Energy Efficiency Policies and Measures in Sweden

ODYSSEE-MURE 2010

Monitoring of EU and national energy efficiency targets

Swedish Energy Agency

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1 Executive Summary

This report presents an analysis of energy efficiency trends in Sweden on the basis of energy efficiency indicators extracted from the Odyssee database, as well as the measure database MURE. The indicators in this report are updated to 2009 and for some until 2010.

The analysis focuses on changes and trends in the Swedish policy within energy efficiency for the period 1990–2011. The general trends towards more market based systems, where general taxes and information campaigns are preferred

The total energy consumption in Sweden increased from 31.7 Mtoe in 1990 to 33.4 Mtoe in 2009. Total final energy consumption for the residential and tertiary sector has decreased since 1990 while the transport sector has increased and the energy use in industry is about the same. In 2009 the energy use in transport and industry sector declined due to the recession. Regarding energy savings, the largest savings have been made in the household sector, which represented 70 % of the total savings in 2009, followed by industry 20 % and transport 10 %.

2 Key messages

Energy efficiency should be viewed from a system perspective, i.e. energy efficiency measures could be in the extraction, refining, conversion, distribution or end-use. This means that primary energy efficiency should be taken into account and evaluated rather than a one-sided focus on energy end-use. Well-functioning energy markets are the backbone of achieving primary energy efficiency measures in Sweden. Well-functioning energy markets are characterized by correct prices. The consumers will then react on the prices and do energy efficiency measures. The policy making is hence focusing on correcting market imperfections.

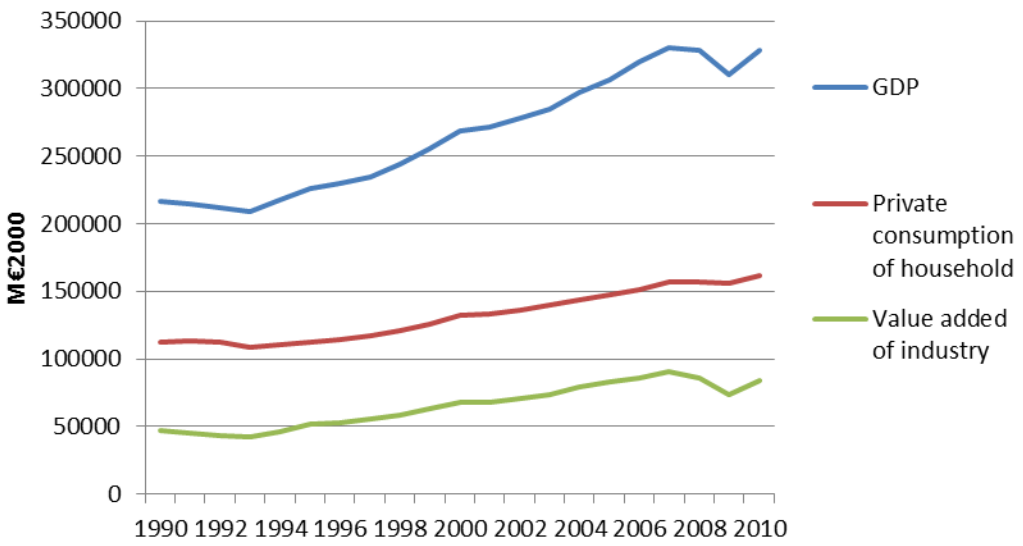
3 The Background to Energy Efficiency

3.1 Overall economic context

Figure 1 shows the trends in the main macro-economic indicators: GDP, private consumption and value added of industry.

The average growth rate of GDP has been around 2.1 % per year since 1990. The years of recession in 1991 to 1993 (-1.2 %) were followed by rapid growth. The recession in 2008 (-0.6 %) and 2009 (-5.3 %) were followed by rapid growth in 2010 (5.7 %).

Figure 1: Macro economic development in Sweden



Source: Odyssee database

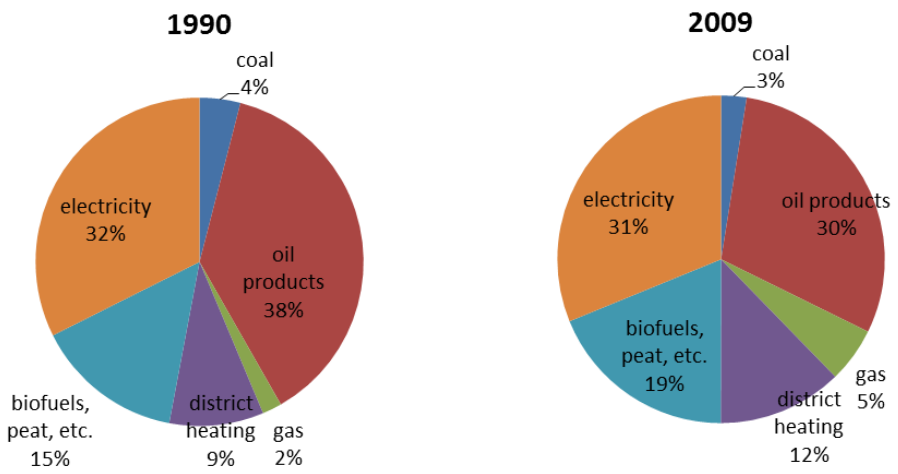
The average growth rate of private consumption of households has been around 1.8 % per year during the period. Except for the years of depression (in 1992, 1993 and 2009) when the growth was decreased. After 2000 the growth rate has been higher than between 1990 and 2000.

The average annual growth rate of value added of industry has been 3.2 % during the period. The recession in 2009 affected the industry in Sweden and the value added decreased by -13.8 %.

3.2 Energy consumption trends:

The total final energy consumption increased in Sweden from 31.2 Mtoe in 1990, to 33.4 Mtoe in 2009. Figure 2 shows the distribution of used fuels and how the use of oil products has decreased while the use of gas, heat and renewable sources has increased since 1990.

Figure 2: Final energy consumption by fuel in Sweden

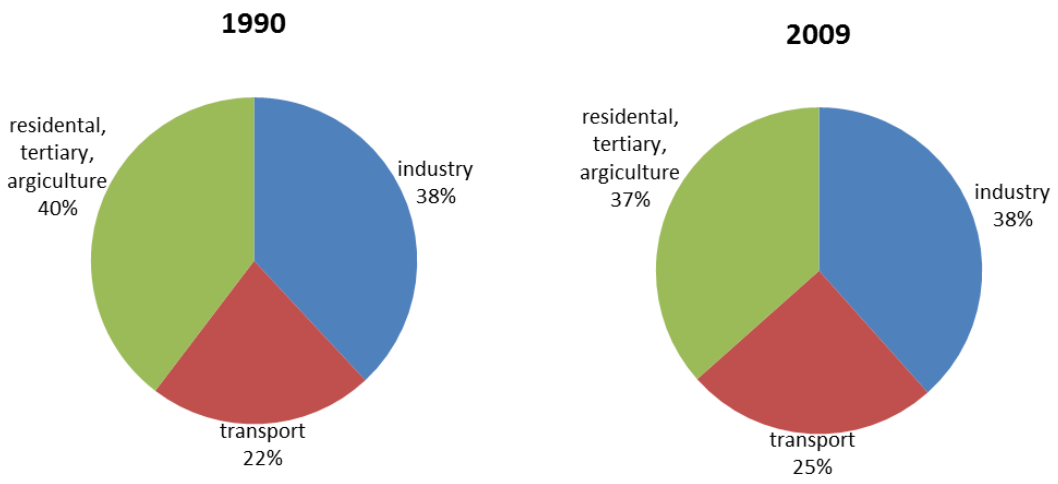


Source: Odyssee database

Figure 3 shows final energy consumption by sector in Sweden. The transport sector has increased while the residential, tertiary and agriculture sector has decreased.

Figure 3: Final energy consumption by sector[1]

[1] Non-energy use excluded



Source: Odyssee database

Energy use in the residential and tertiary sector is about the same in 2009 as in 1990. Energy use in the sector is in the short run mostly affected by variations in temperature. The heating demand is relatively high a cold year and vice versa for a warm year. This means that the sector's share of the total energy use can differ between years but usually lies around 40 %.

Industrial energy use has remained about the same since 1990. In 2009 the energy use in industry declined which could affect the share of energy use.

As Figure 3 shows, the transport sector's share has increased since 1990, which can be explained by the fact that its total use increased by 25 % in 2009 compared to 1990. The main reason is a substantial increase in the use of diesell oils within road transports and gasoline for the domestic flights.

3.3 The policy background to energy efficiency

In 2007 a commission (inquiry) started a study concerning what Sweden should do in order to fulfil the requirements of the Energy Services Directive. The first national energy efficiency action plan was set in November 2008. The proposals include radically increased support for energy efficiency in buildings, increased taxes on cars with high fuel consumption and stricter building codes.

An action plan for energy efficiency and actions was set to fulfil the requirements in the Energy Services Directive. A second energy efficiency action plan was set in June 2011. According to the directive the final energy use should decrease by 6.5 % to 2010 and by 9 % to 2016 compared to average energy use in 2001–2005. According to as-

sessments by the Swedish Energy Agency, the targets will be reached[2]. The physical target corresponds to 24.0 TWh to 2010 and 33.2 TWh to 2016.

Also, the energy and climate policy declared a target of 20 % better energy efficiency by 2020 compared to 2008, measured relative to GDP, i.e. the supplied energy per unit of GDP at constant prises will be reduced by 20 %. This goal includes all sectors and includes energy efficiency in all stages from energy transformation and distribution to end users of energy.

A national goal concerning energy use in building was set. The total energy use per unit of area in residential and commercial buildings should be reduced by 20 % to 2020 and by 50 % to 2050 compared to 1995.

According to the action plan Sweden will reach the target according to the Energy Services Directive. The savings will, according to the European Commission's calculation methods, be 33.1 TWh to 2010 and 53.8 TWh to 2016 of the final energy use. The calculation in the second action plan differs from the first action plan because the calculation methods are different, as are the time period and lifetimes.

Some changes in policy measures have been made over the last years:

- EU state aid rules have changed and The programme for energy efficiency (PFE) will after December 2012 no longer exist in its current form. Companies that are already in the programme will be able to fulfil their five year programme.
- Since 2010 municipalities and county councils can seek energy efficiency support from the Swedish Energy Agency. The given money may be used to strategically work on energy efficiency for transportation and buildings within the organization.
- Sweden has recently started analysing the consequences and making a plan on fossil-fuel-independent vehicle fleet.

In the most recent budget proposition some changes were made that affect the action plan. New suggestions in the Budget proposition[3] for 2013:

- Support to "near zero energy buildings". The government will provide 120 million SEK per year 2014-2016.

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[2] Swedish Energy Agency, Underlag till den andra handlingsplanen, ER2010:32

[3] Swedish goverment. Budgetpropositionen för 2013 - Förslag till statens budget för 2013, finansplan och skattefrågor. (september 2012)

- Support to biogas. The government will provide an additional 280 million SEK between 2013 and 2016.
- Solar energy support extends to 2016 with a support of 210 million SEK.
- Energy research will be supported by the government which means that the annual support will increase from 1.3 billion SEK today up to 1.4 billion 2016..

4 Overall Assessment of Energy Efficiency Trends

4.1 Overall trends in energy intensity

Energy intensity is a measure that shows how efficiently energy is used within the economy. The measure is a ratio between the total amount primary or final energy and gross domestic product, GDP. Final energy intensity represents the assessment of the energy productivity of the whole economy of final consumers only. Table 1 and Table 2 show primary and final energy intensity in Sweden and the average value for EU during 1990–2010. GDP is converted into € 2005 using purchasing power instead of exchange rates.

Table 1: Primary energy intensity in Sweden and the average value for EU during 1990–2010

	Unit	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sweden	koe/€2000	0,22	0,19	0,21	0,20	0,20	0,20	0,19	0,18	0,17	0,17	0,17	0,17
EU	koe/€2000	0,21	0,17	0,17	0,17	0,17	0,17	0,17	0,16	0,15	0,15	0,15	0,15

Source: Odyssee database

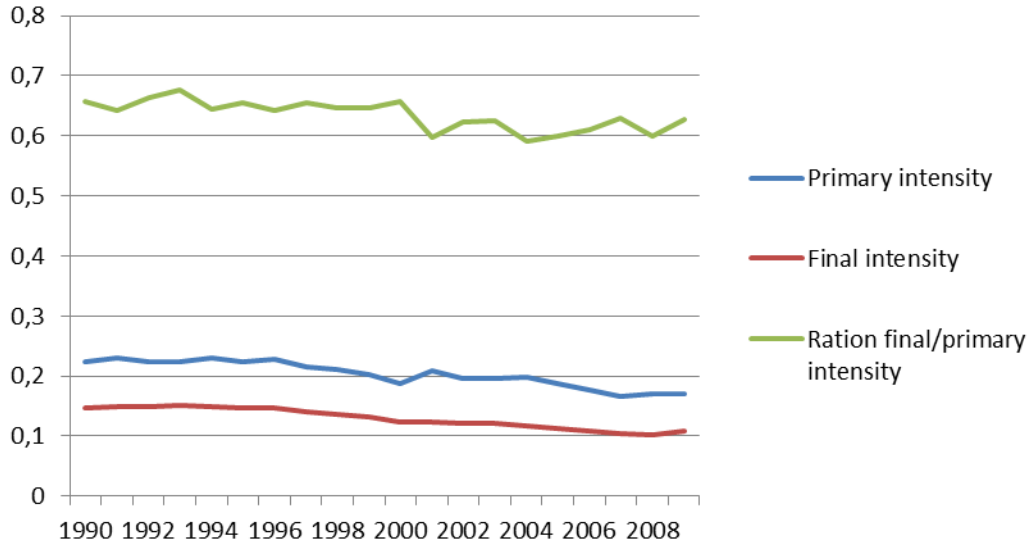
Table 2: Final energy intensity in Sweden and the average value for EU during 1990–2010

	Unit	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sweden	koe/€2000	0,15	0,12	0,12	0,12	0,12	0,12	0,11	0,11	0,10	0,10	0,11	n.a.
EU	koe/€2000	0,13	0,11	0,11	0,11	0,11	0,11	0,11	0,10	0,10	0,10	0,10	0,10

Source: Odyssee database

The different variations in primary and final intensities are captured by the ratio of final to primary intensity, Figure 4. This ratio has remained more or less constant from 1990 to 2009. The ratio is unchanged but together with an increasing share of electricity and district heating in final consumption, we can say that the transformation sector became more efficient over the period.

Figure 4: Primary and final energy intensity

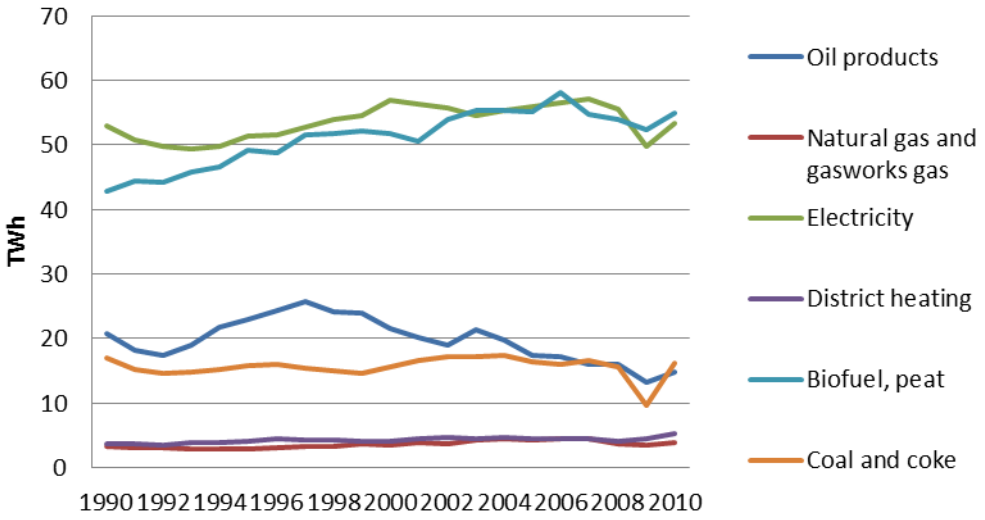


Source: Odyssee database

4.2 Industry:

Energy use in industry in 2010 amounted to 148.3 TWh and represent 38 % of Sweden's final energy use. The main energy providers in industry are biofuels and electricity, at 37 % and 36 % respectively, complemented by 23 % of energy from fossil sources. District heating provides the remaining 4 % of energy use.

Figure 5: Final energy in the industrial sector, 1990–2010



Source: Swedish Energy Agency and Statistics Sweden (EN 20 SM, EN 31 SM)

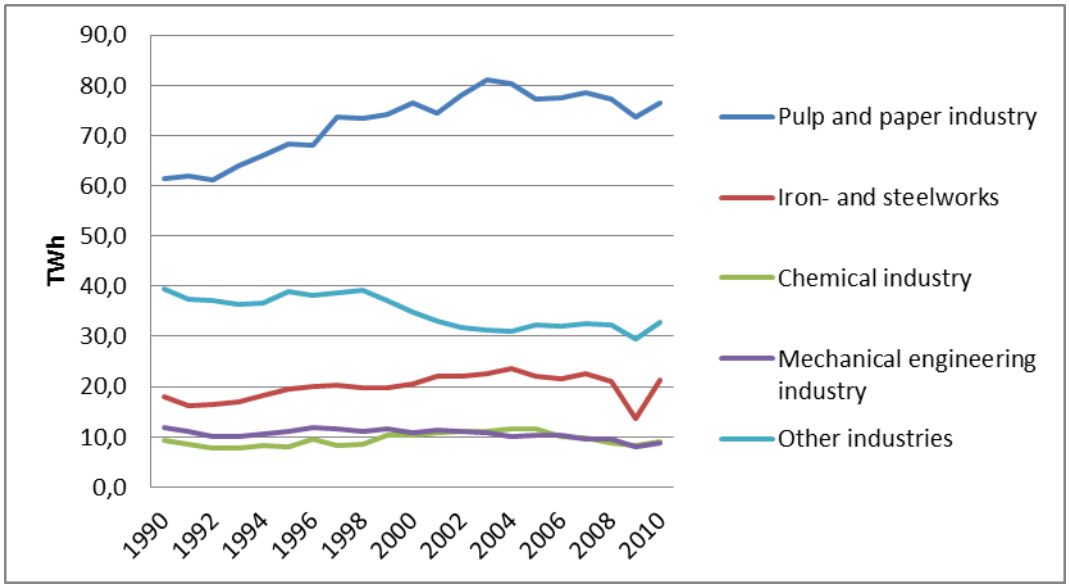
In Sweden, a small number of sectors account for the bulk of energy use in industry: see Figure 6. The pulp and paper industry uses 52 %, mainly electricity or black liquors[4]. The electricity is used mainly for grinders producing mechanical pulp, while the black liquors provide fuel for soda recovery boilers in sulphate mills. The iron and steel industry uses about 14 % of industry's energy, primarily in the form of coal, coke and electricity. Coal and coke are used as reducing agents in blast furnaces, while the electricity is used chiefly for arc furnaces for melting steel scrap. The chemical industry is responsible for 6 % of industrial energy use: here, electricity is used mainly for electrolysis processes. Together, these three energy intensive sectors account for almost three-quarters of total energy use in industry.

The engineering industry, although not regarded as energy intensive, nevertheless accounts for over 6 % of total energy use in industry, as a result of its high proportion of Sweden's total industrial output. The remaining 22 % of the energy used by industry meets the needs of other sectors. Although some of them can be regarded as energy intensive, their total energy use is relatively low. Some sectors are dominated by the use of fossil energy, such as the non-metallic minerals industry, while others, such as non-ferrous metals industries, are dominated by the use of electricity. This category also includes sectors mainly using a mix of fossil energy and electricity, such as the

[4] Black liquors are a by-product of pulp manufacture in sulphate pulp mills. They can be burnt to recycle chemicals and release energy.

mining industry, and those which are dominated by biofuels, such as the wood products industry, which also uses a considerable proportion of electrical energy[5].

Figure 6: Energy use in industry, by sectors, 1990–2010



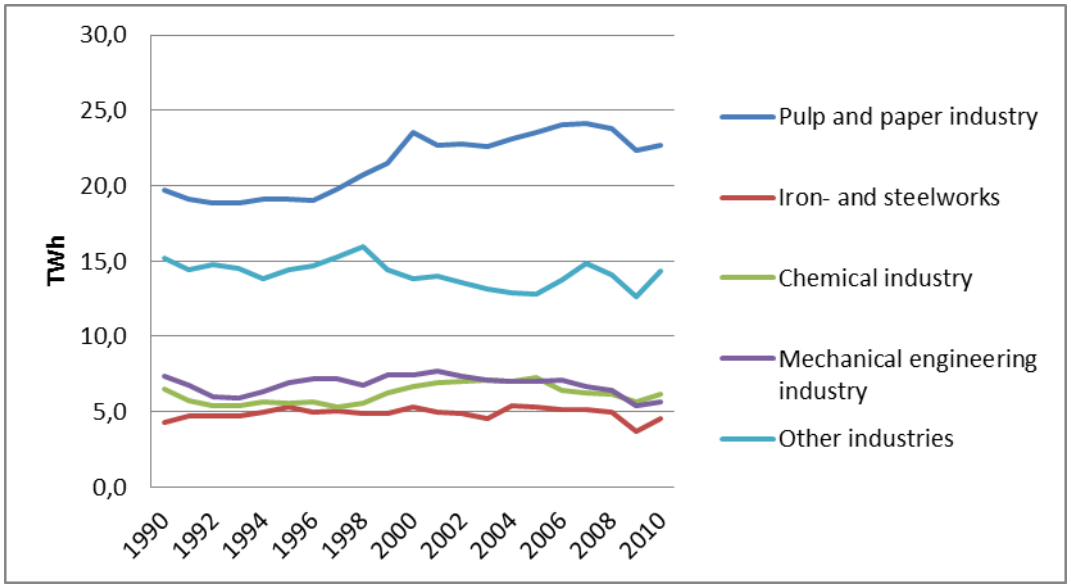
Source: Swedish Energy Agency and Statistics Sweden (EN 20 SM, EN 31 SM)

Industry's energy use is governed in the short term by production volume. In the longer term, it is also affected by such factors as taxation, changes in energy prices, energy efficiency improvements, investment, technical development, structural changes in the sector and changes in the types of goods produced.

2010 saw a marked increase of 16 % and 12 % respectively for production volumes and energy use in industry. The background to this was the effects of the recession on Sweden's industries in the second half of 2008 and in 2009. This period was characterized by loss of production and reduced energy use by 22 % and 18 % respectively. The recession affected certain sectors more than others. The iron and steel industry was the sector with the greatest reduction in energy use, which also resulted in a marked reduction in its use of coal and coke.

[5] Other sectors' include the mining industry, metal works industries, wood products industries, quarrying, the food industry and "other industries" (NACE 36-37, rev 1.1).

Figure 7: Electricity use in industry, by sectors, 1990–2010



Source: Swedish Energy Agency and Statistics Sweden

Industry's energy use has remained fairly constant since 1970 despite increased industrial production. This is a result of energy efficiency improvements as well as a gradual transition from oil to electricity. The proportion of electricity use making up industry's total energy use has increased from 21 % to 36 % since 1970. This development began because of the oil crises of the 1970s, which led to both business and society in general embarking on intensive work to reduce oil use. In 1970, oil use represented 48% of the total energy use in industry, compared with 10 % today. Oil use did see an increase for a period between 1992 and 1997, but this later began to decline. The use of oil and other fuels declined sharply during the recession, but oil use increased again in 2010.

The proportions of biofuels and peat making up industry's total energy use increased from 21 % to 37 % during the period 1970 to 2010. In the pulp and paper industry and the wood products industry, biofuels are the dominant energy carrier.

Specific energy use – i.e., the amount of energy used per monetary unit of value added – provides a measure of the efficiency of energy use. Since 1990, specific energy use in industry has fallen continuously: between 1990 and 2010, it fell by 53 %, or on average by 3 % per year, reflecting a clear trend towards less energy-intensive products and production processes, together with structural changes in the sector.

Both energy use and the value added by processing fell during 2008 and 2009, although the value added fell more. The reason for this increase in specific energy use in

2009 is that a certain amount of energy must still be used despite smaller production volumes and reduced capacity usage. This is why specific energy use increased in 2009. In 2010, the value added increased more than energy use, which meant that specific energy use saw a reduction of 5 %.

The transition from oil to, above all, electricity is reflected in the specific energy use figures for oil and electricity. Between 1970 and 1992, the specific energy use for oil fell by 81% while that of electricity rose by 23 %. The specific energy use for both oil and electricity increased in 2009 due to the recession, and decreased in 2010 by 8 % and 7 % respectively.

4.3 Residential and tertiary sector:

Final energy use in the residential and tertiary sector amounted to 156 TWh in 2010, see Figure 8. This accounts for 40 % of Sweden's total final energy use. The sector consists of residential premises (including holiday homes) and commercial premises (excluding industrial premises), land use[6], and other service activities, which include the construction sector[7], street lighting, sewage treatment plants, electricity and waterworks. Of the total energy use in the sector, most (about 90 %) is used in residential buildings and commercial premises.

Almost 60 % of the energy in the sector is used for space heating and domestic hot water production. As the energy use for space heating is affected by temperature conditions, there can be variations in energy demand from one year to another.

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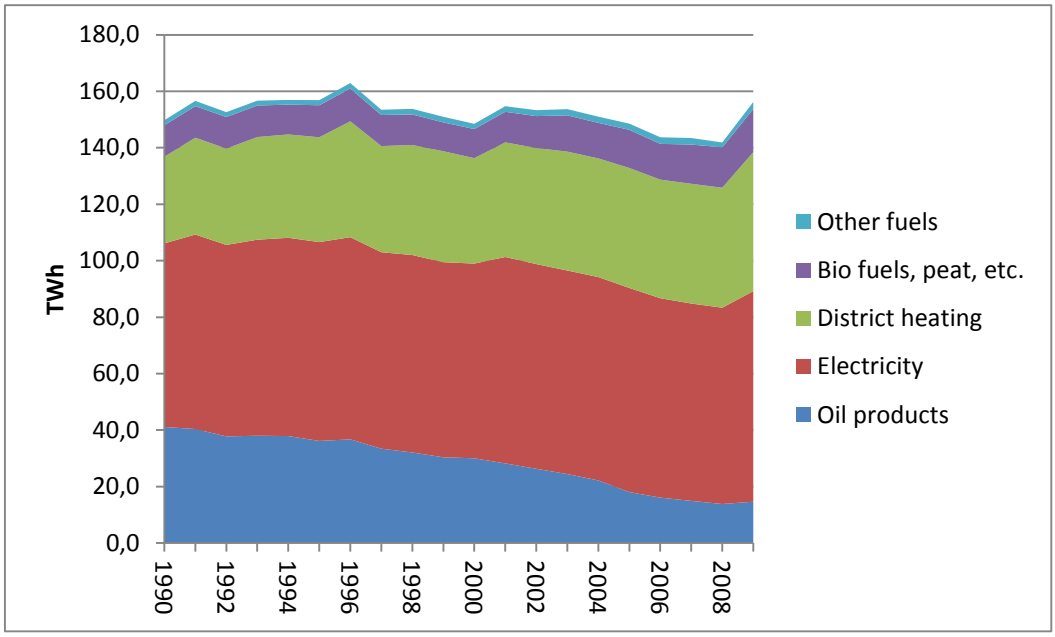
[6] Land use includes agriculture, forestry, horticulture and fisheries. More detailed information on energy use in these sectors can be found in the publications 'Energy Use in Agriculture 2007' (Statistics Sweden), 'Energy Use in the Fisheries Sector 2005' (ER 2006:35) and 'Energy Use in Forestry 2005' (ER 2007:15). Information on energy use in the horticultural sector can be found in 'Horticultural Production 2005', which can be downloaded from www.jordbruksverket.se.

[7] Energy use in the construction sector 2004

Figure 8: Final energy use in the residential and tertiary sector, 1990–2010



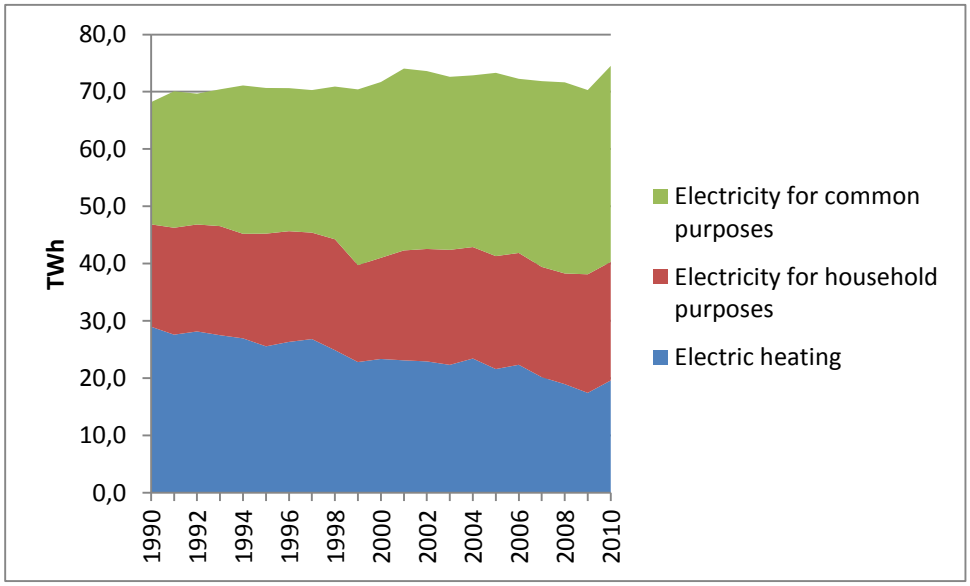
Source: Statistics Sweden, EN 20 SM, calculations by the Swedish Energy Agency.

The relative proportions of the different energy carriers have changed over time, which can be seen in Figure 8. Oil crises, rising energy prices, changes in energy taxation and investment policies have all affected the shift from oil to other energy carriers. An important reason for the decrease of oil use has been the rise in oil prices, leading to a change to electricity, district heating or bio fuels. Bio fuels in particular are used for heating in one- and two-dwelling buildings. The most common bio fuel is wood, although pellets and wood chips are also used.

Figure 9 shows how the total use of electricity in the sector has changed during 1990–2010. Much of the electricity used in the sector is for building services systems and for work activities in non-residential buildings / commercial premises[8]. The amount of electricity used for this purpose has increased substantially, from 21.3 TWh in 1990 to over 34 TWh in 2010. This increase has been driven by a growth in the service sector, with a resulting increase in physical floor areas, coupled with a greater use of office equipment. This in turn has resulted in more lighting and greater need of comfort cooling.

[8] Electricity for building services systems is that which powers fixed equipment in the building, such as lifts, escalators etc., and for climate control and for lighting in common areas (entrance lobbies, stairwells etc.) Electricity for activities in the building is that used for such purposes as computers, office equipment and lighting in occupants' areas.

Figure 9: Use of electricity in the residential and tertiary sector 1990–2010, temperature corrected.



Note. Temperature correction according to the method used by the Swedish Energy Agency
Source: Statistics Sweden, EN 16 SM, EN 20 SM, calculations by the Swedish Energy Agency

The use of electricity for domestic purposes[9] increased from 17.9 TWh in 1990 to 19.6 TWh in 2010. This increased use can be explained by an increase in the number of households and greater ownership of electrical and electronic equipment. In 2010, the average domestic electricity use amounted to about 6 000 kWh in one- and two-dwelling buildings, and in apartment buildings to about 40 kWh per m^2 and year[10].

Over the period 2005–2008, the Swedish Energy Agency carried out a study to provide up to date data on the breakdown of uses of domestic electricity. The results indicate a wide spread in measured electricity use between households, varying from 2 000 kWh/year to 7 000 kWh/year for a detached house, and from 1 000 kWh/year to 5 000 kWh/year for an apartment. Over the whole year, lighting is the largest user of domestic electricity, followed by electricity use for refrigerators and freezers in second position, and entertainment electronics (TV, computers etc.) in third position.

The use of electricity for heating in the sector increased gradually from 4.7 TWh in 1970 to 29 TWh in 1990 (statistically corrected values), reaching a peak at the begin-

[9] Domestic electricity is that which is used for lighting, white goods, domestic appliances and other electrical equipment in a home.

[10] This guide value figure was developed from a questionnaire investigation of energy use by apartment residents, carried out by Statistics Sweden over the period 1997–1999. Prior to 1999, the figure had been 50 kWh/m^2, year.

ning of the 1990s, and then falling somewhat. In 2010, electric heating amounted to 20 TWh. Electricity used for floor heating and fan heaters also contributes to the heating of a building, but is partly accounted for in the statistics as domestic electricity.

A total of 84.9 TWh were used for space heating and domestic hot water production in 2010.

Total use of energy for space heating and hot water in in one- and two-dwelling buildings amounted to 35.8 TWh 2010. Of this electricity was 16.1 TWh, solid biofules 12.4 TWh, district heating 5.8 TWh, oil 1.3 TWh, gas 0.2 TWh. Heat pumps were used in almost 45 % of the one- and two-dwelling buildings in 2010.

District heating is the most common form of heating in multi-dwelling buildings, with about 85 % of the area being heated by it in 2010. Total use of energy for space heating and hot water in multi-dwelling buildings amounted to 26.7 TWh 2010. Of this 24.9 TWh was district heating, 1.0 TWh electric heating, 0.4 TWh of oil, 0.2 TWh gas and 0.2 TWh solid biofuels.

District heating is the main source of heat in non-residential premises (offices, commercial premises and public buildings) as well, with 71 % of the area being heated by it in 2010. Total use amounted to 22.4 TWh of which 18.5 TWh was district heating, 2.2 TWh electrical heating, 0.9 TWh oil, 0.3 TWh gas and 0.5 TWh solid biofuels.

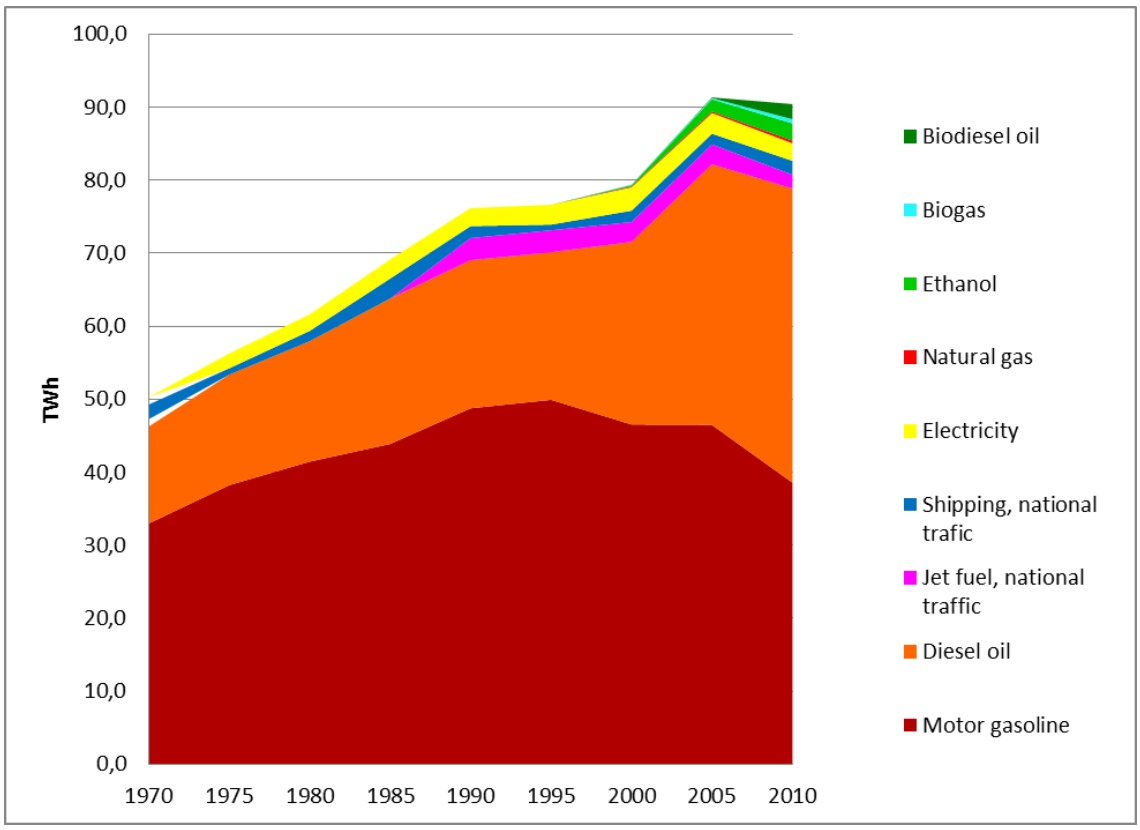
4.4 Transport:

The transport sector accounts for a quarter of Sweden's energy consumption, and is mostly based on fossil fuels. With the increasing requirements to reduce emissions of greenhouse gases, the conversion to alternative fuels or energy sources will play a major role for the next years to come.

Figure 10 shows how total final energy consumption in transport sector has changed during 1970–2010. Sweden’s energy use for the transport sector has been continually increasing; a trend that seems to have changed after 2007 when the transport sector reached its highest level ever (126.3 TWh). The transport energy use curve has since then slowly decreased down to 122.1 TWh.

Transport is the end use sector that has the greatest difficulty in changing to a different energy carrier, and alternative solutions for transport are therefore one of the greatest policy challenges.

Figure 10: Final energy use in the transport sector 1970–2010, including international transport



Source: Statistics Sweden, calculations by the Swedish Energy Agency.

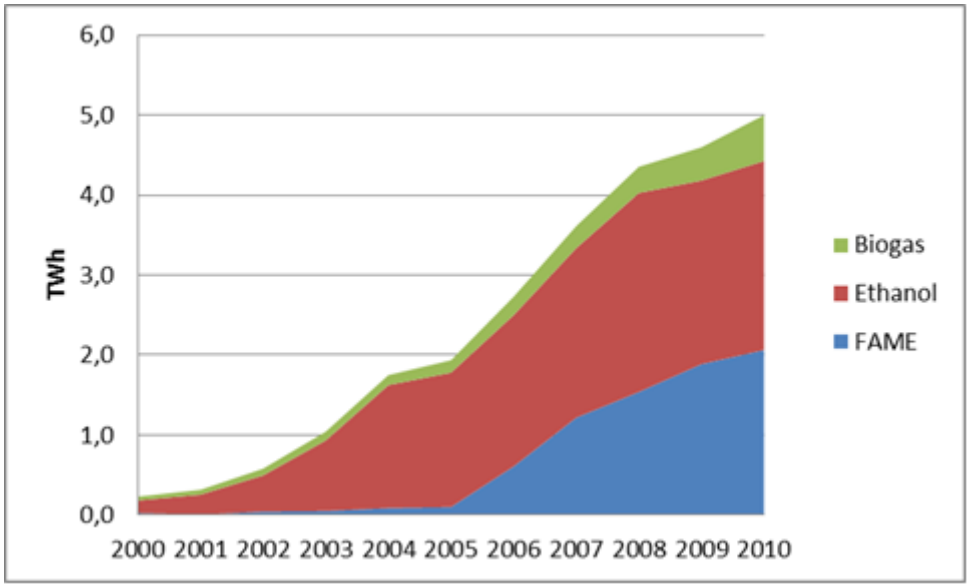
Total energy use for national transport in 2010 amounted to about 90 TWh.. Energy use in the transport sector is met mainly by oil products, primarily petrol and diesel fuel. In 2010, the use of these two fuels met 82 % of the country's energy requirement for domestic transport, with electricity accounting for a further 3 % and aviation fuel for 2 %. The remaining energy requirement for transport was met by medium and heavy fuel oils, biogas, natural gas, biodiesel and ethanol. The use of petrol has declined with 22 % since 2002, which partly can be explained by a constantly falling proportion of petrol engines in passenger cars and light commercial vehicles. The use of diesel fuel has increased steadily, 41 %, over the same period, which is largely due to a steadily in-creasing pro-portion of diesel-powered vehicles among new vehicle sales. The propor-tion of new vehicles that were diesel-powered during 2010 was 51 %, which can be com-pared to the petrol driven vehicles share of 34 %.

The use of domestic aviation fuel increased radically over the period 2002–2005, but has decreased approximately 22 % since then.This decrease over the last five years is dueto the transition from domestic aviation to railway and also partly due to the effects

of the economic crisis of 2009 which lead to decreased numbers of domestic flights. Bunkering for international maritime traffic shows the same pattern as aviation traffic.

In 2010, renewable motor fuels, such as ethanol, FAME and biogas, supplied about 6 % of the energy use for road traffic. At present, the costs of producing alternative motor fuels exceed the corresponding costs for petrol and diesel oil. However, this difference in cost, and the difference in cost of using such fuels instead of petrol or diesel fuel, is falling as a result of technical development, the introduction of environmental taxes and a general rise in the price of petrol/diesel oil. At present, biobased motor fuels are untaxed, which means that their cost at the pump can be less than that of conventional fuels despite a higher production cost. The average price for a litre of 95-octane unleaded petrol was about SEK 12.97 during the year 2010. The price of a litre of E85 fuel (consisting of 85 % ethanol and 15 % petrol) was about SEK 9.48. However, as ethanol has a lower energy content than petrol, it takes about 1.25–1.35 litres of E85 to provide the same energy as a litre of petrol. Allowing for this, the cost of using E85 at that time was about SEK 0.65 less per petrol equivalent litre than the cost of petrol. LPG as a motor fuel was also cheaper than petrol, with a difference on that date of about SEK 2.82 per /litre (petrol equivalent)

Figure 11: Final use of renewable motor fuels in Sweden, 2000–2010.



Source: Statistics Sweden and the Swedish Gas Association

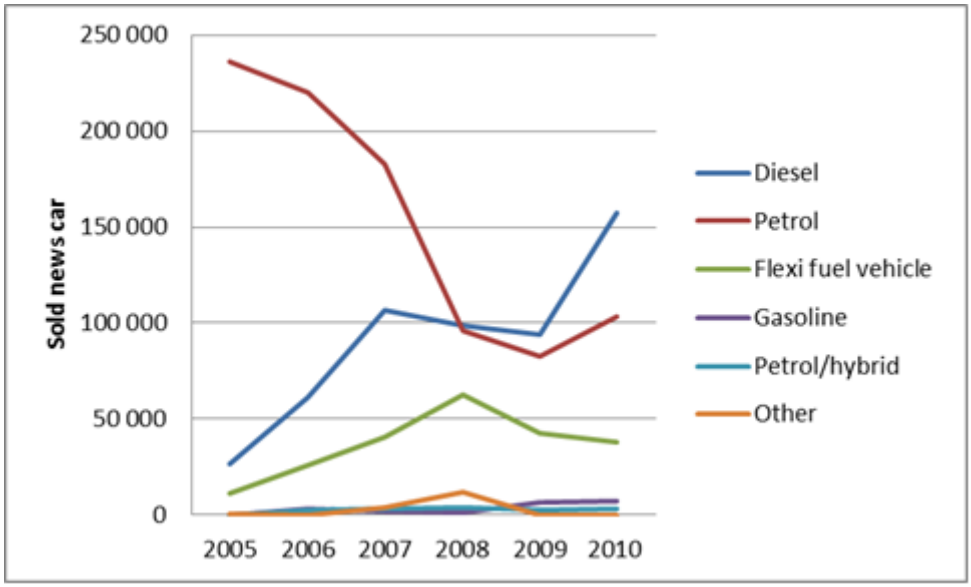
Since the introduction of the Pumps Act in 2006 has the effect been that stations with renewable fuels as an option has increased from 10 % (2005) up to 62 % (2010). The choice among the gas stations has almost exclusively been to install E85 pumps. The Pumps Act means that all petrol stations that sell more than 1000 m³ of petrol or diesel

fuel each year must supply at least one renewable fuel, and its purpose is to increase the availability of renewable fuels and thereby reduce CO_2 emissions.

During 2010, 80 % of all diesel fuel contained 5 % admixture of FAME and 96 % of all petrol contained 5 % ethanol. The permissible admixture proportion of 5 % biodiesel (FAME) in diesel and 5 % ethanol in petrol changed during 2011 up to a total of 7 % for biodiesel and 10 % for ethanol, which has led to a higher consumption of admixed biodiesel. The level of admixed ethanol has however stayed the same as before (5 %), which mainly can be explained by the rules for E10. When petrol has an admixture level that exceeds 5 % of ethanol, is it called E10 and the fuel companies are forced by law to inform the public about the new fuel because of its changed quality. They also have to offer another petrol fuel (preferably E98) to compensate for those vehicles with engines that cannot be driven with a fuel that contains a higher ethanol amount than 5 %. All this is linked with high costs, which is why higher admixtures of ethanol are not used although they are allowed.

Technical development occurs both in the form of improvements to existing technology and completely new technical solutions. As far as the road traffic sector is concerned, it is expected that hybrid vehicles, and perhaps others, will achieve commercial breakthroughs during the next five years. A hybrid vehicle has two alternative drive systems, such as an electric motor and a combustion engine. The technology is now being developed to include both private cars and heavier vehicles. Development is also in progress of what are known as plug-in hybrid vehicles, which are electric hybrid vehicles that can also be recharged off the mains. As we speak in 2012, a few international vehicle manufacturers have launched their first commercial plug-in hybrids in to the commercial market. Although, the Swedish Energy Agency is not expecting the share of electrical cars and plug-in hybrids of the new car market to be more than approximately 2 % in 2020.

Figure 12: Sold new cars, 2005-2010



Source: Swedish Traffic Analysis (TRAFA)

At the end of 2010, there were more than 4.3 million passenger vehicles in Sweden. Of these vehicles, approximately 250 000 were passenger vehicles which could be run predominantly on renewable energy, which equates to 5.6% of the passenger vehicle fleet. This is an increase from 2007, when the number of vehicles amounted to 27 100.

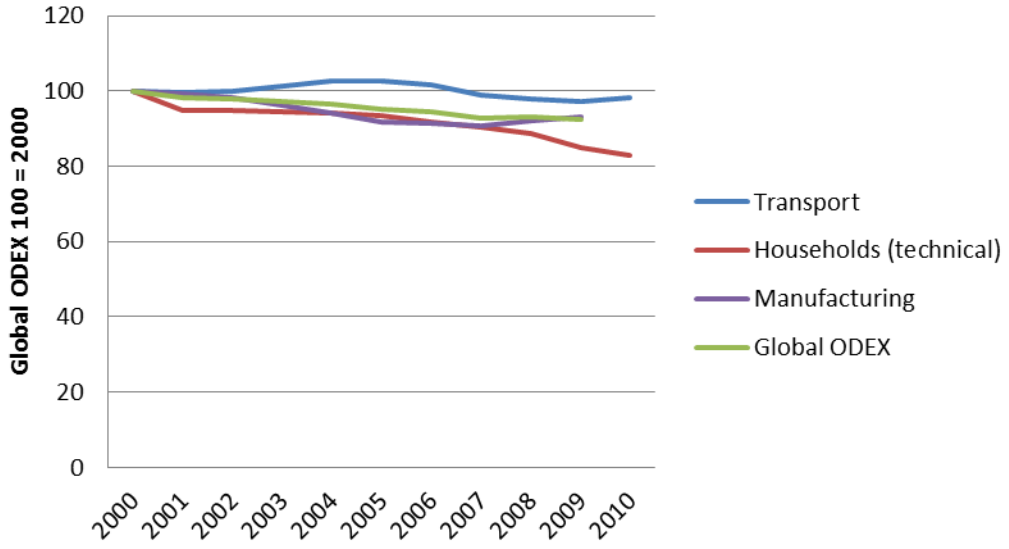
4.5 Assessment of energy efficiency/savings through ODEX:

Global ODEX[11] is a weighted measure between the share of consumption for manufacturing-, transport- and household (technical)[12] – ODEX. Figure 13 shows both how the three different parameters of total ODEX and how total ODEX has changed.

[11] For definitions of ODEX se *Definitions of ODEX indicators in the ODYSSEE data base* http://www.odyssee-indicators.org

[12] Household has two different ODEXs, household and technical household. The difference is that actions due to behaviour are excluded in technical household.

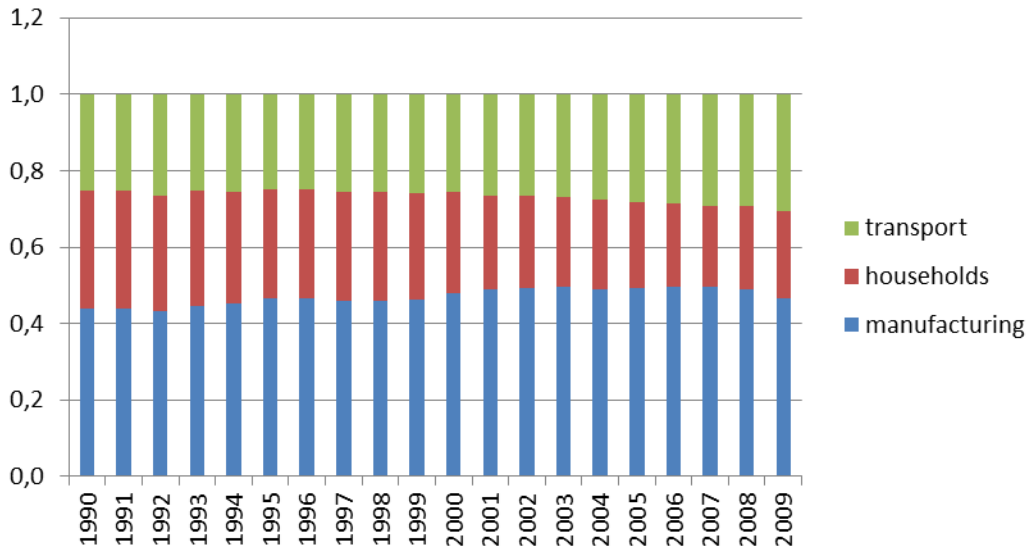
Figure 13: Global ODEX, 2000–2010



Source: Odyssee database

As Figure 14 shows, manufacturing has the largest consumption share and therefore the largest influence on the Global ODEX. Both the consumption shares of manufacturing and transport has increased while the consumption of households has decreased during 1990–2009.

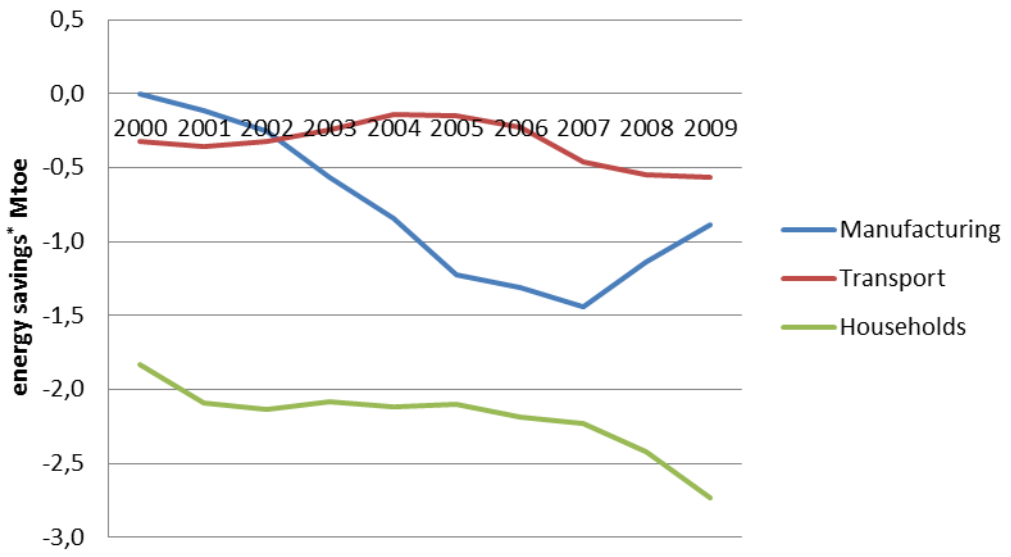
Figure 14: The ratio of consumption between the transport, household and manufacturing sectors in Sweden 1990–2009



Source: Odyssee database

Figure 15 shows the energy savings in manufacturing, transport, and household sectors. The largest savings have been made by the household sector, which represented 70 % of the total savings in 2009, followed by manufacturing, 20 % and transport, 10%.

Figure 15: Energy savings in manufacturing, transport and household sectors, 2000–2009



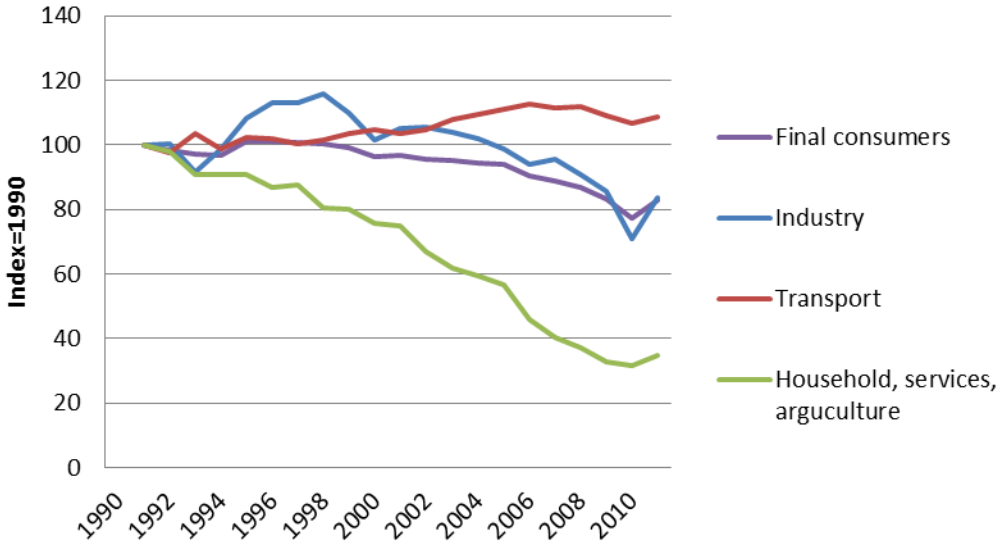
*With technical index (based on MM3, three years moving average, and cleaned from variations in the index increases)

Source: Odyssee database

4.6 CO_2-emissions trends:

Figure 16 shows CO_2 emissions trends, total and by sector in index, with 1990 as a reference year. In total the annual average reduction has been 0.8 % between 1990 and 2010, but there are large differences between the sectors. The largest reduction is due to the residential and tertiary sector (households, services, agriculture) which shows an annual average reduction at 3.3 %. The annual average reduction for industry is 0.8 % while the transport sector shows an opposite trend with an annual average increase of 0.4 %.

Figure 16: CO_2 emissions, total and by sector, index



Source: Odyssee database

In the previous part, the results from ODEX showed that the ODEX-value for the transport sector has decreased, which can be explained by more fuel-efficient cars. As Figure 16 shows, the CO_2 emissions for transport have increased since 2009, which can be explained by an economic recovery from the depression. Increased industrial intensity leads to more freight transports. Although, higher CO_2 emissions for 2010 does not mean that the efficiency has decreased, in fact has it increased.

The reduction of CO_2 emissions from households, services and agriculture depends mostly on conversions where oil based heating systems have been replaced by biofuel-based district heating, heat pumps and biomass-fuelled boilers.

5 Energy efficiency measures

5.1 Recent Energy Efficiency Measures

Residential and Tertiary Sector

Tougher energy requirements in the building code

On 1 January 2012 the energy requirements in the building code for new buildings became tougher. Already in 2009 the energy requirements were tightened for buildings with electric heating. Now the energy requirements for buildings that have different heating than electric heating are tougher also. The change means increased requirements by about 20 % on the specific energy consumption (kWh per m^2 per year) and average thermal insulation (W/m^2K).

Energy declarations

The European Energy Performance Directive of Buildings came into force 4 January 2003 and was implemented in Sweden on the 1st October 2006. Multi-dwelling buildings (apartment blocks) had to be energy declared by the end of 2008. Energy declaration of other buildings started the 1st January 2009. The Government or the National Board of Housing, Building and Planning are responsible for regulation issues on exemptions from the energy declaration requirement.

Energy declarations have to contain the following information:

- The energy performance of the building.
- The mandatory performance inspection of the building's ventilation system.
- The radon measurement of the building.
- A reference value for comparison of the energy performance of the building.
- Proposals for appropriate energy efficiency measures to be taken.

Hence, the energy declaration is intended to provide recommendations about cost-effective measures to improve the energy performance of the houses.

Transport Sector

Energy efficiency measures in infrastructure

In its plan for 2011–2014, the Swedish Transport Administration (including previously separate Swedish Board for Road Administration) aims at making the total energy usage of roads and railways more efficient. According to some estimates, 10 % of energy use in the transport sector originates from construction, maintenance, and operation of infrastructure. Measures include the choice and production of materials, and methods of construction. It also involves design and choices of speed limits. With a long-term perspective, the Swedish Transport Administration assumes it can influence the energy consumption of future transport systems at the planning, design or construction stage.

In addition to these measures, eco-driving has been introduced on road ferries (e.g. cable ferries where appropriate), while energy efficiency is highlighted on airport services and harbours, e.g. lighthouses have been equipped with energy efficient lamps.

Green Approach

Green approach is the equivalent to eco driving, but for airplanes. It means that the information in the airplane and the control centrals are used together, which makes it possible to plan the approach more carefully. Thus, it is about planning the landing in advance in order to lower the fuel consumption. The project Green Approach is a co-operation between the Swedish Transport Agency and the airline SAS. In 2006, when SAS launched this programme, it was allegedly the first airline worldwide to do so. According to the Swedish Transport Agency, Green Approach can lower the consumption of fuel by 100–800 kg per flight. At present the figure is 100 kg per flight, which is due to the fact that it can only be used during certain circumstances.

Energy efficiency support for research and demonstration projects within transport

The Swedish Energy Agency has decided to allocate a total of 70 million SEK in the years 2010–2013 to projects aimed at improving energy efficiency in transport.

The definition of transport energy efficiency is modification and improvement of existing solutions in passenger and goods transport. Examples of this may be projects that facilitate the transition to more energy efficient modes of transport, improves utilization through increased fill factor or contribute to more energy-efficient travel patterns, for example by reducing the need for mobility or changing travel behaviours.

Industrial Sector

The Programme for Energy Efficiency, PFE

The programme is intended to increase energy efficiency and to create opportunities for tax exemptions. On 1 July 2004, the tax on industrial process related electricity was

raised from 0 SEK to 0.005 SEK per kWh, based on the adoption of EU Energy Tax Directive. However, industries have the possibility to escape the tax if they participate in a five-year programme to improve energy efficiency. The result of the first programme period shows a saving on 1.45 TWh per year in 100 energy intensive companies. The second programme period is running and 90 energy intensive companies participate. Together they correspond to one fifth of the total electricity use of Sweden, 30 TWh per year. The EU State aid rules has changed, which means that the programme needs to change.

Energy mapping cheque

Energy mapping cheques are a State aid for companies that want to map their energy use. The support is to encourage action and create awareness about energy efficiency in small and medium sized companies. The aid covers 50 % of the cost of the energy audit for companies using more energy than 500 MWh per year. The maximum aid is set to 30 000 SEK.

Cross-cutting measures

Regional climate and energy strategies

Since 2008 all county administrative boards in Sweden have been commissioned by the government to cooperate with other regional and local actors in order to produce regional strategies for climate and energy policies. The administrative boards have a key function in implementing the government policies on climate and energy in Sweden. In 2010 this role was further emphasised by the government when targeted funding for this activity was introduced as a part of a five-year programme for energy-efficiency.

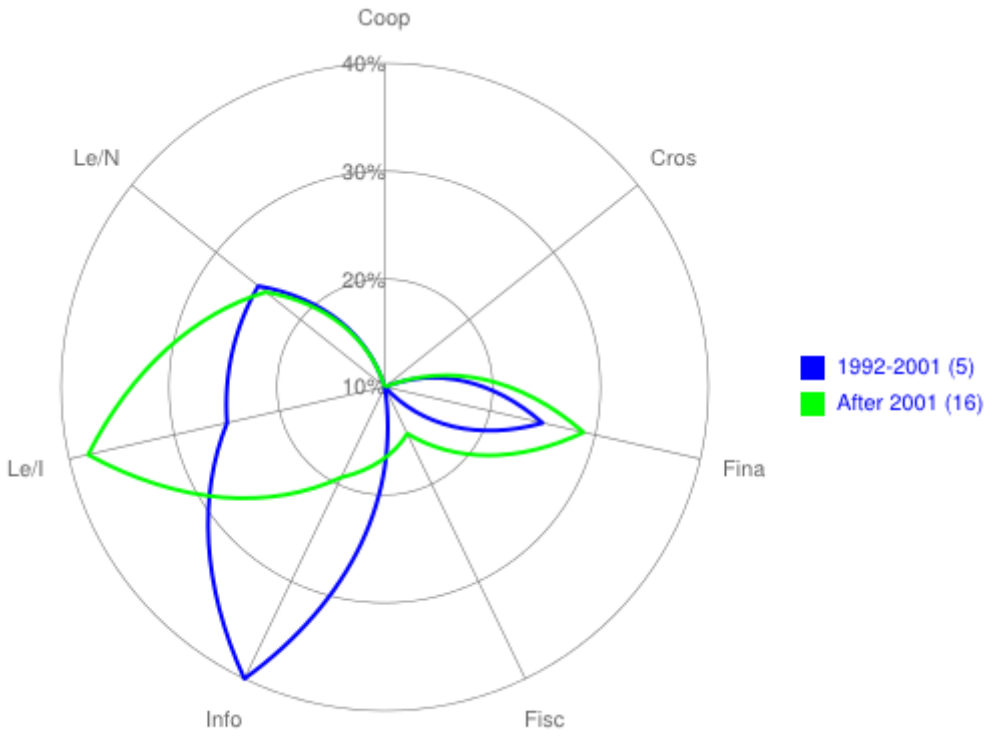
The Swedish Energy Agency is responsible for providing support in preparing the strategies.

5.2 Patterns and Dynamics of Energy Efficiency Measures

Residential Sector

The mix of policies and measures in the household sector has shifted from a large share of purely informative measures to measures with informative as well as legislative elements (see Figure 17). In the general EU case informative elements are less common; instead legislative/normative features have a more prominent role.

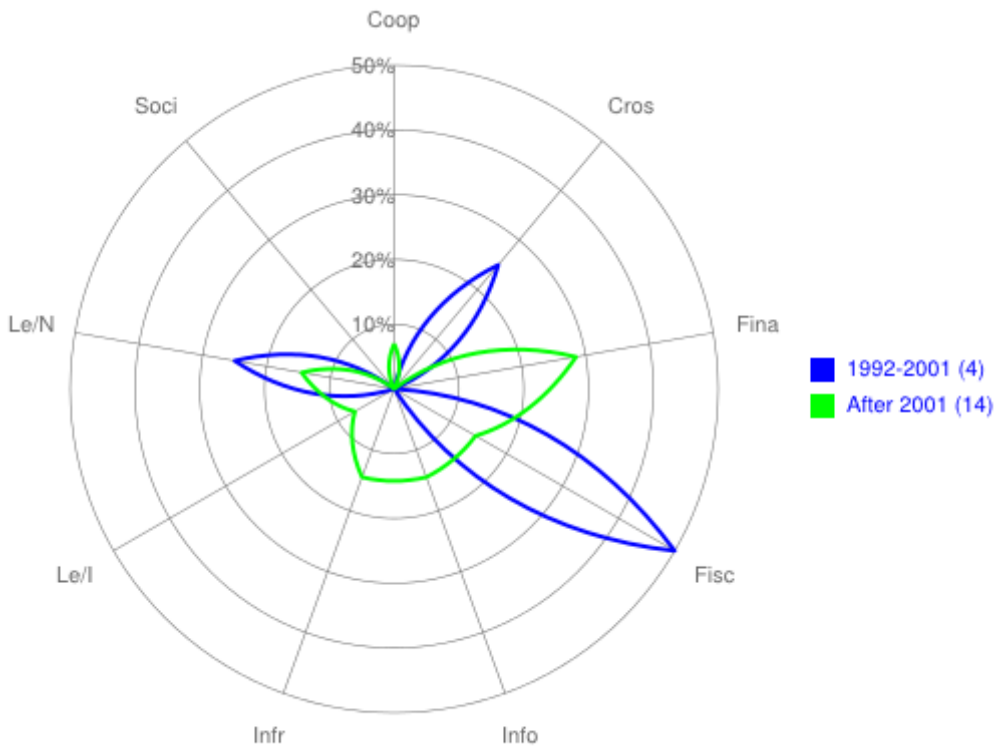
Figure 17: Household



Transport Sector

Figure 18 shows different mixes of instruments in the transport sector when comparing two periods. In the second period a wider range of instruments are used. Compared to the EU total the share of informative measures is very low in Sweden, and was not used at all in the first period. It is now being used during the second period, and has with time even become more important than the legislated and financial measures.

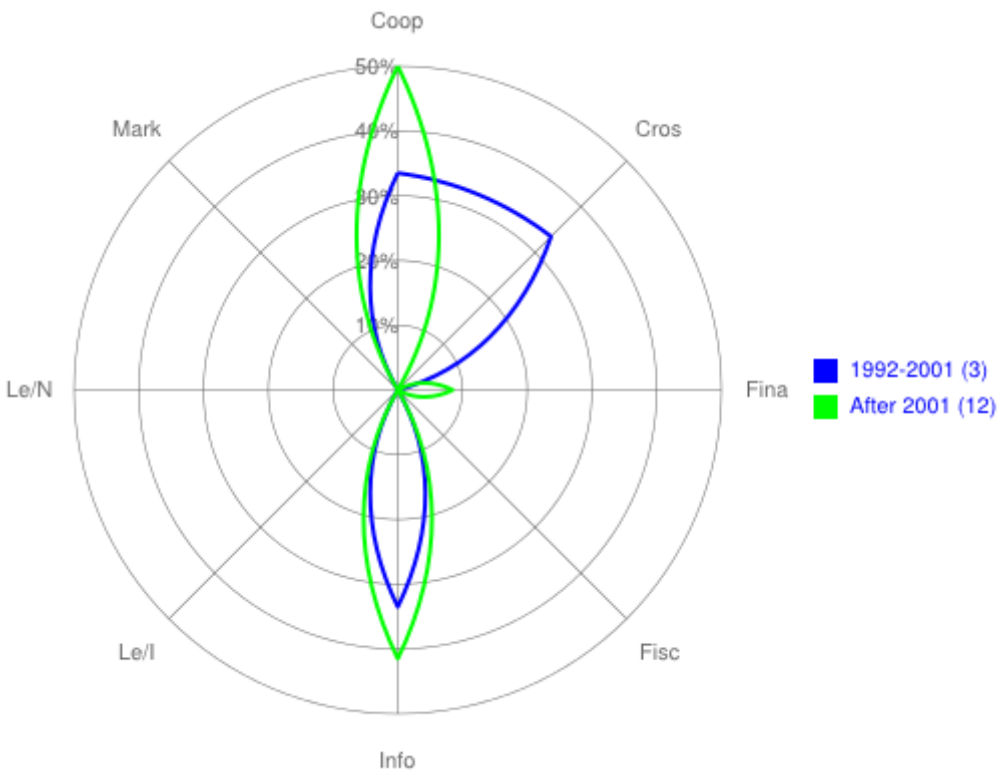
Figure 18: Transport



Industrial sector

The two periods shown in Figure 19 are quite similar in terms of policy instruments used in the industry, with focus on cooperative and informational measures. Crossover measures were used only in the first period and the tiny share of financial measures present in the second period constitutes the difference between the two periods. The Swedish profile is quite different compared to the EU total. An analysis based on all member states shows that financial measures are the most common in the European Union.

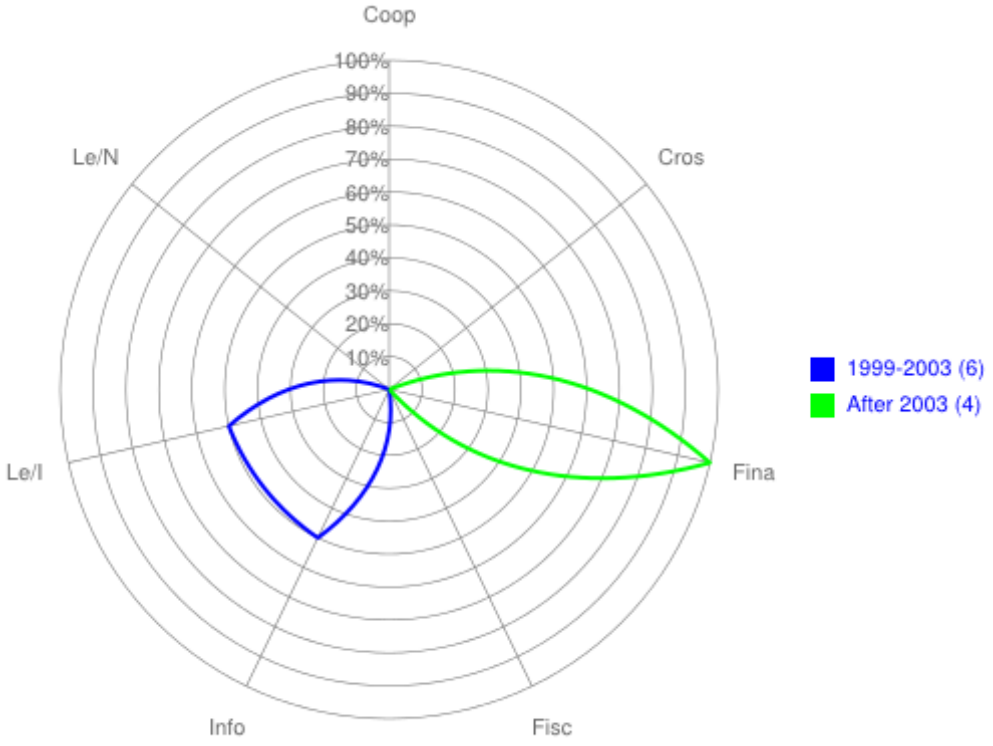
Figure 19: Industry



Tertiary Sector

The graph in Figure 20 is based on two five year periods because the observations are few and concentrated in time. The policy instruments used in the tertiary sector were in the first period informative and legislative/informative. In the second period only financial measures are employed. In some sense this is the opposite trend compared to the common trend in all member states, where financial and informative measures dominated in the first period, but where later replaced by a larger degree of legislative/normative measures.

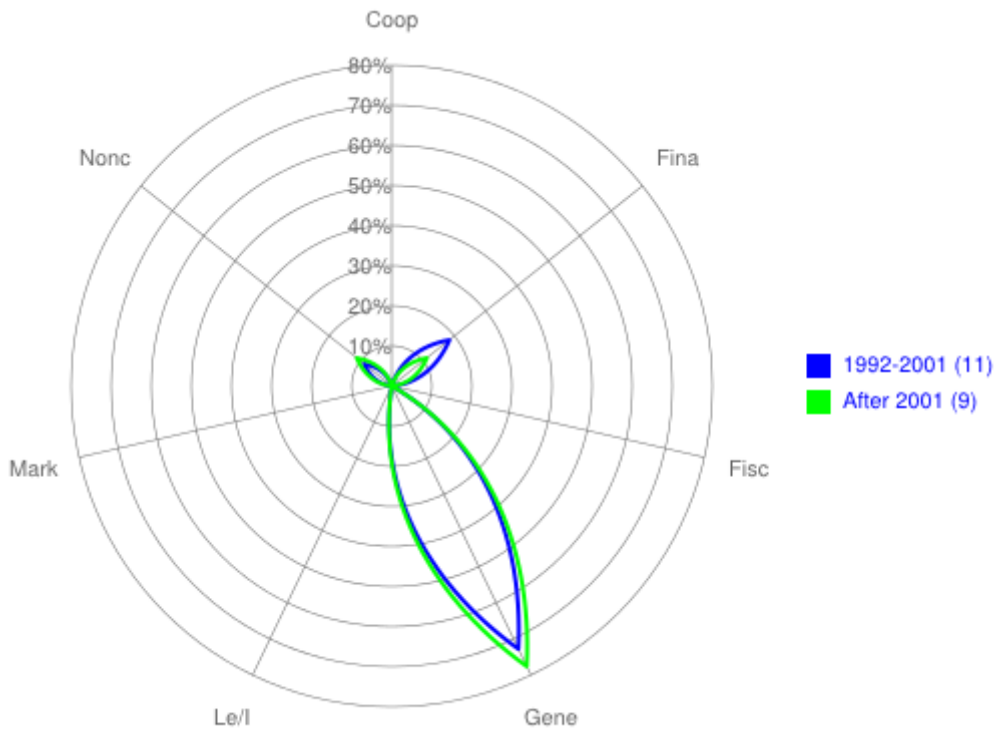
Figure 20: Tertiary



Cross-cutting measures

The distributions of instruments are more or less identical in both periods with a clear focus on General Energy Efficiency/Climate Change/Renewable Programmes. Also, the profile is very similar to the corresponding profile for all member states.

Figure 21: Crosscutting



5.3 Innovative Energy Efficiency Measures

Network

Sweden has a lot of networks for energy efficiency, which is quite rare. The goal of the networks is to help municipalities, county councils, industries, estate owners, public sector, households etc. in energy efficiency issues. Below we describe some of these networks.

The Sustainable Municipality

The Swedish Energy Agency's programme for a Sustainable Municipality is a unique cooperation between the Agency and 38 municipalities. It is based on the participating

municipalities' ambitions to make their local communities more sustainable. The Swedish Energy Agency contributes with their knowledge, information and networks which facilitate and make the work done by each municipality more efficient.

The municipality is an important operator because they are a local self-government. The municipalities are legally or contractually responsible for social services, childcare and preschools, planning and building issues, refuse collection and waste management etc. They are also often owners of energy companies. Therefore the municipalities can achieve sustainable energy use within an energy system which is safe, cost-effective and has a low negative impact on health, the environment and climate. When the municipality is thinking of building, planning a new part of town, renovating properties and so on, a long-term and systematic handling of energy issues is an important element for sustainable development.

The municipality's efforts to develop a more energy and environmentally-aware business and industry, can create work and economic growth when the market continues to demand sustainable products and services.

The Swedish Energy Agency and other authorities contribute with their expertise and know-how. The municipalities that participated in previous stages of the programme participate in the form of Nestor municipalities contributing with their experience and knowledge. Another important aspect of the programme which forms the substructure of the cooperation is that the municipalities can learn from each other's experiences, can give and provide support and discuss the various possibilities or obstacles.

The programme has existed since 2003 and is now in its third stage. The programme runs between 2011 and 2014 and has a focus on physical planning and economy policy with a focus on energy.

BEBO

A large part of Sweden’s apartments were built in the years 1965–1975, which is called the Million Programme. These buildings are of great interest in terms of energy efficiency because they are many, similar and now due for renovation. If more property owners are investing in energy efficient remodelling, the total energy use for residential sector will fall sharply. The Swedish Energy Agency supports projects to demonstrate that the energy measures are worthwhile to bet on.

The network runs development projects with a focus on energy and environment issues. Participants in this network include real estate owners, managers and others directly involved in the maintenance of buildings. The network represents 70 % of Sweden’s apartments.

BELOK

Belok is a network between The Swedish Energy Agency and sixteen of Sweden's largest real-estate owners. The goal with the network is to promote and support energy efficient systems and products to come out earlier on the market. The development projects focuses on energy efficiency in the property while function and comfort improve. The network represents 20 % of Sweden´s commercial spaces.

HYLOK

HyLok is a network for energy efficiency in government agency facilities. The network supports the government agency energy efficiency of buildings. HyLok aims to make government agencies set an example by improving energy efficiency in its own operations, but also by reducing the total energy use in the premises. HyLok aims to spread knowledge and information on energy efficiency, support dialogue between authorities and property owners, identify methods for improving energy efficiency etc.

BeLivs

BeLivs is another network and collaboration between the Swedish Energy Agency, trade and trade association in the food sector. The goal is true demonstration and skills development in order to increase the amount of energy efficient food premises.

LÅGAN

The Swedish Energy Agency has granted the Swedish Construction Federation a five-year-programme for the development of buildings with very low energy use (LÅGAN). The purpose is to promote energy efficient new construction and renovation. The energy use of the projects has to be at least 50 % lower than the present requirements and the projects are required to have significant demonstration value.

Local energy and climate counselling

Since 1st January 1998, state support is given to municipalities that practice energy counselling. The purpose is to spread objective information about energy supply, energy distribution and energy consumption in order to lower the use of electricity. The counselling is directed at the general public, enterprises and to local organisations. In addition, there are established regional energy offices, which coordinate and support the energy counsellors.

UFOS Energy

The network for the development of real estate business in the public sector, UFOS, started cooperation with the Swedish Energy Agency in 2004 on energy and climate

related projects. The purpose is to increase the level of knowledge of energy-related measures in the participating organisations in UFOS, such as the Swedish Association of Local Authorities and Regions, the National Property Board, and some major owners of property. This cooperation has been named UFOS Energy.

Technology procurement

The aim is to accelerate the development of more energy efficient products and systems. In every procurement agencies, manufactures and client groups have invested major resources, in terms of money and time. Therefore, the procurement also has provided valuable experience and results. Technology procurement has also contributed to increased interest among customers and manufacturers as well as created new contacts. These experiences can be an important aid in future projects and procurements.

5.4 Energy efficiency measure evaluations

5.4.1 Semi-quantitative Impact Estimates of Energy Efficiency Measures

Table 3 contains measures currently in use together with impact assessments from the Mure database[13]. Measures lacking impact assessments have been excluded from the table. Similar to the old Odyssee-Mure report (Swedish Energy Agency, 2009) we find that energy and carbon dioxide taxes are estimated to have high or medium high impact (depending on sector) on energy efficiency. In the energy sector the programme for energy efficiency (PFE) has been successful in improving energy efficiency. Companies participating in PFE are entitled to reduced tax if they implement and certify a standardized Energy Management Systems (EMS), perform Energy Mapping and analyses over energy consumption etc. However, PFE will be terminated since it does not comply with EU regulations regarding subsidies to the industry.

[13] As noted in the last Odyssee-Mure report, has the impact of the policy instruments on energy efficiency not been estimated strictly. The semi-quantitative impact assessments in the Mure database are based on judgements.

Table 3 Impact estimates of ongoing energy efficiency measures.

Sector	Measure	Semi-quantitative impact
General cross-cutting	Local Energy and Climate Counsellors	Medium
Household	Energy and carbon dioxide tax in the household sector	High
	Building Regulations	Medium
	Information campaign on improved energy efficiency	Medium
	Support for installation of Solar heat	Medium
Industry	The Programme for Energy Efficiency in Industry	High
	Technology Procurements	Medium
	Energy taxation in industry	Medium
Tertiary	Improved statistics for buildings	Low
	Grants for solar collecting systems in commercial buildings	Low
Transport	Energy and carbon dioxide tax on fuels in the transport sector	Medium
	EU-related: Emission performance standards new passenger cars (Regulation 443/2009/EC) - Label for new vehicles	Medium
	Procurement of governmental cars	Medium
	Vehicle taxation according to CO2 emissions	Medium
	Autmatic speed surveillance	Low
	Green approach (for aeroplanes)	Low

5.4.2 Lessons from Quantitative Energy Efficiency Measure Evaluations

Various subsidies for clean cars

Clean car purchases and usage are promoted by three types of subsidies. First, purchase of some vehicles that are considered environmental friendly are subsidised[14]. In its current form the subsidy guarantees the buyers 40 000 SEK if they are private persons and 35 % of the price difference (maximum 40 000 SEK) between the environmental friendly car and a corresponding normal car if they are legal entities. Buyers of new cars with a maximum emission of 50 grams CO_2 per kilometre are eligible to this subsidy[15]. Presently nine types of cars fulfil the 50 grams requirement, all of which are fully electric or plug-in hybrid cars[16].

The regulation does not explicitly state the maximum energy use of these vehicles but the cars currently fulfilling the carbon dioxide requirement can be assumed to be economical in the energy efficiency perspective as well.

The energy efficiency effect from this measure is substantial if measured by car but the total short term impact is low since the numbers of cars in this category is yet very low[17]. In the long run the subsidy is expected to stimulate development of new types of cars and for the necessary infrastructure as well[18].

Second, the value of the fringe benefit of a company car is lower for some type of cars[19]. Full electric vehicles, charge hybrid cars and gas cars are valued 40 % lower than a corresponding car with a conventional car. Hybrid cars and combustion engine cars adapted for ethanol and other types of alternative fuels are taxed equally to corresponding conventional cars, which in some cases is beneficial for the car owner.

The government expects the reduced value to have positive effects on the environment by stimulating purchases of vehicles using new technologies[20].

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[14] Subsidy for Clean Car Purchase. Swe 16

[15] Swedish Code of Statues. (2011:1590). Förordning om supermiljöbilspremie. SFS

[16] www.transportstyrelsen.se

[17] according to Swedish transport agency 213 subsidies have been paid

[18] Swedish transport agency, *Uppdrag att utarbeta förslag till en supermiljöbilspremie,* 2010

[19] Value of fringe benefits for company cars, Swe 13

[20] Swedish government. (2011/12:1). *Budgetpropositionen för 2012 - Förslag till statens budget för 2012, finansplan och skattefrågor.*

Third, vehicles that fulfil a vehicle/fuel specific requirement of CO_2 emissions or fuel consumption are exempted from vehicle tax for five years[21]. For instance, vehicles fuelled by gasoline or diesel, possibly in combination with electricity, are exempted from vehicle tax if the emission of carbon dioxide does not exceed 120 grams per kilometre. For vehicles using other types of fuel (e.g. electricity, gas or ethanol) the requirement is expressed in terms of fuel consumption[22]. The tax waiver is expected to have a long term influence on the distribution of cars with different environmental impact[23].

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21 Environmental-vehicle tax waiver, Swe022

22 Swedish Code of Statues. (2006:227 (senast ändrad 2012-07-19)). *Vägtrafikskattelag.*

23 Ministry of Finance. (2009-06-29). *Skattebefrielse för personbilar med bättre mijlöegenskaper.*

6 National Developments under the EU Energy Efficiency Directive and the 20% Energy Efficiency Target of the EU

During 2009, Parliament approved a new climate and energy policy on the basis of the Government Bills 2008/09:162 and 2008/09:163, under the common name of A joint climate and energy policy. The new climate and energy policy, which is based on the EU's 20/20/20 targets, sets a number of targets and strategies for Sweden.

A national burden-sharing agreement has been decided for each member state, which for Sweden entails a renewable energy share of 49 %. Sweden has further raised this goal so that its renewable energy share should be at least 50 % of the total energy use. Sweden's target for renewable energy in the transport sector is the same as that of the EU. In addition, the long-term aim is for vehicles in Sweden to be independent of fossil fuels by 2030. Swedish energy policy has set an overall target of a 20 % reduction in energy intensity between the years 2008 and 2020.

Swedish greenhouse gas emissions are to be reduced by 40 % by the year 2020 compared with 1990. This target encompasses activities not included in the EU Emissions Trading System. The vision for 2050 is that Sweden should have no net emissions of greenhouse gases into the atmosphere. This decision is a supplement to the environmental quality target for limited climate impact.

Ways of reaching these targets include government proposals to modify taxes and implement more stringent economic policy instruments. Green investments in developing countries as well as EU-wide decisions have also been highlighted as important means towards achieving these targets.

The energy efficiency directive requires that each member state implement an energy efficiency obligation scheme ensuring annual energy savings equal to 1.5 % of their energy sales, or take other measures to achieve an equally sized energy saving[24]. The Swedish government has commissioned the Swedish Energy Agency to, based on impact estimates of the energy efficiency measures currently in use, propose an implementation scheme for the directive[25]. Previous analyses have shown that the obligation scheme is not a cost efficient means to achieve the required energy savings in

[24]European commission. (2011). Directive of the European parliament and the council on energy efficiency and repealing directives 2004/8/EC and 2006/32/EC

[25] Swedish goverment. (2012-06-20). *Uppdrag att föreslå hur artikel 6 i Europaparlamentets och rådets direktiv om energieffektivisering ska genomföras.* N2012/3144/E.

Sweden. Thus the measures that are to be proposed should be based on other mechanisms.

Annex 1

Energy Efficiency Measure Summary by Country

Households sector

Code	Title	Status	Type	Starting Year	Semi-quantitative
SWE6	Assignment 2000 (Uppdrag 2000)	Completed	Co-operative Measures	1986	Low
SWE23	Technology procurement (teknikupphandling)	Ongoing		1989	Unknown
SWE4	Energy and carbon dioxide tax in the household sector	Ongoing	Cross-cutting with sector-specific characteristics	1991	High
SWE3	Tests and trials on domestic appliances	Ongoing	Information/Education	1995	Unknown
SWE9	Labelling of domestic appliances and windows	Completed	Legislative/Informative	1995	Medium
SWE12	Building Regulations	Ongoing	Legislative/Normative	1995	Medium
SWE20	The Building-Living Dialogue (Bygga-bo-dialogen)	Completed	Unknown	1999	Medium
SWE5	Investment grants for solar heating	Completed	Financial	2000	Medium
SWE10	Investments grants for small scale biofuel-fired heating systems and more energy efficient windows (Stöd för installation av energieffektiva fönster eller biobränsleanordningar)	Completed	Fiscal/Tariffs	2006	Low
SWE14	Support for conversion of heating system in household	Completed	Financial	2006	Medium
SWE18	Information campaign on improved energy efficiency	Ongoing	Information/Education	2006	Medium
SWE25	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy efficiency certificates (Energideklarationer)	Ongoing	Legislative/Informative, Legislative/Normative	2006	Unknown
SWE24	Infomation campaigns	Ongoing	Information/Education	2007	Unknown
SWE19	EU-related: Energy Performance of Buildings (2002/91/EC)	Ongoing	Legislative/Informative	2008	Unknown
SWE21	Support for installation of Solar heat (Stöd till installation av solceller)	Ongoing	Financial	2009	Medium
SWE22	Programme for buildings with very low energy use (Program för byggnader med mycket låg energianvändning - LÅGAN)	Unknown	Financial	2010	Unknown

Transport sector

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
SWE26	Public-private cooperation (Samverkan mellan offentliga aktörer och näringsliv)	Ongoing	Infrastructure, SocialPlanning/Organisational		Unknown
SWE10	Energy and carbon dioxide tax on fuels in the transport sector	Ongoing	Cross-cutting with sector-specific characteristics	1995	Medium
SWE13	Value of fringe benefits for company cars (Förmånsbeskattning av miljöbil)	Ongoing	Fiscal	1997	Low
SWE17	Autmatic speed surveillance (Trafiksäkerhetskameror)	Ongoing	Legislative/Normative	2001	Low
SWE19	EU-related: Emission performance standards new passenger cars (Regulation 443/2009/EC) - Label for new vehicles	Ongoing	Legislative/Informative	2002	Medium
SWE14	Procurement of governmental cars	Ongoing	Legislative/Normative	2005	Medium
SWE12	Vehicle taxation according to CO2 emissions	Ongoing	Fiscal	2006	Medium
SWE18	Green approach (for aeroplanes)	Ongoing	Information/Education/Training	2006	Low
SWE16	Subsidy for Clean Car Purchase	Complete d	Financial	2007	High
SWE20	Eco driving (Sparsam körning)	Ongoing	Information/Education/Training	2007	Unknown
SWE23	Congestion tax (trängselskatt)	Ongoing	Financial	2007	Unknown
SWE22	Environmental-vehicle tax waiver	Ongoing	Financial, Fiscal	2009	Unknown
SWE25	Technology procurement (teknikupphandling)	Ongoing	Co-operative Measures	2010	Unknown
SWE24	Energy efficiency measures in transport infrastructure	Ongoing	Infrastructure	2011	Unknown
SWE21	EU-related: Energy labelling of tyres	Unknown	Legislative/Informative	2012	Unknown

Industry sector

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
SWE5	Technology Procurements (Energimyndighetens teknikupphandlingar)	Ongoing	Co-operative Measures	1992	Medium
SWE10	Energy taxation in industry	Ongoing	Cross-cutting with sector-specific characteristics	1995	Medium
SWE7	EKO Energi - Programme for Efficient Use of Electricity	Completed	Information/Education/Training	1997	Low
SWE3	The Programme for Energy Efficiency in Industry (Programmet för energieffektivisering i energiintensiv industri)	Ongoing	Co-operative Measures	2005	High
SWE14	Energy efficiency in small and medium sized enterprises	Ongoing	Co-operative Measures, Information/Education/Training	2008	Unknown
SWE17	Energy efficiency networks for the industry	Ongoing	Co-operative Measures, Information/Education/Training	2009	Unknown
SWE16	Energy mapping vouchers (Energikartläggningscheckar)	Ongoing	Financial	2010	Unknown

Tertiary sector

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
SWE18	Energy performance contracting (EPEC)	Completed	Information/Education/Training	2002	Low
SWE15	Improved statistics for buildings (Förbättrad energistatistik i bebyggelsen)	Ongoing	Information/Education/Training, Legislative/Informative	2003	Low
SWE19	UFOS Energi	Ongoing	Co-operative Measures, Information/Education/Training	2004	Unknown
SWE5	Grants for solar collecting systems in commercial buildings	Ongoing	Financial	2006	Low
SWE12	Support for energy efficiency, conversion and solar cells in public buildings	Completed	Financial	2006	Medium

Cross-cutting sector

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
SWE11	Research programmes	Ongoing	Non-classified Measure Types		Unknown
SWE12	Energy and carbon dioxide taxes (Energi- och koldioxidskatt)	Unknown	General Energy Efficiency / Climate Change / Renewable Programmes	1995	High
SWE8	Local Energy and Climate Counsellors (Lokala energi- och klimatrådgivare)	Ongoing	General Energy Efficiency / Climate Change / Renewable Programmes	1998	Medium
SWE9	Local investment programmes	Completed	Financial Measures, General Energy Efficiency / Climate Change / Renewable Programmes	1998	Low
SWE4	1997 short run programme	Completed	Financial Measures, General Energy Efficiency / Climate Change / Renewable Programmes	1998	Medium
SWE5	The Environmental Code	Ongoing	Non-classified Measure Types	1999	Unknown
SWE7	Local Climate Investment Programmes (Klimp)	Completed	Financial Measures, General Energy Efficiency / Climate Change / Renewable Programmes	2003	Medium
SWE10	EU-related: Energy End-use Efficiency and Energy Services ESD (Directive 2006/32/EC) - Government Subsidies for Local Energy Efficiency Measures (Statligt stöd till energieffektivisering i kommuner och landsting)	Unknown	General Energy Efficiency / Climate Change / Renewable Programmes	2010	Unknown
SWE13	Regional climate and energy strategies (Regionala klimat och energistrategier)	Ongoing	General Energy Efficiency / Climate Change / Renewable Programmes	2010	Unknown
SWE14	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Transposition of Directive 2009/125/EC	Ongoing	Non-classified Measure Types	2010	Unknown

Annex 2

Country Profile

Energy Efficiency Profile: Sweden

May 2011

Energy Efficiency Trends

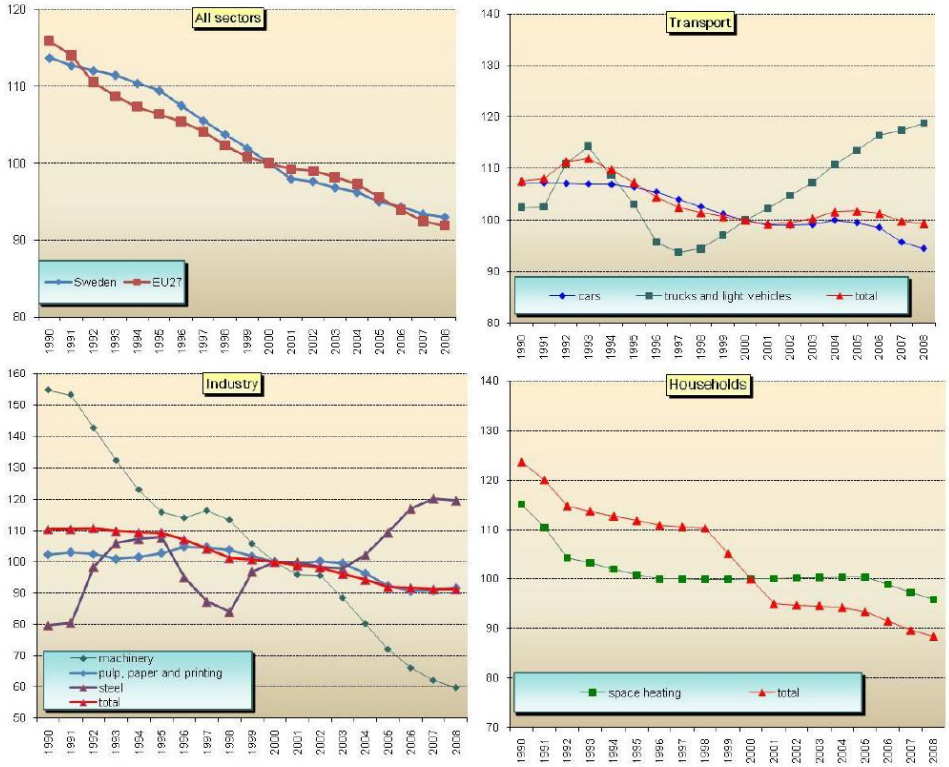
Overview
Since 1990, energy efficiency has improved by 18 % for the economy as a whole. Since 2000, the efficiency has improved by 7%, a bit less than the EU average.

Industry
The efficiency in the industrial sector has progressed by 17 % between 1990 and 2008. The greatest efficiency improvement is made within the machinery industry, followed by paper, pulp and printing. Energy efficiency in intensive industry such as the steel industry as measured per ton of steel has decreased by 50% since 1990.

Households
In the household sector, the energy efficiency has improved by 29 % since 1990 and 12 % since 2000. The efficiency of heating has increased since 1990.

Transport
The overall efficiency improvement for transport is 8 % since 1990. The efficiency of cars has improved more, whereas trucks and light vehicles show a decrease in efficiency mainly since 1997.

Energy efficiency index (base 100=2000)*



* All indicators measured as a three-year moving average
Source ODYSSEE
For more information : http://www.odyssee-indicators.org/

Energy Efficiency Policy measures

Institutions and programmes

Since 1997 the **Swedish Energy Agency** (STEM) is the authority responsible for the implementation of energy policies set out by the government. There are also 13 regional energy offices as well as 290 municipal energy consultancy services funded by state support. There is also a broad programme for energy efficiency cooperation between the STEM and nearly a quarter of the Swedish municipalities.

Current energy efficiency policy is based on Government regulation 2008/09:163. Swedish energy policy in general is focused on the functioning of markets and thus a priority is to remove obstacles and to address market failures. A cornerstone of energy efficiency policy is taxation of carbon and energy content. In addition to this, research and information dissemination play a crucial role. Individual policy measures are e.g. the programme for energy efficiency in industry, vehicle taxation, and several measures applied to the building sector.

Industry

In July 2004, the tax on industrial process-related electricity was raised from 0 to 0,5 Euro per MWh. Industries are able to escape the tax in the production process by taking part in the **Programme for Energy Efficiency** in Energy Intensive Industry (PFE). A programme period lasts for five years, divided into two periods. During the first two years the firm needs to implement and certify a standardized Energy Management Systems (EMS). At the end of the first period, the firm has to present an evaluation of the two first years to the Swedish Energy Agency which includes suggestions of measures to improve the energy efficiency. The first programme period ended during 2009 and a new five-years program started the same year.

Households, Services

A major component of Swedish energy efficiency policy in the entire building sector is the creation of technology purchasing groups. These groups gather both owners and tenants for coordinated procurement of energy efficiency equipment or services. As a result, it is assumed that new technology will be stimulated and prices reduced, thus facilitating a knock-on effect on other actors in energy efficiency. Currently, there are procurement groups for commercial spaces, apartments, and facilities rented for public sector use.
The Swedish Energy Agency supports a five-year program by the Association of Swedish Construction Confederation to develop buildings with very low energy use (LÅGAN). Projects supported must reduce energy use by a minimum of 50% (either in new or refurbished buildings) and they are required to have significant demonstration value.
In 2009 a new subsidy for the installation of solar cells was introduced. The aim is to increase the use of solar-based energy by 2.5 GWh. In the end of 2011, the subsidy will be evaluated and its continuation will depend on the outcome of the evaluation.

Transport

Measures in the transport sector include vehicle tax based on CO_2 emissions. Particularly environmentally friendly vehicles are granted a waiver on the tax for five years. Information and awareness-making play an important role in the transport sector, too. Several projects on energy efficiency in traffic infrastructure have been carried out, such as lighting of roads and railway station areas. Public authorities are required to observe special rules for vehicle lease and purchase.

Energy prices and taxes

Since 1991, there is a CO_2 tax. In 2011, the tax was at around € 120 /ton, but it is reduced for several industrial sectors (outside the EU-ETS). Since 2009, the Government has gradually removed reductions with the aim of all emitters paying at least 60% of the standard tax by 2015.
The level of the energy tax will increasingly depend on the energy content of fossil fuels.

Budgets

The exact amount of resources budgeted to energy efficiency is difficult to establish, because several measures follow from other budget headings than energy efficiency. However, in accordance with Government regulation (Prop. 2008/09:163) between 2010 and 2014, energy efficiency is granted € 35 million annually. These resources are aimed at strengthening local and regional efforts, and to enhance information dissemination. But for instance tax reductions for individuals refurbishing their flats or houses also include energy efficiency measures.

Selected Energy Efficiency Measures

Sectors	Title of Measure	Since
Industry	Programme for Energy Efficiency (PFE)	2005
Household	Support for Solar Cell Systems	2009
Household	Revised construction regulations	2009
Transport	Eco driving in driver's license	2007
Household	Energy declarations	2006
Transport	Change in vehicle taxation	2006, 2009
Transport	Transport infrastructure energy efficiency	No particular starting year

Source MURE
For more information : http://www.isisrome.com/mure/