



## Energy Efficiency trends and policies in the Netherlands

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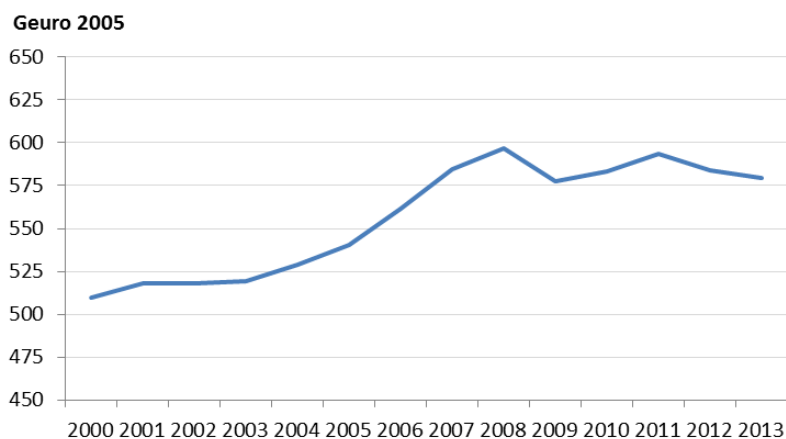
## EXECUTIVE SUMMARY

The overall energy efficiency improvement rate for The Netherlands from 2000 to 2012 as derived from the ODEX efficiency index was 1.5%/year. For households the improvement rate was 2.5%, for industry 2.6% and for transport (excluding air transport) 0.6%. The effects of the economic crisis are clearly visible in lower efficiency improvements after 2008, when the overall improvement rate went down to just 0.6%/year. National policies contributing most to energy savings were the high energy tax, the range of agreements with industry, agriculture, social housing and goods transport, and the vehicle tax stimulating efficient cars. Effective EU policy measures were the energy performance for buildings directive EPBD, the Ecodesign directive for large electric appliances and differentiating taxes for cars depending on their fuel economy.

## 1. ECONOMIC AND ENERGY EFFICIENCY CONTEXT

### 1.1. ECONOMIC CONTEXT

Until the economic crisis of 2007/2008, the average annual growth of the GDP was 2% per year. The economic crisis is clearly visible in the trend break for GDP of the Netherlands in 2008 (see fig 1.1). Corrected for inflation the GDP was still lower in 2013 than it was in 2007.



**Figure 1.1** – GDP in billions of euros of 2005 (source: Odyssee)

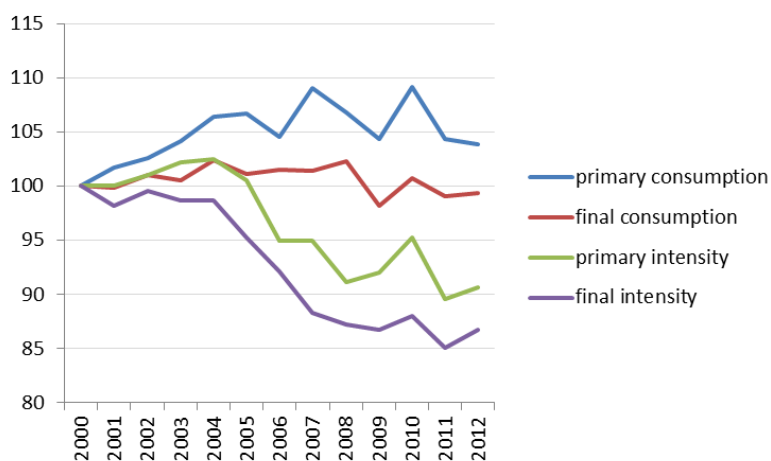
The crisis has had a significant impact on the progress of energy efficiency as we will see later.

### 1.2. TOTAL ENERGY CONSUMPTION AND INTENSITIES

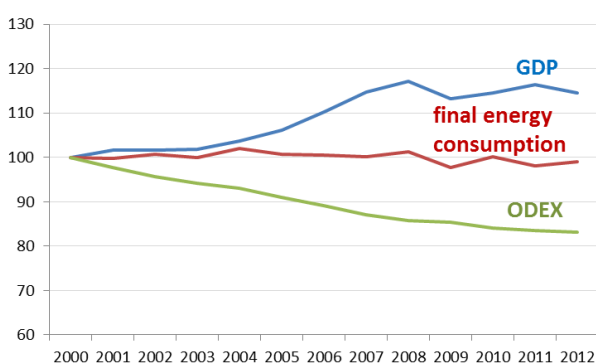
The total primary energy consumption has increased until 2007, while the final consumption remained more or less stable between 2000 and 2012 (see figure 1.2). The primary energy intensity (primary energy consumption per unit of GDP) has increased up to 2005 and then decreased. Final energy intensity has been decreasing after 2005, but the progress has slowed considerably since the economic crisis of 2007/2008.

Figure 1.3 shows the GDP, the final energy consumption and the ODEX, which is the energy efficiency index for all end-use sectors. The ODEX relates energy consumption to the quantities that define energy demand (number of dwellings, output of industry, person-km in transport), something the energy intensity does not do.

Energy efficiency of final consumers has improved by 17% between 2000 and 2012, which translates into an average gain of 1.5% per year. Since the start of the economic crisis, the improvement rate was lower (0.6%), probably due to a lower addition of (much more efficient) new dwellings to the dwelling stock, less optimal energy consumption in industry due to only partly used process capacity, and less investments in new energy using devices. The efficiency improvement derived from the Odyssee index ODEX is higher than the improvement of 1.1% found for 2000 – 2012 in the report about the national energy savings in The Netherlands by ECN [ECN, 2012]. This can be explained by the different methodology like the inclusion of savings in energy supply and CHP.



**Figure 1.2** – Index of primary and final energy consumption and primary and final energy intensity (euro/PJ), all corrected for temperature (2000=100) (source: Odyssee)



**Figure 1.3** – Indices for GDP (corrected for inflation), final energy consumption and the energy efficiency index ODEX (2000 = 100) (source: Odyssee)

## 1.3. ENERGY EFFICIENCY POLICY BACKGROUND

### 1.3.1. ENERGY EFFICIENCY TARGETS

Energy Efficiency policy is coordinated by the Ministry of Economic Affairs in collaboration with other ministries covering the transport and buildings sectors. In September 2013, more than 40 parties, including government, have concluded the Energy Agreement ([Energieakkoord, 2013]) for sustainable growth. Investments in energy savings should lead to 100 PJ extra savings, bringing the yearly energy efficiency improvement until 2020 at a level of 1.5% per year. The extra savings should be realized mainly in dwellings and buildings, but also industry, transport and agriculture should contribute. The Agreement builds on earlier policy formulated in the “Clean and Efficient” (in Dutch: Schoon en Zuinig) programme.

For years, the basis of energy efficiency policy has been a collection of national cross-cutting measures such as energy taxation (one of highest in Europe), programmes with supporting measures (information on saving options, pilot projects and subsidies) and various voluntary agreements for end-use sectors. The Energy



Agreement can be seen as the latest and broadest example of such agreements.

EU derived policy also plays a large role; in minimum efficiency standards for appliances (Ecodesign directive), the strengthening of standards for new dwellings or buildings and labels for existing ones (EPBD), a higher average efficiency of cars due to the EU car standard, and industrial savings due to the Emission Trading Scheme. New EED policy, such as on the introduction of smart meters (EED art. 9-11), has been transposed into national legislation. Strengthened existing policies could cover most other EED policy: the exemplary role of the public sector (art. 5), purchasing by public bodies (art. 6), regular audits and energy management systems (art. 8), info for consumers (art. 12), cost-effective heating/cooling through district heating (art. 14), efficiency in transport and distribution (art. 15), EES (energy efficiency services) quality system (art. 16), education of EES suppliers (art. 17) and EES market stimulation (art.18).

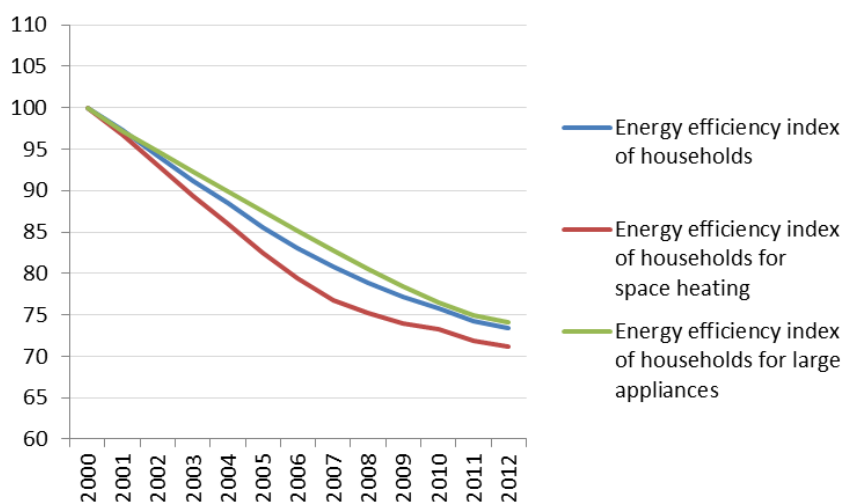
Other measures are targeted at split incentives, access to the grid and introduction of a revolving fund (art. 19 and 20). In 2013 a revolving fund for savings in buildings has been created, with 150 million euro of government and 450 million from market parties.

## 2. ENERGY EFFICIENCY IN BUILDINGS

### 2.1. ENERGY EFFICIENCY TRENDS

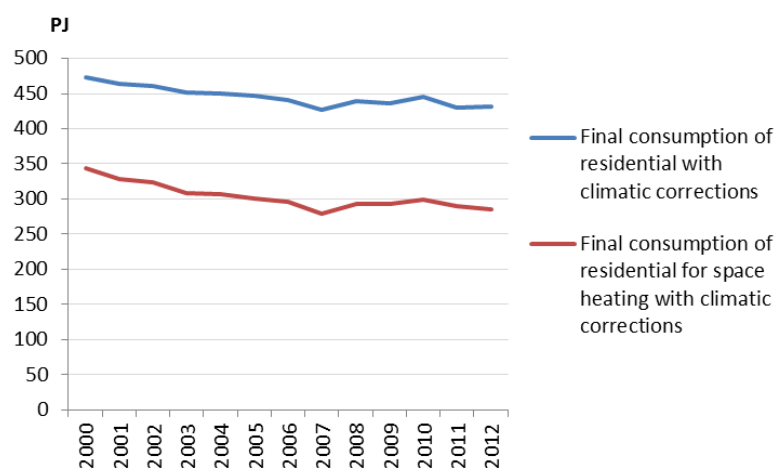
#### Households

The energy efficiency in households has made a lot of progress since 2000. The efficiency of space heating increased especially quickly until 2007, after which it slowed down because less new and efficient new dwellings were built due to the economic crisis. The electrical appliances show a more steady improvement. The average efficiency improvement rate between 2000 and 2012 was 2.5%/year.



**Figure 2.1** – Energy efficiency indices for households, households space eating and households electrical appliances (2000 = 100) (source: Odyssee)

Figure 2.2 shows that the energy consumption trend follows the consumption for space heating, being responsible for the majority of energy consumption in households. The efficiency of space heating has increased due to better insulation and a larger share of condensing boilers.



**Figure 2.2** – Total final consumption and consumption for space heating (source: Odyssee)

The consumption of electricity per dwelling has remained more or less constant (see figure 2.3), although the

consumption of large appliances has decreased considerably (see figure 2.4). The stabilisation of electricity consumption despite the efficiency gains in large appliances is caused by the increased ownership of other electrical appliances like IT and media appliances.

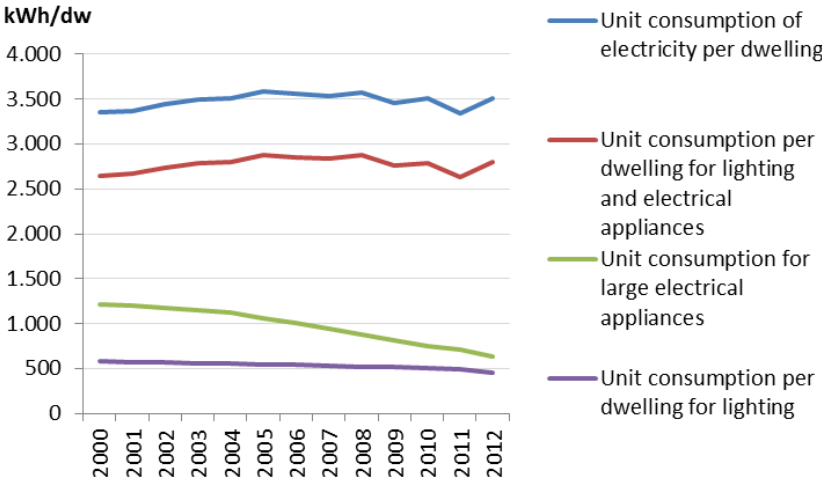


Figure 2.3 – Average electricity consumption per dwelling (source: Odyssee)

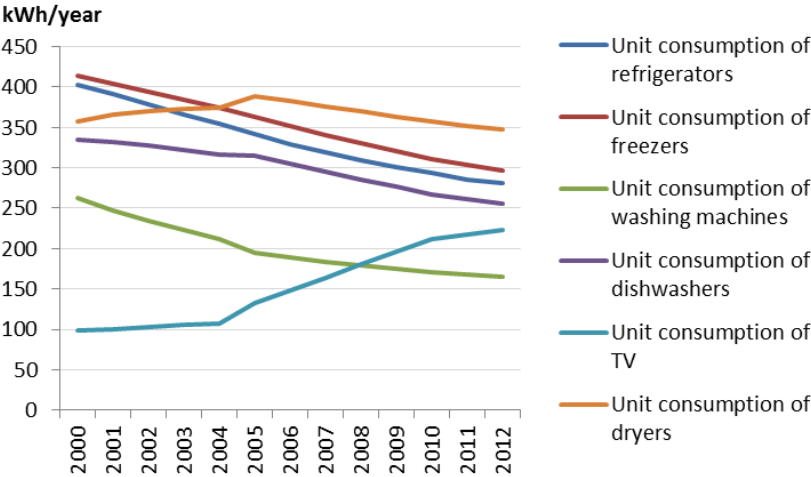
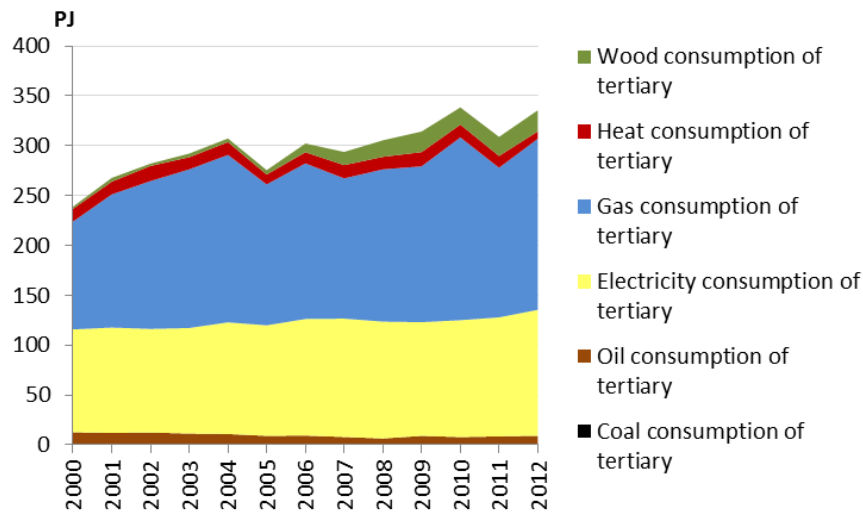


Figure 2.4 – Efficiency of large electric appliances (source: Odyssee)

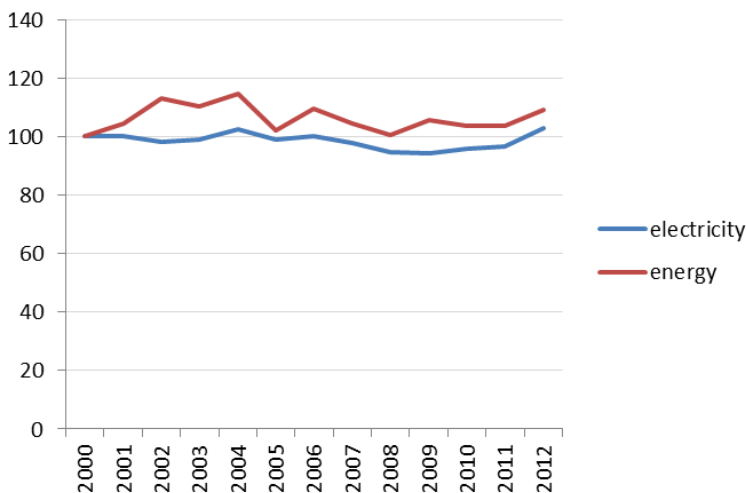
## Services

In the services sector, electricity consumption forms a larger share of total consumption than in the households sector, and it is growing with 1.7%/year, see figure 2.5.



**Figure 2.5** – Energy consumption in the services sector (not adjusted for temperature) (source: Odyssee)

The energy intensity (energy use per Euro Value Added) in the Services sector does not show a clear trend, other than a rise in electricity intensity in recent years, see figure 2.6. There is no clear difference between energy intensity developments in different services sectors.

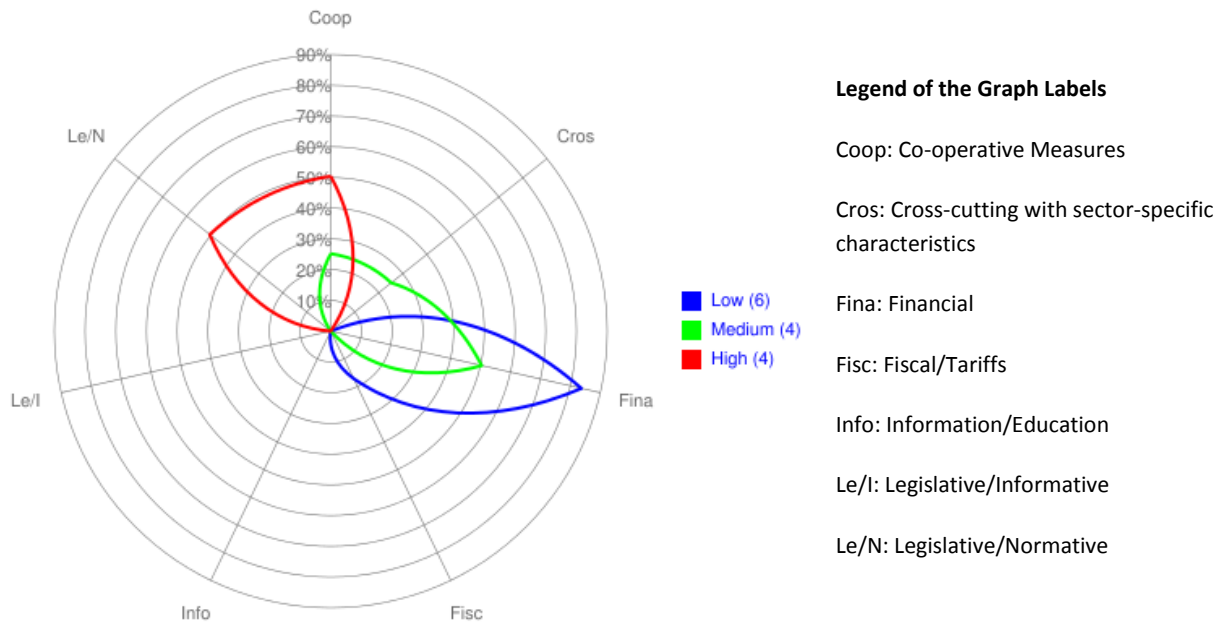


**Figure 2.6** – Total energy intensity and electricity intensity in the services sector (2000 = 100) (source: Odyssee)

## 2.2. ENERGY EFFICIENCY POLICIES

For buildings, the continuously strengthened standards for new dwellings (for which the energy performance coefficient decreased from 1.4 in 1996 to 0.4 in 2015) and buildings has provided a large part of all policy savings, increasing from 5 to 33 PJ for the period 2008-2012. For existing dwellings, various agreements have been concluded with social housing corporations. As part of a new policy on social housing 400 million euro of subsidies are available to stimulate investments for savings. The new Energy Agreement, with all relevant

players (landlords, energy companies and the construction sector), should lead to extra savings. Currently, savings are estimated at 13-43 PJ, especially for owners of dwellings, with help of a new fund and the renovation strategy (article 4) which is also part of the Agreement. Figure 2.7 shows the policy measure types for EED article 7 and NEEAP3. The measures with the highest impact are legislative/normative and cooperative measures.

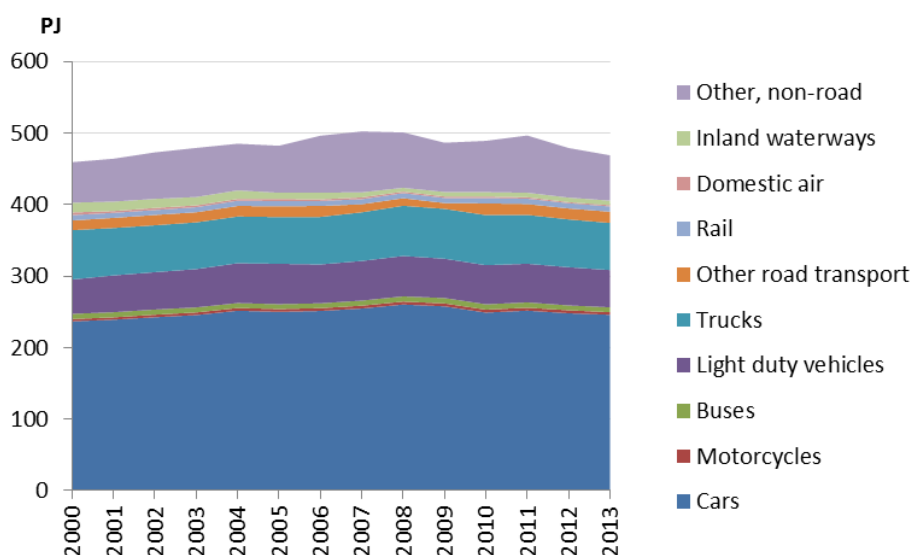


**Figure 2.7** – NEEAP3 and EED article 7 measure types by impact in the households sector (source: Mure)

### 3. ENERGY EFFICIENCY IN TRANSPORT

#### 3.1. ENERGY EFFICIENCY TRENDS

Energy consumption in the transport sector (excluding international air transport) decreased in recent years, but has not fallen below the level of 2000, see figure 3.1. Just over half of all the energy consumed in transport is used by cars. The consumption of cars, trucks and light vehicles peaked in 2008.



**Figure 3.1** – Final energy consumption in the transport sector, excluding international air transport (source: *Odyssee*)

The energy efficiency of the transport sector as a whole increased by 13% since 2000 as a result of relatively large savings for air transport, including international flights. The more relevant index for the Netherlands excludes air transport, as air transport is not targeted in national policies and incorporating it would conceal the actual efficiency figures for domestic transport.

The energy efficiency gains in the transport sector are less than in other sectors, see figure 3.2. The index without air transport leads to an average efficiency improvement rate of 0.6%/year.

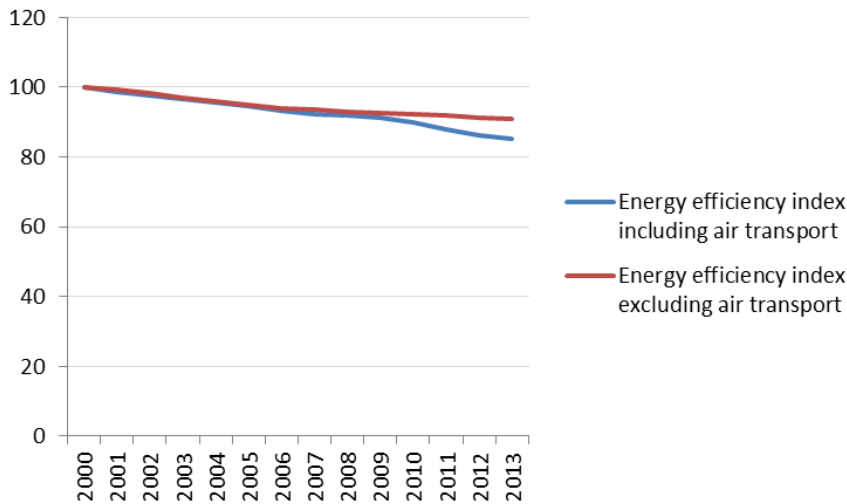


Figure 3.2 – Energy efficiency index for transport, including and excluding air transport (source: Odyssee)

### 3.2. ENERGY EFFICIENCY POLICIES

For goods transport, the major policy measure has been the long term agreements with measures on logistics, the drag coefficient of trucks and better driving behaviour. For cars, the eco-driving scheme has been of importance. Recently, the amended purchasing tax (Dutch: BPM) has stimulated the purchase of more efficient cars that entered the market due to the EU car standard. This has led to a much larger shift to small and efficient new cars compared to other EU countries, see figure 3.3.

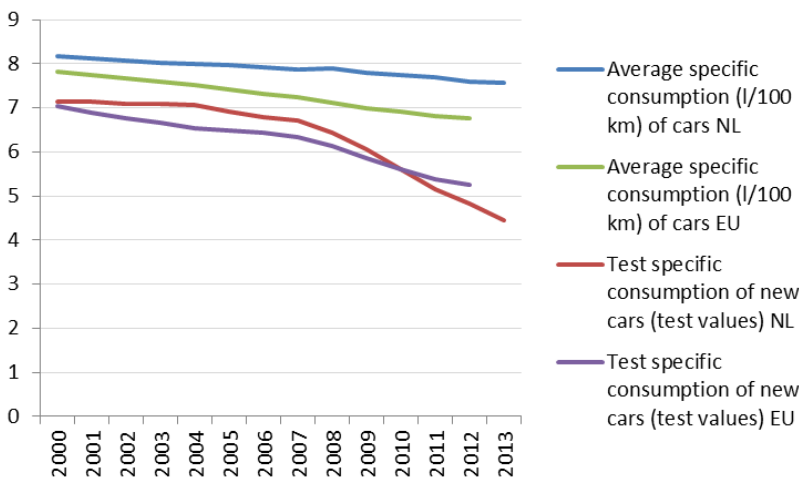


Figure 3.3 – Average specific consumption of all cars and of new cars in the Netherlands and in the EU (source: Odyssee)

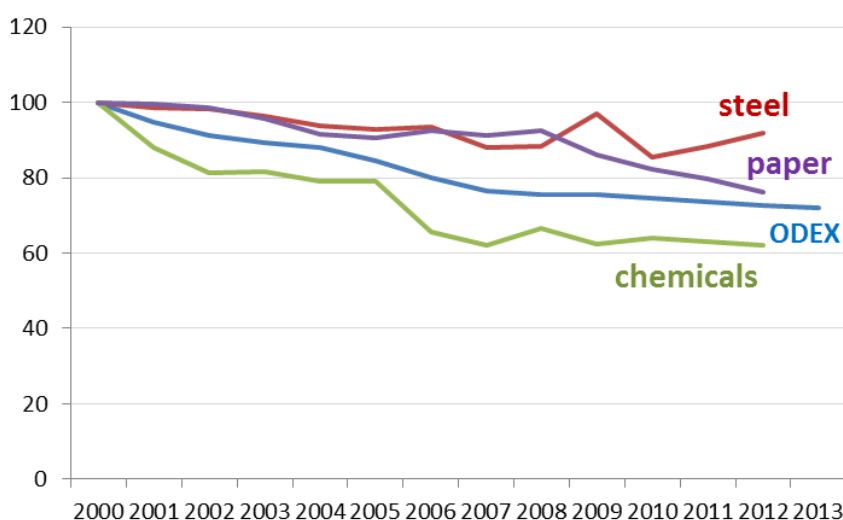
## 4. ENERGY EFFICIENCY IN INDUSTRY

### 4.1. ENERGY EFFICIENCY TRENDS

Figure 4.1 shows the energy efficiency improvements in industry as a whole (ODEX) and for the three most energy consuming branches. The energy efficiency progress in the manufacturing industry was 27% between 2000 and 2012, or 2.6% per year.

In the chemical industry the improvement was 3.9% per year, but stalled after 2007. Unlike other industrial branches, the improvement for the chemical industry is not based on energy consumption per unit of physical production because these are difficult to retrieve and thus are not used in the Odyssee project. The improvement is based on energy intensity, which compares energy consumption to added value. Therefore, it also includes shifts to products with a higher added value. This most probably leads to a higher value of the efficiency improvement for the chemical industry. The energy efficiency of the steel industry improved little (0.7% per year) and also showed negative effects of the economic crisis, especially in 2009. The overall improvement for the steel industry since 2000 was just 8%.

The energy efficiency in the paper industry was 24% and does not show a negative effect of the crisis at all. Actually, the rate of increase in efficiency was higher after 2007 with 3.6% per year.



**Figure 4.1** – Energy efficiency developments in industry (ODEX) and three branches. The index for chemistry is based on energy intensity (energy per added value instead of physical production) (2000 = 100) (source: Odyssee)

### 4.2. ENERGY EFFICIENCY POLICIES

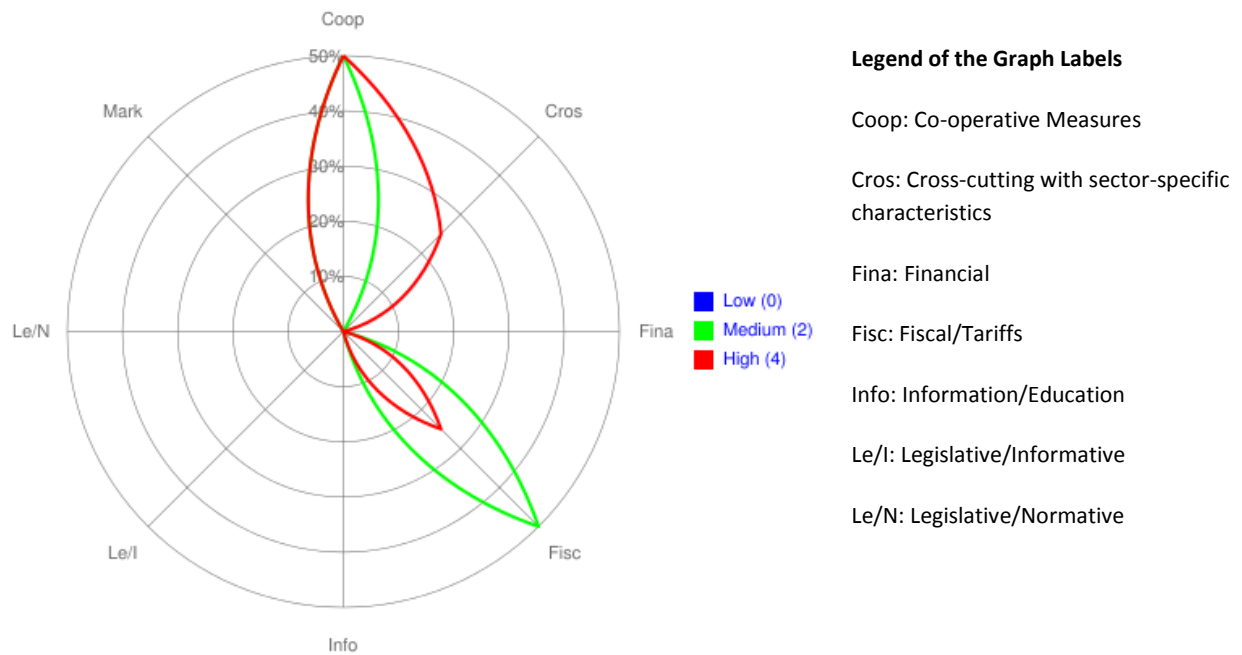
In industry there are various Long-Term Agreements (LTA) on Energy Efficiency, for ETS enterprises the MEE agreement (from 2008) and for smaller energy users the LTA-3. Together with tax deduction for investments in energy savings (EIA) these policy measures account for almost all policy related savings in industry, as the price of emission rights in the ETS has been too low to stimulate savings.

ETS is not very effective due to a high supply of emission allowances and low prices. Relatively few, and weak,



policy measures are in place due to the (perceived) overlap of other policies with ETS.

The most effective measures are fiscal and cooperative ones, see figure 4.2.

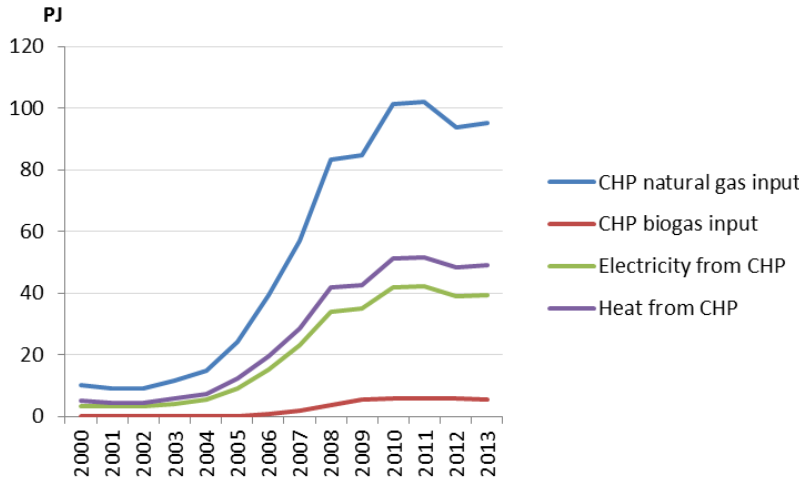


**Figure 4.2** - NEEAP3 and EED article 7 measure types by impact in the industry sector (source: Mure)

## 5. ENERGY EFFICIENCY IN AGRICULTURE

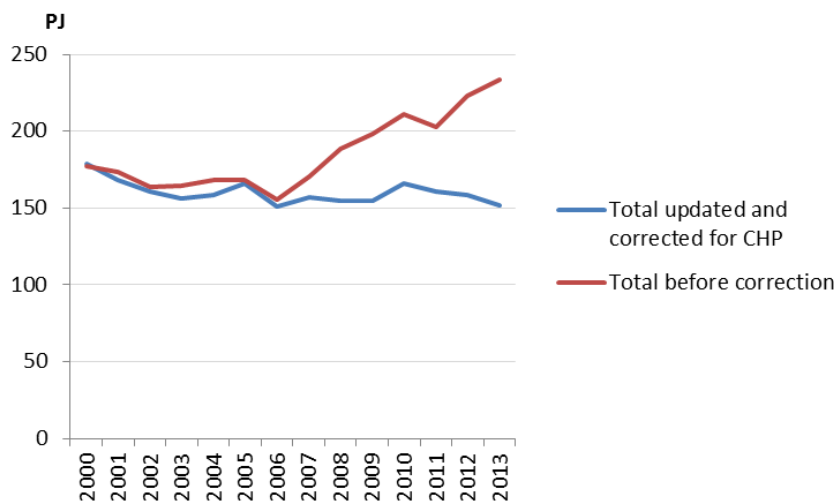
### 5.1. ENERGY EFFICIENCY TRENDS

Horticulture is by far the largest energy consumer in the agriculture sector in the Netherlands. Combined heat and power plays a large role in the Dutch horticulture sector, see figure 5.1.



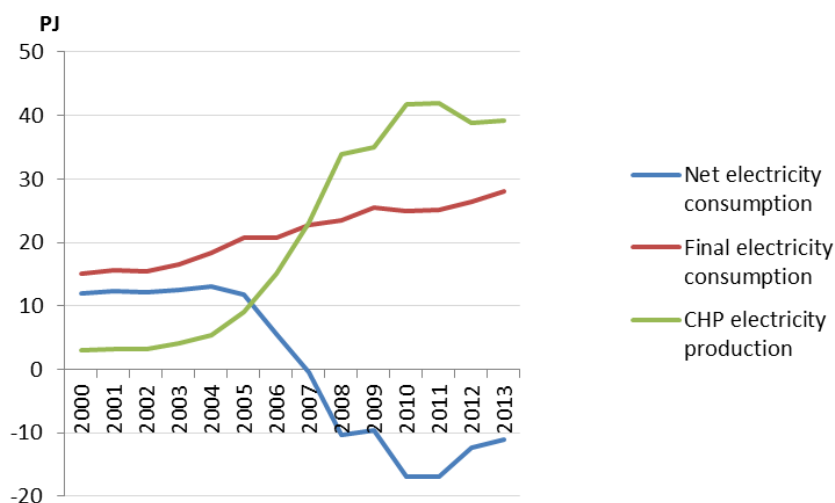
**Figure 5.1** – Energy input and production of electricity and heat by CHP in agriculture (source: CBS)

Figure 5.2 shows the total energy consumption of the agriculture sector corrected for the CHP effect (excluding input for CHP and including final use of electricity and heat from CHP). Data for recent years have also been updated, which lowers the consumption in 2012 and 2013. Comparing the added value of the agriculture sector with the corrected energy consumption leads to an energy intensity improvement of 2.3%/year between 2000 and 2013.



**Figure 5.2** – Total energy consumption in agriculture before and after correction for CHP and data revision (source: Odyssee, CBS)

The amount of electricity produced by CHP surpasses the electricity consumed within the agriculture sector which makes the agriculture sector a net producer of electricity, see figure 5.3.



**Figure 5.3 – Energy input and produced heat and electricity of CHP in agriculture (source: CBS)**

## 5.2. ENERGY EFFICIENCY POLICIES

Since 2008 all actions from the LTA have been stopped when the Action Programme for Clean and Economical Agro sectors (Convenant ‘Schone en Zuinige Agrosectoren’) was signed and energy became part of this. This Action programme is an agreement of the central government and ten organisations, representing the agricultural sector: LTO Nederland, KAVB, LTO Glaskracht Nederland, Produktschap Tuinbouw, Vereniging Platform Hout, Bosschap, FNLI, Produktschap Akkerbouw Nevedi en Platform Agrologistiek.

The Clean and Economical Agro-Sectors agreement sets specific objectives for aspects such as energy efficiency improvements for greenhouse cultivation, livestock farming, arable farming and bulb and mushroom growing for the period up to the end of 2020. One of the targets, also included in NEEAP3, is improved energy efficiency for the horticulture by 43% (compared to 1990).

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