Energy Efficiency trends and policies in the United Kingdom

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EXECUTIVE SUMMARY

This report represents the United Kingdom national case study for the Intelligent Energy Europe project "Monitoring of EU and national energy efficiency targets". It presents recent energy efficiency trends in the UK on the basis of indicators from the Odyssee database and gives an overview of energy efficiency policies and measures based on information in the Mure tool.

Section 1 of the report presents the general context in terms of the overall economic situation, energy consumption developments and recent energy efficiency/ environmental policy measures. For each sector the energy consumption trends and their main drivers are presented as well as the energy efficiency strategy based on the third National Energy Efficiency Action Plan (NEEAP) (DECC 2014). Particular attention is paid to recent and innovative measures. Section 2 is dedicated to buildings, section 3 to transport and section 4 to industry.

After enduring some economic downturn in the late 1980's and early 1990's the UK enjoyed a sustained period of growth between 1993 and 2007. The economic downturn which commenced in the second half of 2008 was noticeable in all sectors; however the industrial sector was affected most.

All sectors show economic growth across the time period 1990 to 2012, with the Tertiary sector leading with 3% per annum (calculated as an average across the time period). The agriculture sector shows the smallest growth of just 0.3% followed by industry with 0.7% over the same period. This is in line with the widely observed shift in the UK towards a service economy as manufacturing and heavy industry tend to move to countries with lower labour costs.

The transport sector is currently the biggest final energy user in the UK, accounting for 38% of the total in 2012. Households account for 30% of final energy use, industry 18%, tertiary 14% and agriculture approximately 1%. Energy use decreased in the agriculture and industry sectors between 1990 and 2012, but increased by 3%, 6.5% and 10% in the Tertiary, Household and Transport sector respectively.

The UK exhibited a downward trend in both primary and final energy intensities over the period 1970-2012. This suggests improvements in energy efficiency especially the domestic sector, but there may be other underlying effects contributing to the changes. These include fuel switching, uses that do not increase in line with economic output (such as space heating), and changes in the structure of the economy, which may all contribute to the observed decreases in intensity.

Since 1990 all ODEX sectors (an aggregate indicator of energy efficiency) exhibits two periods of improving energy efficiency (in the early to mid-nineties and the early part of this century) separated by a period of stagnation in the late nineties. To large extent this trend is replicated in each of the sectors.

Energy efficiency in the manufacturing sector has not improved steadily. Energy efficiency plateaued in the mid to end 90s and improved in recent years. The recent up-turn is largely due to significant improvements in the chemicals, machinery, primary metals, and steel sub-sectors, part of which can be attributed to the introduction of the Climate Change Levy and the associated Climate Change Agreements.

After a significant improvement in UK transport energy efficiency in the early to mid 90's the rate of improvement has since slowed and even appeared in danger of reversing around 2000. The recent improvements can be attributed to a variety of factors including a desire on the part of consumers for more fuel efficient motoring against a background of higher fuel prices, the voluntary agreement between the European Automobile Manufacturers Association (ACEA) and the EC to improve the fuel efficiency of cars and the introduction by the UK Government of graduated Vehicle Excise Duty based on carbon emissions.

Whilst household energy efficiency has improved by around 30% between 1990 and 2012 the ODEX has

fluctuated over that period. This can be explained, in part at least, by the fact that there are several factors acting in conflict in households. Factors acting to improve energy efficiency include: widespread introduction of efficient condensing boilers, initiatives such as energy labelling and the various incarnations of the energy efficiency obligations which started in 1994. However, the preference for higher household temperatures, the proliferation of 'luxury' appliances and the moves towards single occupancy household units have negated some of the energy savings.

The UK's Climate Change Act 2008 set a domestic Greenhouse gas emissions target of reducing emissions by 80% by 2050 based on 1990 levels. After falling in the early 1990's the total UK GHG emissions have plateaued in recent years. The continued gradual decline in GHG emissions from the Industry sector has been cancelled out by slight rises in emissions from the transport and households sectors. This is a trend replicated in many other countries with long established industrial economies where heavy industry is declining, there is improved emissions performance from the power sector but also a strong desire from consumers to travel more, maintain their homes at a higher temperature and purchase more white goods and consumer electronics.

1. ECONOMIC AND ENERGY EFFICIENCY CONTEXT

1.1. ECONOMIC CONTEXT

In 2012, the economic growth was 0.3%, against a 1.1% increase the year before due to the slow recovery of the economic downturn which commenced in the second half of 2008. The macroeconomic trends in the UK over the period 1990-2012 are presented in Table 1 and Figure 1. All figures are calculated at 2006 prices and then indexed against 1990 values.

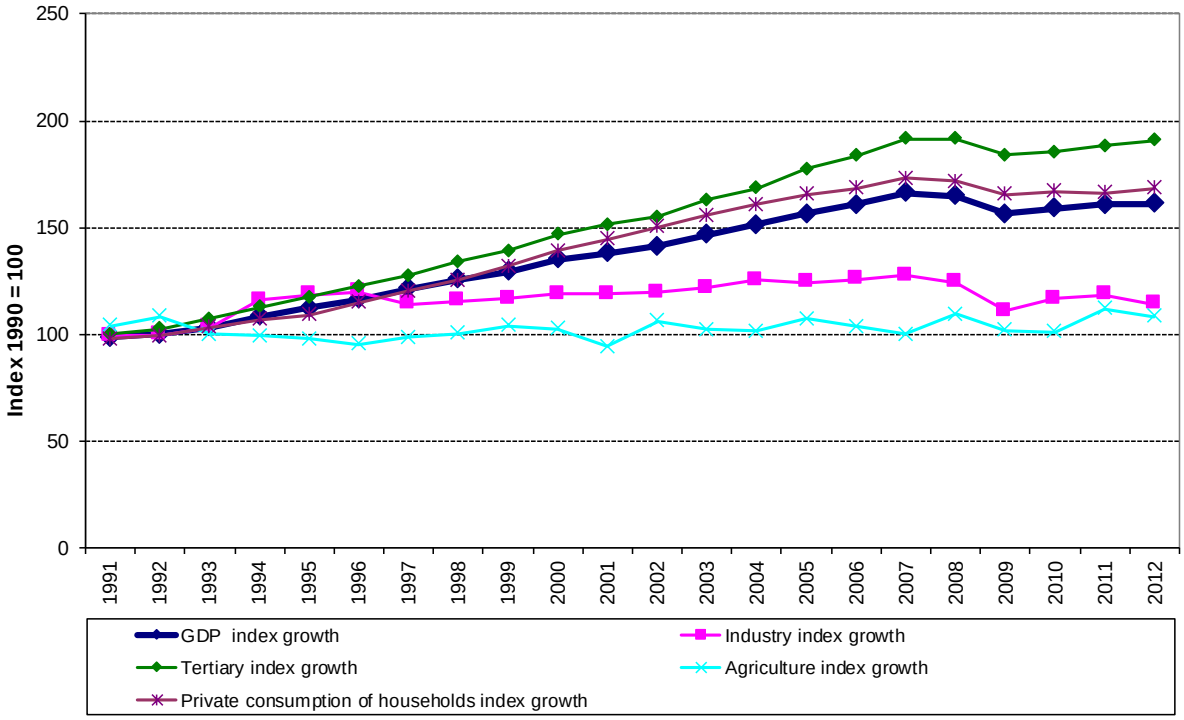
A fall in GDP in 1991 has been followed by growth over the period 1990 to 2010, followed by a fall between 2007 and 2009 and slight increase to 2012. The average growth rate between 1990 and 2012 has been around 2.2%. Industrial sector growth followed a similar trend, but industrial growth was significantly slower when averaged. Taken account of the economic downturn, which affected the industry sector more than other any other sector in the economy, the growth between 1990 and 2012 increased by 0.7% per annum. The greatest growth was seen in the tertiary sector, which averaged 3% per year from 1990 to 2012. This is in line with the widely observed shift in the UK towards a service economy as manufacturing and heavy industry tend to move to countries with lower labour costs. The last 23 years have also been very challenging for the agriculture sector in the UK with an average net increase of just 0.5% per year. The sudden dip in agricultural output in 2001 was caused by a widespread foot and mouth epidemic that resulted in a cull of livestock and restrictions on movements in affected areas.

Table 1 : GDP growth and sector value added (real terms) in the UK (% reduction/net change)

% Per year	1990-2000	2000-2005	2005 - 2012	1990-2012
GDP	11.7%	1.4%	0.2%	3.6%
VA Agriculture	0.9%	0.4%	0.1%	0.5%
VA Industry	6.4%	0.4%	-0.6%	0.8%
VA Tertiary	15.6%	1.9%	0.5%	5.3%
VA Households[1]	67.2%	2.4%	1.5%	21.5%

[1] Measures as private consumption of households

Figure 1 : Macroeconomic developments in the UK, 1990-2012



1.2. TOTAL ENERGY CONSUMPTION AND INTENSITIES

1.2.1. ENERGY CONSUMPTION TRENDS: BY FUEL AND BY SECTOR

In 2012, total final energy consumption in the UK was 135Mtoe, this is lower than in 1990 and 2000. Total final energy consumption in the UK in 1990, 2000 and 2012 by fuel and sector is shown in

Table 2, Figure 2 and Figure 7.

Final energy consumption decreased by 3.6% between 1990 and 2012 due to a combination of issues such as implementation of energy efficiency improvements and to a certain extent the economic downturn (see

Table 2). During the period 1997-2000 the rate of growth slowed and during 2000-2012 there was a fall in energy consumption of 12.2%. Energy use decreased in the agriculture and industry sectors between 1990 and 2012 (see Figure 2) and increased in Household and Transport by 6.5% and 10% respectively.

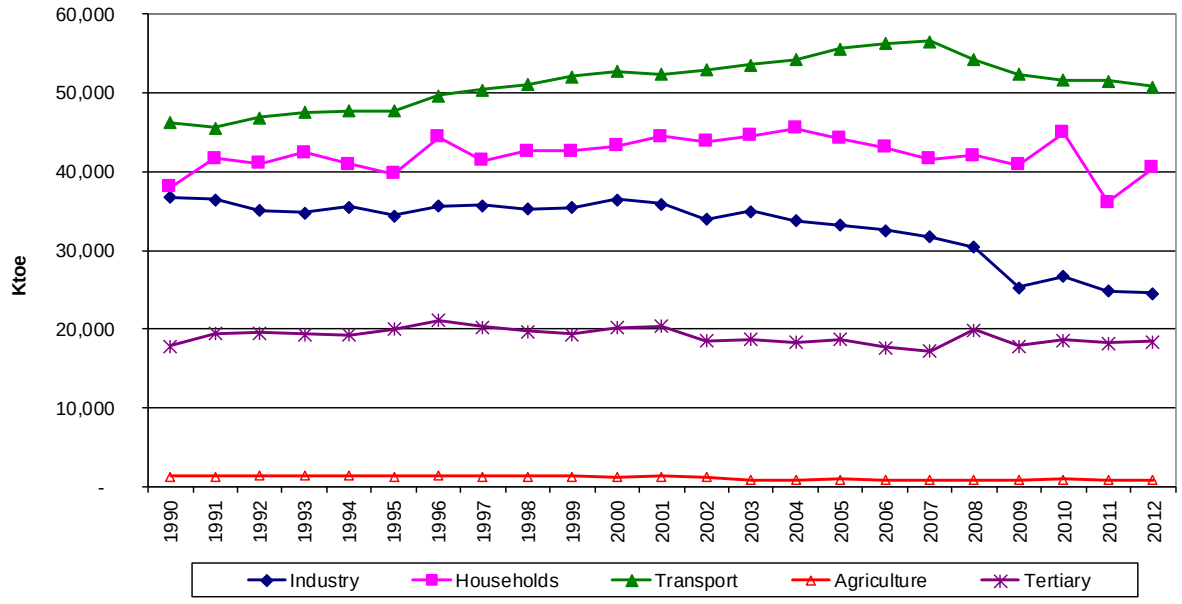
Energy consumption in the households sector increased by 6.5% between 1990 and 2012, peaking in 1996 before falling in 1997, from 1997 to 2000 energy consumption again began to increase at a slower rate. Energy demand in the household sector in-creased between 2009 and 2010 due to the exceptionally cold weather.

Transport energy consumption increased by 10% during the period 1990-2012, increasing throughout with the largest increase between 1990 and 1997. Energy consumption in the Tertiary sector increased by 13.6% by 1997 however since the mid 1990's there has been a decline in the sectors energy consumption.

Table 2 : Final energy consumption

% Changes in energy consumption	1990-1997	1997-2000	2000-2012	1990-2012
Total Energy Consumption	6.5%	3.1%	-12.2%	-3.6%
Industry	-2.7%	2.1%	-32.8%	-33.2%
Households	8.9%	4.5%	-6.4%	6.5%
Transport	9.2%	4.5%	-3.6%	10.0%
Agriculture	2.0%	-10.9%	-30.3%	-36.6%
Tertiary	13.6%	-0.4%	-8.8%	3.1%

Figure 2 : Final energy consumption



As illustrated in Figure 3 the transport sector is currently the biggest final energy user in the UK, accounting for 38% of the total in 2012. Households account for 30% of final energy use, industry 18%, tertiary 14% and agriculture approximately 1%. This sector split has remained roughly the same since 1990.

Figure 4 illustrates energy consumption by fuel in 1990, 2005, and 2012. Gas remains at about 31%, while there has been a decline in the use of solid fuels which were 10% in 1990 but have fallen to 3% of final energy consumption in 2005 and 2012 respectively. The consumption of electricity has increased slightly between the years, making oil the predominant fuel at 43% in 2012.

Figure 3 : Final energy consumption by sector 1990, 2005 and 2010

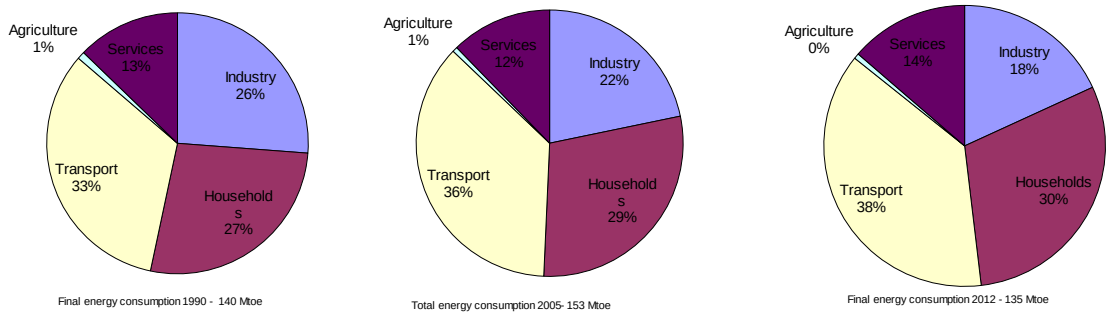
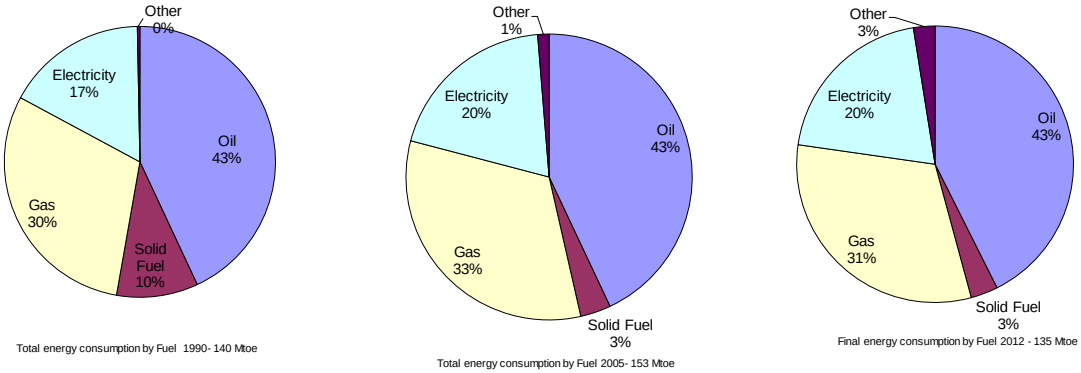


Figure 4 : Final energy consumption by fuel 1990, 2005 and 2010

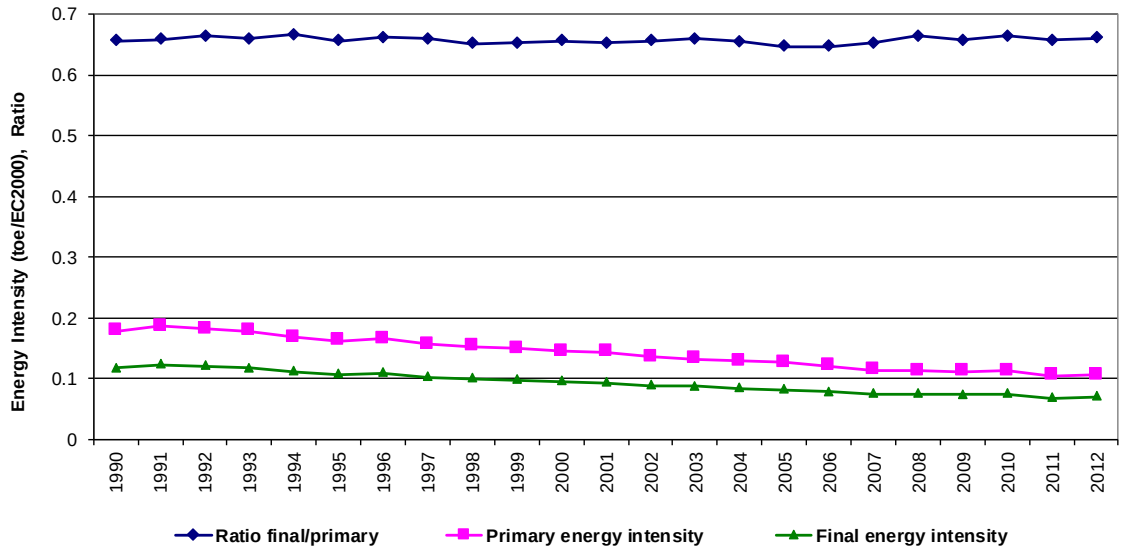


1.2.2. OVERALL TRENDS IN ENERGY INTENSITY

Two aggregate indicators are generally used to characterise overall energy efficiency trends: primary energy intensity (i.e. the ratio of primary energy consumption to GDP), and final energy intensity (ratio of final energy consumption to GDP). Primary energy intensity provides an assessment of the energy productivity of the whole economy. Final energy intensity characterises the energy productivity of final consumers only and so excludes losses in transformation and supply (e.g. of electricity). Final consumption, according to the Odyssee definition, also excludes non-energy uses.

Figure 5 shows a downward trend in both primary and final energy intensities over the period 1970-2010. The downward trend in energy intensity suggests improvements in energy efficiency, but there may be other underlying effects contributing to the changes. These include fuel switching, uses that do not increase in line with economic output (such as space heating), and changes in the structure of the economy, which may all contribute to the observed decreases in intensity.

Figure 5 : Ratio of primary to final energy intensity



Primary energy consumption decreased from 214 Mtoe in 1990 to 206 Mtoe in 2012, a 3.4% decrease, while final energy consumption decreased from 140 Mtoe in 1990 to 135 Mtoe in 2012, a 3.6% decrease. Final energy consumption increased by 9% between 1990 and 2004 but then fell by 12% between 2004 and 2012.

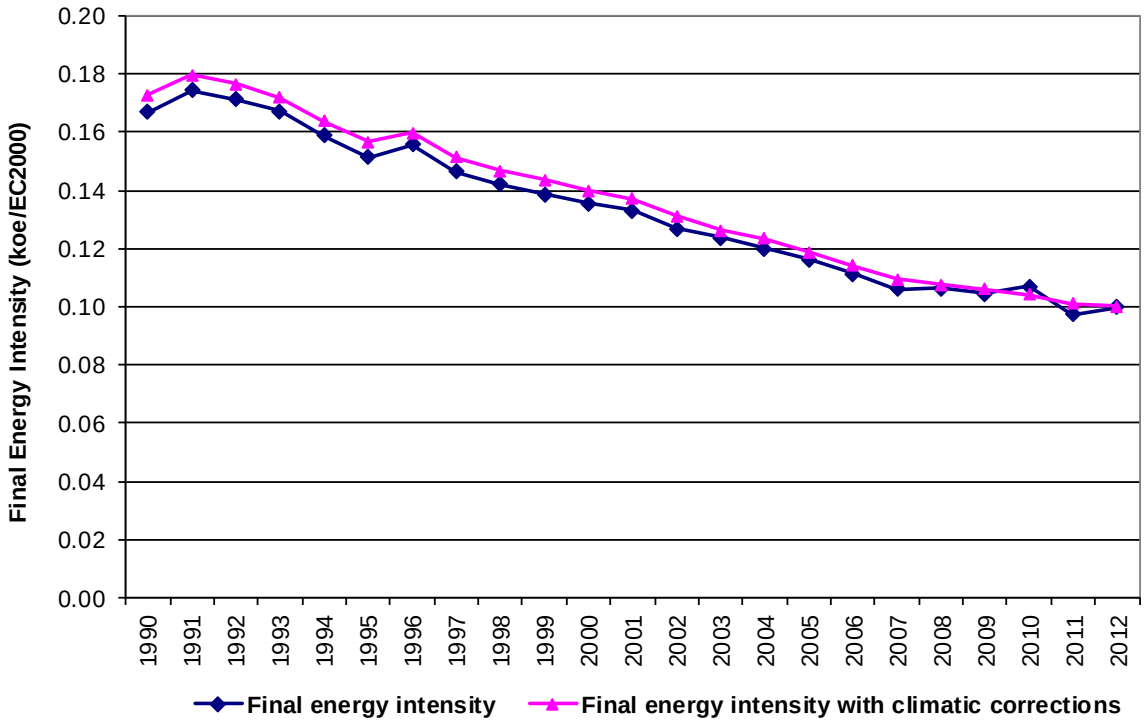
The ratio of final to primary intensity captures the variations between the two separate intensities. This ratio has broadly remained unchanged between 1990 and 2012, indicating that an increasing share of the primary energy consumption is consumed by energy transformations and not consumed by final consumers. This is due to an increasing share of electricity in final energy use, particularly in the Tertiary sector, which will increase the losses from the transformations sector. In the UK this has been partially offset by the introduction of combined cycle gas turbine plants, which have a higher efficiency than some other types of generation that consequently increases the ratio.

1.2.3. EFFECT OF CLIMATIC VARIATIONS ON FINAL ENERGY INTENSITY

Energy intensity values will also be influenced by the climate, as more space heating is required in colder years. To 'clean' energy indicators, and in particular energy intensities, from the influence of climatic variations, energy indicators are calculated with climatic corrections. The final energy intensity with climatic corrections represents the theoretical value of the final energy intensity corresponding to a normal winter.

Figure 6 shows the long-term trend in final energy intensity corrected for climatic variations. With the exception of 1996, 2009 and 2010, most winters in the last decade were warmer than the long-term average, and so final energy intensity increases when climate is taken into account.

Figure 6: Effect of climatic variations on final energy intensity



1.3. ENERGY EFFICIENCY POLICY BACKGROUND

In 2012, the UK Government launched its Energy Efficiency Strategy (updated in 2013), which identified the barriers to energy efficiency take up and the socially cost-effective energy efficiency potential that remains in the UK economy.

In the household sector a succession of Energy Efficiency Obligations from 1994 to 2012, Building Regulations and boiler replacement standards delivered most of the insulation measures and promoted energy efficient heating systems and appliances. New targets have been set for the period 2013-2017 albeit on a smaller scale.

The EU Emissions Trading Scheme (EU ETS), which covers 40% of UK emissions, is a key EU measure driving energy efficiency improvements in the industry sector. In addition, the UK introduced the Climate Change Levy, (a tax on the business use of fossil fuel energy) in 2001. Companies that are part of Climate Change Agreements (CCAs) and which successfully meet the conditions of their agreement are eligible for a discount on the levy.

The Government also implemented the CRC Energy Efficiency Scheme which targets large, non-energy intensive businesses and public sector organisations and emissions not already covered by the EU ETS or Climate Change Agreements.

The 2013 Spending Round announced £500 million to support the development of the Ultra Low Emissions Vehicles market from 2015-2020. The Renewable Transport Fuel Obligation (RTFO) obligates fossil fuel suppliers to produce evidence that a percentage of fuels for road transport supplied in the UK come from renewable sources and are sustainable.

1.3.1. ENERGY EFFICIENCY TARGETS

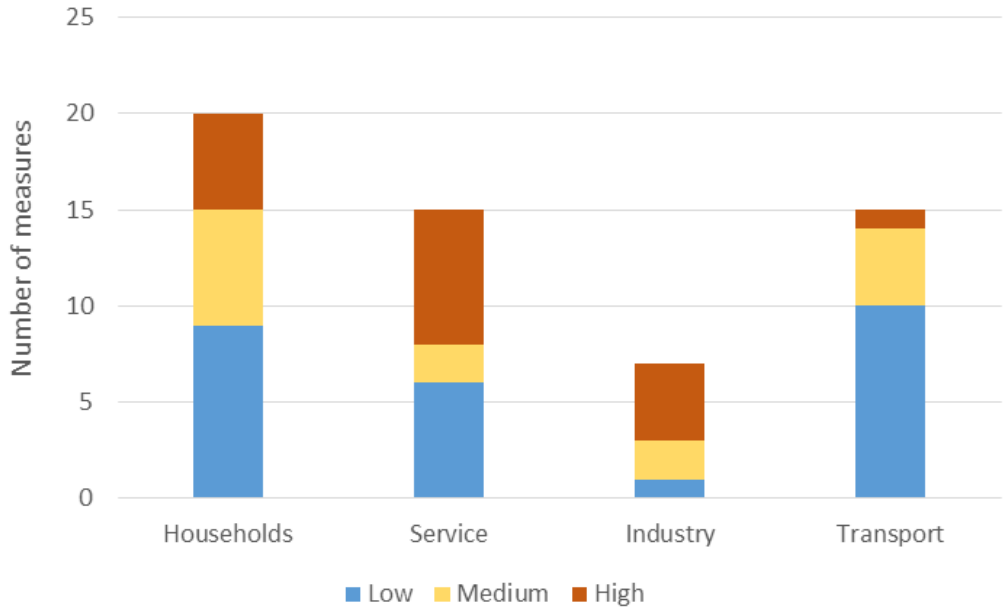
The UK's energy efficiency target was set at the level of 129.2 million tonnes of oil equivalent (mtoe) for final

energy consumption on a net calorific value basis. This represents an 18% reduction in final energy consumption, relative to the 2007 business-as-usual projection.

1.3.2. SEMI-QUANTITATIVE IMPACT ESTIMATES OF ENERGY EFFICIENCY MEASURES

In the measure descriptions which are included in the MURE database, a high importance is attached to the impact evaluation of a measure. If a quantitative evaluation is available for a measure, the methods used for the evaluation and related results are provided, as well as real/estimated energy savings (fuels and electricity) and carbon dioxide emissions reductions achieved over a given time-frame. If no quantitative evaluation is available, or in addition to the quantitative evaluation, a qualitative expert judgement is reported, too, namely an assessment of the measure's impact (high/medium/low) in terms of energy and CO2 savings.[2]

Figure 7 : Number of policy measures and semi-quantitative impact evaluations by sector



Source: MURE database (September 2015)

The highest number of high-impact measures can be found in the service sector. Most of the measures are related to the Energy Performance of Buildings Directive and are legislative measures (Building Regulations). Furthermore, high impact results from the Climate Change Levy, a tax on energy based on carbon emissions. The roll-out of smart metering and Billing for SMEs is expected to deliver high savings as well as is the CRC Energy Efficiency Scheme (CRC), a mandatory reporting scheme on carbon emissions of service sector organisations.

The household has the second highest number of high-impact measures. Similar to the service sector, two of the high-impact measures are related to the Energy Performance of Buildings Directive. Smart Metering and

[2] The categories (low, medium, high) are linked to the aggregate electricity or final energy consumption of the respective sector (households, transport, industry or tertiary). The following limits are defined for the three impact levels: low impact: <0.1 %; medium impact: 0.1 - <0.5 %; high impact: ≥0.5 %. If a quantitative evaluation is available, the qualitative impact can easily be calculated by applying this definition to the quantitative figures. For measures with no quantitative evaluation, the qualitative evaluation is a relatively rough expert judgement.

billing also plays a key role in the household sector in terms of expected savings. In addition, product policy and the Market Transformation Programme, which are related to the Energy Labelling of Household Appliances Directive, achieve high savings. The UK's former supplier obligation, the Carbon Emissions Reduction Target (CERT) delivered a significant amount of energy savings achieved through home retrofits mainly with insulation measures and boiler replacements.

The industry sector is also targeted by a relative high number of high-impact measures. The main policy measures are Climate Change Agreements and the Climate Change Levy, a combination of energy taxation and tax relief connected to voluntary agreements. Significant savings also arose from the Carbon Trust programmes, although the Carbon Trust is no longer grant funded by Government. Finally, the effects of the EU Emission Trading Scheme are classified as high impact.

The transport sector is targeted by only one high-impact policy measure, the supporting fiscal measures for the EU voluntary agreements for car CO2.

2. ENERGY EFFICIENCY IN BUILDINGS

2.1. ENERGY EFFICIENCY TRENDS

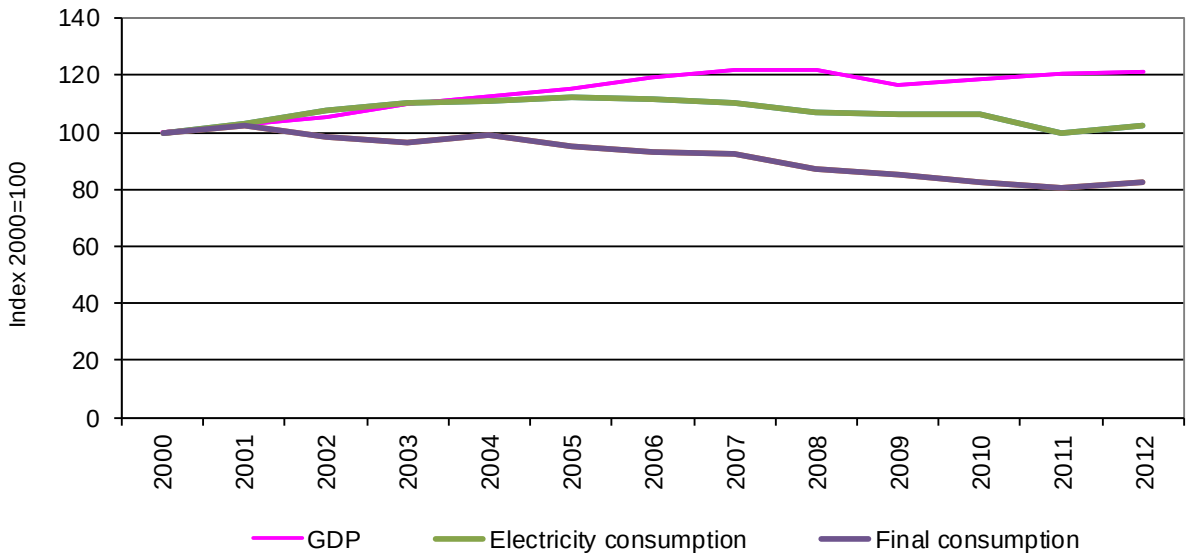
Buildings (residential and non residential) account for about 44% of total final energy consumption and around 67% of electricity consumption in the UK in 2012. Buildings are the second largest end-use sector (30%), behind transport (38%), industry (18%) and agriculture (1%). Around two thirds of the consumption of buildings is for residential buildings (Figure 8).

Figure 8 : Share of final energy consumption from buildings (2012)

The energy consumption of buildings has been decreasing since 2008. However, final energy consumption of buildings[3] has increased by 2% between 2011 and 2012. This trend is not fully explained by the economic recession as the GDP remained fairly stable since 2000 with a dip in 2008. Electricity consumption has remained roughly stable since 2008, with a dip in 2011 indicating a warm winter that year (Figure 9).

[3] Final consumption of residential with climatic corrections

Figure 9 : UK Energy consumption trends in buildings (with climate correction) and GDP



2.1.1. HOUSEHOLDS

Since the late 1990's there has been a gradual reduction in the energy intensity of household consumption to private expenditure.

Figure 10 : Final intensity of households to private consumption (koe/€2000)

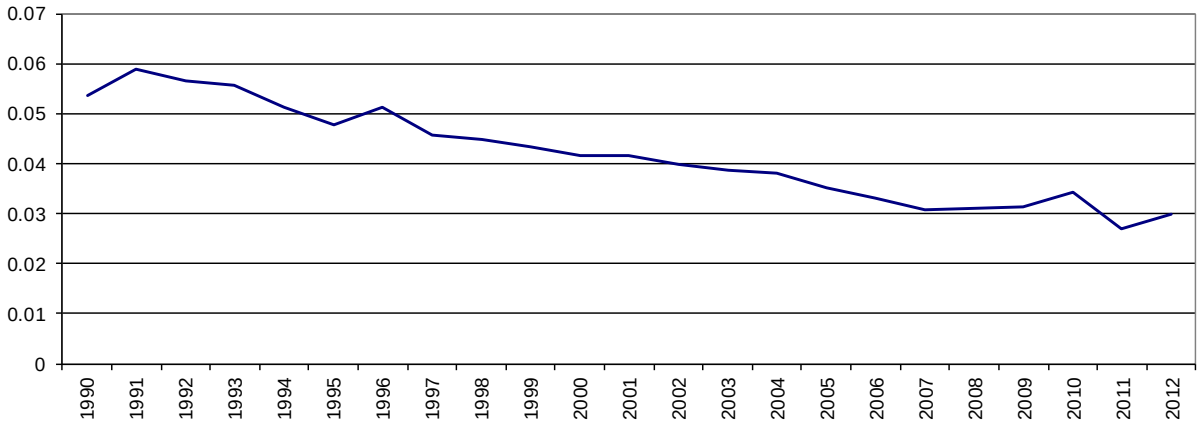
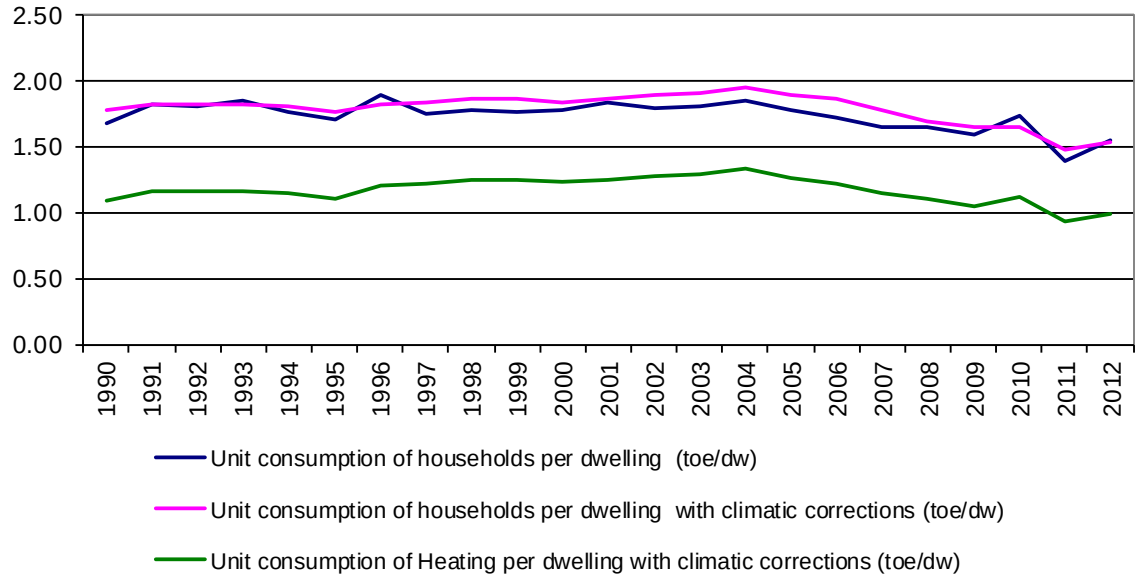


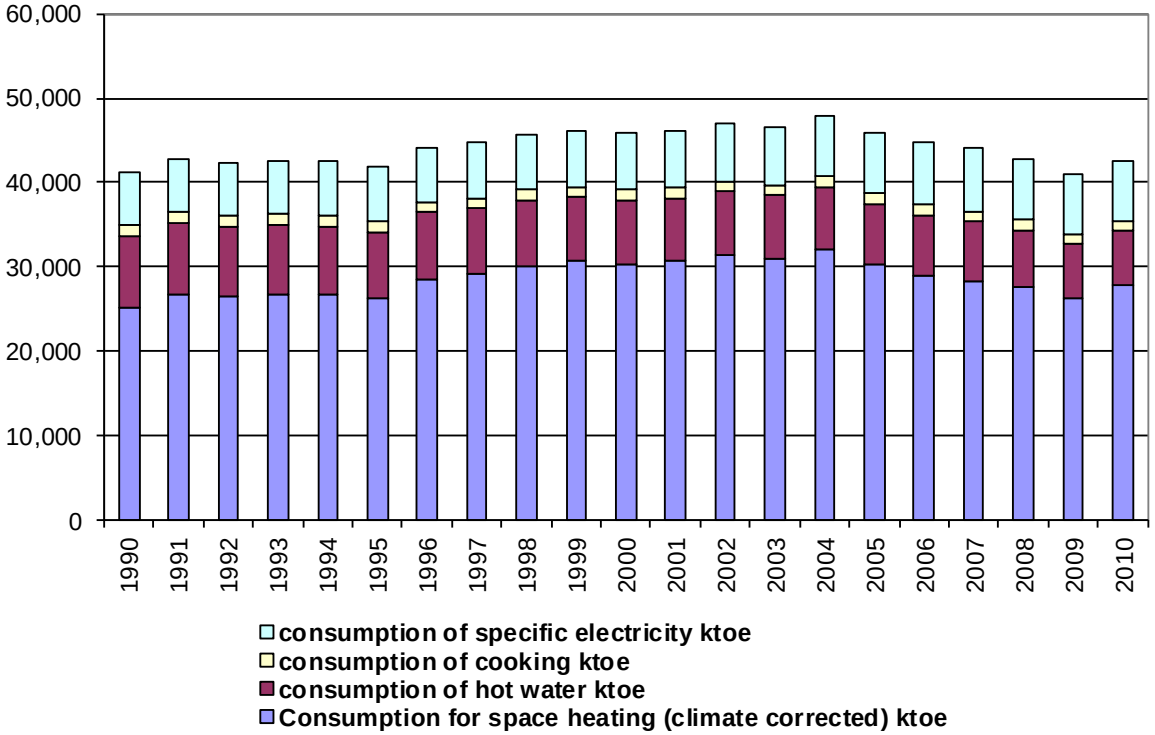
Figure 11 shows the unit consumption per dwelling. Consumption per dwelling compares the energy consumption of households per permanently occupied dwelling, whilst correcting for climatic variations between Member States. The fact that a dwelling requires more energy to heat it to a comfortable temperature in Sweden, or far less to heat in Spain, is factored out of the indicator using the 'degree days' methodology. The unit for this indicator is tonnes of oil equivalent per dwelling (toe/dw). There was little change in the UK's performance on this indicator between 1990 and 2012.

Figure 11 : Unit Consumption



The UK has made good progress in improving household energy efficiency which is due in particular to the efficiency of domestic boilers, including widespread replacement of broken boilers with more efficient condensing boilers. Figure 12 shows that space heating and electrical appliances, closely followed by hot water remains the highest sources of energy consumption in the household sector.

Figure 12: Household Energy consumption



The fuels used in space heating in the household sector are given in Figure 13, gas remains the predominant fuel used for space heating throughout the time series.

Figure 13: Energy consumption of space heating

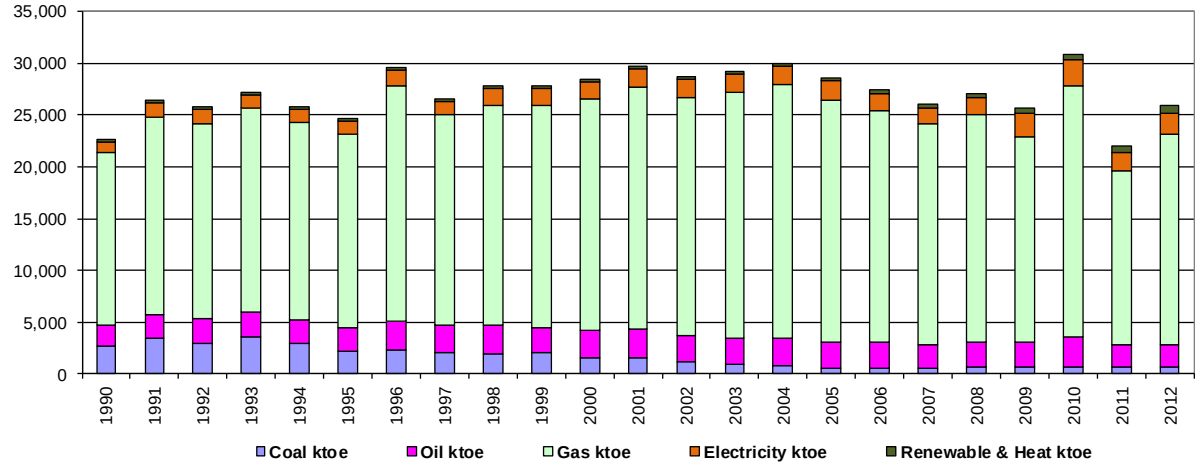
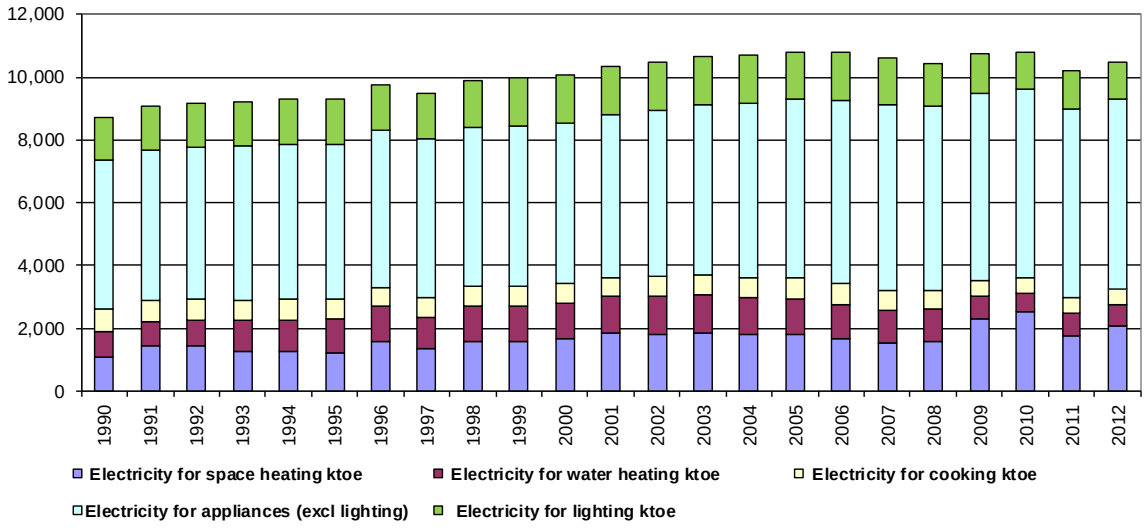


Figure 14 shows the electricity consumption of households, since 1990 this has increased in the UK. Although appliance efficiency has increased in the UK marketplace overall (due to activities such as DECC's Market Transformation Programme), this improvement has been overshadowed by the increase in range, quality and affordability of domestic electrical appliances, and hence, the net effect over the 1990 – 2012 period has been negative.

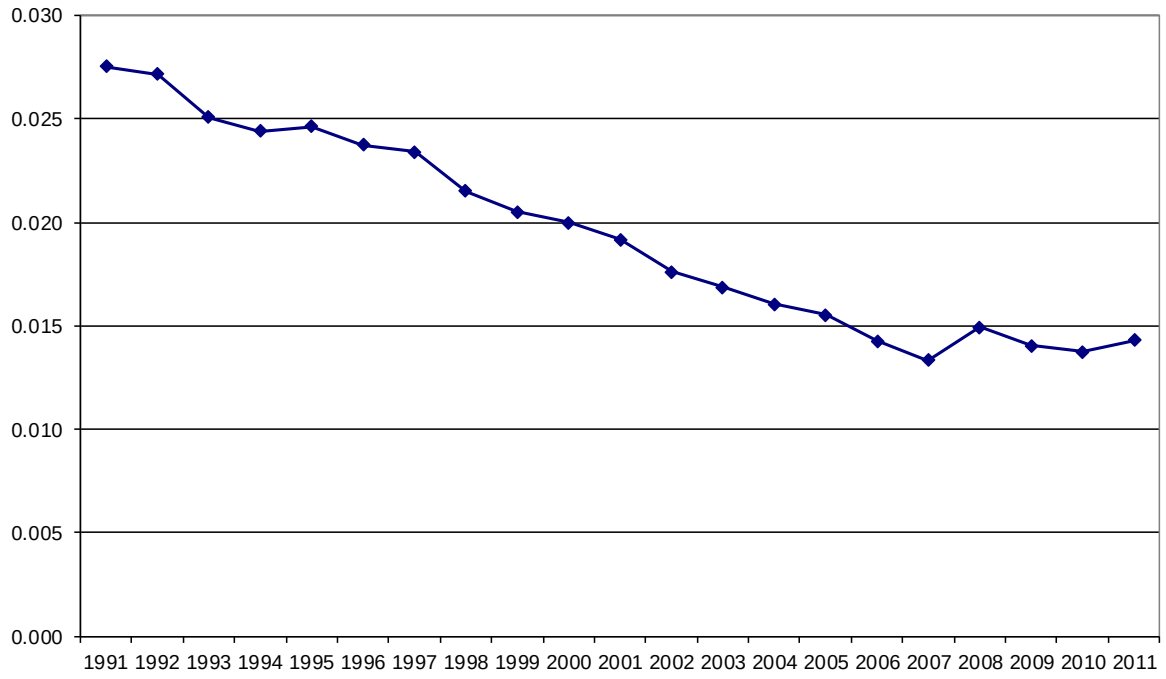
Figure 14: Electricity consumption of households



2.1.2. SERVICES

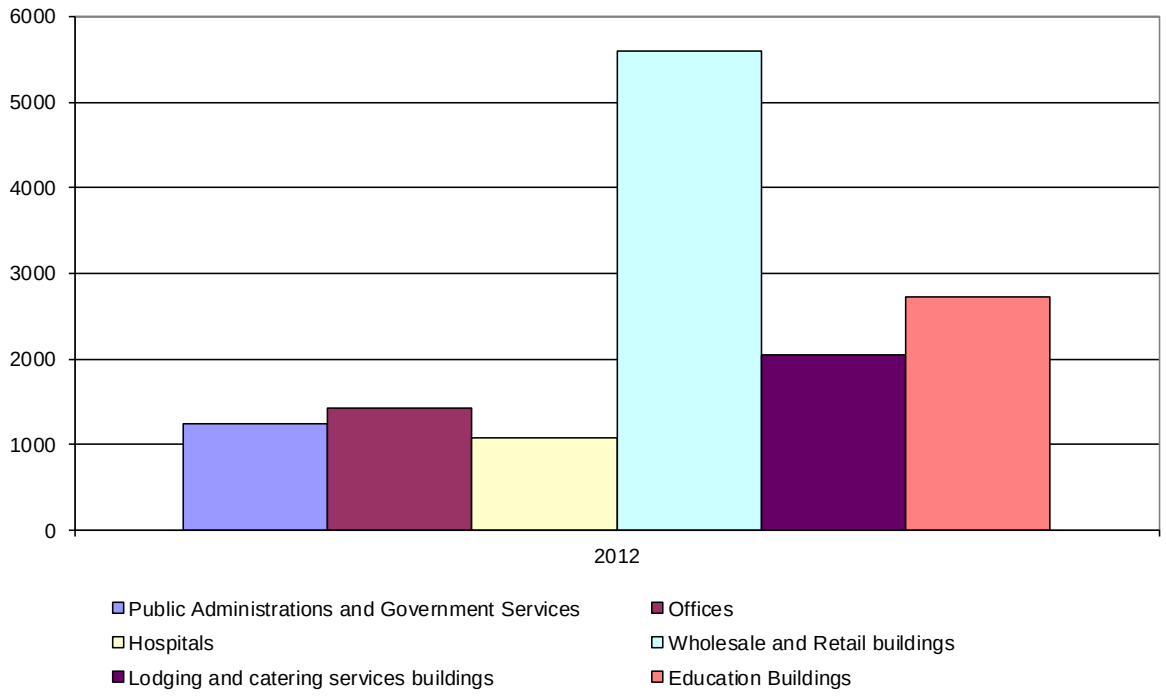
The energy intensity of services has fluctuated between 1991 and 2012 but overall shows a declining trend, this trend is illustrated in Figure 15.

Figure 15: Energy intensity of services (koe/€2000)



Energy consumption information by branch in the tertiary sector is only available since 2005. Figure 16 presents the data for the most recent year, it is clear that wholesale and retail buildings use significantly more energy in comparison to the other branches.

Figure 16: Energy Consumption by Branch (in ktoe)



2.2. ENERGY EFFICIENCY POLICIES

The UK has a number of policies aimed at improving energy efficiency in buildings. For domestic buildings the

UK has historically relied mainly on Supplier Obligations (introduced first in 1994) and building regulations to deliver energy savings in homes.

2.2.1. RECENT DEVELOPMENTS IN DOMESTIC BUILDINGS

Green Deal

After 2012 the UK government restructured the policy landscape significantly following the introduction of the Green Deal, a flagship programme for building refurbishment. The Green Deal is a pay as you save mechanism and allows loans for investment in energy efficiency measures to be attached to the property rather than the owner.

In July 2015 the UK government announced that it would no longer fund the Green Deal in light of low take-up and concerns about industry standards. The government is currently (September 2015) evaluating options for a new approach to domestic energy efficiency policy.

Supplier Obligations

At the same time of introducing the Green Deal, the Supplier Obligations were re-orientated towards more costly measures such as solid wall insulation resulting in a significant reduction of the energy savings delivered by this policy instrument. In 2014 the target of the Energy Company Obligation was revised in order to lower the cost to consumers. The revised target will deliver about 25% less energy savings than the initial target of the Energy Company Obligation.

2.2.2. RECENT DEVELOPMENTS IN NON-DOMESTIC BUILDINGS

Smart Metering and Billing

The Department of Energy and Climate Change (DECC) is leading a roll-out (links below) of smart meters with support from the industry regulator, Ofgem. Ofgem E-Serve led the policy design phase of the central programme on behalf of DECC, however, since April 2011, DECC has been directly responsible for managing the implementation of the programme. DECC estimates that over the next 20 years the installation of smart meters will provide £6.7 billion net benefits to the UK: the programme will cost £12.1 billion and provide £18.6 billion in benefits. The Government estimate that by 2020, the average small and medium non-domestic customer will save over £100 on their energy bill as a result of smart metering (DECC 2013).

2.2.3. MEASURES APPLICABLE TO DOMESTIC BUILDINGS

Table 3 lists all the energy efficiency measures applicable to the household sector as listed in the MURE database. The impact is the highest for the legislative/normative measures such as the improvements to building regulations and reductions in energy use from electrical appliances. Financial measures such as Supplier Obligations (including the Energy Company Obligation) continue to generate significant savings.

Table 3 : Measures in the domestic buildings sector

Code	Title	Status	Type	Semi-quantitative Impact
HOU-UK7	Energy Saving Trust	Ongoing	Financial, Information/ Education	Medium

Code	Title	Status	Type	Semi-quantitative Impact
HOU-UK13	EU-related: Energy Labelling of Household Appliances (Directive 92/75/EC) - Product policy and Market Transformation Programme	Ongoing	Legislative/ Normative	High
HOU-UK4	Home Energy Conservation Act 1995 and Energy Conservation Act 1996	Ongoing	Co-operative Measures	Low
HOU-UK3	Reduction in VAT rate for energy saving materials	Ongoing	Fiscal/ Tariffs	Medium
HOU-UK5	Warm Front and Fuel Poverty Programmes	Completed	Financial	Medium
HOU-UK31	Descent Homes Standard - a minimum standard that triggers action to improve social housing	Ongoing	Financial	Low
HOU-UK19	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Building Regulations 2006	Ongoing	Legislative/ Normative	High
HOU-UK21	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance Certificates	Ongoing	Legislative/ Informative	Medium
HOU-UK22	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Code for Sustainable Homes	Ongoing	Legislative/ Informative, Legislative/ Normative	Low
HOU-UK23	Smart Metering and Billing	Ongoing	Information/ Education, Legislative/ Normative	High
HOU-UK24	Act CO2 Campaign	Completed	Information/ Education	Low
HOU-UK26	Stamp Duty - No stamp duty on zero carbon homes	Completed	Financial	Low
HOU-UK30	Zero Carbon Buildings (government targets and Zero Carbon Hub)	Ongoing	Information/ Education	Low
HOU-UK28	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Building Regulations 2010	Ongoing	Legislative/ Normative	High
HOU-UK35	Northern Ireland Sustainable Energy Programme (NISEP)	Ongoing	Financial	Low
HOU-UK34	Home Energy Efficient Programmes (Scotland)	Ongoing	Financial	Low
HOU-UK32	EU-related: Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU) - Building regulations 2014	Ongoing	Legislative/ Normative	Unknown
GEN-UK33	Supplier Obligations - Energy Company Obligation (ECO)	Ongoing	Financial	Medium
GEN-UK29	Supplier Obligations - Community Energy Savings Programme (CESP)	Completed	Financial	Medium

Code	Title	Status	Type	Semi-quantitative Impact
GEN-UK20	Supplier Obligations – Carbon Emissions Reduction Target (CERT)	Completed	Financial	High
GEN-UK11	Green Deal	Ongoing	Financial Measures, Market-based Instruments	Low

2.2.4. MEASURES APPLICABLE TO NON-DOMESTIC BUILDINGS

In the Tertiary sector, the policies with the highest impact are the legislative and fiscal measures, most are also EU-related.

Table 4 : Measures in the non-domestic buildings sector

Code	Title	Status	Type	Semi-quantitative Impact
TER-UK7	Energy Saving Trust	Ongoing	Financial, Information/ Education/ Training	Low
TER-UK2	Carbon Trust programmes	Completed	Financial, Information/ Education/ Training	Medium
TER-UK5	EU-related: Community framework for the taxation of energy products and electricity (Directive 2003/96/EC) - Climate Change Levy	Ongoing	Cross-cutting with sector-specific characteristics	High
TER-UK11	Enhanced Capital Allowance Scheme	Ongoing	Fiscal/Tariffs	Medium
TER-UK22	Public sector procurement standards	Ongoing	Unknown	Low
TER-UK21	Building Schools for the Future	Ongoing	Information/ Education/ Training	Low
TER-UK1	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Building Regulations 2006	Ongoing	Legislative/Normative	High
TER-UK18	Public Sector financing through Salix	Ongoing	Financial	Low
TER-UK19	Greening Government Commitments	Ongoing	Co-operative Measures, Information/ Education/ Training, Legislative/Informative	Low
TER-UK20	Sustainable Schools Action Plan	Ongoing	Information/ Education/ Training	Low
TER-UK14	Smart metering and Billing for SMEs	Ongoing	Information/ Education/ Training	High
TER-UK15	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance Certificates	Ongoing	Legislative/Informative	High
TER-UK12	CRC Energy Efficiency Scheme (CRC)	Ongoing	Cross-cutting with sector-specific characteristics, Legislative/Informative	High

TER-UK17	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Building Regulations 2010	Ongoing	Legislative/Normative	High
TER-UK23	EU-related: Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU) - Building Regulations 2014	Unknown	Legislative/Normative	High

3. ENERGY EFFIENCY IN TRANSPORT

3.1. ENERGY EFFICIENCY TRENDS

Figure Figure 17 shows there has been a decline in the energy intensity of the Transport sector. This has occurred largely because of faster growth in the UK economy and hence GDP, which has been used to calculate energy intensity in the transport sector. More recently a variety of other factors such as the EC voluntary agreement with the European Automobile Manufacturers' Association, the UK Government's decision to introduce fuel efficiency labelling and graduated carbon based Vehicle Excise Duty and an increased consumer demand for more fuel efficient cars (against a background of higher fuel prices) have contributed to the decrease in energy intensity in the transport sector.

Figure 17: Transport Intensity

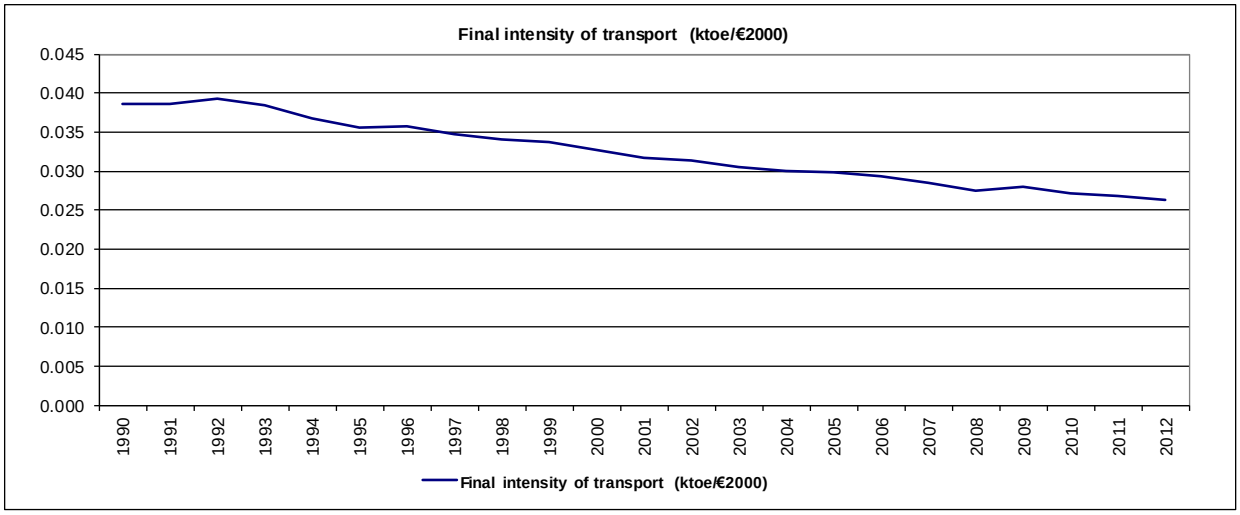


Figure 18 illustrates the energy consumption in each of the transport subsectors. Energy consumption in the rail and air sub-sectors has risen significantly since 1990. In contrast, the energy consumption in the road sub-sectors has decreased steadily and remained relatively constant, respectively. The overall trend of increasing energy consumption in the transport sector is mainly due to long periods of sustained economic growth, apart from 2008 to 2009. Figure 19 shows that there have been improvements in energy consumption per unit between 1990 and 2012 for the rail, air and road goods transport sector. However the unit consumption of road goods transport has remained fairly constant over the time period indicating that more emphasis should be placed on this sector in terms of policies and measures.

Energy consumption in the air sub-sector has risen particularly rapidly because of strong demand to travel further and more frequently fuelled by the growth of low-cost airlines offering cheap fares to European destinations. This is of particular concern given the high energy usage per km for air compared to other modes.

Figure 18: Energy consumption by mode

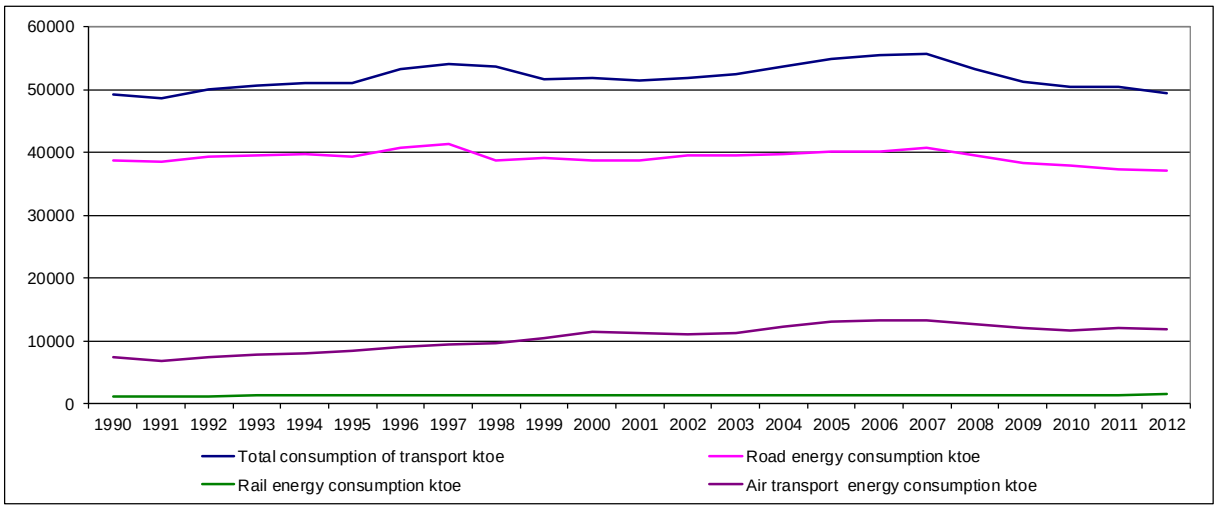
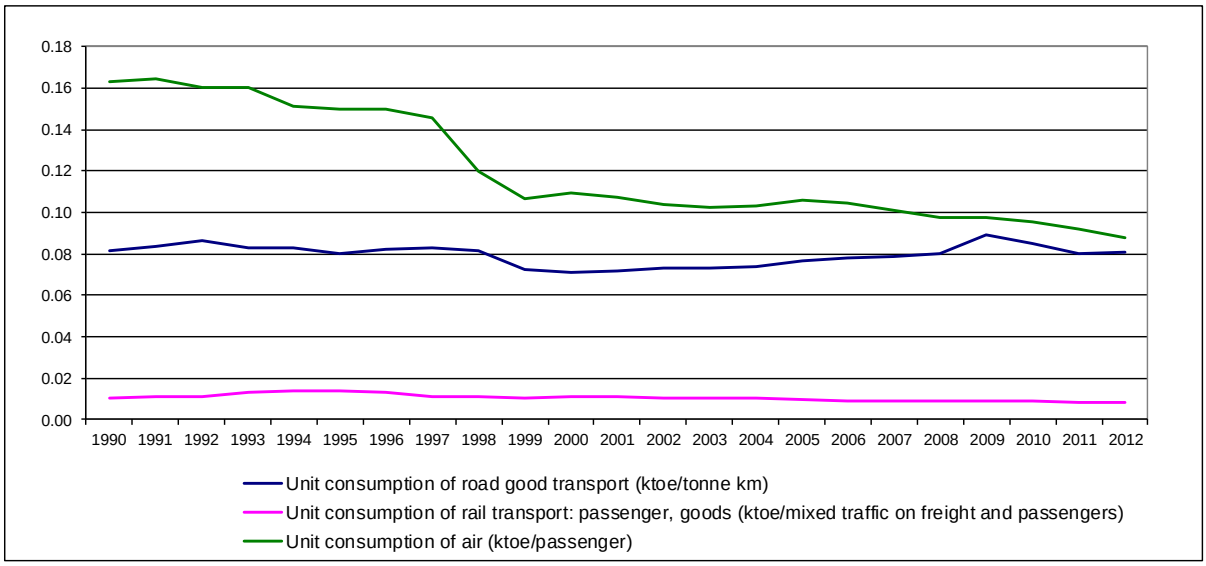


Figure 19: Unit Consumption by mode of transport



This trend in road transport has come about despite steady improvements in the fuel efficiency of new vehicles. Figure 20 provides a breakdown of consumption by mode of road transport, type of fuel Figure 21 shows fuel consumption by fuel type since 1990. The trends show a switch from gasoline to diesel which is likely to be related to the cheaper running costs of diesel fuelled vehicles.

Figure 21 and Figure 22 the average new car fuel consumption.

The savings in car transport are largely the result of more efficient vehicles. For road freight changes such as a shift towards more home deliveries increased the activity of vans and small trucks with much lower loads and therefore energy per tonne km increases due to this shift within the mode.

Figure 20: Consumption by mode of road transport

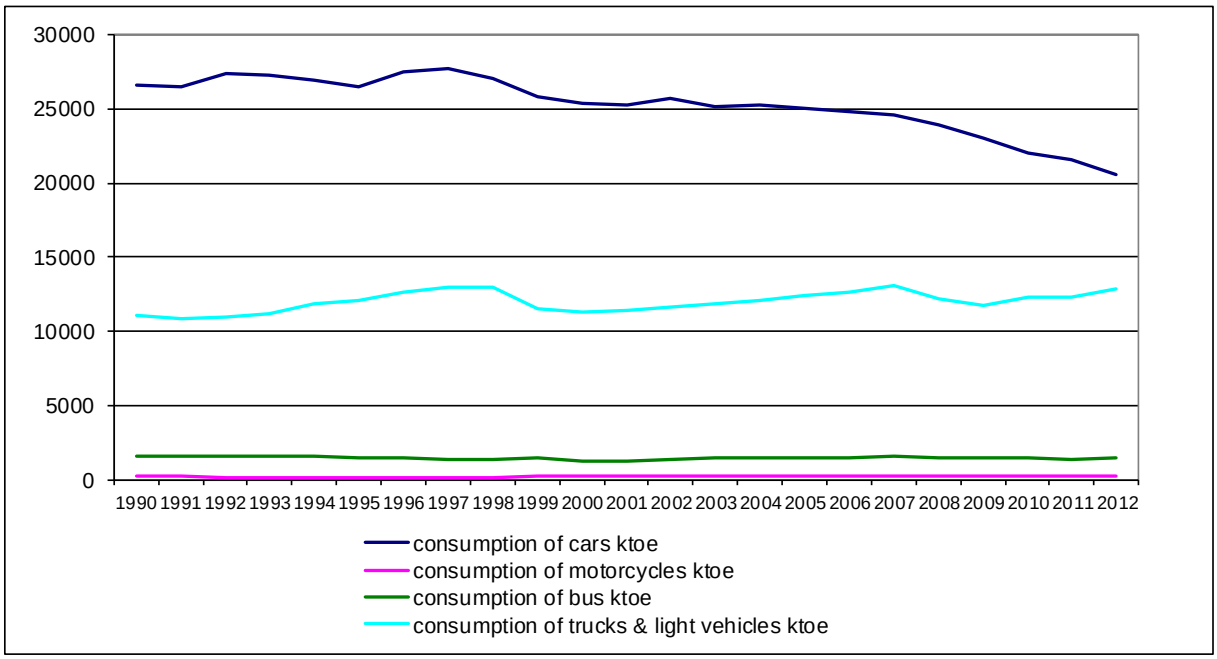


Figure 21 shows fuel consumption by fuel type since 1990. The trends show a switch from gasoline to diesel which is likely to be related to the cheaper running costs of diesel fuelled vehicles.

Figure 21: Consumption by type of fuel (in Mtoe)

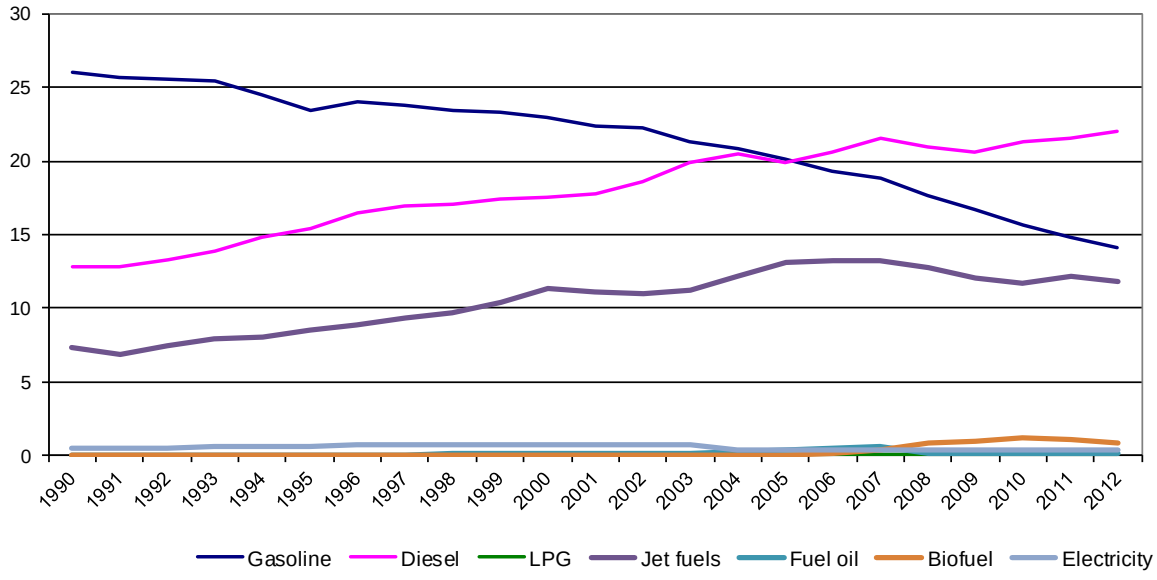
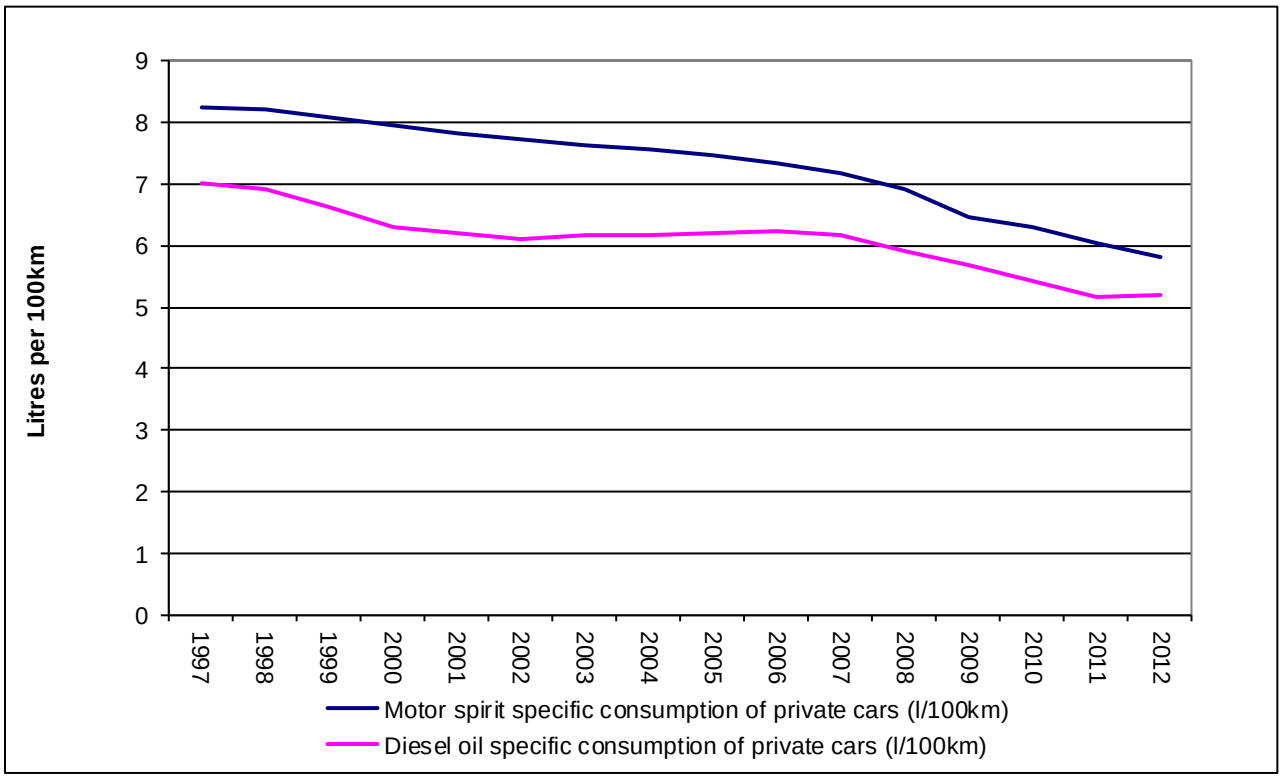


Figure 22: Average New Car Fuel consumption



The transport sector accounted for 25% of total CO_2 emissions in 2012 compared to 21% in 1990. Transport related CO2 emissions have decreased by a modest 1% between 1990 and 2012. The majority of CO_2 emissions within the transport sector is released by passenger cars (Figure 23).

Figure 23: CO2 emissions by mode of transport (MtCO2)

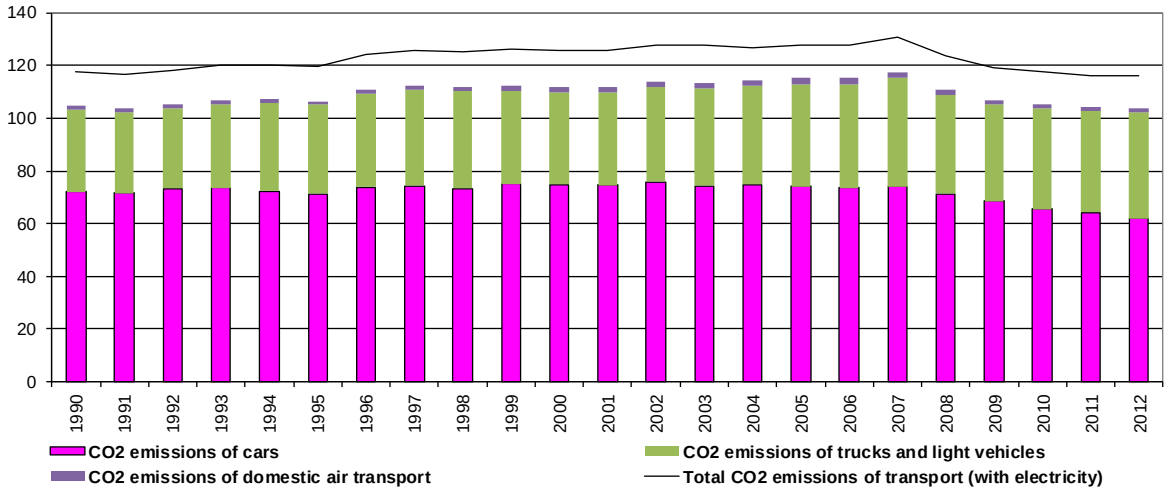
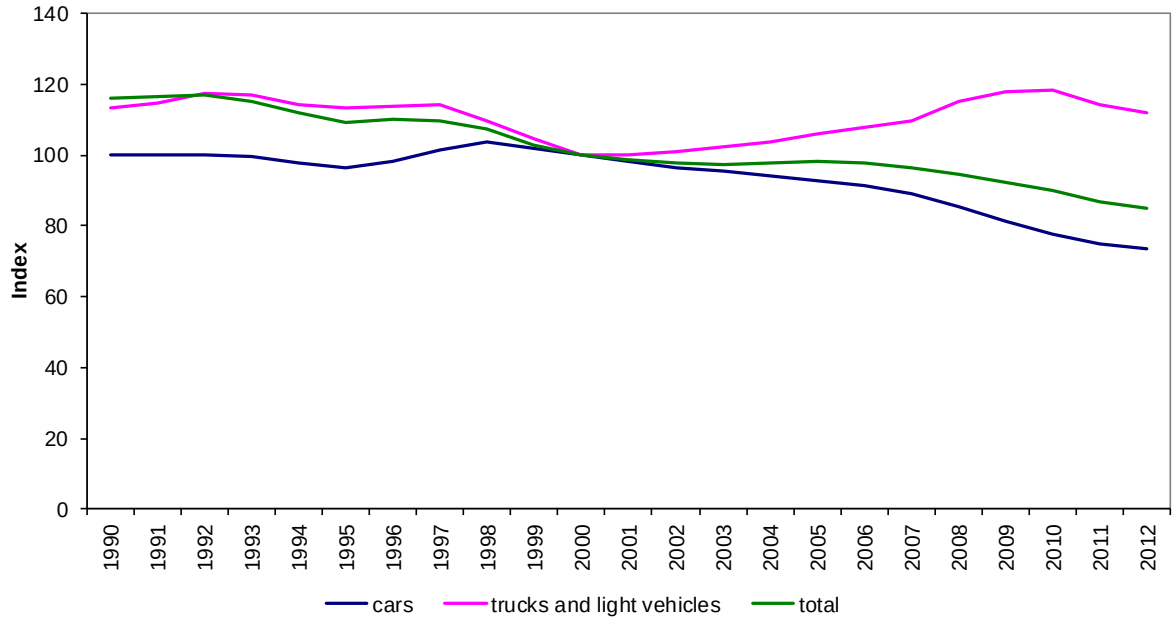


Figure 24 illustrates the transport ODEX. This indicator is called “bottom-up energy efficiency indicators” since it is made up of a weighted average of a series of sub-sector energy efficiency indicators. The advantage of bottom-up indicators is that they can better evaluate energy efficiency trends at an aggregate level than the usual energy intensity indicators. This is because bottom-up indicators can help remove energy changes due to structural effects and/or other factors not related to energy efficiency.

After a significant improvement in UK transport energy efficiency in the early to mid-90’s the rate of improvement has since slowed and even appeared in danger of reversing around 2000. The recent improvements can be attributed to a variety of factors including a desire on the part of consumers for more

fuel efficient (and hence cheaper) cars against a background of higher fuel prices, the voluntary agreement between the European Automobile Manufacturers Association and the EC to improve the fuel efficiency of cars and the introduction by the UK Government of graduated Vehicle Excise Duty based on carbon emissions.

Figure 24: Transport ODEX



3.2. ENERGY EFFICIENCY POLICIES

There are multiple transport-related energy efficiency policies. Those include legislative measures, taxation, financial incentives, cooperative measures and training.

3.2.1. RECENT DEVELOPMENTS

Vehicle Excise Duty

In July 2015 it was announced that the Vehicle Excise Duty (VED), a tax on cars, would be reformed. For cars first registered from 1 April 2017 onwards First Year Rates of VED will vary according to the CO_2 emissions of the vehicle. A flat Standard Rate of £140 will apply in all subsequent years, except for zero-emission cars for which the Standard Rate will be £0. Previously the VED was staged being highest for cars emitting a lot of CO_2 and lowest for cars emitting very little or no CO_2.

Plug-In Car Grant

The Government has confirmed that the current structure of the UK government's Plug-In Car Grant will end this year, coinciding with the sale of the 50,000th electric vehicle (EV) or the end of the budget period, whichever comes first. The Plug-In Car Grant commenced in January 2011 to help both private consumers and businesses purchase an electric, plug in hybrid or hydrogen fuelled car. Motorists purchasing a qualifying ultra-low emission car are able to receive a grant of 25% of the vehicle price, up to a value of £5,000. These vehicles will, initially, be more expensive 'up front' than conventional cars due to low production volumes and the high cost of the battery. The grant helps to provide a more level playing field for new technologies, until the growing market drives purchase costs to a more competitive level.

More than 25,000 Plug-In Car Grants have been handed out to car buyers since 2010 with take-up on the rise

as 2,000 grants were claimed in January 2015 alone. A tiered system will replace the current universal grant of £5000 for all vehicles with emissions under 75 g/CO2 km at a yet to be determined date this year. The level of grant funding under the new scheme is still to be determined.

3.2.2. MEASURES

The energy efficiency policies with the largest impact in the Transport Sector tend to be the fiscal or legislative. Significant savings are expected from biofuels in the transport sector and there are a number of national supporting measures building on EU voluntary agreements, interim targets to reduce emissions to 130g CO2/kg for all new passenger cars from 2015 and 95gCO2/km target from 2020.

Table 5 : Measures in the transport sector

Code	Title	Status	Type	Semi-quantitative Impact
TRA-UK26	Speed Limits and Active Traffic Management	Ongoing	Legislative/ Normative	Low
TRA-UK13	Freight Facilities Grant (closed 2011)	Completed	Infrastructure	Low
TRA-UK10	EU-related: Promotion of Biofuels or other Renewable Fuels for Transport (Directive 2003/30/EC) - Fuel Duty Levels	Ongoing	Fiscal	Medium
TRA-UK2	Energy Saving Trust – Transport Initiatives	Ongoing	Financial, Information/ Education/Training	Low
TRA-UK29	National supporting fiscal measures for the EU voluntary agreements for car CO2	Ongoing	Co-operative Measures , Fiscal	High
TRA-UK8	EU-related: Fiscal Measures to Promote Car Fuel Efficiency - Graduated Vehicle Excise Duty	Ongoing	Fiscal	Medium
TRA-UK9	EU-related: Fiscal Measures to Promote Car Fuel Efficiency - Company Car Taxation	Ongoing	Fiscal	Medium
TRA-UK19	Low Carbon Vehicle Partnership	Ongoing	Co-operative Measures	Low
TRA-UK31	Low carbon buses & SAFED bus driver training	Completed	Financial, Information/ Education/ Training	Low
TRA-UK17	Smarter choices	Completed	Information/ Education/ Training	Low
TRA-UK27	EU-related: Passenger Car Labelling on fuel economy rating (Directive 1999/94/EC) - UK Fuel Economy Labels for new and used cars	Ongoing	Legislative/ Informative	Low
TRA-UK28	EU-related: Speed limitation devices for certain categories of motor vehicles (Directive 2002/85/EC) - UK28_Speed limiter for Goods Vehicles and Buses	Ongoing	Legislative/ Normative	Low
TRA-UK25	Act on CO2 (Transport) Campaign and Eco Driving	Completed	Information/ Education/ Training	Low

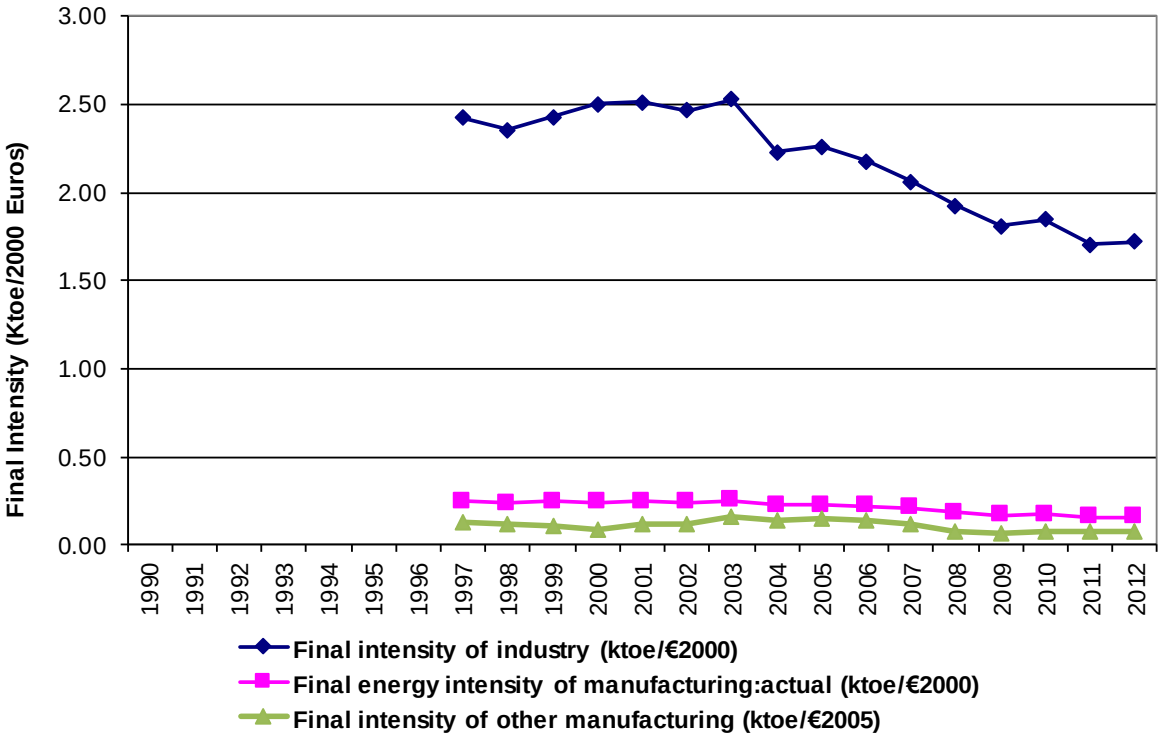
Code	Title	Status	Type	Semi-quantitative Impact
TRA-UK16	EU-related: Promotion of Biofuels or other Renewable Fuels for Transport (Directive 2003/30/EC) - UK16_Renewable Transport Fuels Obligation	Ongoing	Legislative/ Normative	Medium
TRA-UK20	Transport Innovation Fund	Completed	Infrastructure	Low
TRA-UK32	Plug-In Car Grant	Ongoing	Financial	Unknown

4. ENERGY EFFICIENCY IN INDUSTRY

4.1. ENERGY EFFICIENCY TRENDS

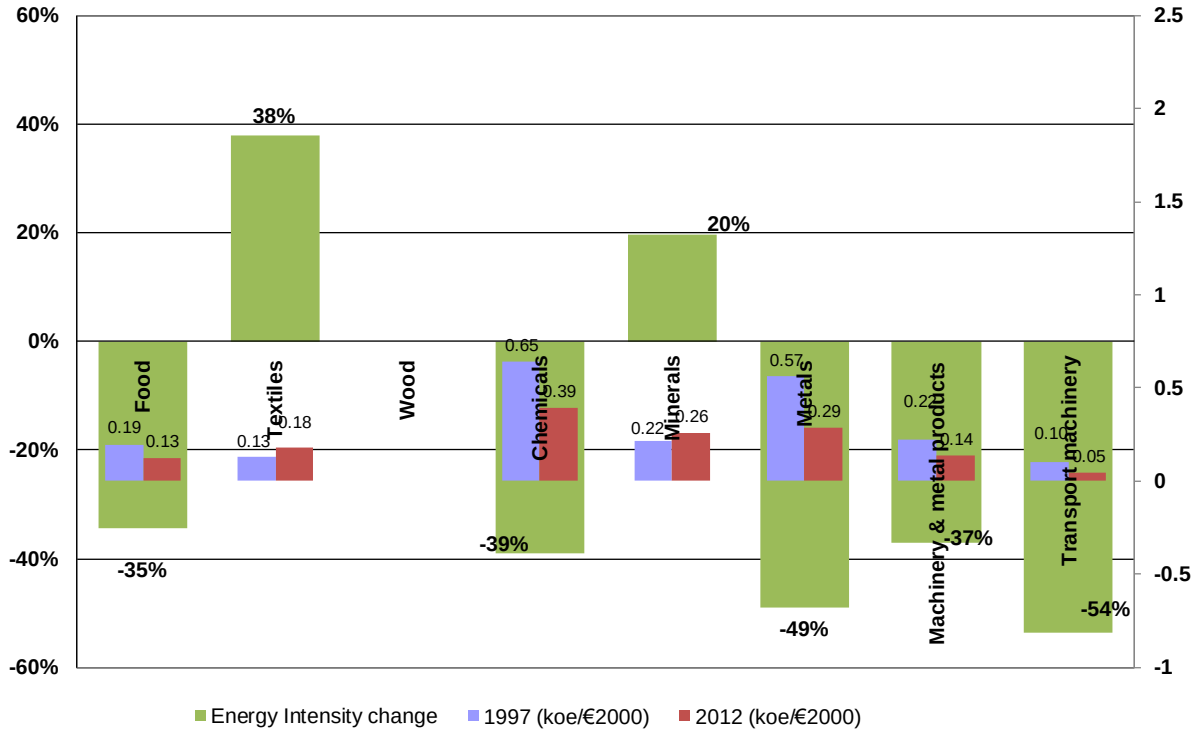
There has been a reduction in the energy intensity of industry and manufacturing sectors, which can be explained by a reduction in energy intensive heavy industry and more recently by improved energy efficiency driven by the Climate Change Agreements.

Figure 25: Energy intensity of industrial and manufacturing sectors



Despite the overall fall in final energy use, electricity consumption in manufacturing industry has been steadily growing. Figure 26 illustrates the energy intensity changes by sector, in most sectors there has been a reduction.

Figure 26: Energy Intensity in 1997 and 2012 and Energy Intensity change



The UK has high energy consumption per unit in the energy intensive sectors compared to other EU counties. Figure 27 shows how unit consumption has fluctuated in the steel, cement and paper sectors.

The UK has higher energy consumption per ton of steel than EU-27 average as most steel produced in the UK is using the Basic oxygen process which uses more energy than electric arc process, in 2012 produced 7.5 million tonnes using the basic oxygen process and only 2.1 million tonnes using electric arc.

The Cement industry is energy intensive mainly because of the fuel requirements of kilns. Wet processes and long dry kilns use more energy because of the drying processes. As kilns were replaced energy efficiency has improved since 1960's but this has levelled off since 1990 – however the recent commissioning of new kilns is expected to make improvements so this should be a trend that improves in the future.

The UK paper industry has high unit consumption, as the energy performance of the paper industry is linked to the share of pulp produced in the country in relation to the paper production: the higher this ratio, the higher the unit consumption

The energy intensive sectors are a small part of the UK economy, perhaps more so than other countries

Figure 27: Unit consumption for energy intensive industry

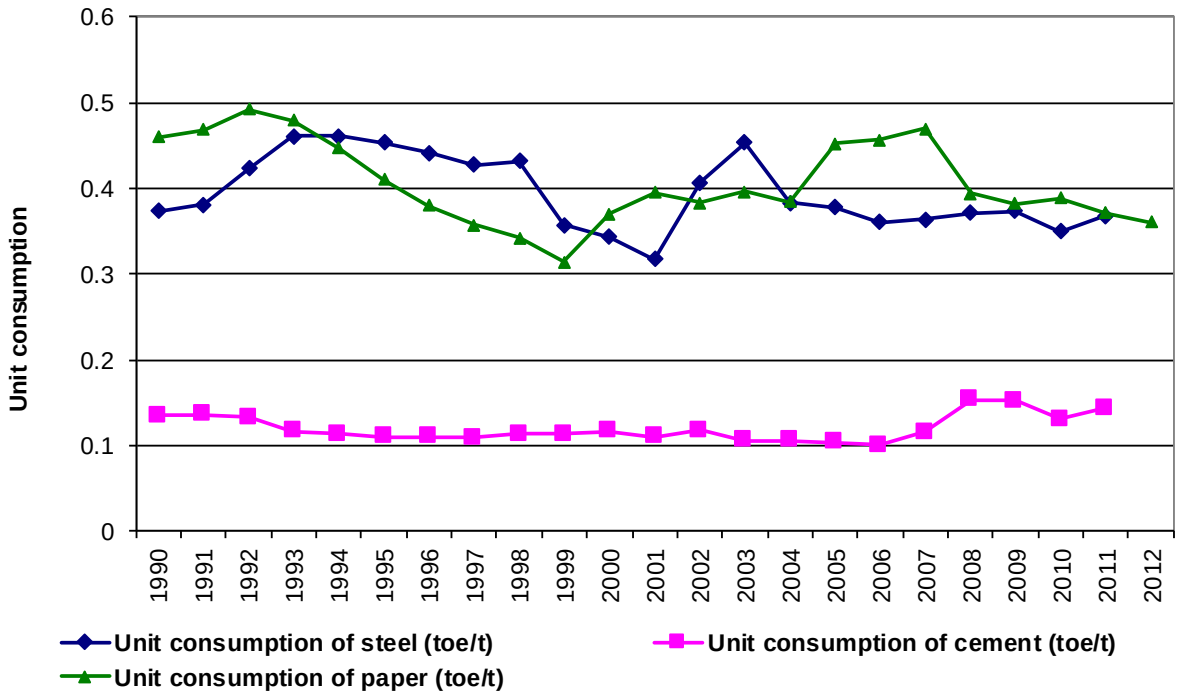
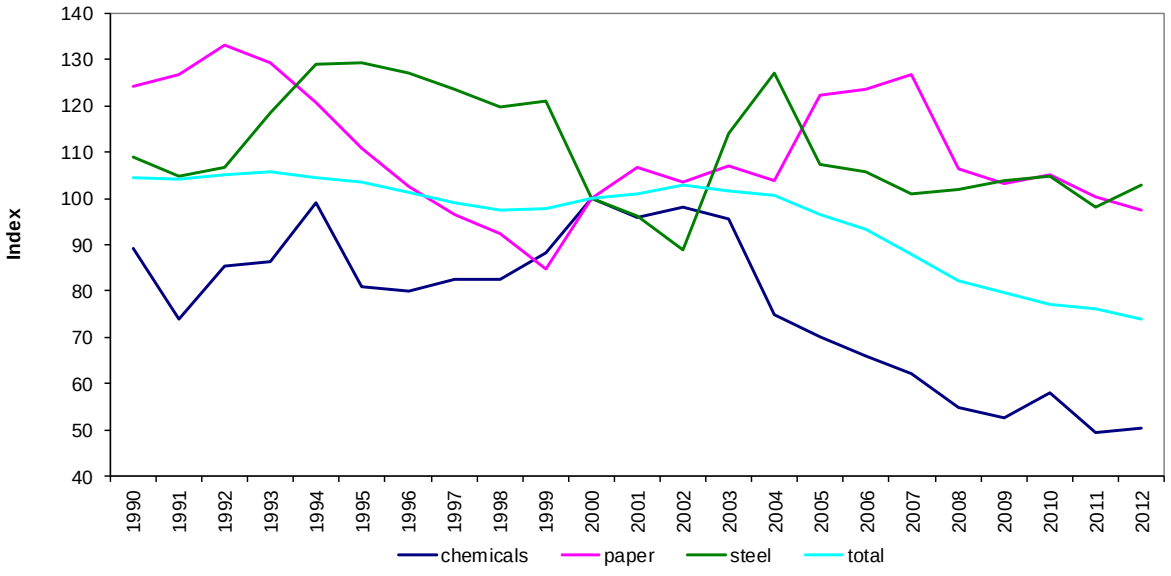


Figure 28 illustrates the industry ODEX, which shows that in 2012 energy efficiency in industry had improved by around 29% since 1990. However, energy efficiency in the manufacturing sector has not improved steadily. After worsening in the early 90's, energy efficiency improved sharply in the mid-90's before plateauing and finally improving rapidly once again in recent years. The recent upturn is largely due to significant improvements in the chemicals, machinery, non-ferrous and steel sub-sectors, which can be directly attributed to the introduction of the Climate Change Levy and the associated CCAs.

Figure 28: Industry ODEX



4.2. ENERGY EFFICIENCY POLICIES

There are three policies affecting the industry sectors in the UK:

- Climate Change Agreements (CCAs)
- Climate Change Levy (CCL)
- Enhanced Capital Allowances (ECA)

These policy instrument operate together with the impact of the EU Emissions Trading Scheme.

The main policy instrument are CCAs which sets targets for each sub-sector within the industrial sector to reduce carbon emissions by 2020.

4.2.1. RECENT DEVELOPMENTS

Climate Change Levy

The CCL is a tax on energy delivered to the energy-intensive industry in the United Kingdom. Its aim is to provide an incentive to increase energy efficiency and to reduce carbon emissions.

Renewable electricity has been exempt from the CCL since its introduction in 2001. The tax is not paid on renewable electricity supplied to businesses and the public sector under renewable source contracts. In July 2015 it was announced that the government would remove the exemption from the Climate Change Levy (CCL) for renewable electricity which is supplied to business or public sector consumers under the terms of a renewable source contract. There will be a transitional period from 1 August 2015, during which electricity suppliers will be able to continue to exempt renewable electricity generated before that date. The length of the transition period is currently under review.

4.2.2. MEASURES

A mixture of co-operative, financial and market based measures have been expected to have the largest impact in the industry sector.

Table 6 : Measures in the industry sector

Code	Title	Status	Type	Semi-quantitative Impact
IND-UK7	EU-related: Integrated Pollution Prevention and Control IPPC (Directive 2008/1/EC) - Integrated Pollution Prevention and Control (IPCC)	Ongoing	Legislative/ Normative	Medium
IND-UK5	The Enhanced Capital Allowance Scheme	Ongoing	Financial, Fiscal/Tariffs	Medium
IND-UK6	Climate Change Agreements	Ongoing	Co-operative Measures, Fiscal/Tariffs	High
IND-UK8	Carbon Trust programmes	Ongoing	Financial, Information/ Education/ Training	High
IND-UK16	EU-related: Community framework for the taxation of energy products and electricity (Directive 2003/96/EC) - Climate Change Levy	Ongoing	Cross-cutting with sector-specific characteristics	High

Code	Title	Status	Type	Semi-quantitative Impact
IND-UK17	EU-related: Combined Heat Power (Cogeneration) (Directive 2004/8/EC) - Combined Heat and Power (CHP)	Ongoing	Fiscal/Tariffs, Information/ Education/ Training	Low
IND-UK11	EU-related: EU Emission Trading Scheme (2003/87/EC) - EU Emission Trading Scheme (ETS)	Ongoing	New Market-based Instruments	High

4 REFERENCES

DECC (2014): National Energy Efficiency Action Plan. London: DECC

DECC (2013): Smart meter roll-out for the domestic and small and medium non-domestic sectors (GB): Final Impact Assessment. London: DECC