.

Cities and urban areas have a key role in the energy and climate challenge. The Urban Agenda for the EU, established by the Pact of Amsterdam in May 2016, better involves cities in the design and implementation of policies, including those related to the Energy Union. It is implemented through Partnerships, in which the Commission, Member States, cities and stakeholders work together on a number of important areas, including on Energy Transition, Urban Mobility, Air Quality, Climate Adaptation and Housing. The Netherlands is participating in the partnerships on Air Quality, as coordinator and with the city of Utrecht as member, Energy Transition, with the city of Tilburg as member, Urban Mobility, with the city of Nijmegen as member, and Housing, as member.

17 cities of the Netherlands participate to the Covenant of Mayors, and have sustainable energy action plans. As seven of the largest cities in the Netherlands are signatories, these plans cover over 3.5 million people and 20.6 % of the population. All together, these municipalities committed to reduce by 2020 the GHG emissions by 33.8% (as compared to 1990 baseline).



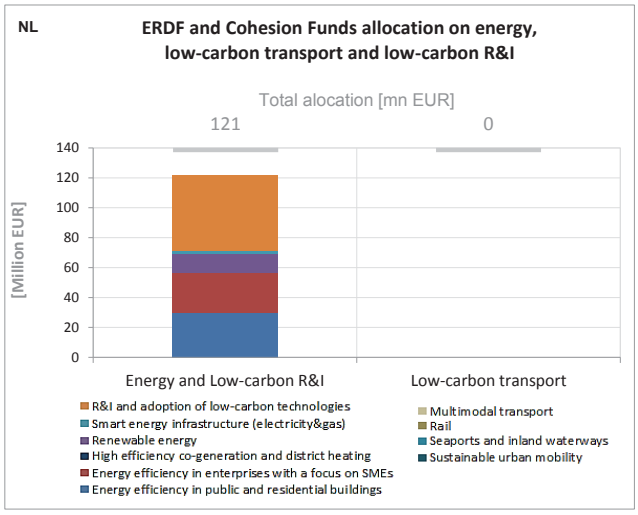

*(source: JRC 2016. Notes: SEAP=sustainable energy action plan, GHG=greenhouse gas emissions)*

In the Netherlands, by September 2016, 3 cities (covering 0.92 million inhabitants) have committed to conduct vulnerability and risk assessment and develop and implement adaptation plans in the framework of the Covenant of Mayors for Climate and Energy.

## Cohesion policy and EU-supported clean energy investments

EU cohesion policy makes a key contribution to delivering the Energy Union objectives on the ground, including investment possibilities to implement energy policy objectives in the Netherlands which are complemented by national public and private co-financing, aiming at optimal leverage. It also ensures integrated territorial solutions to energy and climate challenges, supports capacity building and provides technical assistance.

Over 2014-2020, cohesion policy is investing some EUR 71 million in energy efficiency and renewable energy improvements in public and residential buildings and enterprises, as well as in renewable energy and smart electricity distribution grids in the Netherlands. Cohesion policy is also investing significantly in R&I and in SME competitiveness in the Netherlands, based on the regional strategies for smart specialisation. For the Netherlands, the strategies include a focus on low-carbon technologies. At this stage, at least EUR 50 million is foreseen for investments in R&I and adoption of low-carbon technologies in the Netherlands, but this is expected to increase further in line with the evolving content of the smart specialisation strategy.




*(source: DG REGIO)*

These investments are expected to contribute to around 1,000 households with improved energy consumption classification and around 70 MW of additional capacity of renewable energy production. For example, the project partners of Oosterschelde Tidal Power, including SMEs and knowledge institutions, are developing a power plant and test centre on the Eastern branch of the river 'Scheldt' to further explore the potential of tidal energy while at the same time providing power to 1,000 households. The contribution from the European Regional Development Fund (ERDF) 2014-2020 amounts to EUR 745 000.

As another example, households are increasingly turning in to producers of energy who could be able to supply their locally produced energy to the energy market. With the support of the 2007-2013 European Regional Development Fund (ERDF) programme "North", Hanze University Groningen, the

University of Groningen, the Energy Research Centre of the Netherlands ECN, Gasunie Engineering & Technology, TNO-ICT, and Icopal BV under the project "Flexines" are jointly developing applications that will facilitate the entrance of households in this market and to help them make the right choices, as suppliers and as users. The contribution from the ERDF was EUR 448,000.

Through its support to sustainable transport systems, The Connecting Europe Facility (CEF) also contributes to the goals of the Energy Union. Following Dutch participation to the CEF – Transport 2014-2015 Calls, the Dutch action portfolio comprises 38 signed grant agreements, allocating EUR 260.3 million of actual CEF Transport Funding to Dutch beneficiaries (state-of-play February 2017)[26]. The transport mode which receives the highest share of funding is rail (40% of actual funding); however, road has the highest number of actions.

The Netherlands are highly investing in Rail and the development and implementation of the European Railway Traffic Management System (ERTMS). The highest co-funding is allocated to the realisation of the new Theemsweg railway section in the Port of Rotterdam, which will remove the bottleneck in the rail freight access of main port Rotterdam towards three Core Network Corridors connecting the port with its European hinterland. The other studies within rail concern cross-border rail connections. The CEF Programme contributes to the improvement of the Dutch Road network by co-funding the development of new technologies and innovation, the deployment of Intelligent Transport Systems and Services (ITS) and safe and secure infrastructure. In terms of new technologies and innovation five multi-national actions are supported. These actions concern studies including real-life pilots aiming at greening road freight transport, public and private transport through the promotion of the use of LNG, hydrogen and electric-driven vehicles. The Netherlands also demonstrate a strong commitment in promoting the use of LNG as a marine fuel, improving the environmental performance of maritime transport via the deployment of new technologies on vessels and supporting compliance with Marpol Annex VI rules.[27]

[26] Note that European Economic Interest Groups and International Organisations are excluded from the analysis.

[27] Source: INEA