Short-term indicators – Intensities as a proxy for savings

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December 2013
ECN-O--13-046

Acknowledgement

This study is part of the Odyssee/MURE project, supported by the EEI program through the Executive Agency for Competitiveness and Innovation (EACI). The study has been executed by Piet Boonekamp from ECN, the Netherlands. All information on the calculation of energy efficiency indicators is taken from the Odyssee database and website managed by Enerdata in France. For the review of the report assistance was provided by Bruno Lapillonne from Enerdata and Didier Bosseboeuf from ADEME.

This project is registered at ECN under project number 5.2384. The contact person for this study is by Piet Boonekamp (boonekamp@ecn.nl).

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Odyssee indicators

The ODYSSEE database on energy efficiency indicators (www.odyssee-indicators.org) has been set up to enable the monitoring and evaluation of realised energy efficiency improvements and related energy savings. The database covers the 27 EU countries as well as Norway and Croatia and data are available from 1990 on. Decrease in energy indicators that relate energy consumption to a physical output (ton of steel), a performance (person-km driven per car) or number of energy using devices (refrigerators) show the increase in energy efficiency realised and amount of energy saved. Aggregating indicators provides efficiency indices by sector and for the whole economy (so-called ODEX), to evaluate overall energy efficiency progress.

This work contributes to the growing need for quantitative monitoring and evaluation of the impacts of energy policies and measures, both at the EU and national level, e.g. due to the Energy Service Directive and the proposed Energy Efficiency Directive.

Short term indicators

Because the underlying data become available only after some time, the savings figures are not always timely available. This is especially true for the ODEX values per sector that rely on a number of indicators. Therefore, there is a need for so-called short-term indicators that become available shortly after the year has passed for which data are needed.

The short term indicators do not replace the savings indicators but function as a proxy for the savings in the most recent year. This proxy value is faster available, but will be less accurate than the saving indicators themselves. The short term indicators have to be checked regularly with the ODEX indicators in order to see whether they can function still as a proxy.

Intensity indicators

Sectoral energy consumption can be related to performance quantities at sector level, such as number of households or total industrial production, providing so-called

sectoral intensities[1]. The aggregated data used are faster available than the detailed data underlying the ODEX index. Therefore, sectoral intensities can act as a short term indicators, if it can be shown that they are a proxy for the savings shown by the ODEX indices.

This report presents a first analysis of sectoral intensities as short term indicators. It is also explored whether at the national level a national intensity could function as a proxy for overall savings, as shown by the overall ODEX.

Set-up of report

The second chapter provides a short overview of the Odyssee indicators, the calculation of individual indicators, aggregated ODEX and energy savings thereof. Then follow possible intensities per sector and how they score as a proxy for savings, based on findings for the Netherlands. Chapter 4 shows the same results for a few countries. Finally, chapter 5 shows how the approach can be used for policy purposes.

[1] Intensity is often defined as energy use per economic unit (Euro); here it is defined on performance quantities, such as transport activity (person-km and ton-km), mentioned in the proposed Energy Efficiency Directive.

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Overview of Odyssee indicators

2.1 Efficiency indicators

The ODYSSEE database on energy efficiency indicators (www.odyssee-indicators.org) encompasses various types of indicator, which can be classified into the following seven categories:

a. Energy/CO_2 intensities: relate the energy used in the economy or a sector to macroeconomic variables (e.g. GDP, value added).

b. Unit consumption/emissions: relate energy consumption/CO_2 emissions to physical indicators (unit consumption per ton of steel, per car or per dwelling); specific consumption of vehicles, refrigerators, …

c. Energy efficiency indices by sector and for the whole economy (ODEX) to evaluate energy efficiency progress.

d. Energy/CO_2 savings: calculate the amount of energy/CO_2 saved through energy efficiency improvements.

e. Adjusted indicators to allow the comparison of indicators across countries (adjustments for differences in climate, general price level, fuel mix, industry and economic structure…).

f. Benchmark/target indicators by sector to show the potential improvement based on countries with the best performance.

g. Indicators of diffusion to monitor the market penetration of energy-efficient technologies (number of efficient lamps sold) and practices (% of passenger transport by public modes). These indicators are easier to monitor and can be updated more quickly than energy efficiency indicators that depend on the availability of data on end-use consumption.

Indicators regard yearly quantities, e.g. the efficiency index or percentage of public transport in total passengers traffic in 2005.

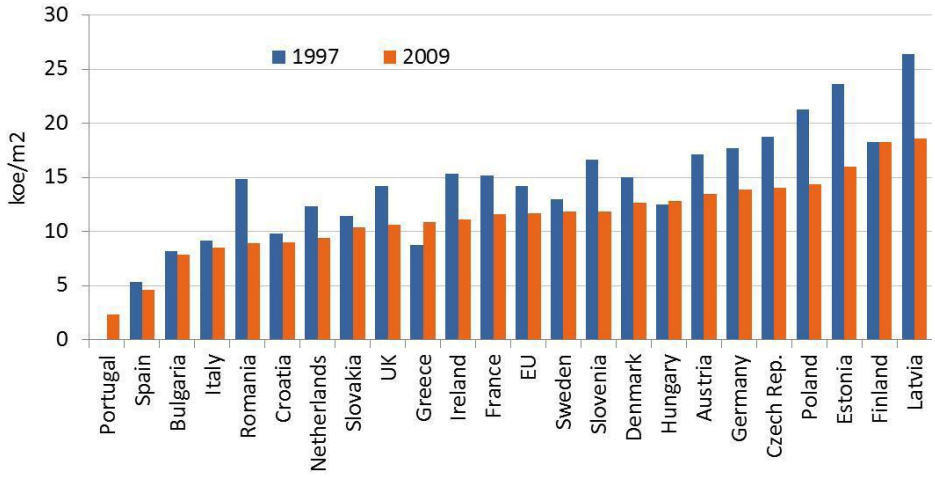
Here the focus is on unit consumption indicators (b), from which follow the energy efficiency indices per sector and the ODEX for all end-use (c) and the related energy savings (d).

2.2 Unit consumption indicators

Unit consumption indicators regard trends for a chosen targeted energy use. An example is energy use for space heating per m^2 floor area in dwellings. The unit consumption is calculated from total yearly energy use for space heating and the number of dwellings times the average size per dwelling.

The trend for average space heating energy use is shown in **Figure 2-1** for all EU countries. Variations in yearly climate can distort the real trend for unit consumption; therefore, energy consumption figures are corrected for the deviation from average temperature during the heating season and for the severity of winters in the different countries.

Figure 2-1: Average space heating energy use per m^2 floor area in dwelling (EU-27)

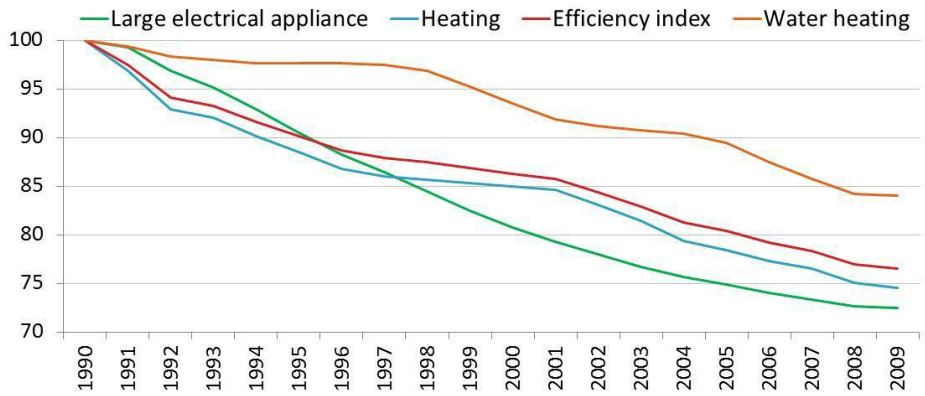


The trend for unit consumption is translated into an index, with a value of 100 for the base year. In this way the trends for all indicators can be shown in a comparable fashion. The unit consumption indicator for space heating in dwellings, at the EU level, is shown in **Figure 2-2** (see 'Heating').

2.3 Aggregated ODEX indices

The trends for unit consumption by sub-sector or targeted end-use can be aggregated into one index, called ODEX. The ODEX per sector is based on the adjacent unit consumption indicators, each weighted with its share in the total energy consumption of the sector. **Figure 2-2** shows the ODEX-Households which comprises indicators for space heating, hot water use and a set of electric appliances (see 'Efficiency index').

Figure 2-2: ODEX-Households for 1990-2009 (EU-27)



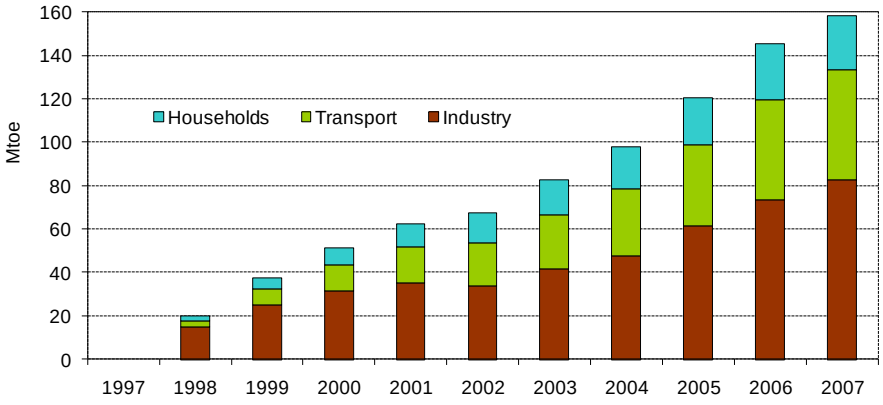
For the overall ODEX the same method is applied with weighting factors based on the shares in total final energy consumption.

2.4 Energy savings

The decrease in the value of the indicator is assumed to be due to savings. For example, if the index for average energy use per dwelling decreases from 100 to 85 in a period, the relative savings are 15%, or (100 – 85)/100. The absolute savings, expressed in Joule or Mtoe, are found by multiplying the relative savings with the energy consumption (in all dwellings) in the end year.

The indicator value (normally) decreases over time, which reflects relative savings that increase year by year. Therefore, the absolute savings thereof show the cumulative savings over a period from the base year (see **Figure 2-3).**

Figure 2-3: Cumulative energy savings for 1996-2007 for EU-27



3

Calculation of intensities

3.1 Available Odyssee data to calculate intensities

Intensities relate energy consumption to socio-economic quantities. At the national level the intensity is normally defined as the ratio between total primary energy consumption and GDP.

The intensity per sector is the ratio between total energy consumption and a sector-specific quantity, e.g.:

- Households: number of people or number of households
- Industry: value added or production volume
- Services: number of employees or value added
- Transport: GDP or transport activity (person-km/ton-km).

The ODEX is defined at the same aggregation level as the sectoral intensities but, contrary to the intensities, it is based on the des-aggregated data of the indicators.

Odyssee does also contain data to calculate intensities because these are used in a decomposition analyses where savings are shown in combination with growth factors and structural changes that also affect energy consumption. Often additional socio-economic data are available with which alternative intensities can be calculated. For instance, in industry both value added and production volume are available to calculate the intensity. In that case it can be analysed which intensity functions best as proxy for energy savings (see next chapter).

Generally data are available from 1990 up to 2009. The goal of this analysis is to check whether intensities can function as a proxy for savings in different circumstances. Therefore the intensities are calculated for the whole period.

3.2 Intensities for Households

The intensity for households can be defined per capita or per household. Total energy consumption can be based on statistical figures but is normally corrected for yearly variations in temperature during the heating season. The four intensities are shown in Figure 3-1.

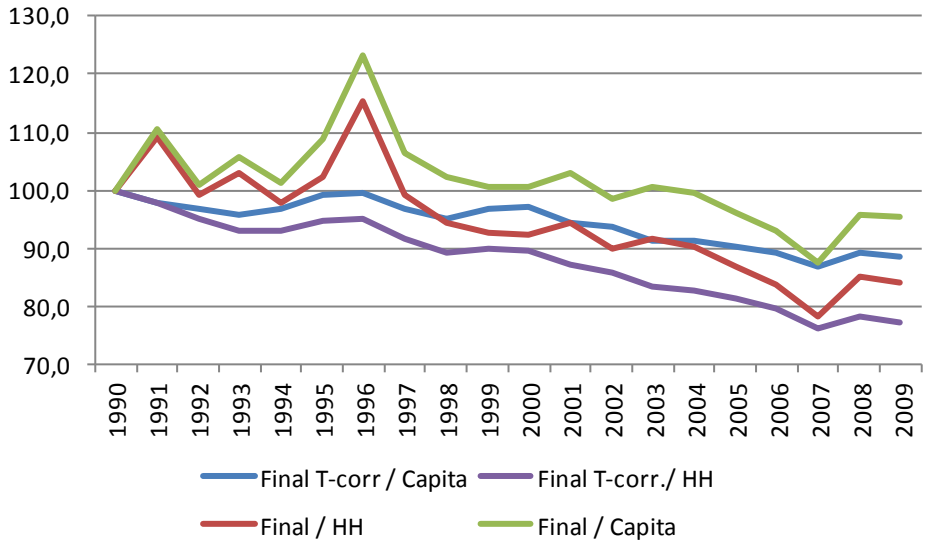


Figure 3-1: Intensity trends for Households (index, 1990=100)

From the figure it can be seen that temperature-corrected intensity shows a more stable pattern and that energy use per capita decreases faster than energy use per household.

3.3 Intensities for Industry

The intensity for industry can be defined as energy use per unit of VA (value added) which comprises the difference between output in economic terms and inputs of intermediate products and services.

However, energy consumption can also be related to the output itself instead of the difference between output and input. In that case the intensity regards the ratio between energy use and the production volume (PV).

Figure 3-2 shows that energy use per unit of PV (in the Netherlands) has a less stable pattern, but both decrease at the same rate from 1993 on.

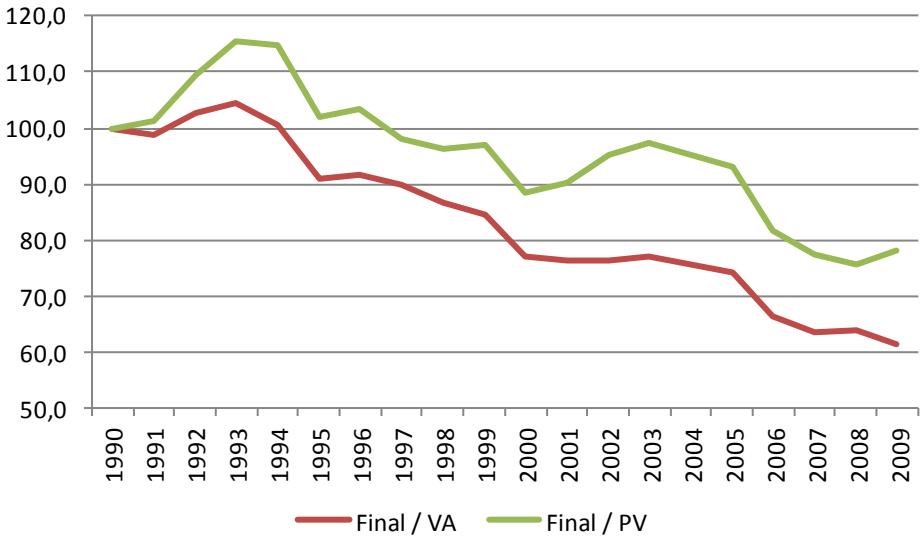


Figure 3-2: Intensity trends for Industry (index, 1990=100)

3.4 Intensities for Transport

Transport activities are more or less coupled to the level of economic activities because the produced goods have to be transported and increasing incomes generally enable more travelling. Therefore the intensity can be defined as transport energy use per unit of GDP. Figure 3-3 shows that the intensity, Total(incl.Air) / GDP, first increases and then decreases.

One reason for the increase in intensity could be fast increasing energy consumption for air-transport. Therefore, the intensity is also shown excluding energy use for air-transport (see Total(excl.Air) / GDP). The intensity value falls below the base year level but still a small increase in the intensity value is visible in 1996. Probably this effect is coupled to the international role of the Netherlands in air traffic[2].

[2] A relatively large energy consumption for air-transport, especially for small countries, has been the reason for the European Commission to limit the contribution to total final energy consumption, when calculating the amount of renewable energy in the RES directive.

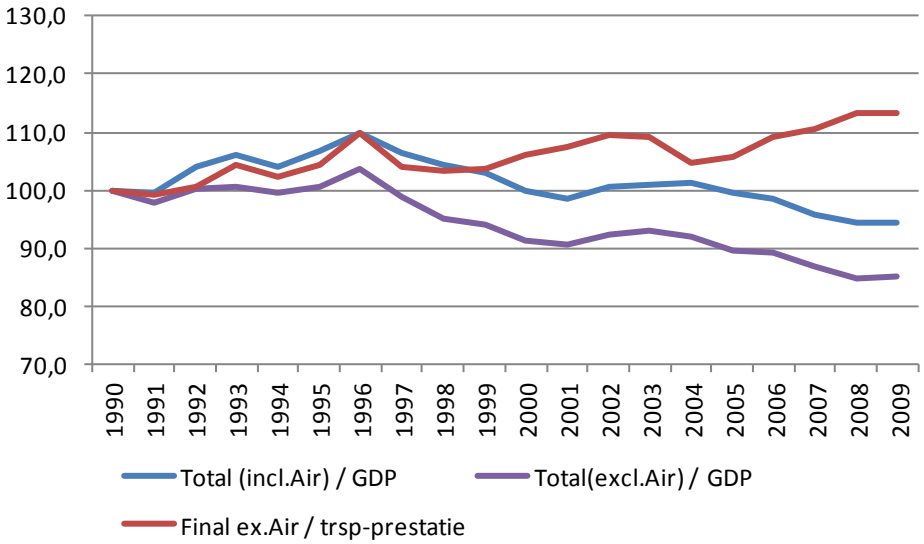


Figure 3-3: Intensity trends for Transport (index, 1990=100)

Energy consumption can also be related to the transport activities themselves, which can be expressed in the amount of person-km driven and amount of ton-km for goods. The activity is the sum of person-km and ton-km, weighted by their fraction in total energy consumption in the base year. Figure 3-3 shows that in this case the intensity increases more or less continuous, probably due to shift to more energy intensive modes of transport. This intensity is not shown including air traffic because no person-km are available for air transport.

The intensity based on transport activities asks for many data that are not always available in the short run. Therefore another short term alternative can be used, namely the specific fuel use of cars, trucks and buses. In order to aggregate these specific uses the number of trucks and buses have been expressed in equivalent cars. The specific fuel use per equivalent car could be relevant because technical efficiency gains provide most of the savings in transport. This indicator is already calculated in the Odyssee database.

3.5 Intensities at national level

At the national level total energy consumption can be related to GDP (in real terms). However, the data according to Odyssee inputs (“Odyssee”) differs from that in the Eurostat statistics (“Eurostat”). Figure 3-4 shows that both intensities actually show almost the same pattern.

Total energy consumption is often related to the size of the population; the figure shows that this intensity is increasing while the GDP based intensities decrease.

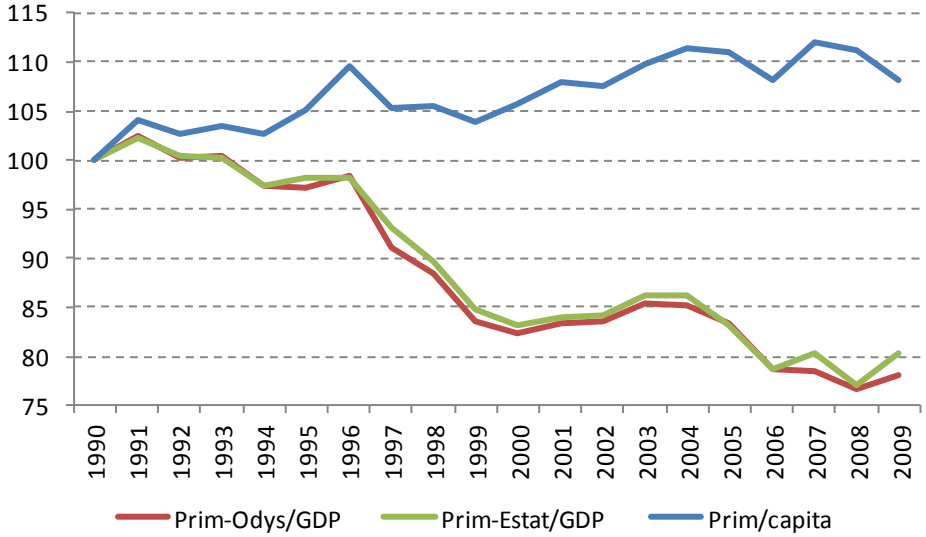


Figure 3-4: Intensity trends at national level (index, 1990=100)

4

Comparison of intensities and savings

4.1 Comparison of direction of yearly changes

In chapter 2 sectoral savings were shown based on aggregated indices per sector for Households, Industry and Transport. For Services no ODEX index is yet available due to lack of data. The three sectoral ODEX indices have been converted into a Global-ODEX.

The trends for the ODEX indices are compared to the following intensities:

- Households: energy consumption per household or per capita
- Industry: energy consumption per Euro value added (VA) or production volume (PV)
- Transport: energy consumption per unit of GDP or transport performance (person-km/ton-km) and specific fuel use per equivalent car
- National: total energy consumption per Euro GDP or per capita.

It cannot be expected that intensities and savings show the same pattern, because intensities also incorporate structural effects (which are eliminated as much as possible in the Odyssee calculations). What could be plausible is that a change in the amount of savings works through in the intensity. An increase for savings, meaning a decrease in the ODEX value, will show up as well as a decrease for the intensity, and vice versa. If that proves to be the case over a longer period, the change in the intensity is a proxy for more or less savings.

In order to check whether the sectoral intensities are a good proxy for sectoral savings, represented by the ODEX, the year-to-year changes in both quantities are compared. If the direction of change is the same for most years it can be concluded that the intensity change is a first proxy for increasing or decreasing savings.

The approach is first tested for the Netherlands. For each sector the different intensities mentioned earlier are tested (see sections 4.2 to 4.4). The check for the national level is

described in section 4.5. In chapter 5 results are given for two other countries, France and Germany, and overall conclusions are drawn.

In the Odyssee database the ODEX values are a three-year moving average of yearly ODEX values. This adaptation delivers ODEX trends that are cleaned from incidental yearly deviations. For this exercise the original yearly ODEX values have been recovered.

In recent Odyssee reports savings are presented from 1996 on, due to unavailability of figures for some countries. Here, the ODEX values have been calculated for the whole period 1990-2009.

4.2 Comparison for Households

For households the trends for savings, based on the ODEX-index (non-smoothed), and the intensity, based on number of households, are shown in Figure 4-1. It can be seen that both show more or less the same up and down pattern over the period.

The ODEX is based on energy consumption corrected for yearly deviations in the average temperature during the heating season. The intensity has also been calculated with temperature corrected energy consumption. If no temperature correction is applied this results in much more differences with the ODEX trend.

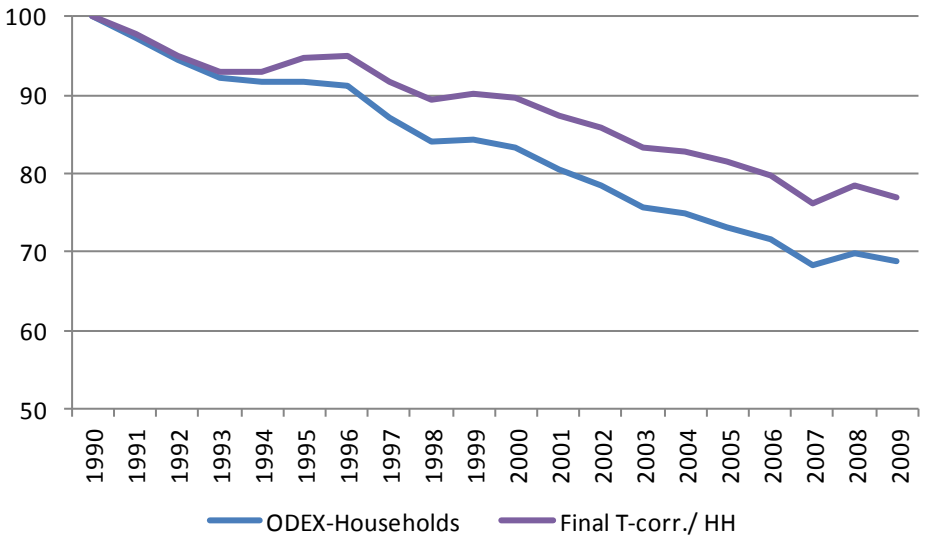


Figure 4-1: Trends for savings and intensity for Households (Netherlands)

The direction of yearly changes for both quantities have been compared; if they show the same sign the consistency between intensity and savings is rated as “F”. Table 4-1 shows the consistency for each year, both for per capita intensity and per household intensity.

Table 4-1: Fit for yearly changes in ODEX and intensities for households

	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09
Intensities																			
Capita	F	F	F				F	F	F	F	F	F	F	F	F	F	F	F	F
Household	F	F	F				F	F	F	F	F	F	F	F	F	F	F	F	F

It can be concluded that the intensity based on number of households fits exactly as good with the ODEX changes as the intensity based on number of inhabitants.

4.3 Comparison for Industry

For industry the trends for savings, based on the ODEX-index (non-smoothed), and the intensity, based on production volume (PV), are shown in Figure 4-2. It can be seen that both show more or less the same up and down pattern over the period.

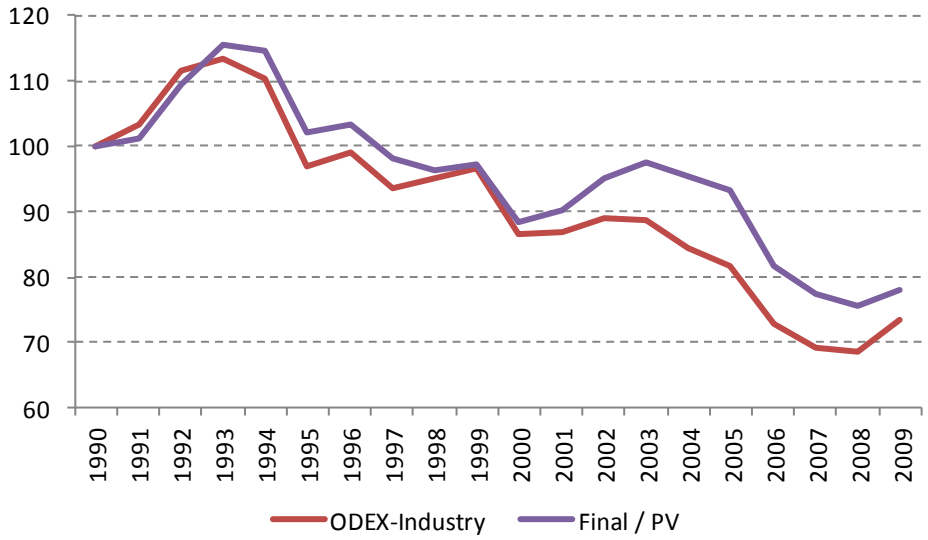


Figure 4-2: Trends for savings and intensity for Industry (Netherlands)

The direction of yearly changes for both quantities have been compared, rating an "F" if they show the same sign. From Table 4-2 it can be seen that intensity based on PV provides a better fit with the ODEX savings than the intensity based on VA.

Table 4-2: Fit for yearly changes in ODEX and intensities for Industry

	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09
Intensities																			
PV	F	F	F	F	F	F	F		F	F	F	F		F	F	F	F	F	F
VA		F	F	F	F	F	F			F		F		F	F	F	F		

4.4 Comparison for Transport

For transport the trends for savings, based on the ODEX-index (non-smoothed), and the intensity, based on transport activity, are shown in Figure 4-3. It can be seen that both show more or less the same up and down pattern over the period.

The intensity based on transport activities asks for many data that are not always available in the short run. Therefore another short term alternative is used, namely the specific fuel use of cars, trucks and buses. In order to aggregate these specific uses the number of trucks and buses have been expressed in equivalent cars. The specific fuel use per equivalent car could be relevant because technical efficiency gains provide most of the savings in transport.

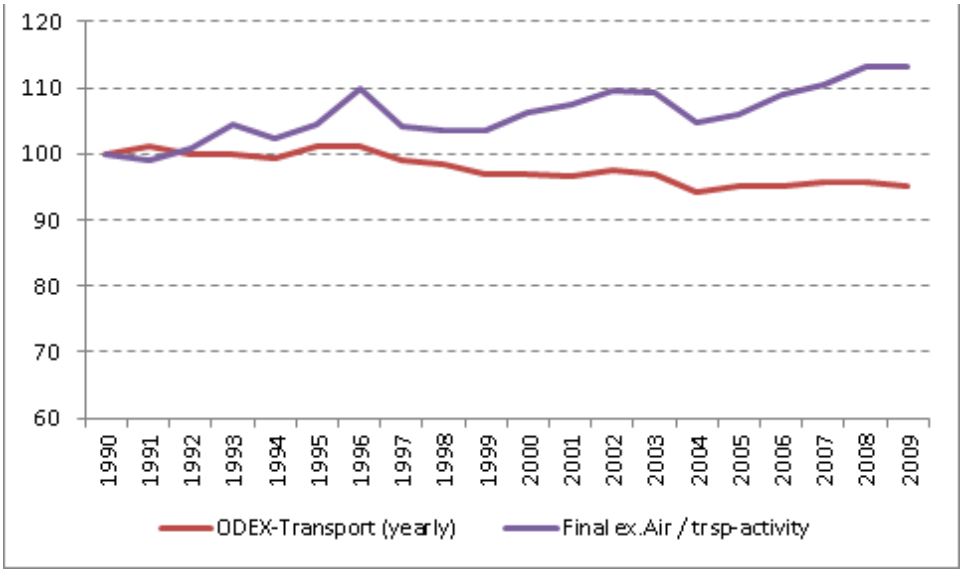


Figure 4-3: Trends for savings and intensities for Transport (Netherlands)

The yearly changes for ODEX have been compared with that of the intensities. From Table 4-3 it can be seen that intensity based on transport performance provides a much better fit with ODEX savings than the intensity based on GDP, especially in recent years. Remarkably, the intensity based on specific fuel consumption of vehicles (Equiv.car) scores even better.

Table 4-3: Fit for yearly changes in ODEX and intensities for Transport

	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09
Intensities																			
GDP				F	F	F	F	F	F	F	F	F							
Activity				F	F	F	F	F				F	F	F	F	F	F	F	
Equiv.car	F	F	F		F		F	F	F	F	F		F	F	F	F			F

4.5 Comparison for total energy consumption

For the overall energy consumption the trends for savings, based on the Global ODEX-index (non-smoothed), and the intensity, based on GDP, are shown in Figure 4-4. It can be seen that both show to a limited extent the same up and down pattern.

The intensity based on population develops in a different direction but shows sometimes the same up and downward changes.

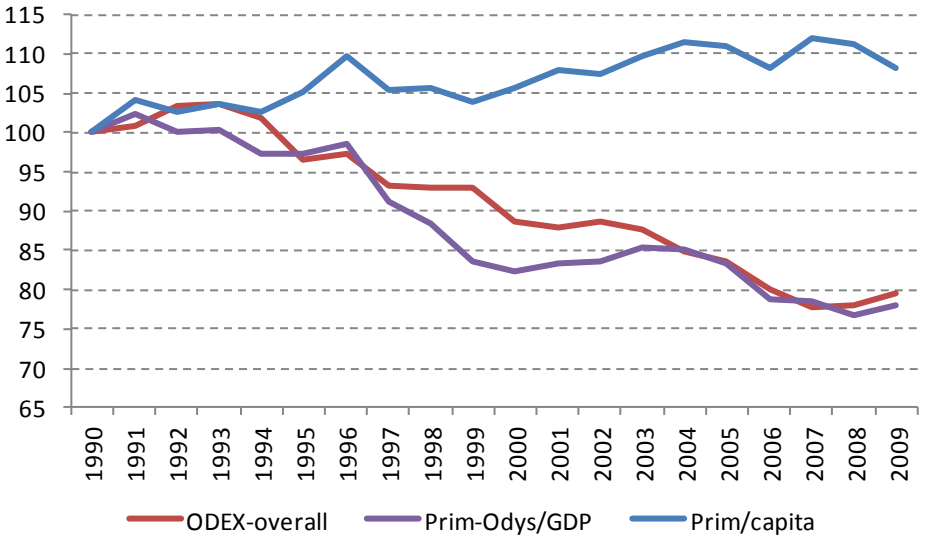


Figure 4-4: Trends for savings and intensities at national level (Netherlands)

The yearly changes for Global-ODEX have been compared with that of the national intensities. From Table 4-4 it can be seen that intensity based on GDP shows a rather good fit with ODEX savings. However, the fit with the intensity based on population is almost absent.

Table 4-4: Fit for yearly changes in ODEX and intensities at national level

	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09
Intensities																			
GDP	F		F	F	F	F	F	F		F		F		F	F	F	F		F
Capita	F		F	F		F	F								F	F			

5

Short term indicators for selected EU countries

This chapter presents the results of a comparison of ODEX and intensity trends for France and Germany. These are taken together with the results for the Netherlands described earlier (see chapter 4) in order to draw general conclusions on using intensities as a proxy for energy savings.

5.1 Standard and alternative intensities

In chapter 4 different intensities per sector and national have been tested for the Netherlands. Based on the best fit between ODEX and intensity trends the following intensities have been chosen as the standard short term indicators of yearly savings:

- Households: energy consumption per household
- Industry: energy consumption per unit of PV
- Transport: energy use per transport activity (person-km/ton-km)
- National: total energy consumption per Euro of GDP.

The other intensities function as alternative short term indicators, in case the standard short term indicator does not deliver satisfying results.

The scores for the fit of the intensities are given for France and Germany in the next sections. Then it will be highlighted how the alternative intensities could also function as a proxy for the ODEX savings.

5.2 Intensities and fit with savings for Germany

The fit between year-to-year changes for ODEX and chosen intensities is shown in Table 5-1. The fit for households with intensity based on number of households is quite good. Remarkably the fit is also the same for intensity based on number of inhabitants

Table 5-1: Fit for yearly changes in ODEX and intensities for Germany

	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09
Households																			
Number	F	F	F	F	F	F	F	F	F	F		F	F	F	F	F	F	F	F
Persons	F	F	F	F	F	F	F	F	F	F		F	F	F	F	F	F	F	F
Industry																			
PV	F	F	F	F	F	F	F	F	F	F		F	F	F		F	F	F	-
VA	F	F	F	F			F	F	F	F			F	F		F	F	F	-
Transport																			
Activity			F	F			F	F		F	F	F	F	F	F	F	F	F	-
GDP	F		F	F		F	F	F		F		F	F	F	F	F	F	F	-
Equiv.car		F		F		F	F			F		F	F	F	F	F	F	F	-
National																			
GDP	F	F		F	F		F	F	F	F	F	F	F	F	F	F	F	F	-
Capita	F	F	F	F			F	F	F		F	F	F	F	F		F		-

The fit for industry using PV for the intensity is also very good (without 2009, for which no values could be calculated). The fit for the alternative intensity based on VA is less pronounced.

The fit for transport for an intensity based on transport activities is modest, especially for nineties. The fit is slightly better for an intensity based on GDP and slightly worse for an intensity based on vehicle performance (specific fuel consumption per equivalent car)..

Finally, the fit at national level using GDP for the intensity is very good. The alternative intensity, based on per capita total energy consumption, scores less good.

5.3 Intensities and fit with savings for France

The results on the fit between year-to-year changes for ODEX and intensities for France are shown in Table 5-2.

Table 5-2: Fit for yearly changes in ODEX and intensities for France

	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09
Households																			
Number	F	F	F	F			F	F	F	F		F			F	F	F		F
Persons	F	F		F			F	F	F	F		F			F	F	F		F
Industry																			
PV			F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	-
VA			F	F		F	F	F	F	F	F	F		F	F	F	F	F	-
Transport																			
Activity	F		F	F	F	F	F	F	F	F			F	F		F	F	F	-
GDP	F		F	F	F	F	F		F	F			F	F	F	F	F		F
Equiv.car				F		F	F			F		F	F	F	F	F	F		
National																			
GDP				F	F		F	F	F	F	F		F	F	F	F	F		-
Capita				F			F				F		F		F	F	F		-

The fit for households is reasonably good, but is also good for the intensity using the number of inhabitants. Remarkably the fit is even better for an intensity based on energy consumption without temperature correction, which is not used in the analysis.

The fit for industry using PV based intensity is very good (without 2009, for which no data were available). But the fit for the alternative VA based intensity is also reasonably good.

The fit with the transport activity intensity is reasonably good (without 2009). Remarkably, the fit for an intensity based on GDP is almost as good taking into account the longer period (including 2009). However, the fit for other alternative intensity based on specific fuel use per equivalent car is much worse.

At national level the fit for GDP is reasonably good, and much better than the fit for per capita intensity

5.4 Overall results for the selected countries

Fit for standard intensities

Table 5-3 shows the fit per sector and country for the standard intensities. Germany performs best overall; the Netherlands is second with exception of transport. France scores lowest, except for transport.

Table 5-3: Fraction of year-to-year fits per country and sector

	France	Germany	The Netherlands
Households (number)	68%	95%	84%
Industry (PV)	89% (*)	89% (*)	89%
Transport (Activity)	78% (*)	72% (*)	63%
National level (GDP)	67% (*)	89% (*)	74%

(*) based on the period 1990-2008, without 2009

It can be concluded that the standard intensities can be used for all sectors and all selected counties, provided that a fit for two-thirds of all yearly comparisons between intensity and ODEX savings is regarded as sufficient. If the minimum score is raised to three-quarters only the standard intensity for industry suffices for all countries.

Acceptable alternative intensities

In a number of cases there is an alternative for the chosen intensity that scores the same or slightly less as to the fit with the ODEX developments (see previous sections and chapter 4). Acceptable alternatives are defines as:

- A score of at least 80% of the score for the chosen intensity
- A fit for at least two-thirds for all year-to-year values.

The resulting alternatives are shown in Table 5-4. It can be concluded that for households there is a reasonable alternative intensity in the form of per capita energy consumption. For transport there is either the alternative of energy consumption per unit of GDP or specific fuel use per equivalent car. For industry the alternative intensity based on VA is possible, but the score for the Netherlands is slightly lower than two-thirds. At national level there is no alternative intensity as per capita total energy consumption only scores above the minimum for Germany.

Table 5-4: Acceptable alternative intensities per country and sector

Sector	France	Germany	The Netherlands
Households	Capita	Capita	Capita
Industry	VA	VA	VA?
Transport	GDP	GDP / Equivalent car	Equivalent car
National level	x	Capita	x

5.5 Quantification of the fit between intensities and ODEX savings

Discussion on methods

The preceding analysis only regards the direction of the year-to-year changes in the intensity values and the ODEX values. No attention was paid to how the changes in the intensity value compared to that of the ODEX. In other words, how strong is the relation between developments for intensity and for savings, as represented by ODEX?

Often regression analysis is used to analyse the correlation, the strength of the relation, between two quantities that both develop in time. In this case the regression analysis could be performed on the values for the period 1990-2009. However, regression analysis provides average values for the correlation over the whole period, while the focus of this study is not on trends but on the relation for the most recent year. For this year circumstances will often differ from the trend for the whole period. Therefore, the quantitative analysis should concentrate on the relation for the separate year-to-year changes.

In the following the separate year-to-year changes for intensities and ODEX savings are related to each other, and the results summed over the whole period. The overall score is compared with the number of fits from the qualitative approach presented earlier. This approach enables to estimate savings from intensities, and also provides an extra check on the reliability of intensities as short term indicator for savings.

Quantification of the fit

For each case where there is a qualitative fit between intensity and ODEX savings, the ratio between the change in the ODEX value and the change in the intensity value is calculated. The ratios are summed up and divided by the number of fits, thus providing the average ratio between the changes in value of both quantities. These average ratios are used to provide an estimated value for the savings on basis of the value for the intensity in the most recent year.

Two remarks must be made:

- For cases without a qualitative fit no rate is calculated because here the ratio is negative (due to different directions of both changes). The sum over, positive or negative, ratios will not provide useful information on the strength of the fit.
- In a few cases the change in the intensity value is close to zero and a very high ratio is found that has substantial influence on the average ratio. This distorting effect has been avoided by capping individual ratios such that this effect is mitigated.

Table 5-5 shows the average ratio per sector and intensity, for the three countries. In most cases the average ratio lies between 0.9 and 1.6 which shows modest differences in the relation between intensities and savings. The value mostly above 1 indicates that changes in savings are relatively stronger than changes in intensity.

Consistency fits and ratios

Table 5-5 also shows the fraction of fits which can be compared with the average ratio. With regard to the consistency between fits and ratios the following can be observed:

- For about the same level of fits different ratios are found, and the other way around. This indicates that the strength of the relation (number of fits) and the quantitative value (how changes in intensities relate to that of savings) are different things.
- On the other side, when comparing for all intensities, a higher fraction of fits often means a higher average ratio. This is especially true for Germany and the Netherlands but France shows contradictory results.

Table 5-5: Qualitative fit and quantitative ratio for intensities and savings

	France		Germany		Netherlands	
	Fraction fits[3]	Average ratio	Fraction fits	Average ratio	Fraction fits	Average ratio
Households						
HH	68%	0,89	95%	1,28	84%	1,20
Capita	63%	0,74	95%	1,48	84%	1,63
Industry						
PV	89%	0,91	89%	1,17	89%	1,37
AV	78%	1,28	72%	1,26	63%	1,91
Transport						
Activity	78%	1,11	72%	1,00	63%	0,63
GDP	74%	1,18	78%	1,41	47%	0,42
Equivalent car	53%	1,95	67%	1,00	74%	0,91
National						
GDP	67%	0,90	89%	1,00	74%	1,69
Capita	39%	2,42	72%	1,56	37%	1,35

An explanation for these contradictory findings can be that relative large changes in savings (thus high ratios) will lead to less cases where savings and intensities show different directions (thus more fits) due to margins in statistical data. The most appropriate intensity must be selected on basis of the number of fits and not on the value of average ratios.

Estimation of recent savings

The savings for the most recent year can be estimated as soon as data become available for the proper intensity. The proper intensity is found from the results for the best fit between intensities and the ODEX-savings, as already done for example countries in chapter 5. The estimated savings are calculated from the recent change in the intensity and the value of average ratio. For each case a separate ratio must be used, based on historic analysis for each country, sector and possible intensity, as described above.

It must be stressed that the saving figures are estimates which prove to be wrong later, because there will not always be a fit (positive ratio) and because the applied value for the average ratio is not valid for each year-to-year case.

[3] Number of year-to-year changes in ODEX savings indicator fitting with changes in the intensity, compared to total number of year-to-year observations in the period.

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Implementation of short term indicators

Presently the full set of Odyssee indicators, and the savings calculated thereof, are only available almost two years after the end of the last year presented. By using short term indicators in the form of intensities this period can be shorted to one year, i.e. providing an estimate of the savings development in the last year about one year later.

In order to apply the short term indicators the updating of Odyssee indicators should start with the intensities specified in this report, especially the standard intensities. Currently the situation as to the calculation of short term indicators is as follows.

National level
At the national level total energy consumption and GDP are readily available to calculate the standard intensity as short term indicator for savings.

Households
To calculate the standard intensity, energy consumption and number of households are readily available. The number of inhabitants is also readily available to calculate the alternative intensity as short term indicator.

Industry
Energy consumption for industry as a whole is readily available and for industrial production volume this will be the case for most countries, enabling the calculation of the standard intensity as short term indicator. The alternative intensity based on VA might cost more time due to lagged availability of VA data .

Transport
For transport the situation is more complicated. Energy consumption and GDP, needed for the alternative intensity based on GDP are readily available. But this alternative short term indicator is not always good enough to estimate the latest development of savings in transport. For the standard intensity (energy consumption per unit of transport activity) many detailed data are needed, generally not available in the short term. The other alternative intensity, specific fuel use per equivalent car, needs also

detailed data but these vehicle data are more readily available than transport activities in person-km and ton-km. Here a combination of the two alternative intensities might enable an reasonable estimate of the development of savings for transport.

In this report the application of short term indicators has been analysed for three countries only. In order to apply the approach in the Odyssee database the analysis should be executed for all countries. The analysis should be updated regularly to check whether the relation between intensities and savings still holds. To this end the analysis method must be made part of the Odyssee calculation system.

Definitions and glossary

ODYSSEE energy efficiency index

ODEX indicators aggregate energy efficiency trends by sub-sector (or end-uses or transport mode) in a single indicator by main sector (industry, households, transport and services) and for the economy as a whole. They are calculated from the unit consumption indices by sub-sector based on the weight of each sub-sector in the total energy consumption of the sector. As indices are used, it is possible to combine different units for unit consumption to provide the best proxy of energy efficiency, e.g. toe/dwelling, koe/m^2, or kWh/appliance for households. A decrease in the index means an energy efficiency improvement: a value of 85 in 2004, for instance, means a 15 % efficiency improvement compared to the base year (1990). ODEX provides an alternative indicator for energy intensities (industry and transport) or unit consumption (per dwelling for households) to describe the overall trends by sector.

Energy efficiency gains are measured in relation to the previous year, and not to a fixed base year to avoid having results influenced by the situation in the base year. It is calculated as a 3 years moving average to avoid short-term fluctuations (imperfect climatic corrections, behavioural factors, business cycles).

In industry, ODEX is calculated from the unit energy consumption indices of individual branches (11 branches). Unit consumptions are expressed in toe per ton produced for steel, cement, and paper and in toe per unit of production index for other branches.

In transport, ODEX is calculated from the unit energy consumption indices of individual modes (7 modes). For cars, motorcycles and buses, energy efficiency is captured by specific consumption measured in litres/100km. For freight transport (trucks and light vehicles), energy efficiency is measured by the unit consumption per ton-km as, ultimately, the main activity involved here is the transportation of goods (at least for trucks). For other modes, the most relevant indicators of unit consumption were taken depending on the statistics available: toe/passenger for air transport, goe (gram oil equivalent) /passenger-km for passenger rail, goe/ton-km for transport of goods by rail and water.

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