



Environmental Policy Since 1997

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Summary

Emissions Reductions

- The UK will meet its Kyoto obligation to reduce Green House Gas (GHG) emissions by 12.5% below 1990 levels by 2008-12. But it is highly unlikely to meet its own domestic target to reduce carbon dioxide (CO₂) emissions by 20% by 2010 relative to 1990 levels.
- Since 1997, CO₂ emissions have fallen at a relatively low rate – just 0.3% per year. Emissions from energy supply and transport (the two biggest sectors) have risen over this period.
- Emissions of other GHGs have fallen relatively fast – by 4.5% a year. Overall, emissions have fallen at about the same rate since 1997 as they did between 1990 and 1997.
- If the UK is to meet its ‘carbon budget’ target for GHGs in 2020, more will need to be invested in renewable energy and transport emissions will need to be reduced – requiring potentially painful and expensive decisions. The government estimates that its various energy policies will add around 8% to household electricity bills relative to 2009 by 2020.
- There has been some success at raising the share of renewables in electricity generation – from about 3.6% in 1997 to 6.8% in 2008– though this is still a very long way below the ambition for 2020 of 30%, and well below the EU average. The largest change in generation has been the rise of gas-fired power at the expense of nuclear power, which means there has been a rise in energy supply emissions since 1997.

Taxes and Policy

- Between 1997 and 2009, green taxes as a share of total receipts fell from 9.5% to 7.9%. There has been no substantial change in the composition of environmental revenues: fuel duty still accounts for more than ¾ of the total, as it did in 1997.
- Real-terms rates of fuel duty first rose substantially under Labour as part of the fuel duty escalator, then fell back after it was abandoned in 1999. Fuel taxes are now about 11% higher in real terms than they were when Labour took office.
- The Vehicle Excise Duty system has been substantially reformed to make payments contingent on the CO₂ emissions of the vehicle. But payments have fallen on average: someone buying a new car of average emissions in 2009 paid less in real terms than someone buying a new car in 1997.

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- Rates of Air Passenger Duty have risen substantially since 1997, though the Government abandoned a reform of the system into a per-plane tax (a policy that at the time appeared to have cross-party support) in 2008.
- The UK has moved off the bottom of the EU 15 league table for the proportion of waste recycled since 1997, and looks set to hit EU Landfill Directive targets. This is in part through very large increases in Landfill Tax to rates that will, by 2014–15, be ten times the original estimates of the marginal externality from landfill.
- Existing energy and transport taxes imply ‘carbon taxes’ that are higher for business than domestic energy use, lower for coal-generated power than gas-generated power, and higher for transport fuel. The fact that households pay only 5% VAT on energy – as opposed to the standard 17.5% rate – probably more than offsets increases in bills they face because of environmental measures.
- It is not clear that targets for emissions have been set in a very coherent way as the necessary carbon price they imply for emissions under the European Emissions Trading System (ETS) and outside the ETS are very different. This suggests the total cost of hitting emissions reduction targets is higher than it needs to be.

1. Introduction

Climate change probably now plays a more important role in government decision making, and in political debate, than at any previous election. In part this reflects increased clarity over the science, in part the influence of the remarkable 2006 Stern review² into the economics of climate change, and in part increased activity at EU and international levels.

This government has put in place a large number of targets and policies aimed at tackling climate change, and has enshrined in law targets to reduce emissions by 80% by 2050 relative to 1990 levels. Stringent targets for 2020 and “carbon budgets” for intervening years also exist. In broad terms the high level of activity has so far yielded neither substantive reductions in carbon emissions nor a genuinely coherent set of policies. While the UK will meet its targets under the Kyoto protocol it will likely miss its own target for 2010. Emissions are on a downward trajectory, but much of the cost of significant falls is still to be felt as a planned large scale move towards renewable generation will lead to large increases in energy bills.

One important element of a strategy ought to be a consistent price for carbon such that emissions reductions take place in the most efficient and cost effective way. In fact there are dramatic differences across the different sources of emissions. Some, like domestic use of gas are wholly untaxed – indeed domestic energy consumption is effectively subsidised as a result of the reduced rate of VAT charged on it. Carbon emissions from electricity generation are priced through the European Union Emissions Trading System (EU ETS). Electricity used by business is then priced again through the (misnamed) climate change levy, and for some will be priced again through the new Carbon Reduction Commitment. Fuel consumption by cars and aeroplanes is dealt with wholly differently. The result is a hotchpotch of prices, taxes and charges which are very distant from a consistent and rational pricing system.

Perhaps most odd is the way the EU ETS sits alongside targets for emissions reductions. The ETS is much the biggest pricing policy in place, covering about half of emissions, and including all

² Stern, N., 2006, *Review on the Economics of Climate Change*, H.M. Treasury, October, <http://www.sternreview.org.uk>, available at http://www.hm-treasury.gov.uk/sternreview_index.htm.

emissions from electricity generation. The problem is that the price that comes out of the ETS is inconsistent with – not high enough to achieve – the targets that government (and the EU) is signed up to achieving. The result is that a range of other policies and costly support for renewables will be required to meet targets with the persistent danger that the policies will be inefficient, subject to intense lobbying and more expensive than need be.

In this note, we will examine Labour’s record on environmental policy since 1997. We begin in section 2 with a relatively broad overview of the environmental record, looking at key outcomes on environmental taxes, expenditures and emissions. Section 3 then looks in detail at policy developments and outcomes in three areas: energy, transport and waste management. Section 4 assesses the coherency of current environmental policy and section 5 concludes.

We will not examine whether, for example, current targets to reduce Green House Gas (GHG) emissions are sensible or make any assessment of the science of climate change. Our aim is to examine the evolution of policymaking with a particular focus on the government’s use of economic instruments for environmental policy.

2. The broad environmental record since 1997

2.1 Environmental taxes

Total receipts

Almost immediately on assuming office, the new Labour Government issued a ‘statement of intent’ to:

‘... explore the scope for using the tax system to deliver environmental objectives ... the Government will aim to reform the tax system to increase incentives to reduce environmental damage. That will shift the burden of tax from “goods” to “bads”; encourage innovation in meeting higher environmental standards; and deliver a more dynamic economy and a cleaner environment, to the benefit of everyone.’³

Interestingly, almost a decade later in a speech to the CBI in 2006, Shadow Chancellor George Osborne made a similar pledge:

‘We want to shift the tax burden away from income and investment and onto pollution. Pay as you burn, not pay as you earn.’⁴

The explicit statement of intent provides one way to assess the extent to which the Government ‘shifted the burden’ of taxation during its time in office. Figure 2.1 shows tax revenues from environmental taxes (in 2009 prices) since 1981, and revenues as a share of national income and total revenues.⁵ The dashed line highlights the start of Labour’s period in office.

³ HM Treasury (1997), *Environmental taxation: statement of intent*, http://www.hm-treasury.gov.uk/tax_environment_statement_of_intent.htm

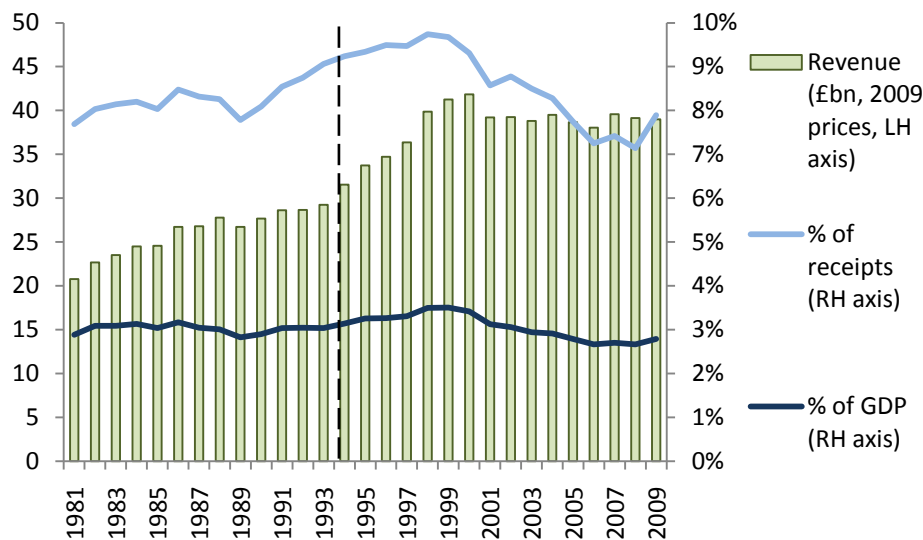
⁴ <http://www.cbi.org.uk/ndbs/press.nsf/0363c1f07c6ca12a8025671c00381cc7/1989b92d601d2d70802572330055fe09?OpenDocument>.

⁵ In this note, we define ‘environmental taxes’ as those used in the ONS *Environmental Accounts* publication (see http://www.statistics.gov.uk/downloads/theme_environment/EA-Feb10.pdf for the February 2010 version). In 2006 the ONS reviewed the set of taxes that should be classified as ‘environmental’ and proposed revisions to the Environmental Accounts series (Gazley, I. (2010), ‘UK environmental taxes: classification and recent trends’, *Economic Trends* 635), though as of the most recent figures these changes have not been implemented so we stick to the old classification. Our receipts data come from Financial Statistics which allows us to update the figures to a longer historical time series and

Broadly, revenues rose during the 1990s, beginning to increase markedly from around 1993 and peaking in real terms in 2000. Labour began their first term with large increases in receipts: real revenues rose from £36.4 billion in 1997 to £39.9 billion in 1998, a single year rise of almost 10%. In 1997, environmental taxes made up 3.3% of national income and 9.5% of total receipts. Both peaked in 1999, at 3.5% and 9.7% respectively, whilst real receipts peaked in 2000 at £41.8 billion.

Reflecting the fact that taxes and associated VAT on petrol and diesel account for the vast majority of taxes dubbed “environmental” (more than 76% in 2009, see table 2.1 below), this increase was almost entirely driven by the introduction of, and subsequent increases in, the fuel duty escalator from 1993 (see section 3.2). This policy was abandoned in the 1999 Pre-Budget Report, and since then environmental tax revenues have fallen in real terms, as a share of national income and as a share of all receipts. By 2009, real receipts were £39.0 billion, 6.8% below their 2000 peak. As a share of national income, receipts fell to 7.9% (having fallen as low as 7.1% in 2008) and as a share of national income to 2.8% (up marginally from a low of 2.7% in 2008). The 2008 figures represented the lowest share of total receipts and national income since 1980, with the increases in 2009 driven by falls in other receipts and in national income – as a result of the financial crisis and associated recession – rather than any increase in environmental revenues.

Figure 2.1: Environmental tax receipts, 1981–2009



Source: authors’ calculations from Financial Statistics and ONS data.

Composition of green tax revenues

Table 2.1 shows a breakdown of real-terms revenues (and their share of total environmental tax revenue) from each environmental tax in 1997 and at the end of each Parliament in 2001, 2005 and the most recent data for 2009.

Overall, the broad structure of green taxes has changed relatively little. Fuel duty (plus associated VAT) remains overwhelmingly the largest single environmental tax, accounting for about 79% of receipts in 1997 and 76% in 2009. There has been a drop in the importance of Vehicle Excise Duty (VED) in total receipts, from 16% in 1997 to 14% in 2009, but a substantial rise in receipts from Air Passenger Duty from 1.5% of the total to 4.6% over the period. Taxes on energy (which in the 2009

include the most recent estimates for 2009. GDP and GDP deflator estimates are from the ONS (series YBHA and YBGB respectively) including the most recent estimates for 2009. Total receipts data comes from ONS Blue Book (series GCSU).

data consisted only of the Climate Change Levy, a tax on the commercial use of energy) made up 2.3% of receipts in 1997 and 1.8% in 2009. Resource taxes (the Landfill Tax and Aggregates Levy) have become more important sources of revenue but are still small, making up 1.4% of receipts in 1997 and 2.9% in 2009.

The importance of taxes on petrol and cars to total environmental receipts is such that it is, arguably, misleading to talk about “environmental” taxes – there are essentially taxes on motoring and then a number of smaller additional taxes.

Table 2.1: Environmental tax revenues, selected years, 1997 to 2009

	1997		2001		2005		2009	
	£ bn	%	£ bn	%	£ bn	%	£ bn	%
Transport	35.04	96.3	38.01	97.0	36.67	94.8	37.17	95.4
Fuel Duty	24.33	66.9	27.07	69.1	25.80	66.7	25.89	66.4
VAT on Fuel Duty	4.26	11.7	4.74	12.1	4.52	11.7	3.88	10.0
VED	5.91	16.3	5.18	13.2	5.38	13.9	5.60	14.4
APD	0.54	1.5	1.03	2.6	0.99	2.5	1.78	4.6
Energy	0.84	2.3	0.57	1.5	0.85	2.2	0.69	1.8
Gas Levy	0.24	0.7	—	—	—	—	—	—
Fossil Fuel Levy	0.55	1.5	0.11	0.3	—	—	—	—
Climate Change Levy	—	—	0.41	1.1	0.83	2.2	0.69	1.8
Hydro Benefit	0.04	0.1	0.06	0.1	0.01	0.0	—	—
Resources	0.50	1.4	0.61	1.6	1.15	3.0	1.12	2.9
Aggregates Levy	—	—	—	—	0.36	0.9	0.29	0.7
Landfill Tax	0.50	1.4	0.61	1.6	0.79	2.0	0.83	2.1
Total	36.38	100.0	39.19	100.0	38.67	100.0	38.98	100.0

Notes: All revenues are in 2009 prices. Source: authors’ calculations from Financial Statistics and ONS data.

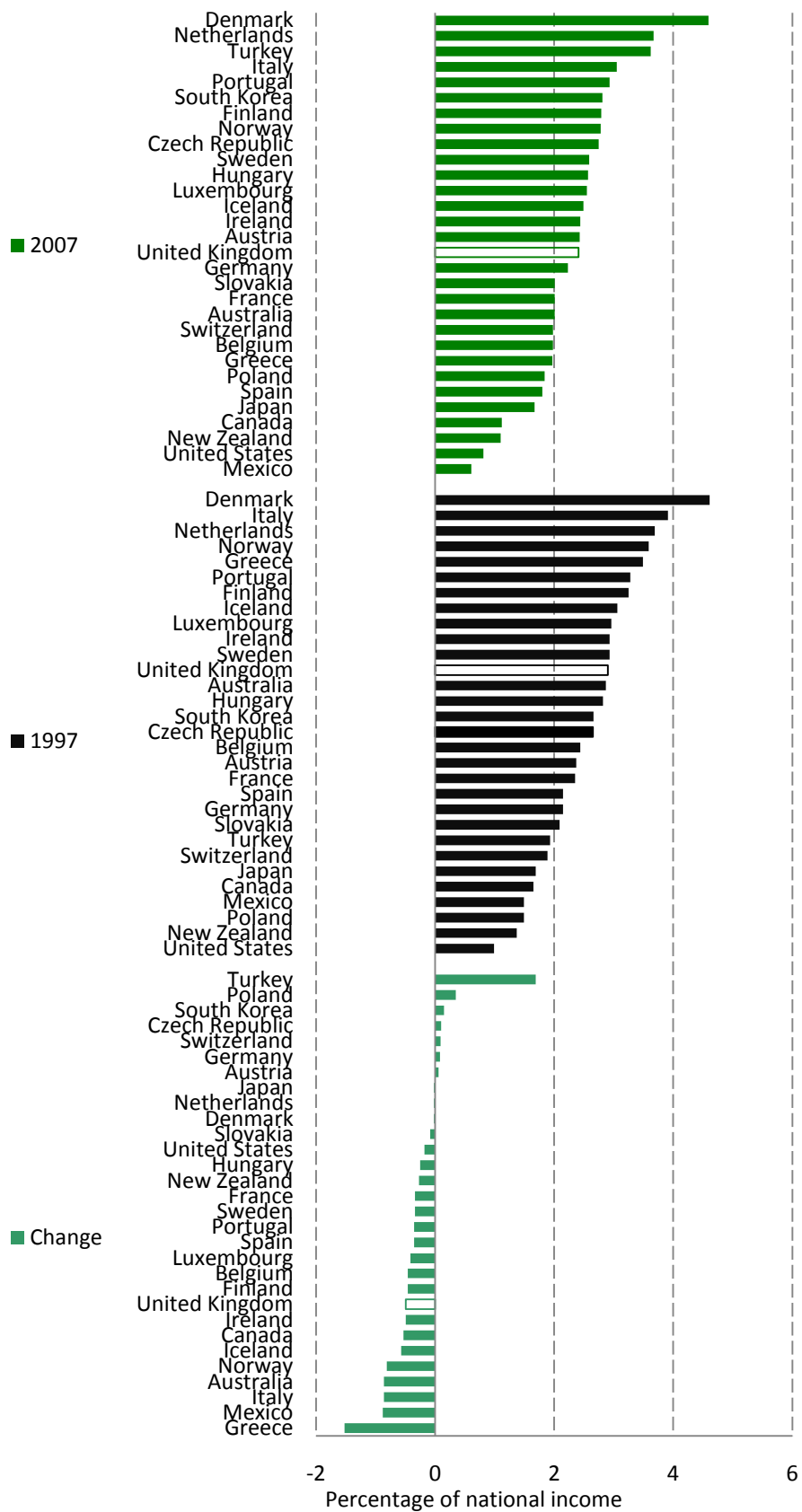
International comparisons

Figure 2.2 shows that the fall in environmental receipts relative to national income was not confined to the UK. OECD data for 30 countries reveals that as a (weighted) average, environmental tax receipts fell from 1.8% of national income in 1997 to 1.6% in 2007, compared with a larger relative fall in the UK from 2.9% to 2.4%.⁶ The UK fell from the 12th highest green tax share of national income in the OECD in 1997 to 16th highest in 2007. As a share of total receipts, the fall in the UK was sharper, from 8.5% to 6.7% over this period, but this is consistent with the international experience as the weighted OECD average fell from 7.5% to 6.6%. Indeed, the UK ranking amongst OECD countries rose from 13th to 12th highest.

Both by the standards of the position in 1997, and compared to other countries, it seems hard to conclude from evidence on receipts that there has been a significant ‘shifting of the burden’ of taxes towards green taxes during Labour’s three terms of office.

⁶ OECD definitions of green taxes are different to those used in Environmental Accounts which explains the difference between the two series. The trends are similar.

Figure 2.2: OECD environmental tax receipts, share of national income



Source: OECD (<http://www2.oecd.org/ecoinst/queries/index.htm>).

However, it is worth making some qualifications to this conclusion. In particular, the level of real receipts or their share of total receipts and national income may not be a good measure of how 'environmental' policymaking has been for a number of reasons:

- Some environmental measures, particularly regulation and the use of emissions trading systems, do not generate tax revenues;
- The tax system can be more precisely focused on environmental objectives without necessarily raising additional revenue. For example, the switch to graduated VED payments based on carbon dioxide (CO₂) emissions (see transport section) in 2001 provided sharper incentives for drivers to purchase cleaner cars than the old system based on engine size, but did not in itself raise much more revenue;
- The aim of environmental taxes is not just revenue-raising but also to change behaviour. The more successful they are at this second objective, the less revenue will be raised ('revenue erosion'). It is not really clear that this would explain much of the fall in the importance of environmental taxes in the UK, however. The most significant environmental taxes are on vehicle ownership and fuel, which (at least in the short run) probably have relatively low price elasticities of demand;
- To the extent that environmental taxes are seen as externality-correcting taxes, the tax rate should be set equal to the marginal external cost of the activity (driving, flying, landfill, etc.) at its socially optimal level. Setting tax rates above this might generate more revenue but would not be sensible environmental policymaking.

2.2 Environmental expenditures

Whilst the Government has not raised significant additional revenues from environmental taxes over its time in office, there has been an increase in the other side of the fiscal ledger: environmental public expenditure. As with taxes, the definition and classification of environmental expenditures is subject to debate. Here, we define 'environmental protection expenditure' as classified in the UN Classification of the Functions of Government (COFOG) definition.⁷

Environmental protection expenditures are divided into:

- Waste management;
- Waste water management;
- Pollution abatement;
- Protection of biodiversity and landscape;
- R&D in environmental protection;
- Other environmental protection spending.

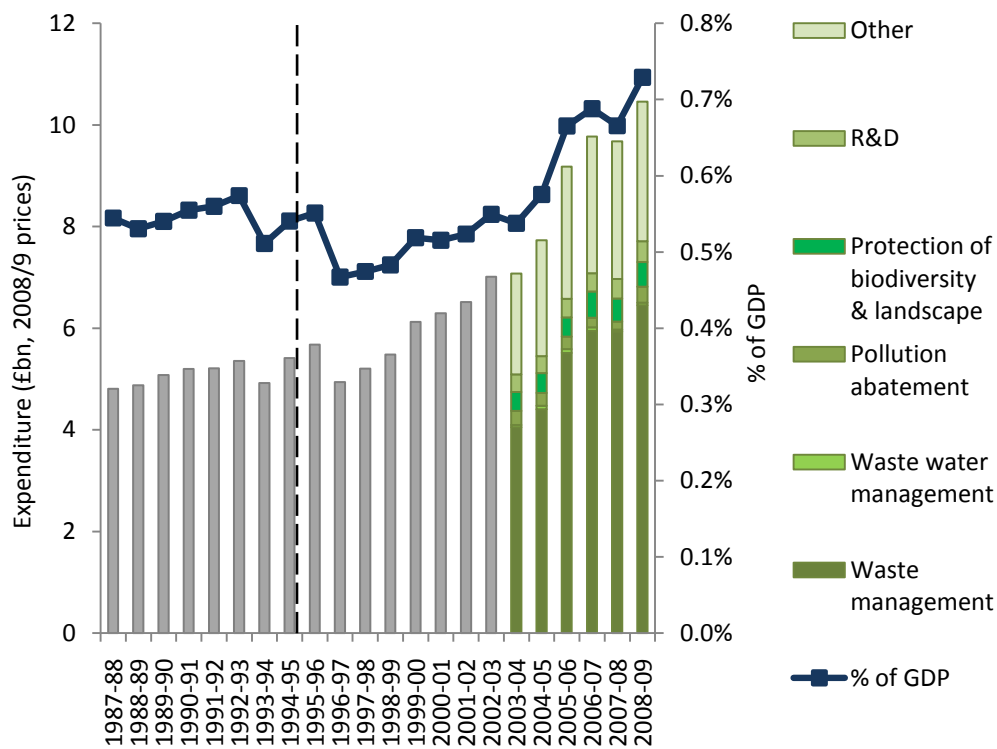
Figure 2.3 shows real-terms expenditure on environmental protection between 1987–88 and 2008–09. Nominal data are taken from the 2009 *Public Expenditure Statistical Analyses*⁸ and converted to 2008–09 values using GDP deflators from HM Treasury.⁹ From 2003–04, data are available for each of the sub-divisions; prior to this, only total expenditures are known.

⁷ See <http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=4> and http://www.hm-treasury.gov.uk/d/cofog_definitions_coins250609.xls for details of the definitions used.

⁸ See http://www.hm-treasury.gov.uk/pespub_pesa09.htm. Data prior to 2003–04 are taken from chapter 4 and are available to the nearest £100 million. Data from 2003–04 are taken from chapter 5 and include a breakdown to the sub-category level to the nearest £1 million.

⁹ See http://www.hm-treasury.gov.uk/data_gdp_fig.htm for latest data.

Figure 2.3: Real environmental protection expenditure, 1987–88 to 2008–09



Note: Nominal expenditure figures prior to 2003/4 are available only as totals to the nearest £100 million. Source: Public Expenditure Statistical Analyses 2009, authors' calculations.

Before 1996–97 there was no sustained real increase in environmental protection expenditure. Between 1996–97 and 2008–09, real-terms environmental protection expenditure more than doubled, from £4.9 billion to £10.5 billion. As a share of national income, this represented an increase from around 0.47% to 0.73% over the same period. There were large real increases over each of the three Parliaments since Labour came to office: around 27% between 1996–97 and 2000–01, 23% between 2000–01 and 2004–05, and 35% between 2004–05 and 2008–09, the latest year for which data are available.

Despite the large increase in real expenditures, environmental protection clearly makes up a small share of all Government spending. In 1996–97, total managed expenditure was around £315.9 billion of which environmental protection made up around 1.2%. By 2008–09, total managed expenditure was around £620.7 billion of which environmental protection made up 1.7%.

Figure 2.3 shows that over the period when a breakdown of spending has been available, waste management has accounted for the lion's share of the total, making up around 60% of the total spend. The data also include a breakdown between current and capital expenditure on environmental protection. Most spending is current – around two-thirds to three-quarters of the total in any given year – though there is some fluctuation over time. This still makes environmental protection more capital intensive than the average public service (in total, just 8-9% of total public service spending was capital spending in 2009–10¹⁰). Given that Treasury spending plans involve much deeper average cuts to investment than non-investment spending this may suggest environmental protection is set for a tough expenditure settlement going forward.

¹⁰ Calculation based on total managed expenditure less spending on debt interest payments and social security benefits. Figures from HM Treasury, Budget 2010: the economy and public finances – supplementary material, available at http://www.hm-treasury.gov.uk/d/budget2010_supplementary_material.pdf.pdf

2.3 Greenhouse gas emissions

Total emissions and emissions targets

Since 1997, the government has signed up to and set itself various different targets for emissions of CO₂ and other greenhouse gases (GHGs):

- Under the Kyoto Protocol, the UK agreed (as its part of an EU wide policy) to reduce its GHG emissions by 12.5% below 1990 levels measured over the period 2008–2012;
- In 1997, Labour set a domestic target for CO₂ emissions to fall by 20% by 2010 relative to 1990 levels;
- The 2008 Climate Change Act established a “Committee on Climate Change” which has been responsible for recommending ‘carbon budgets’, a series of rolling targets for GHG emissions to take the UK on a path to reduce emissions by 80% compared with 1990 levels by 2050. These carbon budgets are enshrined into law and are based on an EU agreement to reduce emissions by 20% relative to 1990 levels by 2020, rising to 30% in the event of a global deal on emissions. The first three carbon budgets commit to GHG reductions of 22% relative to 1990 levels in 2008–12, 28% in 2013–2017 and 34% in 2018–2022.¹¹

Figures 2.4(a) and (b) shows progress towards the immediate Kyoto and domestic targets, relative to a straight-line path to meeting the targets in 2010. The UK is comfortably set to meet its Kyoto target: GHG emissions fell below target as early as 1999 and have continued to fall since. Excluding net purchases of permits under the EU Emissions Trading System, UK GHG emissions in 2008 were 628.3 million tonnes of CO₂ equivalent (mtCO₂e), almost 8% below the Kyoto target level for 2008–2012.

The separate domestic target for CO₂ on the other hand seems unlikely to be reached. Excluding net purchases of ETS permits, CO₂ emissions in 2008 were 532.8 million tonnes, still 12% above the 2010 target level of 474.3 million. It is evident from figure 2.4b that the pace of CO₂ emission reductions has been much slower since the late 1990s than it was during the 1990s – with very different patterns according to emission source as explained below. The UK has seen markedly more reductions in non-CO₂ GHGs (such as methane, nitrous oxide etc. which have both halved relative to 1990 levels) than CO₂ emissions, which explains why the Kyoto target was met whilst the impending domestic target is unlikely to be. The rapid reductions in emissions of these other greenhouse gases are shown in table 2.2.

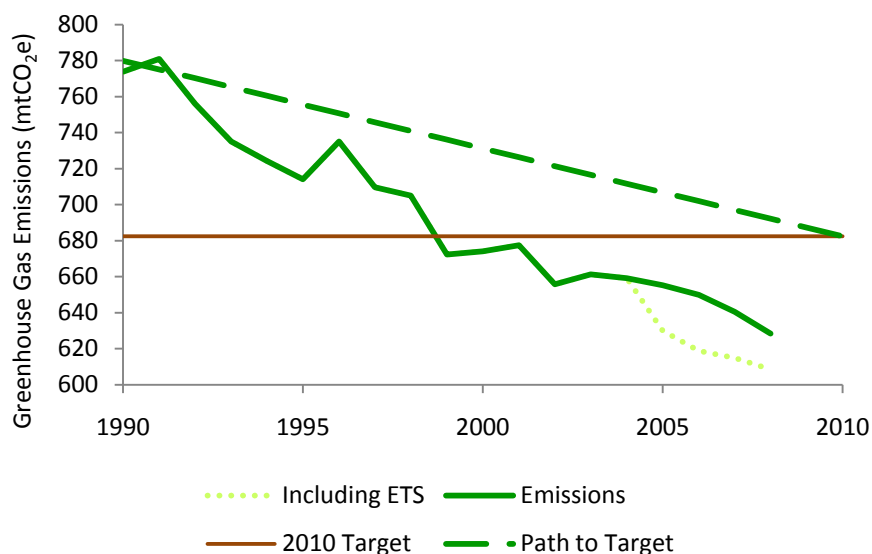
For all targets (including carbon budgets), net purchases of ETS permits are counted as progress towards them. UK firms buying ETS permits are in effect paying for emissions reductions carried out by firms in other countries, presumably more cheaply than the permit price and more cheaply than the UK firm was itself able to reduce emissions. Once these are included, by 2008 GHG emissions were 608.4mtCO₂e, almost 11% below target levels, and CO₂ emissions were 512.9 million tonnes, around 8% above target.

From a global perspective, including net ETS purchases in the emissions figures just means that some emissions reductions carried out abroad are counted as having been carried out in the UK. In 2008, 532.8 million tonnes of CO₂ were emitted in the UK but around 20 million tonnes of CO₂ emissions reductions were carried out in other EU countries, paid for by UK firms acquiring permits. To the extent that the aim of carbon policy is to reduce emissions at a global level, this inclusion of net ETS purchases in the UK total is sensible.

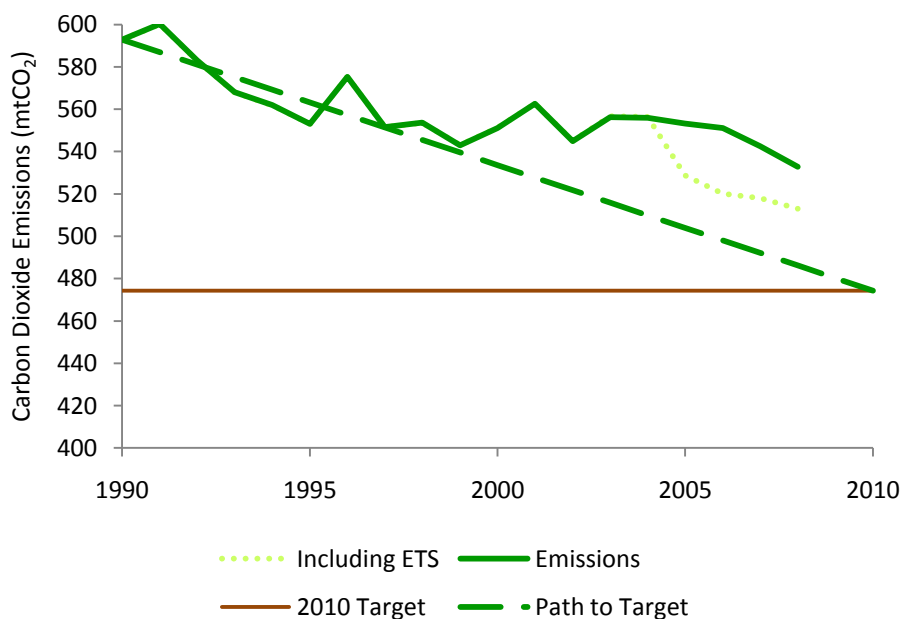
¹¹ See <http://www.theccc.org.uk/carbon-budgets>.

Figure 2.4: Progress towards immediate emissions targets, 1990 to 2010

(a) Kyoto target



(b) Domestic CO2 emissions target



Source: DECC

Table 2.2: Change in emissions of various GHGs, 1990 to 2008

Emissions	1997		2008		Change %
	Actual (mtCO ₂ e)	% of total	Actual (mtCO ₂ e)	% of total	
Net CO ₂	551.5	77.7%	532.8	84.8%	-3.4%
All other GHGs	158.7	22.3%	94.8	15.2%	-40.3%

<i>Total</i>	709.6	100.0%	628.3	100.0%	-11.4%
Annual average change	1990 to 2008		1990 to 1997		1997 to 2008
Net CO ₂	-0.6%		-1.0%		-0.3%
All other GHGs	-3.5%		-1.9%		-4.5%
<i>Total</i>	-1.2%		-1.2%		-1.1%

Source: Department for Energy and Climate Change, data available at

http://www.decc.gov.uk/en/content/cms/statistics/climate_change/gg_emissions/uk_emissions/2008_final/2008_final.aspx Note: Kyoto basket total differs slightly from sum of individual pollutants above as the basket uses a narrower definition for the Land Use, Land-Use Change and Forestry sector (LULUCF). This includes emissions from the UK, Crown Dependencies and UK Overseas Territories.

Emissions by source

Table 2.3 provides a breakdown of how reductions in greenhouse gases were achieved by different sources of emissions, and shows how emissions from each source changed on an annual basis between 1990 and 1997, and then between 1997 and 2007 (the most recent year for which data on emissions by source are available).

Table 2.3: Emissions by source

Emissions	1997		2007		Change % 1997 to 2007
	Actual (mtCO ₂ e)	% of total	Actual (mtCO ₂ e)	% of total	
Energy Supply	220.9	31.1%	225.1	35.4%	1.9%
Business	108.6	15.3%	96.8	15.2%	-10.9%
Transport	130.7	18.4%	136.7	21.5%	4.6%
Residential	87.6	12.3%	81.2	12.8%	-7.3%
Other	162.9	22.9%	96.4	15.2%	-40.8%
<i>Total</i>	710.7	100%	636.2	100%	-10.5%
Annual average change	1990 to 2007		1990 to 1997		1997 to 2007
Energy Supply	-1.1%		-3.0%		+0.2%
Business	-0.8%		-0.3%		-1.1%
Transport	+0.5%		+0.7%		+0.5%
Residential	0.0%		+1.0%		-0.8%
Other	-3.7%		-1.7%		-5.1%
<i>Total</i>	-1.2%		-1.2%		-1.1%

Source: Authors' own calculations from DEFRA data. Note: The total emissions in 1997 differ from those in Table 2.2. The definition used in this table includes net emissions from land use and forestry which are not included in Table 2.2, and because of revisions to the data between 2007 and 2008.

There has not been an across the board fall in GHG emissions since 1997. Emissions from energy supply and transport have risen, whilst those from the residential and particularly the business and "other" sectors (which include agriculture, the public sector, industrial processes and waste management) have fallen. This has led to a shift in the composition of emissions since 1997, with transport and energy supply together accounting for about 57% of emissions in 2007 compared with less than half in 1997.

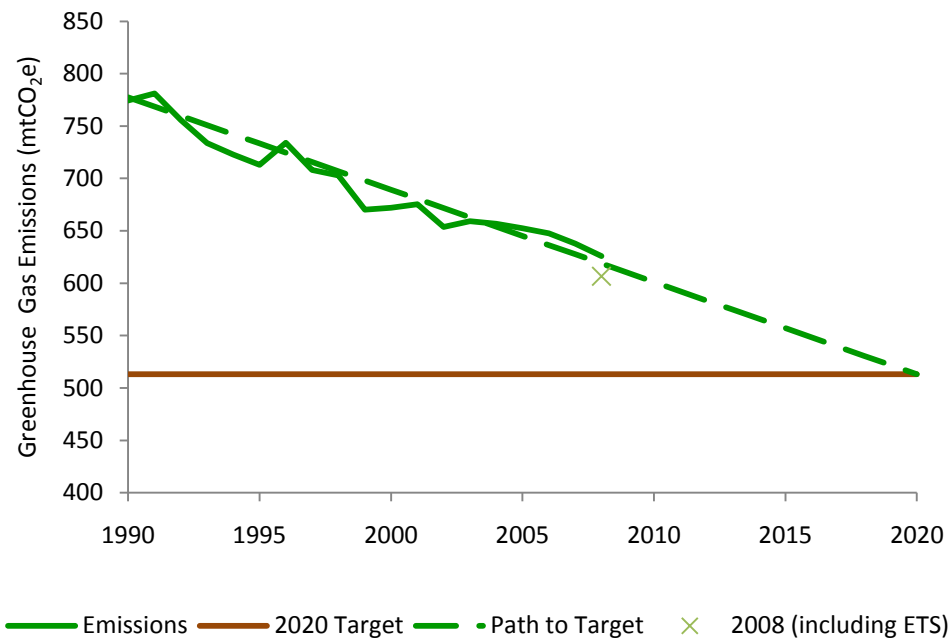
The lower half of Table 2.3 shows that overall emissions fell at a similar annual rate between 1997 and 2007 as they did between 1990 and 1997, but with a markedly different composition in how these reductions were achieved by source. Before 1997, there was a large annual average fall in emissions from energy supply which has not been repeated. This largely reflects the "dash-for-gas"

in electricity generation, which saw a substantial shift from coal-fired power to less polluting gas-fired power in the 1990s (see the energy section below). Emissions from other sources, by contrast, fell only marginally or rose over the 1990–97 period. Since 1997, there has been no further fall in emissions from energy supply – whilst the importance of gas-fired power has continued to grow, it has come largely at the expense of nuclear power rather than coal in more recent years. Emissions from the business and residential sectors have fallen more quickly since 1997, and emissions from transport have risen slightly more slowly than they did before 1997. Most markedly, however, has been the rapid annual fall in emissions from other sectors, averaging more than 5% a year between 1997 and 2007. Particularly striking within this category have been the annual fall in emissions from industrial processes (averaging 8.7% a year since 1997) and waste management (5.3%).

Progress towards carbon budget targets

Having examined the emissions record and how emissions reductions to date have been achieved, we can consider the medium-term objectives looking ahead to the third carbon budget target of reducing GHG emissions by 34% relative to 1990 levels by 2018–2022. Figure 2.5 suggests that the UK is currently on course to meet this target, assuming a straight-line path to 2020. By 2008, GHG emissions were around 1.2% above the straight-line trend from 1990 levels that would be needed to hit the target in 2020. At present, no data are available for years prior to 2008 on the impact of net purchases under the ETS for this target.¹² In 2008, these net purchases reduced emissions by around 19.3 million tonnes and meant that emissions were around 2% below the straight line target path.

Figure 2.5: Progress towards third UK carbon budget target



Source: DECC

The fact that the UK is currently on track to meet its medium term objectives, however, should not suggest that there will be no challenge in meeting the target going forward. As Tables 2.2 and 2.3 made clear, much of the reduction in GHG emissions since 1990 can be attributed to a one-off

¹² The carbon budget target applies to UK emissions only, whereas the Kyoto and domestic CO₂ targets include emissions in UK crown dependencies and overseas territories, so net ETS purchase figures are slightly different to those applying to the shorter-term targets.

“dash-for-gas” in the mid-1990s and a large fall in non-CO₂ GHG emissions since 1997. The largest sources of emissions are energy supply – where emissions rose between 1997 and 2007 despite a relatively large proportional increase in the share of renewable generation – and transport, where emissions have risen relentlessly since 1990 despite the presence of sizable transport taxes (and in the 1990s large, regular increases in fuel duty). It is highly unlikely that the UK can continue to depend on large cuts in non-CO₂ emissions from agriculture and waste management to be on track to meet its targets in future. In particular, reducing energy supply emissions is likely to require large, expensive investments in renewables, and more so if there is no agreement on reversing the recent decline in nuclear generation. Halting the long-term rise in transport emissions will also require some potentially painful policy decisions. At present the government estimates that its various energy policies (including energy efficiency measures which should reduce costs) will add around 8% to household electricity bills relative to 2009 by 2020¹³.

Measuring emissions

There is some controversy over how emissions are measured which also affects the baseline against which targets are set. Figures on emissions from international aviation and shipping are excluded as it is hard to measure how they should be attributed to individual countries, but evidence based on refuelling at UK bunkers¹⁴ suggests these sources of emissions have become significantly more important in recent years. Table 2.4 shows bunker GHG emissions in various years – total emissions have more than doubled since 1990 and, if included in the UK’s national totals, would have accounted for just over 6% of emissions in 2008 compared to 4% in 1997.

Table 2.4: Estimated emissions from international aviation and shipping

	1990	1997	2001	2005	2008
International Aviation (mtCO ₂ e)	15.8	22.8	29.7	35.5	34.4
International Shipping (mtCO ₂ e)	6.7	8.3	6.5	5.8	7.5
Total	22.5	31.1	36.1	41.2	42.0
Percentage of total	2.8%	4.2%	5.1%	5.9%	6.3%

Source: DECC

Importantly, national emissions accounts are “production-based” measure of greenhouse gas emissions which only reflects for emissions generated by activities carried out within the UK. Arguably, a better measure of the UK’s environmental impact would include the carbon content of goods manufactured abroad and imported here for domestic consumption. If the UK ceases to manufacture a particular product and instead imports it from another country, with potentially less strict environmental standards, for domestic consumption instead this would not imply that the UK’s impact on global GHG emissions has fallen. For example, one estimate of a consumption based measure of UK emissions constructed by Helm *et al.* (2007) shows an increase of 19% between 1990 and 2003.¹⁵

International comparisons

Figure 2.7 shows CO₂ emissions for G7 countries between 1990 and 2006 (the latest year for which data are available), indexed to 100 in 1997. These data use a slightly different definition of

¹³ *The U.K Renewable Energy Strategy*, available at: http://www.decc.gov.uk/Media/viewfile.ashx?FilePath=What%20we%20do\UK%20energy%20supply\Energy%20mix\Renewable%20energy\Renewable%20Energy%20Strategy\1_20090717120647_e_@@_TheUKRenewableEnergyStrategy2009.pdf&filetype=4

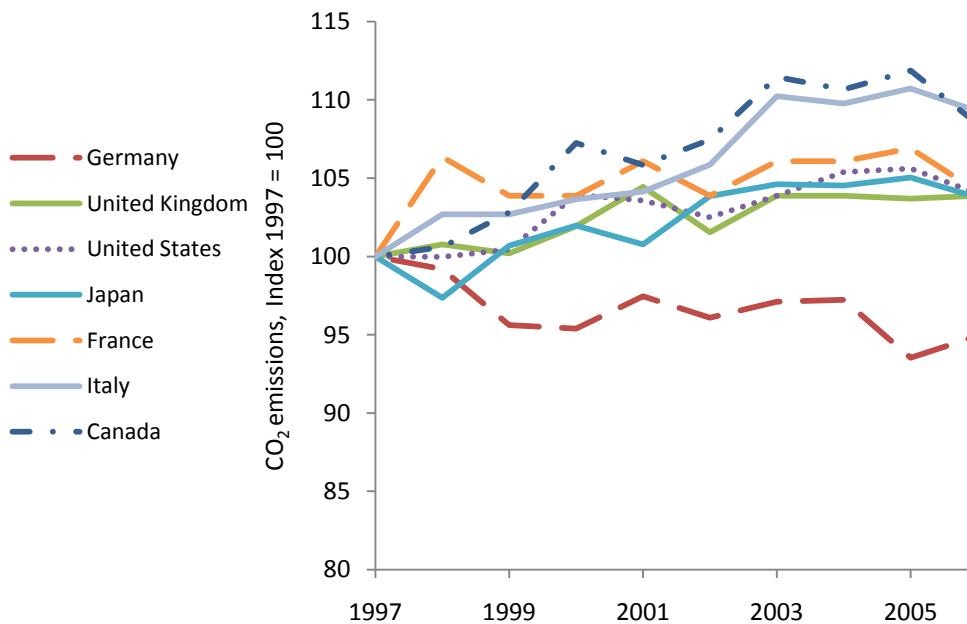
¹⁴ Fuel stores at airports and ports

¹⁵ Helm, D., R. Smale and J. Phillips (2007), *Too Good to be True: The UK’s Climate Change Record* (http://www.dieterhelm.co.uk/sites/default/files/Carbon_record_2007.pdf).

emissions to those used by DECC to judge progress towards its emissions targets, and cover a shorter time period, but allow us to make consistent comparisons across countries.¹⁶ These data show a rise of 3.9% in UK CO₂ emissions between 1997 and 2009, compared with a 0.1% fall in emissions based on DECC data over the same period.

Amongst G7 countries on this definition, the UK saw the third smallest rise in CO₂ emissions over this period, marginally behind Japan and marginally ahead of the US and France. Germany was the only one of the G7 to see a fall in CO₂ emissions over this period. The increase in the UK was just larger than the (weighted) G7 average increase of 3.6%. Looking more widely, the OECD average rise was 6.0% and the global average was 23.4%. This large increase in global emissions reflects outcomes in China (which saw an increase of 80.8% over the period) and India (43.7%), but from much lower per-capita bases.

Figure 2.7: G7 CO₂ Emissions, 1997 to 2006 (1997 = 100)



Source: OECD Factbook 2007: Economic, Environmental and Social Statistics.

3. Policy developments since 1997

3.1 Energy

The government has a legally-binding target under the European Renewable Energy Directive that 15% of all energy (including transport fuels) be supplied from renewable sources by 2020. In order to achieve this, the government has set itself a goal as part of its ‘Renewable Energy Strategy’ to generate 30% of electricity from renewable sources by this date.¹⁷

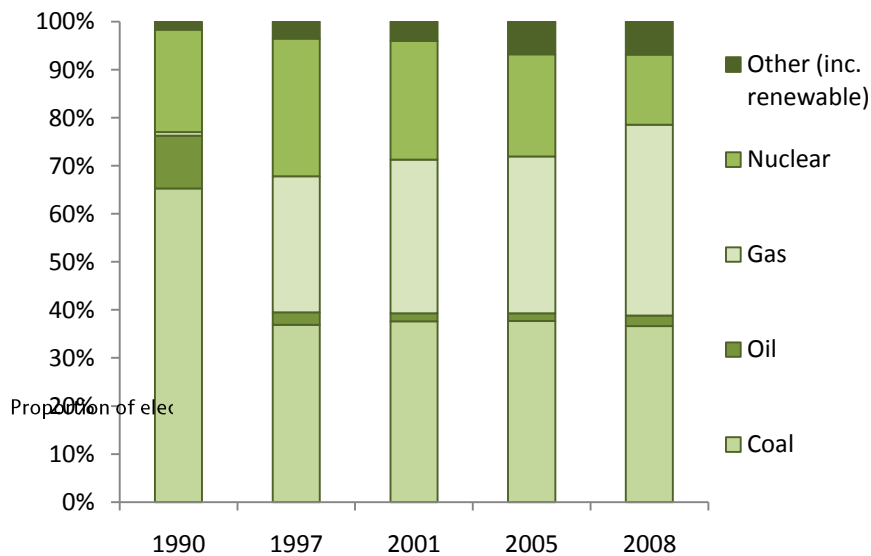
¹⁶ In particular, OECD figures are based on International Energy Agency (IEA) estimates. Discussion of the differences between IEA figures and the UNFCCC measure used by national governments for measuring compliance with Kyoto targets can be found in chapter 2 of <http://www.iea.org/co2highlights/co2highlights.pdf>.

¹⁷ The U.K Energy Renewable Strategy, July 2009, available at http://www.decc.gov.uk/Media/viewfile.ashx?FilePath=What%20we%20do\UK%20energy%20supply\Energy%20mix\Renewable%20Energy\Renewable%20Energy%20Strategy\1_20090717120647_e_@@_TheUKRenewableEnergyStrategy2009.pdf&filetype=4

As Figure 3.1 shows, the government has had some success in this area. The proportion of electricity generated from renewables has risen from around 3.6% to 6.8% of the total between 1997 and 2008.¹⁸ Over this period, the coal share has been constant at around 37–38%, but the share from gas has increased from 28% to 40%. Nuclear power has declined significantly, from 29% to 15%.

Even more striking has been the longer term change in the composition of electricity generation compared with 1990, the graph quite clearly illustrates the impact of the “dash for gas”. Between 1990 and 1997, the gas share of generation rose from 0.7% to 28% while the coal share fell from 65% to 37%. This was accompanied by a substantial decline in emissions from energy supply (see Table 2.4 above). Whilst the gas share has continued to rise since 1997 it has largely been at the expense of nuclear power, which means the benefits in terms of emissions has not been felt.

Figure 3.1: Fuel used in electricity generation, selected years

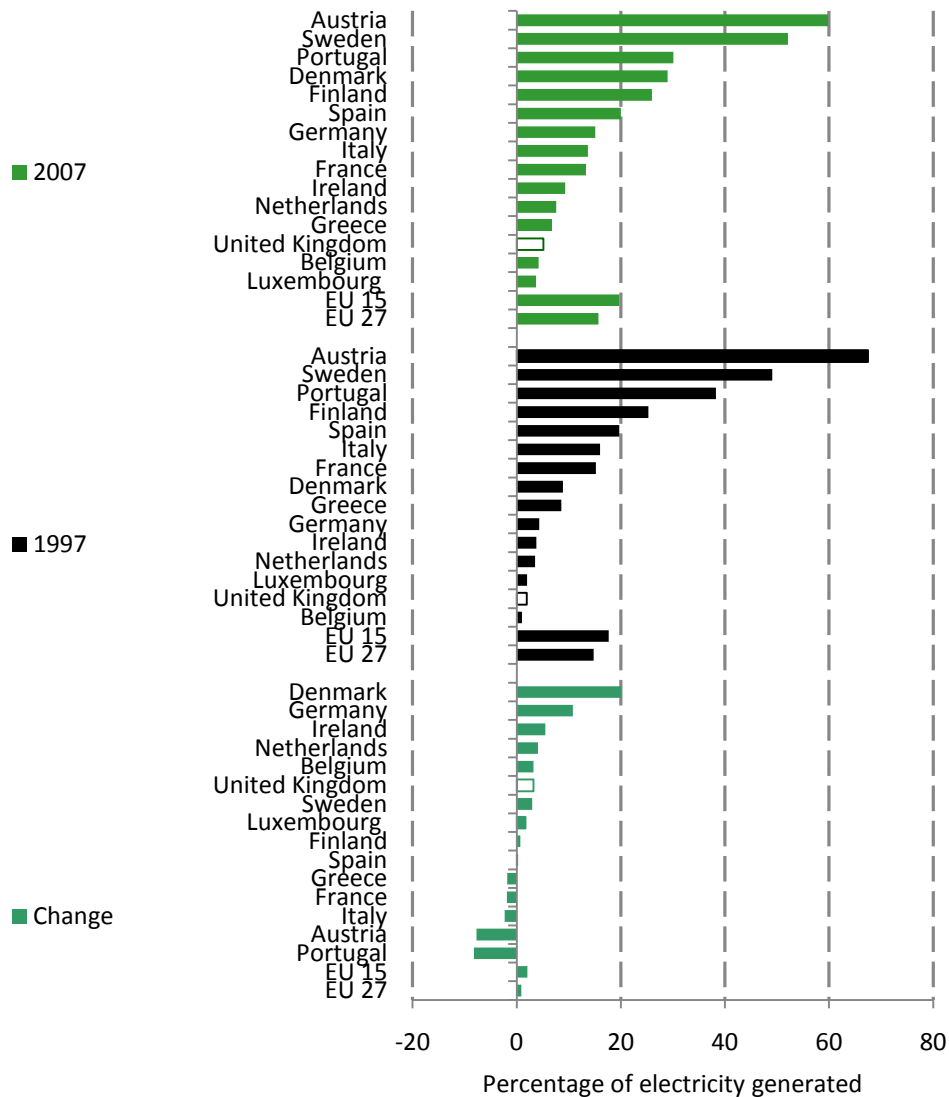


Source: DUKES long-term trends

Eurostat figures (see figure 3.2) suggest that the UK has seen a slight improvement in its position relative to other EU countries in terms of the renewable share of generation since 1997, rising from second- to third-lowest amongst the EU-15, and the percentage point increase in the renewable share between 1997 and 2007 was higher in the UK than the EU-15 average (though from a lower base). However, the UK still remains substantially below the unweighted EU average share for renewables.

¹⁸ Data from DUKES long-term trends of fuel input for electricity generation (see <http://www.decc.gov.uk/en/content/cms/statistics/source/electricity/electricity.aspx>, table 5.1.1). Note that this figure for renewables is “other” sources on this table which may include some small non-renewable sources. Data from Energy Trends Table 5.1 from the same source suggests that the renewable s share of UK generated electricity (i.e. excluding net imports) rose from 2.0% in 1998 to 6.3% in 2009. Earlier figures are not available on this definition.

Figure 3.2: Proportion of electricity generated from renewable sources in EU-15 countries, 1997 to 2007



Source: Eurostat

Labour has introduced a number of policies in order to meet its renewable targets, including: the Climate Change Levy (CCL); the Renewables Obligation (RO) for firms; and a series of energy efficiency programmes. We now go through each of these in turn.

Climate Change Levy

The CCL was introduced in April 2001. The CCL is a tax on non-renewable energy levied on businesses. Beyond excluding renewables the charge on electricity does not depend on how the energy was generated. This means that coal, gas, and nuclear power are taxed at the same rate, despite the fact that the carbon emissions associated with these different sources of energy production are very different (see section 4). Firms can reduce their liability for the CCL by making a Climate Change Agreement (CCA). This is a commitment to cut their carbon emissions to specified level in exchange for receiving a 65% discount on the CCL (reduced from 80% in the 2009 Pre-Budget Report).

Renewables Obligation

To meet its targets on renewable energy, the government has introduced a range of measures including the RO. This requires energy companies to source a certain percentage of their energy from accredited suppliers of renewables each year. When it was introduced in April 2002 the obligation was for 3.0% of electricity in England and Wales (there are separate targets for Scotland and Northern Ireland) to be supplied from renewable sources. By 2010-11, this target had risen to 11.1%.

As part of the RO, firms are required to provide a certain number of renewable obligation certificates (ROCs) for each MWh they supply. If they fall short, they must purchase “buyouts” at a fixed price to make up the shortfall. This in effect caps the increase in costs per MWh for the firm. If renewable energy proves to be more expensive than the buyout price then the firm can just purchase buyouts instead of providing Ofgem with ROCs.

EU Emissions Trading System

An EU-wide emissions trading system (the EU ETS) was introduced in 2005. Phase I of the EU ETS ran from 1 January 2005 to 31 December 2007. Phase II started on 1 January 2008 and will end on 31 December 2012. The third phase will operate from 2013 to 2020.

The Phase I cap was seen as too lenient resulting in a very low price for traded carbon. As a result, the Phase II allocations to EU member states have been tightened. In Phase II the scope of the scheme will also be widened (for instance to include aviation from 2012).

National governments have some freedom in deciding how their allocations should be allocated across firms. The Labour government has made a number of changes to the way permits are allocated for Phase II. In Phase I, allocations were made according to historic emissions, whereas now power stations will receive a benchmark allocation based on input fuels and load factors. The net result of this change would be to give fewer permits to stations with more carbon intensive inputs such as coal. The government chose not to auction any permits in Phase I, but has begun auctioning permits in the second phase and plans to auction 7% of total permits during Phase II.¹⁹ The EU cap on the proportion of permits which member states are allowed to auction was 5% under Phase I and is now 10% under Phase II.

The UK has generally been a net purchaser of ETS allowances from other countries.

Energy efficiency measures

The government has a number of policies to encourage household energy efficiency. These include Warm Front, the Carbon Emissions Reduction Target (CERT) and the Community Energy Savings Programme (CESP).

Warm Front was launched in June 2000. It provides those receiving certain benefits with grants of up to £3,500 (or £6,000 if they require oil central heating) to purchase insulation for walls and boilers, timer controls, thermostats, low energy light bulbs etc.

The carbon emissions reduction target (CERT) was introduced in April 2008. It requires energy suppliers to subsidise energy efficiency measures (such as insulation etc.) among households. They are not restricted to helping their own customers. Certain types of innovation, for example trialling a new technology, can also count towards their target. At least 40% of the supplier’s reductions must come from assistance given to a “Priority Group” of customers. The Priority Group is made up of poorer households, the elderly and households which are “hard to treat” – for instance those with solid walls.

¹⁹ Details of ETS auctions in the UK are at <http://www.dmo.gov.uk/index.aspx?page=ETS/AuctionInfo>.

The Community Energy Saving Programme (CESP) came into effect in 2009. The energy efficiency improvements under CESP are supposed to be achieved among households in 4,500 deprived areas who are considered harder to reach. Otherwise it is very similar to CERT.

These schemes are typical of government policy towards domestic energy which have relied on measures to encourage efficiency rather than, as in the business sector, trying to establish a price for energy use that includes some formal charge for environmental costs (such as the CCL or emissions trading). There may well be good economic reasons for the government to intervene in the energy efficiency market: market failures such as credit constraints, imperfect information and principal-agent issues where landlords may not invest in energy efficiency measures on behalf of tenants would lead to inefficiently low levels of energy efficiency installation in a purely private market.

Further, given the existence of fuel poverty targets, it may be that the government is mindful of policies that would directly raise the price of energy such as a carbon tax that applied to households. However, it may be possible to use revenues from such a tax to compensate poor and vulnerable households such that on average they are no worse off but face the correct price for their energy use. One possible objection to this approach is that there is considerable variation in energy use even within households with similar income levels. It may therefore be very difficult to compensate fully all low-income losers from higher energy prices using the wider benefits system.²⁰

3.2 Transport

By far the biggest “environmental” tax is that on petrol and diesel. Such fuel duties are higher than their 1997 level, despite a long period of from 2000 to 2007 when there was little or no adjustment even for inflation. But these duties remain below their real rate in 2000. Despite some promising noises no progress has been made towards any national system of road pricing either to replace or complement fuel duties.

VED is the second biggest of the environmental taxes. It has been restructured to penalise those with less fuel efficient cars, but its average level has actually dropped quite substantially – so while it may play more of a role in creating a disincentive to drive a big car, it plays less of a role than it did in adding to the cost of car ownership in general.

Table 3.1 shows the main rates of environmental transport taxes as they were in April 1997, just before Labour came to power, and as they are in April 2010. It also shows the April 1997 rates in April 2010 prices (uprated using the all-items RPI between the two months).²¹

Table 3.1: Transport taxes, April 1997 and April 2010

		April 1997	April 1997 (April 2010 prices)	April 2010	Real change (%)
Fuel Duty	Petrol/Diesel ^a (p/litre)	36.86	51.72	57.19	+10.6%
Vehicle	Private car	145	203.45	Varies by CO ₂	-38.6%

²⁰ See for example, Dresner, S. and P. Ekins (2006), ‘Economic instruments to improve UK home energy efficiency without negative social impacts’, *Fiscal Studies*, 27 (1), 47-74.

²¹ All-items RPI data is available up to February 2010; we assume the inflation rate remains unchanged between February and April.

Excise Duty	(£/year)	(all cars)		emissions:	(average
				£0-£435 (standard); £0-£950 (1st year) ^b	emissions); +113.8% (255+g CO ₂ /km) ^c
Air Passenger Duty	UK/EU flight, standard class	£5	£7.02	£11 ^d	+56.7%
	UK/EU flight, higher class	£5	£7.02	£22 ^d	+213.4%
	Non-EU flight, standard class	£10	£14.03	£45 ^e	+220.7%
	Non-EU flight, higher class	£10	£14.03	£90 ^e	+541.5%

^a Rates shown apply to most commonly purchased petrol/diesel product in each period.

^b Rates apply for cars registered after 22 March 2006. Cars registered before then but since 1 March 2001 pay a maximum of £245/year (£550/year in first year). Cars registered before 1 March 2001 pay £125/year if their engine size is less than 1,550cc and £205 if over.

^c Average emissions refer to a new car purchased in 2010 with emissions of 149.5g CO₂/km (average in 2009), which would be band F (£125).

^d Rates shown are for flights between 0 and 2,000 miles from London which includes all EU/EEA countries but also some North African destinations.

^e Rates shown are for flights between 2,000 and 4,000 miles from London, which includes flights to the US. Higher rates apply for destinations further from London, see http://www.hm-treasury.gov.uk/d/budget2010_pressnotice2.pdf page 31 for details.

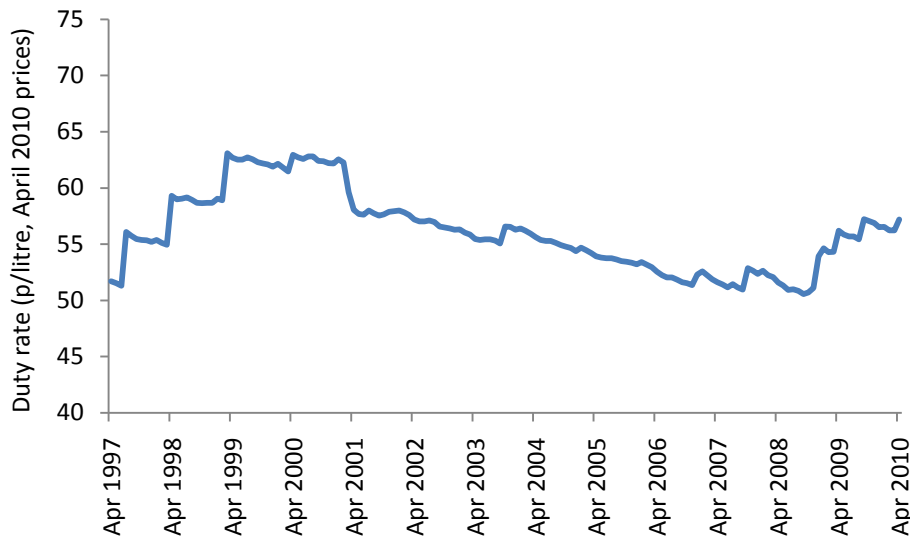
Fuel duty

As section 2 made clear, fuel duty is by far the largest environmental tax in terms of the revenue generated and so trends in fuel duty substantially drive trends in total environmental tax receipts. Figure 3.3 shows the real-terms (April 2010 prices) rate of duty charged on a litre of the most commonly purchased unleaded petrol in each month since April 1997.

In 1997, Labour inherited a “fuel duty escalator” from the Conservatives, which had first been introduced in the Spring 1993 Budget by then Chancellor Norman Lamont. This was a policy to increase the rate of fuel taxes above inflation each year as a matter of course. Initially, the escalator rate was 3%, though when Labour came to power the rate was 5%. In his first Budget as Chancellor, Gordon Brown increased the rate to 6%.²² This policy then remained in place until the Pre-Budget Report of 1999 when the escalator was abandoned (the policy was not, as is sometimes misremembered, abandoned as a result of the fuel price protests which took place in Autumn 2000, almost a year later). The escalator policy is clearly visible in the first two years of Labour’s period in office, and saw real-terms duties rise significantly, from the 51.7p/litre or so inherited to a peak of around 63.1p/litre in March 1999.

²² Labour’s “emergency budget” just after coming to power was held in July 1997, which also meant the increase in duty under the escalator which had previously occurred following November Budgets took place in July. With the move to annual Budgets and PBRs following this, the annual Budget statement then moved to around March time. This meant that fuel duties increased by RPI+5% in November 1996, RPI+6% in July 1997 and RPI+6% again in March 1998.

Figure 3.3: Real duty, litre of unleaded petrol, April 1997 to April 2010



Note: figure includes 1p rise in duty for April 2010 as announced in Budget 2010. Figures are deflated using all-items RPI figures each month, assuming the RPI inflation rate remains at its February 2010 rate of 3.7% in March and April 2010. Source: DECC Energy Price Statistics, authors' calculations.

Between 2000 and 2008, there were no real-terms increases in the main rates of fuel duty on petrol or diesel. Indeed, even the normal inflation uprating was often postponed and then cancelled altogether. Over this period, real duties therefore declined substantially, falling as low as 51.0p/litre in September 2007, slightly below the real rate inherited in April 1997.

It was not until Budget 2008 – Alistair Darling's first – that further plans for real-terms increases in fuel duty were announced. Budget 2009, almost a decade after the original escalator policy was abandoned, announced a resumption of year-on-year real increases in duty, with an escalator policy of one penny above inflation to be implemented in each year up to 2013, and Budget 2010 announced this policy was to be extended to 2014. Real duty rates have risen fairly substantially from their trough in Autumn 2007, and their April 2010 level of 57.19p/litre is around 11% higher than the level inherited in April 1997. It is worth noting, however, that at the same time as announcing an additional year of the escalator policy in Budget 2010, the Government revealed plans to stage the increase that was scheduled for April 2010, originally to be 2.76p/litre, into three smaller, staggered components up to January 2011 which calls into question the commitment to certain, regular real-terms increases going forwards.

VAT is additionally charged on top of the duty, effectively raising the duty rate by 17.5%. In February 2010, the last month for which figures are available, the average pump price of a litre of unleaded was estimated to be 111.9p, compared with an inflation-adjusted 83.1p in April 1997.²³ Including VAT, taxes made up around 77% of the pump price in April 1997 and 65% in February 2010, reflecting the substantial increases in pre-tax prices over the period. At the peak of the original escalator policy in March 1999, taxes (duty and VAT) made up around 86% of the price of a litre of petrol. This figure fell as low as 57% in July 2008, when oil prices were at their peak, lower than in any month for when data are available from January 1990.

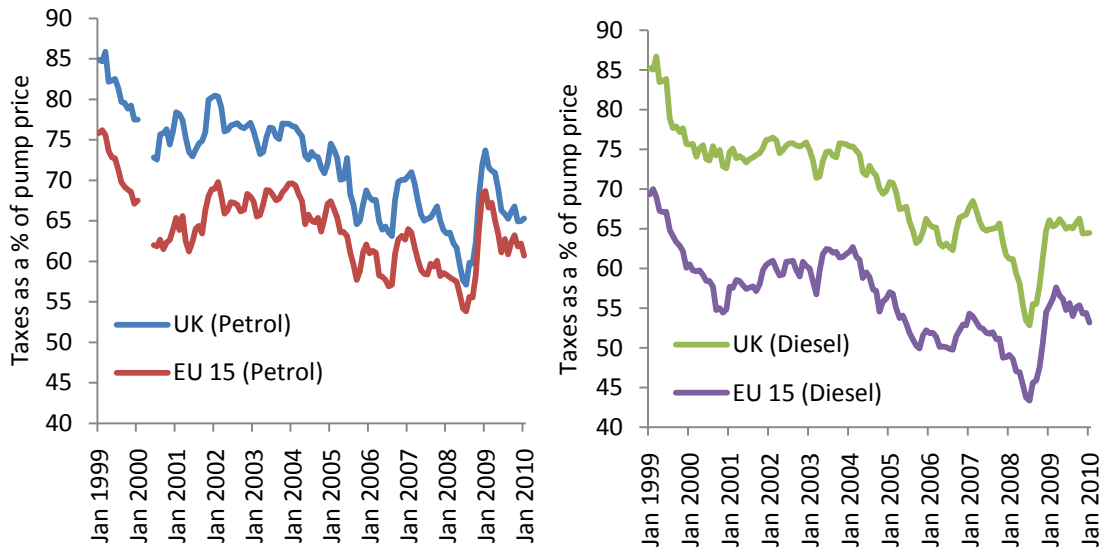
One key impact of fuel duty is to encourage the purchase of more fuel-efficient cars. Using data from the DfT on the total distance driven, an estimate of the average fuel duty paid per kilometre can be

²³ Data from DECC (<http://www.decc.gov.uk/en/content/cms/statistics/source/prices/prices.aspx>), inflation adjustment to February 2010 prices is authors' calculation.

made. This gives a figure of 5.4p/km in 1997 and 4.9p/km in 2008 (peaking at 6.2p/km in 2000) suggesting that a greater proportion of vehicle km were driven by fuel efficient vehicles.²⁴

How has the UK's approach to fuel taxation changed compared with other countries' during Labour's time in office? Figure 3.4 compares the total tax share of the pump price of a litre of unleaded petrol and diesel in the UK with the (unweighted) EU-15 average share between January 1999 and January 2010, the period over which data are available.²⁵

Figure 3.4: Taxes (duty and VAT) as a share of pump price, UK and EU-15



Source: DECC, authors' calculations.

Taxes in the UK make up a larger share of the pump price than the average across other EU countries. The gap has narrowed over time, particularly for petrol (from around 9 percentage points in January 1999 to 4.6 percentage points in January 2010). For diesel, the gap fell from 15.9 to 11.3 percentage points, but the UK remains the only EU-15 country to tax diesel at the same rate as petrol and so has had the highest tax share in the EU-15 over the whole period. For petrol, the UK had the highest share routinely until around 2003 but has not had the highest share since June 2009.

To what extent is the current rate of fuel duty in the UK justified by the various external costs associated with motoring? Fullerton *et al.* (2008) concluded that duty rates could probably be justified but would be at the high end of estimates of the externalities.²⁶ By far the largest single externality associated with motoring is congestion – Sansom *et al.* (2001) suggest that congestion makes up around $\frac{3}{4}$ of the total marginal externality.²⁷ However, congestion costs vary substantially according to both time and location: they are highest in urban areas during rush hour but virtually zero in some other areas. Since fuel duty is applied at a constant rate for each litre

²⁴ Note that distance data is for Great Britain and receipts data for the UK, though it is unlikely that this makes a substantial difference to the trends.

²⁵ Data come from DECC (<http://www.decc.gov.uk/en/content/cms/statistics/source/prices/prices.aspx>). Note data are missing for four months in 2000 for the petrol series. We focus on the tax share rather than the level to avoid having to convert taxes to a common currency which may lead to currency market fluctuations driving changes as well as tax changes. Note, though, the general downward trend in the tax share over the period represents increases in the pre-tax cost of vehicle fuel rather than falls in the tax amounts in the UK or other countries. Excluding taxes, the pre-tax fuel price tends to be quite similar across EU-15 countries.

²⁶ Fullerton, D. *et al.* (2008), *Environmental Taxes* (<http://www.ifs.org.uk/mirrleesreview/reports/environment.pdf>)

²⁷ Sansom, T. *et al.* (2001), *Surface Transport Costs and Charges – Great Britain 1998*, Leeds: Institute for Transport Studies

consumed irrespective of where and when it is used, it represents a very blunt instrument to tackle congestion costs.

An alternative approach would be to introduce a system of national congestion charging, varying the price according to time and location, and reducing fuel duty commensurately. Such a system would largely benefit rural motorists. Congestion charging was strongly supported by the 2006 Eddington Review.²⁸ The Government has considered road pricing for commercial vehicles in the past: in Budget 2002, Gordon Brown announced the intention to introduce in 2005 or 2006 a Lorry Road User Charge (LRUC) that would be payable by all commercial lorries using UK roads. In July 2005, however, then Transport Secretary Alistair Darling announced the abandonment of the scheme in the House of Commons, suggesting that the intention was to develop a national system for all vehicles:

“We are now taking forward work on a national system of road pricing, so it is right for us to take forward the plans for distance-based lorry charging as part of the wider work on national road pricing – to develop a single, comprehensive, cost-effective system.”²⁹

Almost five years later, no proposal for such a national scheme has been made by the Government.

Renewable Transport Fuel Obligation

The Renewable Transport Fuel Obligation (RTFO) was introduced from April 2008, and operates in a similar way to the RO. It requires transport fuel suppliers to supply a percentage of their fuel from sustainable renewable resources (largely bioethanol and biodiesel which can be blended with standard petrol and diesel). For 2010–11, the target is 3.5%, and is set to increase gradually to 5% in 2013–14.

Vehicle Excise Duty

VED is an annual tax levied on vehicle ownership.³⁰ When Labour came to power, the duty for private cars was a flat-rate of £145 for a full year. This system has been substantially reformed in recent years. The key reforms were:

- In June 1999, a two-tier rate was introduced according to the vehicle engine size;
- From March 2001, the ‘graduated’ VED (GVED) system was introduced which made payments contingent on the per-kilometre CO₂ emissions of the vehicle. From April 2010, there are 13 bands (for cars registered since 23 March 2006) with rates varying between £0 and £435;
- From April 2010, a first-year rate applies to new cars in their first year of registration. The rate varies from £0 to £950.

The substantial ‘greening’ of the VED system has not been accompanied by higher real revenues despite a large increase in the number of licensed vehicles from 26.97 million in 1997 to 34.21 million in 2008.³¹ Someone purchasing a new car in April 1997 at the average CO₂ emissions of new cars in that year (see below) would have paid the flat rate £145 (equivalent to about £203 in April 2010 prices) whereas someone purchasing a new car in April 2009 at the average CO₂ emissions in that year would have paid £125 (equivalent to about £130 in April 2010 prices). Another

²⁸Eddington, 2006, The Eddington Transport Study, Department for Transport, <http://www.dft.gov.uk/about/strategy/transportstrategy/eddingtontstudy/>

²⁹ <http://www.publications.parliament.uk/pa/cm200506/cmhansrd/vo050705/debtext/50705-06.htm>

³⁰ For full details of the current rates, see http://www.direct.gov.uk/en/Motoring/OwningAVehicle/HowToTaxYourVehicle/DG_10012524.

³¹ Source: Department for Transport Vehicle Licensing Statistics, 2008 (<http://www.dft.gov.uk/excel/173025/221412/221552/228038/458107/datatables2008.xls>).

comparison shows that the average VED payment per licensed vehicle fell from £219 in 1997 (at 2009 prices) to £165 in 2008.

The reformed VED encourages households to purchase less polluting cars by tying the tax rate explicitly to emissions. It may also encourage manufacturers to produce more efficient (i.e. lower emissions) vehicles. Data from the Society of Motor Manufacturers and Traders (SMMT) shows that the average emissions of new cars has fallen steadily in recent years.³² In 1997, new cars emitted 189.8g CO₂/km on average, compared to 149.5g CO₂/km in 2009, a fall of more than 21%. It is not clear what the direct contribution of reforms to VED has been to this trend since a considerable number of other factors, including rising fuel prices and changes in vehicle manufacturing technology, will also be key factors in determining the sorts of cars that are available and that consumers choose to buy. Nevertheless it is noticeable that the recent increase in the number of VED bands and the substantial widening of differentials between highest and lowest rates appears to have coincided with recent rapid falls in new car emissions.

A higher first year rate of VED (sometimes called the 'showroom tax') may be justified if vehicle purchasers fail to take into account annual VED differentials that will be liable over the lifetime of a more polluting vehicle over a less polluting vehicle, in effect making the costs of picking a more polluting car more salient to consumers.

Air Passenger Duty

Air Passenger Duty (APD) was introduced in November 1994. It is a tax on passengers departing on most flights from UK airports. Initially, there were only two rates: £5 for flights within the UK or EU, and £10 for flights outside the EU. These rates doubled in November 1997 (a decision taken in the last Conservative Budget in November 1996).

This system remained in place until April 2001, when the rates varied according to the class of the flight as well as the destination, a policy announced in Budget 2000. Interestingly, this policy represented a cut in APD for passengers flying standard class within the EEA from £10 to £5, and was included in the Budget 2000 Red Book under the heading "Fairness for Families and Communities". Subsequent rises in APD rates have, by contrast, tended to be included under headings related to environmental protection instead.

In 2007, the Government launched a consultation on reforming APD into a new tax, Aviation Duty, levied on the flight rather than the passenger. As a per-passenger tax, APD does not give airlines an additional incentive to load their aircraft fully, whereas a per-flight tax would sharpen this incentive and would have more easily allowed freight-only flights (which, by their nature, do not have any chargeable passengers) to be brought into the tax system. At the time, the idea of basing the tax on the flight rather than the passenger had cross-party support. However, after the consultation the Government concluded that a better reform was to modify the existing APD rather than implement a per-flight tax. The Government argued that the basis on which it had proposed to vary the tax – the weight of the aircraft and distance flown – would not adequately reflect the environmental emissions of each flight or encourage investment by airlines in new, larger and heavier but more efficient aircraft.³³ Thus the reform was to introduce 4 distance-based bands (depending on the distance from London to national capitals) rather than the previous EU/non-EU

³² See SMMT (2010), *New Car CO₂ report 2010*, <http://www.smmt.co.uk/downloads/SMMT-Annual-CO2-report.pdf>.

³³ See http://www.hm-treasury.gov.uk/d/pbr08_aviationduty_395.pdf for the Government's response to consultation to reform APD into a per-flight tax. Leicester and O'Dea (2008) examined the potential effects of a per-flight tax in the *IFS Green Budget 2008* (<http://www.ifs.org.uk/budgets/gb2008/08chap9.pdf>).

rate, again with rates varying by class of flight.³⁴ This means there is a slightly greater correlation between distance (and hence emissions) and tax, though it is still the case that a flight from London to, say, Turkey will attract the same tax as a flight to Edinburgh. Table 3.2 shows the rates of APD that have been in place since 1997 – large increases in APD rates for passengers flying outside Band A (0–2,000 miles from London) are planned for November 2010. It is worth noting, however, that in 2009 the vast majority of passengers, around 73%, were charged the lowest rate of APD.

Table 3.2: Rates of APD, 1997 to 2010

	EEA destinations				Non-EEA destinations			
April 1997	£5				£10			
Nov 1997	£10				£20			
	Standard class		Higher class		Standard class		Higher class	
April 2001	£5		£10		£20		£40	
Feb 2007	£10		£20		£40		£80	
	Band A (< 2,000 miles)		Band B (2–4,000 miles)		Band C (4–6,000 miles)		Band D (> 6,000 miles)	
	Stand.	Higher	Stand.	Higher	Stand.	Higher	Stand.	Higher
Nov 2009	£11	£22	£45	£90	£50	£100	£55	£110
Nov 2010	£12	£24	£60	£120	£75	£150	£85	£170
Passengers (2009, m)	9.70	0.18	1.52	0.34	0.98	0.20	0.33	0.07

Notes: Distance bands since 2009 are based on distances from London to national capitals. Passenger numbers come from UKTradeInfo (<https://www.uktradeinfo.com/index.cfm?task=bullair>).

APD represents the only tax on aviation. Article 24 of the Chicago Convention, which established the International Civil Aviation Organisation, exempts fuel used on international flights from fuel duty³⁵, and air tickets are zero-rated for VAT. APD can therefore be seen as an attempt to correct for the relative undertaxing of aviation as well as the environmental externalities caused by noise, congestion and GHG emissions. In the absence of any likely international agreement on taxing fuel, it would still be possible to bring domestic flights into both the fuel duty and VAT systems which would seem desirable.

Leicester and O’Dea (2008) examined various studies of the externalities of aviation which suggested that APD rates were higher than would be justified by the externalities alone (though noted considerable uncertainties over the costs of, for example, cirrus cloud formation from aviation) but argued that higher rates would be justified given the lack of other tax instruments.³⁶

³⁴ A list of countries in each band can be found in Appendix 1 of http://customs.hmrc.gov.uk/channelsPortalWebApp/channelsPortalWebApp.portal?_nfpb=true&_pageLabel=pageVAT_Sh owContent&id=HMCE_CL_000505&propertyType=document.

³⁵ For a recent paper on the rules governing taxes on aviation fuel see Seely (2009), <http://www.parliament.uk/commons/lib/research/briefings/snbt-00523.pdf>.

³⁶ Leicester, A. and C. O’Dea (2008), “Aviation taxes” in Chote, R. *et al* (eds.), *IFS Green Budget 2008* (<http://www.ifs.org.uk/budgets/gb2008/08chap9.pdf>).

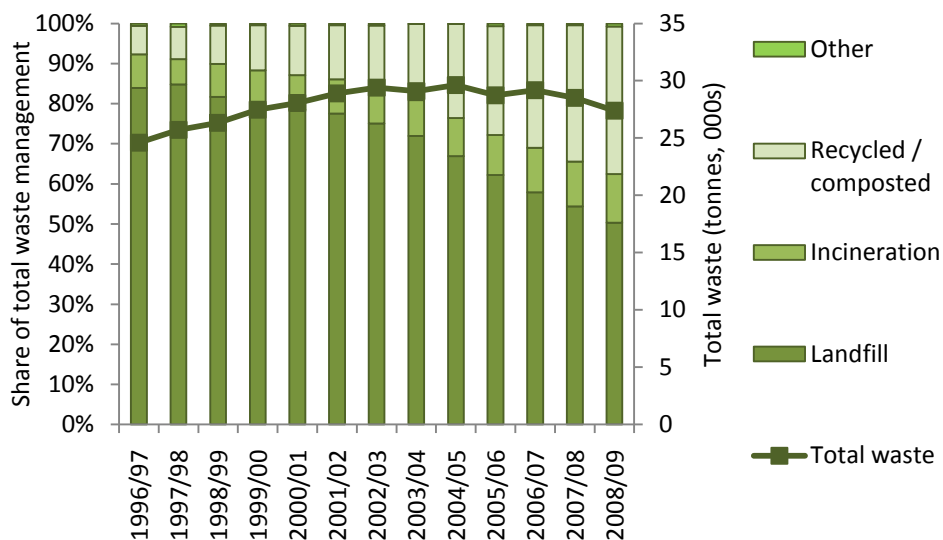
From 2012, aviation will be included in the EU ETS, though only 15% of the permits are planned to be auctioned – and thus raise revenue for the Government – in the first instance.³⁷ Including aviation in the ETS limits the rationale for domestic taxes on aviation that deal with carbon emissions, though other externalities such as noise and non-carbon emissions, as well as congestion in the air and around airports, would provide ongoing justification for national aviation taxes beyond 2012.

3.3 Waste Management

The government is committed to reduce the amount of biodegradable municipal waste going to landfill to 75% of 1995 levels by 2010, 50% by 2013, and 35% by 2020 under the European Landfill Directive. Eurostat figures for the UK show that the rate of landfill was 79% of its 1995 level by 2008, suggesting that the 2010 target is likely to be met.³⁸

Since 1996–97, the proportion of waste going to landfill in England has fallen steadily from 84% of waste to just over 50% (see figure 3.5). The primary reason for this reduction has been the growth in recycling/composting of waste, which accounted for just 7% of waste in 1996–97 and 37% in 2008–09. The proportion of waste being incinerated has also increased from 8 to 12% over the same period.

Figure 3.5: Management of municipal waste in England, 1996–97 to 2008–09



Source: Authors' Calculations from DEFRA Data

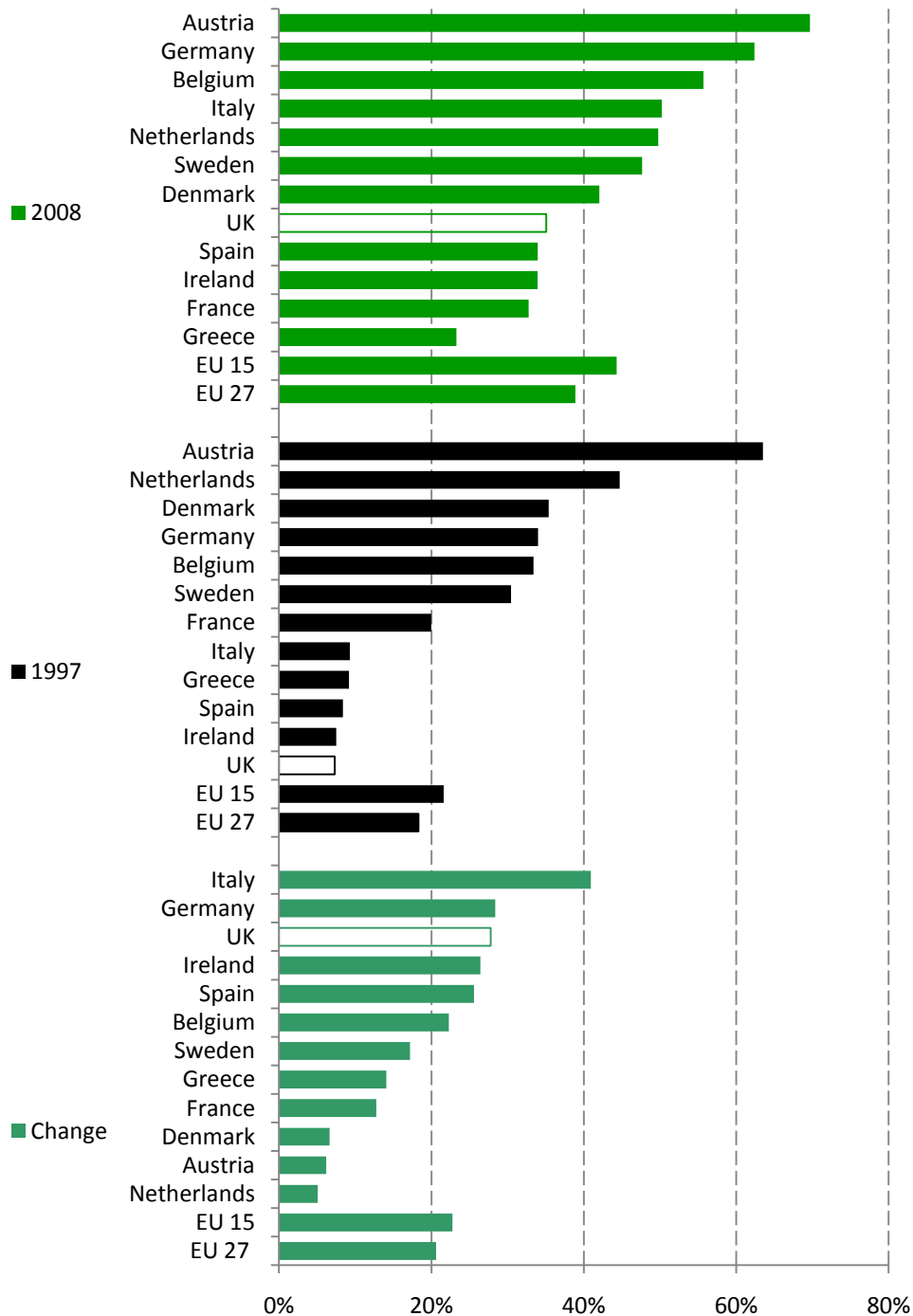
Compared with other EU countries, recycling rates have risen markedly in the UK since 1997. Figure 3.6 shows that in 1997, of the twelve EU-15 countries for which we have comparable data, the UK ranked last in terms of the proportion of waste recycled, but by 2008 had risen to 8th, though still with recycling rates below the EU-15 as a whole. Of these countries, the UK saw the third largest rise in the proportion of waste recycled.

³⁷ See http://www.decc.gov.uk/en/content/cms/what_we_do/change_energy/tackling_clima/emissions/eu_ets/aviation/aviation.aspx.

³⁸ <http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data/wastemanagement/landfill>

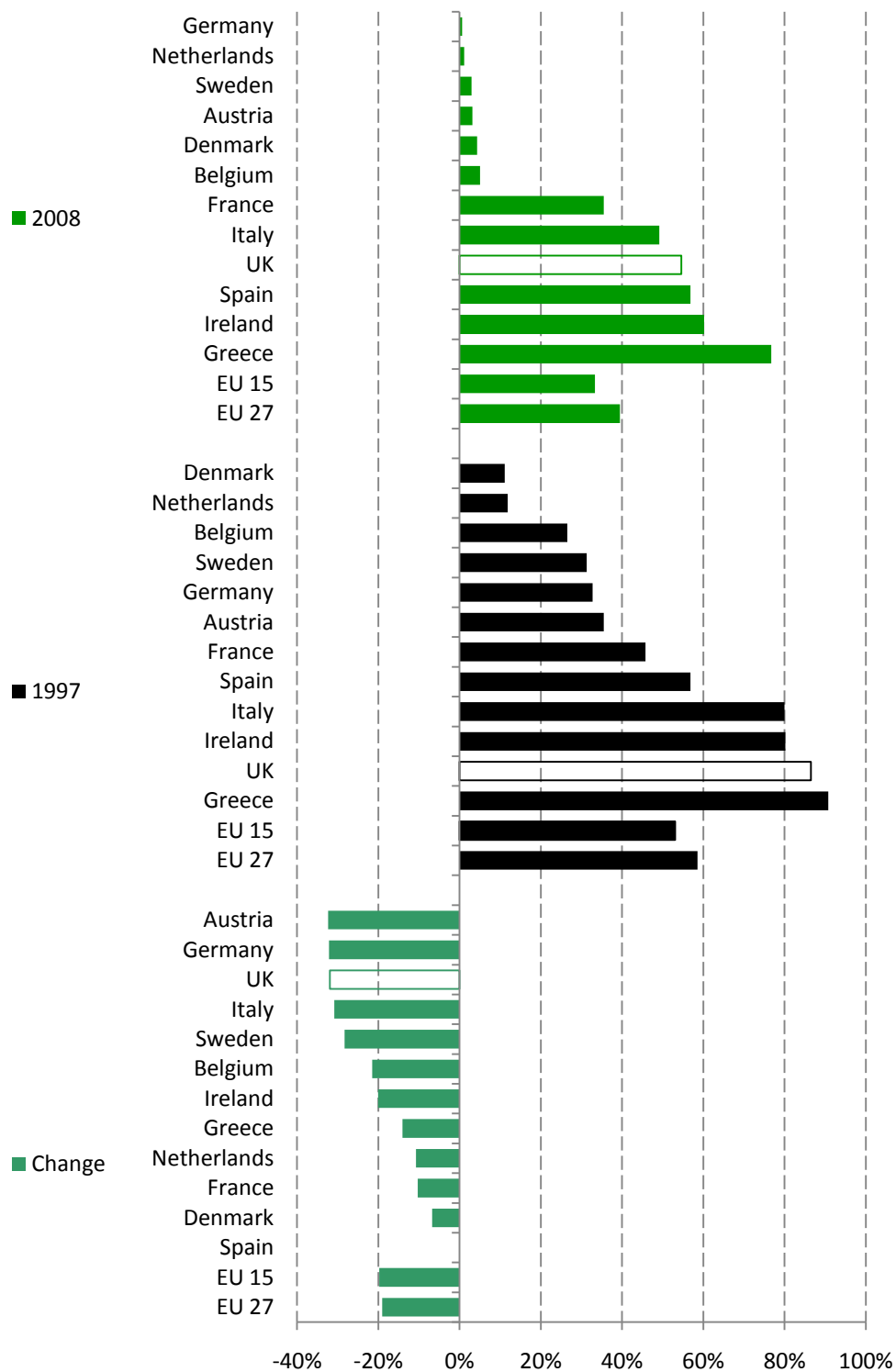
The UK also saw the third largest fall in the proportion of waste landfilled (see figure 3.7) and rose from 11th lowest landfill rate of 12 to 9th between 1997 and 2008, though again landfill rates are still substantially higher in the UK than the EU-15 (and indeed the EU-27). According to Eurostat statistics, in 2008, the UK recycled 35% of its municipal waste compared to an EU-15 figure of 39%, and sent 55% of its municipal waste to landfill compared to 39% for the EU-15 as a whole.

Figure 3.6: Proportion of municipal waste recycled or composted, 1997 to 2008



Source: Eurostat. Note: We have only included the 12 countries for which we have individual data for both 1997 and 2008, but Eurostat provides unweighted averages for both the EU 15 and EU 27.

Figure 3.7: Proportion of municipal waste landfilled, 1997 to 2008



Source: Eurostat. Note: We have only included the 12 countries for which we have individual data for both 1997 and 2008, but Eurostat provides unweighted averages for both the EU 15 and EU 27.

Landfill Tax

In terms of explicit tax policy towards waste, the key development has been the rapid rise in the rate of landfill tax since 1997. The landfill tax is a tax levied on waste disposed by businesses and

local authorities. It has two rates, a lower rate which applies to inert waste and a standard rate which applies to all other waste.

The landfill tax was first introduced in October 1996 at a standard rate of £7/tonne and £2/tonne for inert waste. Rates were unchanged until April 1999 and then began to rise rapidly as part of an escalator policy that was established at the same time as the EU Landfill Directive was enacted. Between April 2000 and April 2004, the standard rate rose by £1/tonne each year, and the accelerator was increased to £3/tonne from 2005 and then £8/tonne from 2008. By April 2010, the rate of landfill tax had risen to £48/tonne for standard waste and £2.50/tonne for inert waste. This represents a real terms increase in the standard rate over the level inherited of almost 390%, but a real cut in the reduced rate of just over 10%. Current proposals are to continue to increase the standard rate by £8 per year until 2014–15, by which time the rate will be £80/tonne, a more than tenfold nominal increase on the rate at which the tax was introduced.

When the Landfill Tax was introduced, the rates set reflected the estimated marginal external costs of landfill based on a study carried out by CSERGE, Warren Spring Laboratory and EFTEC.³⁹ These costs include GHG emissions (landfill is a particularly important source of methane emissions), and the risks of leaching into the water supply. The fact that rates are now so much higher reflects the need to hit the EU Landfill Directive targets and suggests that taxes set at the marginal external cost would have been far too low to achieve this objective.⁴⁰ If the estimated externalities were right, the implication is that the targets under the Directive are much stricter than would be justified by the external costs of landfill alone and that the UK implementing inefficiently high tax rates as a means to meeting them. Of course, since 1993 estimates of the costs of GHG emissions, for example, may have changed substantially, but it may be hard to argue the initial estimates of the externality were too low by a factor of more than 10 as would be needed to justify a rate of £80/tonne.

Aggregates Levy

The Aggregates Levy is a tax on mining rock, sand and gravel. It was introduced in April 2002 at a rate of £1.60/tonne having been announced in Budget 2000. The rate was frozen in nominal terms until April 2008 when it rose to £1.95/tonne and was inflation-uprated to £2/tonne in April 2009. This rate was frozen for 2010–11. Inflation uprating the rate at introduction to April 2010 prices gives almost precisely £2/tonne, the current rate. The rate is set to rise to £2.10 from April 2011.

The levy is relatively small in revenue terms. Real terms (2009 prices) revenues fell from about £394 million in 2003, its first full year, to around £348 million in 2008, partly reflecting the nominal rates freeze. Revenues fell further, to £285 million in 2009, which may well reflect the impact of the recession on the construction industry.

4. Coherence of environmental policy

4.1 Implicit ‘carbon tax’ rates

To the extent that it is desirable to use economic incentives to reduce carbon emissions, the objective should be to set a single price for carbon emissions via a carbon tax or comprehensive emissions trading system. Those who are most cheaply able to abate their emissions will then do so

³⁹ *Externalities from Landfill and Incineration*, London: HMSO.

⁴⁰ The Government also introduced a Landfill Allowance Trading Scheme (LATS) in England in 2005, which sets targets for landfill for local authorities. Those who reduce landfill below target can trade surplus allowances to those authorities who fail to meet their targets. The caps allowed under the LATS are set to reduce landfill in proportion with the requirements of the Landfill Directive. For more on LATS see <http://www.defra.gov.uk/environment/waste/localauth/lats/>.

whilst those who cannot will pay the carbon price instead. Ideally, such a system would be global since the external costs of emissions have global effects.

Clearly, policy is far from this ideal at present. Yet the different taxes and instruments already in place do impose implicit costs on carbon emissions through their impact on the cost of energy use and the extent to which different energy sources generate varying amounts of carbon. If these implicit ‘carbon taxes’ on different fuels used by different users are inconsistent, they will distort the choices of different polluters to reduce their emissions. If households, for example, face lower ‘carbon tax’ rates than businesses then the relative pattern of abatement will be skewed towards the business sector meaning that either less abatement will be achieved for a given cost, or the cost of reducing emissions by a given amount will be higher.

Using various assumptions and data sources, Table 4.1 shows estimates of the implicit carbon taxes in place during 2009–10 on different fuels for different end users. Full details of the way in which these figures have been calculated are available in the appendix to this note.

Table 4.1: Implicit carbon taxes, 2009–10

Fuel Type	CO ₂ Emissions: g/kWh	RO: p/kWh	CCL: p/kWh	ETS: p/kWh	Implicit tax: p/kWh	Implicit tax: £/tonne CO ₂
Electricity (business)						
Coal	910	0.36	0.47	2.00	2.83	31.13
Gas	393	0.36	0.47	0.86	1.70	43.14
Nuclear	0	0.36	0.47	0.00	0.83	∞
Renewables	0	0.00	0.00	0.00	0.00	0.00
Gas (for heating, business)	184	0.00	0.16	0.00	0.16	8.91
Electricity (domestic)						
Coal	910	0.36	0.00	1.94	2.30	25.96
Gas	393	0.36	0.00	0.86	1.22	31.18
Nuclear	0	0.36	0.00	0.00	0.36	∞
Renewables	0	0.00	0.00	0.00	0.00	0.00
Gas (for heating, domestic)	184	0.00	0.00	0.00	0.00	0.00
Transport Fuel	CO₂ Emissions: g/kWh	CO₂ Emissions: g/litre		Fuel Duty pence per litre	RTFO p per litre	Implicit Tax £ per tonne CO₂
Petrol	240	2303		56.19	0.54	246.33
Diesel	250	2639		56.19	0.54	214.96
Aviation Gasoline	238	2226		34.57	0.00	155.30
Aviation Turbine Fuel	245	2528		0.00	0.00	0.00

Note: all figures are for the year 2009–10. Source: Authors’ own calculations.

The table should be interpreted with care. Electricity consumers, for example, do not buy their power from a particular power station that generates electricity using a single fuel, but rather from a supplier that has a particular mix of fuels. In terms of electricity, the interpretation of the table should be: “in a world where all electricity were produced from the same fuel source (coal, nuclear, gas, etc.) what impact would various policies have on the price and what implicit carbon tax does this give for that source given the CO₂ emissions it generates?”

Our results indicate that there is considerable variation in the implied taxes for CO₂ from different energy sources and for different users. Households pay a lower ‘carbon tax’ for energy than businesses, since they are not required to pay the CCL. Gas for heating is charged a much lower implicit tax than gas used to generate electricity; for domestic gas there are in effect no taxes at all. While the inconsistency in pricing between households and businesses is inefficient in terms of setting a single carbon price, it may be seen as more equitable since energy represents a significant part of the expenditure of poorer households. Of course, it is likely that the relatively higher taxes

faced by businesses for their energy use are ultimately at least partly incident on the household sector anyway in the form of higher prices.

Implicit taxes on gas-fired power are higher than those on coal-fired power for two reasons. First, the RO raises the price per kWh for all non-renewable sources for all end-users by the same amount, which translates into a higher tax for gas-fired power since its emissions are lower. Second, the CCL also applies at the same rate to all non-renewable sources (but is only applied to the business sector). Further, since both the CCL and the RO apply to nuclear power, which generates no carbon emissions there is in effect an 'infinite' carbon tax on nuclear energy. There may of course be non-CO₂ reasons not to exempt nuclear power from the CCL but it seems less obvious why there should be no differentiation between coal and gas-fired electricity where the emissions are very different.

The lower levels of environmental taxes on households are not the only reason why businesses face a higher cost of energy use. Domestic users also receive an implicit subsidy from the fact that energy is only charged a reduced rate of VAT (5%), whereas businesses face the main rate (17.5%). Indeed, one of Labour's first policy announcements on coming to power in 1997 was a reduction in the VAT rate on domestic fuel from 8%.

This implicit subsidy is so large as to negate almost entirely the environmental taxes on energy use that households do actually face. For instance, the average standard credit electricity bill for a typical consumer (defined as having an annual consumption of 3300 kWh) was £461 in 2009⁴¹. If consumers faced the full rate of VAT on energy then the cost of this electricity would have been £515.88. The difference, £54.88, represents an estimate of the subsidy households receive from the reduced VAT. Ofgem estimates⁴² that for a consumer with the average electricity consumption, the RO and the EU ETS increased bills by around £36 in 2009, less than the benefit consumers enjoyed from the lower VAT rate.

CO₂ from transport emissions is apparently taxed at a much higher rate than CO₂ from power generation, if we consider the entire fuel duty to be a carbon tax. The implicit tax rates are broadly comparable to those on power generation if we take around 10–20% of the fuel duty to represent a tax on carbon. Now somewhat dated estimates from Sansom *et al.* (2001) suggest that the marginal climate change externality from motoring makes up only around 4% of the total marginal externality, though these estimates may well be based on estimates of the cost of carbon that are somewhat lower than more recent ones.⁴³

The implicit tax on diesel is slightly lower than that on petrol: both attract the same tax per litre but diesel emissions per litre are slightly higher. Perhaps more relevant for vehicle fuel is emissions per kilometre – diesel vehicles are more efficient so produce less CO₂ per kilometre driven. However, there is evidence they also generate more particulate emissions which affect local air quality.⁴⁴

Aviation gasoline (AVGAS), used by small aircraft, has a lower tax rate per litre. Whilst emissions from burning a litre of AVGAS are lower than those from a litre of petrol or diesel, this does not appear to justify the substantially lower tax rate in terms of the implicit carbon price. Jet fuel (aviation turbine fuel) used by large aircraft is not subject to tax at all due to international agreements.

⁴¹ DECC, *Quarterly Energy Prices*, 2010.

⁴² Ofgem, *Updated: Energy Bills Explained*, <http://www.ofgem.gov.uk/Media/FactSheets/Documents1/updatedhouseholdbills09.pdf>

⁴³ Sansom, T. *et al.* (2001), *Surface Transport Costs and Charges – Great Britain 1998*, Leeds: Institute for Transport Studies

⁴⁴ Quality of Urban Air Review Group (1993), *Diesel Vehicle Emissions and Urban Air Quality*, London: DoE

4.2 Carbon Pricing in Policy

The differences in carbon pricing across different sectors and different fuels is not just implicit. The Department for Energy and Climate Change explicitly assigns different costs to carbon emitted in what it calls the traded (covered by the EU ETS, roughly half of total emissions) and non-traded sectors. This is in contrast to a previous system, in use prior to 2009, which valued the cost of a tonne of carbon using an estimate of the lifetime warming damage it caused but without reference to where that tonne of carbon was generated.

The old system was an attempt to set a price of carbon such that businesses and consumers “internalised” the costs of emissions which they impose on society as a whole. The new approach on the other hand is “target consistent” in that the price is set so as to achieve politically agreed targets to reduce emissions. For example, if one sector’s target can be met relatively cheaply, then emissions from that sector will have a lower price assigned to them. Since the traded and non-traded sectors have different targets (the traded sector’s is set by the emissions cap under the ETS whereas the non-traded sector’s target represents the additional abatement needed to comply with domestic and EU emissions reductions targets), they have different carbon prices. At present, emissions reductions in the non-traded sector are assigned a higher value. In 2010, the central estimate is a price of £22/tCO₂ in the traded sector and £52/tCO₂ in the non-traded sector.

These different prices imply inconsistencies in the way targets have been set and in the interaction between the ETS and wider target-setting mechanisms at the EU and UK levels. Emissions covered by the ETS have an explicit price resulting from the cap set in that sector. The overall target for emissions reduction effectively requires a higher price than comes out of the ETS process. This has two results. First, a set of additional policies aimed at achieving reductions in the ETS sector by providing large subsidies for renewables. This of course rather undermines part of the point of the price in the trading system, which ought to be providing the right incentives for these investments to be made without additional government intervention. Second, an implicit price for policy which is higher in the non-traded sector than the official price in the traded sector. This is not going to result in emissions reductions occurring efficiently and at least cost.

5. Conclusions

This Briefing Note has examined the government’s record on the environment. Many government policies in this area have been motivated by external targets (though ones that the Government played an active role in determining), including European Directives for Landfill and Renewable Energy, targets for emissions reductions and the Kyoto Protocol. Some of the most important policy developments, notably the EU ETS, have also been developed at a supra-national level. Purely domestic policy development has been more piecemeal, sometimes with environmental objectives at the forefront (such as the redesign of the VED system) and sometimes with what looks like one eye on raising additional revenues from a relatively undertaxed sector without necessarily substantially improving the environmental incentives (such as increases in APD).

In terms of outcomes, the story is one of steady progress. The government has slightly improved the UK’s historically poor ranking among EU countries in recycling and the share of electricity generated from renewable sources and has ambitious targets going forward in both areas. However there is little sign of success on the stated intent to “shift the burden” of the tax system from goods to bads, an outcome which is inextricably linked to the decision to abandon the fuel duty escalator in 1999.

The government looks set to comfortably achieve its Kyoto targets for reducing GHGs, largely reflecting one-off changes such as the “dash for gas” in the mid-1990s and success in reducing non-

energy mix, and so does not vary by fuel type. If all energy were generated from coal power this would add roughly a penny to the implicit carbon tax rate per KWh, and if all energy were generated from gas power it would add an extra half penny per KWh for energy supplied to businesses.