ENVIRONMENTAL ACCOUNTS: TIME SERIES + ECO-TAXES

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Preface

This study was commissioned by the European Commission in cooperation with Eurostat with the objective of improving and extending the scope of the environmental accounts for Ireland. It follows two previous studies, *Pilot Environmental Accounts* published by the Central Statistics Office and the *Satellite Environmental Accounts for Ireland 1996*, unpublished report to Eurostat (2000). As indicated in the title, this study presents time series, which in some cases are of considerable length, and provides information on what could loosely be called eco-taxes. Additionally, where feasible the study relates environmental information to the underlying economic magnitudes and movements, and broadens the information considerably.

The report consists of three self-contained sections. The sections cover (1) emissions to air, (2) discharges to water and (3) disposals of solid waste and these three types of releases to the environment are disaggregated according to NACE Rev 1 by five major economic sectors:

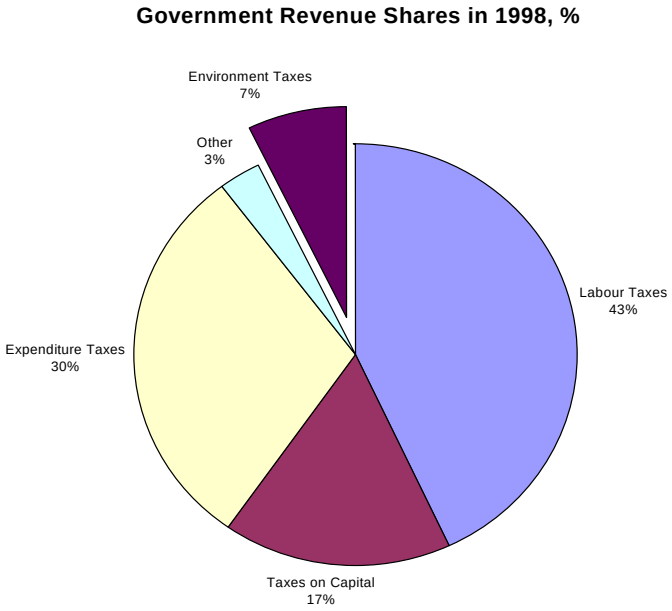
Agriculture/forestry/fishing
Energy transformation
Industry
Transport
Services
Households

though in some areas the breakdown is unavoidably less detailed and it is more detailed in others.
Section 1 on emissions to air concentrates on greenhouse gases and on improving the underlying information on energy use. Behavioural analyses have been hampered in the past by inadequate time-series of energy-related prices and taxes so that a large effort was devoted here to presenting coherent time-series of these items.

Section 2 reformats the information on loss of BOD, N and P to water that is given in the EPA's database to relate the data to economic activity. In order to investigate prices and charges for discharges to water, three other sources are investigated, namely, the National Accounts, the Census of Industrial Production and the Local Authorities themselves. The National Accounts yields the most useful time-series, though the Census of Industrial Production has considerable potential. There are in fact no eco-taxes, strictly defined, relating to water services in Ireland, but the charges per unit of water supplied and waste water serviced were investigated in some depth as these can have ecological implications.

Section 3 on solid waste extends the level of detail on waste streams based on the two National Waste Database Reports for 1995 and 1998, produced by the EPA. There are no time series apart from the data for these two years. This information is supplemented by data on uptodate charges presented in some detail for each local authority. Collection of information on charges is not on an official footing and this is a serious shortcoming.

As described by Eurostat (2000) investigations of environmental taxes (or eco-taxes) are frequently expanded to cover environmental fees, with Denmark, Greece, Italy, Portugal and Spain describing aspects of financing environmental expenditures in their reports. A similar approach is applied in parts of this report. In fact there is a distinction between taxes as defined in the national accounts and other payments to general government, such as fees. Taxes are compulsory unrequited payments while fees are paid for a purchase for supply or services. The taxes presented in Section 1 on energy are indeed taxes, though only loosely based on air emissions. The charges presented in Sections 2 and 3 are fees for water and waste services. The subsidies identified in the provision of water services, which could be described as benefits in kind, are also loosely termed here as 'negative eco-taxes', in so far as they can have ecological effects and represent a deviation from the recovery of costs. If one were to go to the extreme and label all taxes on energy and vehicles as well as all fees for environmental services as 'environmental taxes' then the share of total revenue that accrues from environmental taxes is as shown in the pie chart below. Pushing the definitions to their limits, environmental taxes are shown to contribute seven per cent of revenue.



It is seen from this report that information on quantities is improving in many areas, particularly in respect of quantities of pollutants released to the environment. The allocation of official responsibility to the EPA to gather this information is bearing fruit in rich data sets. Unfortunately the call made in the *Pilot Environmental Accounts* (CSO 1999) for subsequent coordination between the agencies involved has remained unheeded. Reclassification of environmental data according to NACE in order to make it compatible with economic data, for example, and to 'mainstream' the environment into economic policy analysis has yet to be made an official and routine task. As for price data, improvements have not been forthcoming and, given recent suggestions from the European Environment Agency and OECD that the potential for eco-taxes and economic instruments be investigated, the data deficiencies on this front are all the more pressing.

REFERENCE

Eurostat, 2000. *Statistics on Environmental Taxes and other Economic Instruments for Environmental protection in EU Member States. A collection of studies in 13 EU Member States and the Czech Republic.*

Contents

1. Emissions to Air

1.1 Introduction

The purpose of this section is to describe and present information relating to Emissions to Air. This task has entailed assembling a database from a wide range of different sources, which helps to illustrate the interaction between economic growth and emissions to air (in particular emissions of greenhouse gases). Energy use is responsible for some two-thirds of Irish emissions of greenhouse gases (with agriculture being responsible for most of the rest of the emissions). In trying to describe the interaction of the economy, energy use and emissions, there have been persistent problems in obtaining the necessary data on the energy sector. Many analyses require long runs of time-series data. The data should span the major oil price shocks of the last 30 years if we are to fully understand the factors driving energy use and emissions to air. As a result, in this report we pay particular attention to energy data as a vital ingredient in developing our understanding of the factors driving greenhouse gas emissions. These data also play an important role in modelling the interaction of economic growth with a range of other environmental problems such as acid rain, traffic, congestion, and noise.

The problems that have beset modellers interested in energy data have been:

- The failure by many relevant bodies to appreciate the importance of collecting price data;
- The need for consistent time-series over three decades.

As a result, in this section of the report, as well as collecting data on greenhouse gas emissions, considerable attention is devoted to producing a well-documented database of energy data. Given the volatility of energy prices since the first oil price shock in 1973, it is desirable to have series that predate this. As a result, much of our data goes back to the 1960s. The advantage of this is that in modelling work it allows one to observe the responsiveness of different sectors to price movements over a period in which there were significant changes in prices.

In order to assemble the database it has been necessary to utilise a wide range of different sources, each of which is outlined below. Considerable effort has gone into the use of linking techniques in order to build consistent price series for as long a period as the data permitted. It is really only in the past decade that a consistent approach to data collection has been adopted by the relevant government department[1]. Indeed, the problem of global warming only captured the interest of governments during the 1990's, and hence the collection of relevant data on emissions to air is a recent phenomenon.

[1] The department now regularly produce energy balance sheets on a consistent basis and have made them available back to 1980 (see Myers, 1994).

However, the Environmental Protection Agency (EPA) is currently devoting significant attention to this issue.

The results presented here are available as a series of different spreadsheets. Before looking at these, the next section describes the different data sources. Having considered each of the series in section 1.3, sections 1.4 to 1.7 illustrate the important trends that have emerged over time and the implications for emissions to air. The final section contains the conclusions of this report.

1.2 Data Sources

The Energy Balance Sheets constitute the primary method of classifying energy data. For each year they provide a breakdown of energy into the major fuels (coal, peat, oil, gas, electricity, and renewables) and build up a supply side and a demand side for each. The total primary energy supply of a fuel (TPES) – the supply-side aggregate – is equal to indigenous production plus imports minus exports (adjusting for stock changes and international marine bunkers). Total final consumption (TFC) – the demand-side aggregate – is equal to the sum of the consumption of each fuel by the principal sectors – industry, transport, commercial, residential and agriculture. The difference between TPES and TFC is taken up by the transformation of the raw supply of certain fuels into more useful alternatives for final consumption. Electricity generation from fossil fuels is the most obvious example, but also included here is the manufacture of peat briquettes and oil refining. The units used are Tonnes of Oil Equivalent (TOE) which is a measure of chemical energy equal to roughly 41.86 Gigajoules.

The Energy Balance Sheets were provided by the Department of Public Enterprise (DoPE) from 1980 onwards. Data for the period 1960 – 1979 were obtained from the International Energy Agency (IEA), who collects energy balances for OECD countries annually. In its publication *Energy Statistics of OECD Countries 1960-1979*, the IEA also provide a more thorough breakdown of oil balances into petrol, diesel and fuel oil, which is incorporated in the spreadsheets. On the whole, the data should be reasonably accurate, but a few points are worth mentioning. The inception of the single market in 1992 meant a complete relaxation of import restrictions and has in all likelihood facilitated the smuggling of significant amounts of coal to get around the smoky coal ban. It is probable, therefore, that the reported figures represent an underestimate of final consumption throughout the 1990's. Also, some of the private harvesting and sale of turf by farmers may be passing unnoticed. However even if the totals are reasonably good there is no guarantee that their apportionment to the various sectors is as accurate. For oil in particular, it is left up to the major suppliers to determine who the final consumers of their products are, and they may not be getting it right.

Different fuels are traded at different prices in different sectors, so ideally one would like to be able to assign a price to each component of the energy balance sheet. The International Energy Agency (IEA) publications also provided much of the data on prices, as published in their periodical *Energy Prices and Taxes*. Further price data were obtained from Eurostat.

There was some discontinuity between certain years, which necessitated the use of a linking process in order to obtain a consistent series. The linking process is explained in the appendix. The Irish Energy Centre provided further data on prices from 1981 onwards. They publish prices for various fuels for both industrial and domestic users each quarter and it was possible to obtain at least one observation per year, although the periodicity was unreliable.

There are also other issues with the price data that are worth noting. For many fuels, large customers have bargaining power and can usually negotiate their own price with the supplier. This is especially true in gas but also applies to oil. The problems with smuggling and underreporting described above also cause difficulties in trying to identify prices, especially where there is VAT and excise evasion (Energy Centre prices are inclusive of VAT at the prevailing rate).

The Central Statistics Office (CSO) publishes some useful series. The CSO National Accounts series provides information on household consumption, and includes figures for personal sector consumption of different fuels and energy. The CSO Trade Statistics give imports and exports of energy. The CSO Census of Industrial Production contains manufacturing sector expenditure on energy. The monthly consumer price index includes relevant price series, such as the price of fuel and light, energy products and motor fuel, while the monthly wholesale price index includes price series for petroleum fuels, electricity and energy products bought by industry.

Another source of data is Bord na Móna (the Irish Peat Company) Annual Reports, which contain figures for peat production and sales in both value and volume terms. Other price data were obtained from Eurostat's New Cronos Internet facility, while the Revenue Commissioner's Statistical Reports provided tax and excise figures. Finally, the EPA provided data on emissions of greenhouse gases.

1.3 Series Available

The results of this data assembly are available as a series of spreadsheets. To facilitate the locating of particular data, a brief summary of where to find the principal series is given. Following this, a description of each of the available spreadsheets is provided. Given the large quantity of data presented, each variable is given a mnemonic as well as a label. The abbreviation EN represents energy, and when preceded by P corresponds to the price. A number between one and nine follows EN, representing each of the different types of energy (e.g. 4 = oil). The rest of the mnemonic consists of letters signifying the use of each type fuel (e.g. TD = total primary energy use), while the unit of measurement and source can also be included with the use of underscores. So for example, the primary energy demand for oil in TOE's is given by EN4TD_T. A full explanation of each of the symbols used in the mnemonics is given in the Appendix.

The vast majority of the data regarding energy quantities are contained in "ENERGYJH.XLS", and also in the spreadsheet called Table 11.WK1. The spreadsheet names are derived from the filenames

used in the ESRI's databank for the Irish macroeconomic model. Energy prices are best observed from spreadsheet Table 37.WK1, which gathers together the price data from all sources. Imports of energy can be found in Table 29.WK1, where they are broken down by SITC classification. Energy Taxes are best observed in the spreadsheet "ENERGYTAXES.XLS".

Turning to a more thorough description of the series available, much of the data are contained in ENERGYJH.XLS. This spreadsheet contains forty-eight separate worksheets. Forty of these are labelled y60, y61… y99, which are the energy balance sheets for each individual year, and are self-explanatory. The worksheet entitled "energy use" summarises these balance sheets. For each of the main energy types (coal, peat, oil, gas, electricity, and renewables) it gives the breakdown of the total at Factor Cost and Total Primary Energy Supply for each year. It also lists the conversion factors for each fuel type. The sheet entitled "oil 1000mt" gives a more detailed breakdown of oil balances and is included in "energy use", having been converted to TOE's. The prices obtained from the Irish Energy Centre are given in the sheet "Energy Centre Prices", and includes price series for coal, gas, petrol, electricity and turf, all inclusive of VAT at the prevailing rates. The sheet entitled "New Prices" contains prices from Eurostat for natural gas for industry and households, heating oil, and pump prices of petrol and diesel. The rest of the worksheets contain data from the IEA. Energy prices from 1968 to 1978 are given in the sheet "Prices £", and prices from 1979 to 1999 can be found in "Prices linked". The full thirty-two year series of prices is given in Table37.WK1 (see below). The sheet "Prices and Taxes" is used to generate "Prices linked", while the final worksheet, "Price Indices", gives some miscellaneous energy prices in index form.

Although there are some data on taxation rates contained in the "Prices and Taxes" worksheet of "ENERGYJH.XLS", the most important data on energy taxation is contained in the spreadsheet "ENERGYTAXES.XLS". This spreadsheet contains revenue data, rates of excise taxes on vehicles and on the different fuels. Most of the series run from 1960, with some beginning before this.

The rest of the database is presented in thirteen separate spreadsheets called TableXX.WK1. The spreadsheets are taken from an ESRI database, which is updated annually and used in the preparation of the ESRI Medium Term Review. The tables presented here are those directly relevant to this particular study, forming only a small subset of the overall database. For this reason, the numbering of the tables is not sequential being drawn from the wider databank. A brief explanation of each spreadsheet follows:

Table 6. This spreadsheet gives personal sector consumption data from the CSO as contained in the National Accounts. Total personal consumption is disaggregated into its constituent parts and presented in both current and constant prices. There are separate series for consumption of domestic heating oil, electricity, energy, kerosene, LPG, petrol, and a joint series for kerosene and heating oil. All series run to 1999 and some date back to 1953, although most date from later.

Table 11. This is the Energy Balance Sheet data. It is the same summary information as is contained in the "energy use" worksheet of "ENERGYJH.XLS". From 1980 onwards the figures are from the Department of Public Enterprise, while the pre-1980 figures are given on a consistent basis by the IEA. The series run from 1960 to 1999.

Table 12. This is energy consumption data, with detailed breakdowns of TFC and TPES for certain sectors. The series cover the period 1960 – 1999.

Table 28. This spreadsheet consists of data from the Revenue Commissioner's Statistical Report, and details consumption of LPG (both auto and non-auto), diesel, fuel oil and petrol. Most series run from 1960 to 1999, with one petrol series beginning in 1953.

Table 29. This contains data on Imports from the CSO Trade Statistics. Imports are given in current and constant prices, broken down by SITC code and distributed according to main use. Some of the series go back as far as 1938 while most begin in 1960. The relevant SITC sector is sector 3, which refers to Mineral fuels, lubricants and related materials. The next two digits in the code refer to the division; 32 refers to coal, coke and briquettes, 33 to petroleum, petroleum products and related materials, 34 to natural and manufactured gas, while 35 refers to electric current.

Table 35. This spreadsheet gives the price deflators to convert consumption values (including taxes) to constant prices from Table 6. Again, the relevant series are the price deflators for consumption of domestic heating oil, electricity, energy, kerosene, LPG, petrol, and the joint series for kerosene and heating oil, with most going back to 1960.

Table 37. This spreadsheet contains energy price data. It contains around 80 price series, each with mnemonic and description, as in "ENERGYJH.XLS". Some of the series are linked to give complete series dating back as far as 1953, using the linking process described in the Appendix. These linked series are formed using other series that span only certain time periods. This spreadsheet includes all of the price data from "ENERGYJH.XLS" and from all other sources.

Table 42. This spreadsheet gives the price deflators for imports. Again, the deflator relates to SITC 3, but the spreadsheet also contains deflators for goods and services both separately and together, as well as for other SITC sections.

Table 45. This spreadsheet contains the price deflators for energy inputs into the different sectors of industry from 1970 to 1999, as well as a series for the price of imported energy in Ireland from 1958.

Table 49. This gives the value of energy inputs into industry from 1991 to 1998, taken from the CSO Census of Industrial Production. Industry is broken down by NACE code. The spreadsheet includes series for the value of energy inputs into mining, manufacturing, food processing and the production

and distribution of electricity, gas and water. The manufacturing sector itself is also broken down into significant detail.

Table 51. This spreadsheet details indigenous energy production and consumption. There is a series for total domestic energy production, as well as series for production of peat and turf, hydroelectricity, and natural gas used in the transformation sector, each from 1960 to 1999. The other series give energy consumption by different sectors of industry, and have a shorter time-span.

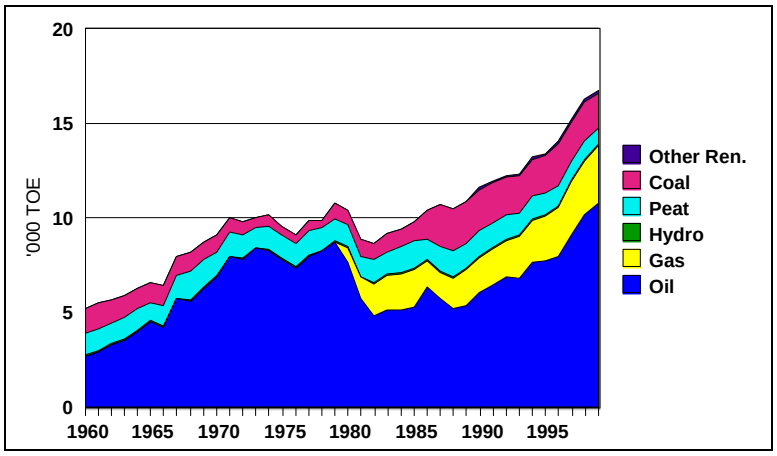
Table 71. This spreadsheet contains the environmental data on emissions to air collected by the EPA. They split Greenhouse Gas emissions into carbon dioxide, methane and nitrous oxide. They then disaggregate further to trace the source of the emissions back to particular sectors. The data runs from 1990 to 1998.

Table 80. This details expenditure on energy by the manufacturing sector, based on the old Census of Industrial Production ISIC classification. The manufacturing sector is disaggregated in great detail, and the spreadsheet includes series for expenditure on energy in the production of electricity, gas, water and turf, as well as in the coal and oil sectors. The data run from 1973 to 1978.

1.4 Trends in Energy Demand

We first set out the trends in energy demand. As trends of this length have not been shown before, they are set out in some detail. Given a database of this magnitude, it is possible to analyse many aspects of energy demand, supply, consumption and pricing over time. This is especially interesting given the volatility of energy prices, with major price shocks in 1973/4 1979 and 1986. Most of the price series run from 1968, while consistent balance sheet data are available from 1960 onwards, thus permitting modelling of behaviour before, during, and after these shocks. Using a series of graphs, certain relationships are considered below. Obviously, this is just the tip of the iceberg, as there is considerable scope for further exploiting the data.

Figure 1.1: Total Primary Energy Supply



We first consider the supply side of the Energy Balance sheets. Recall that Total Primary Energy Supply (TPES) equals domestic production plus imports minus exports with an adjustment for stock changes and international marine bunkers. Figure 1.1 indicates that over the last forty years, the total primary energy requirement for Ireland has more than trebled, with TPES exceeding sixteen million tonnes of oil equivalent in 1999. The graph illustrates a general upward trend, which is to be expected as an economy expands and modernises over time. Innovations since the 1960's have tended to be energy consuming, such as household appliances and computers in the workplace. Population increases have also driven the upward trend in TPES, as well as the extension of the electricity and gas networks. Oil forms the largest share of TPES (see also Figure 1.2 below), and so it comes as little surprise that the oil price shocks of the 1970's resulted in slight decreases in the energy requirement. Natural gas came online in 1979 and fulfilled some of the energy requirement since then. Once oil prices began to fall again during the mid-1980's TPES increased with economic growth. The rate of increase accelerated throughout the 1990's as Ireland entered its period of unusual economic growth. Massive levels of job creation have led to substantial net immigration and a dramatic increase in the number of households. The booming economy has required more energy in order to satisfy the ever-increasing number of households and businesses.

Figure 1.2: Total Primary Energy Supply by Source (per cent)

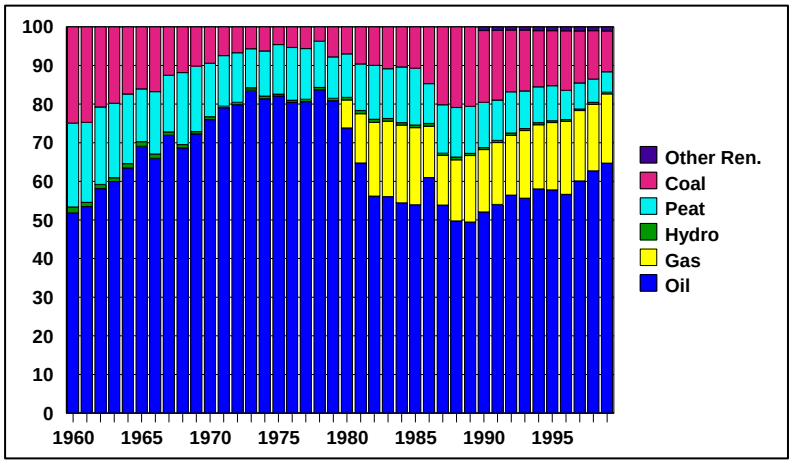


Figure 1.2 gives a breakdown of Total Primary Energy Supply into its constituent parts. The importance of oil to the Irish economy is highlighted. The proportion of TPES made up by oil began the 1960's at some fifty per cent, and rose thereafter. By the time of the first oil crisis in 1973 oil constituted over eighty per cent of TPES. It wasn't until the second oil price shock in 1979 that oil's share of TPES began to decline. This decline was primarily due to the introduction of Natural Gas to the Irish economy, and gas quickly gained importance as the new domestic source of supply came on stream. By 1985 oil's share in TPES was back down to its 1960 level, as coal and gas increased in importance and peat maintained its share. Nevertheless, oil still constituted over fifty per cent of Ireland's TPES throughout the entire period. When the price of oil began to fall again in the late-80's and the economy began to grow again, oil's share rose accordingly. In the period since then both gas and oil have grown in importance, while peat has become significantly less important. Coal still makes up over ten per cent of TPES, but this continues to fall gradually.

Figure 1.3: Dependency on Imports

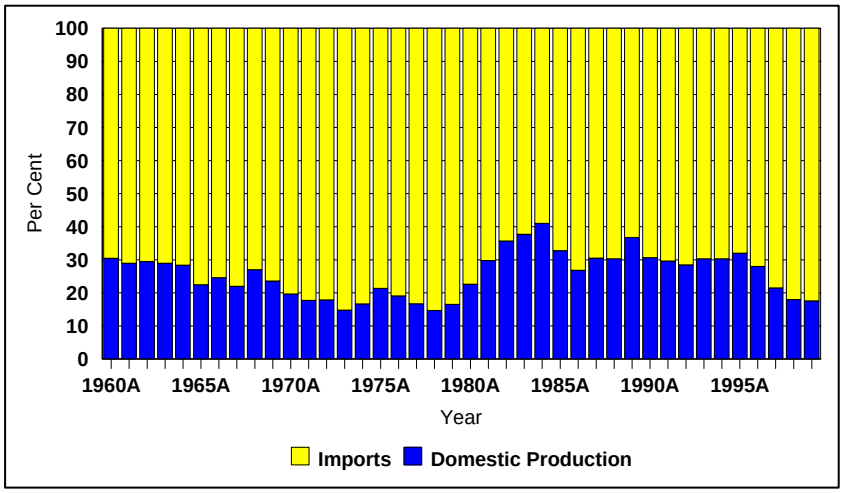
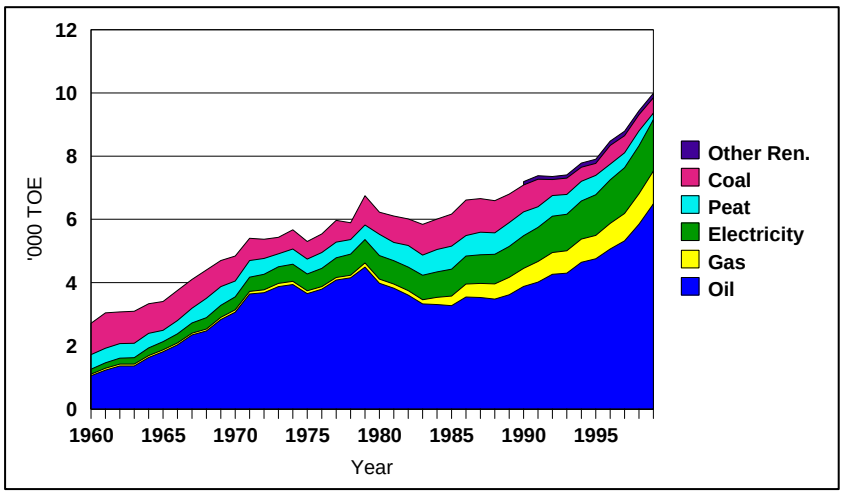


Figure 1.3 illustrates Ireland's dependence on energy imports. Domestic production accounted for about thirty per cent of energy requirements throughout the 1960's, mainly due to indigenous peat production. Increasing dependence on imported oil drove this proportion down to below twenty per cent by the time of the first oil price shock. The introduction of domestically produced natural gas in

1979 reduced imports share of energy requirements to below sixty per cent by 1985. However, since the mid-1980's imports of oil rose again and domestic production accounted for about thirty per cent of energy requirements over the decade to the mid-1990's. Since then imports have significantly increased their share of energy requirements. This is because the increasing primary energy demand seen in Figure 1 is faced with a relatively fixed level of domestic production; the remainder of the energy requirement must be satisfied with imports. By 1999, domestic production accounted for less than 20 per cent of the total energy requirement, and this proportion is set to fall further as natural gas reserves are exhausted and peat production continues to decline.

Figure 1.4: Total Final Consumption



The demand side of the Energy Balance sheets is graphed in Figure 4. Recall that Total Final Consumption (TFC) is equal to the sum of the consumption of each fuel by the principal sectors – industry, transport, commercial, residential and agriculture. TFC shares a similar trend to TPES, however the magnitudes are much smaller. This is a result of substantial energy losses when converting energy from one form to another. Electricity generation is the biggest culprit, with an efficiency of conversion of about thirty-five per cent. Consequently, magnitudes in the supply side of the energy balance sheets are significantly greater than those in the demand side of the balance sheets. In 1999 this gap was of the order of over six million TOE's.

Figure 1.5: Total Final Consumption by Source

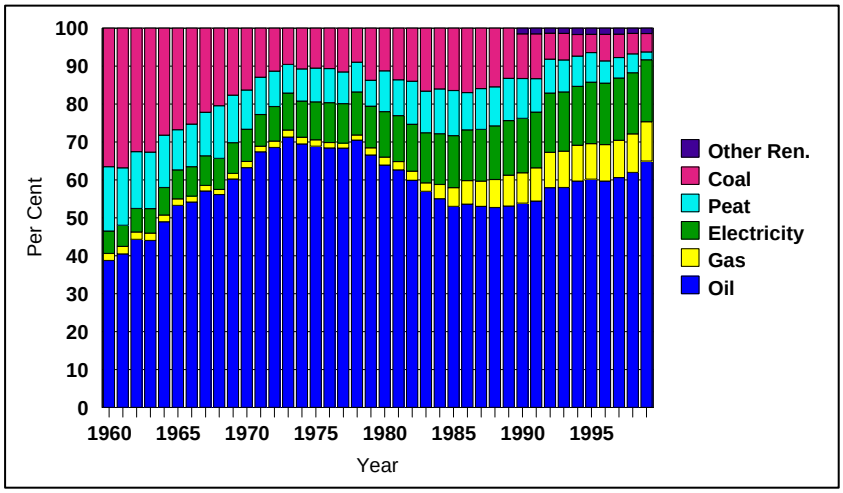


Figure1.5 illustrates the breakdown of TFC into its constituent parts. The trends between TFC and TPES are very similar, with the dependence on oil increasing until the oil price shocks, and declining rapidly until prices fell in the mid-1980's. Final consumption of peat has fallen to negligible levels, especially in the last five years. Gas has increased its proportion of TFC consistently since domestic natural gas production began in 1979. The graph also indicates the growing importance of electricity in final consumption. It is interesting to observe the decline of coal as a fuel in final consumption over the forty-year time horizon. At the beginning of the 1960's coal accounted for almost forty per cent of final consumption. Its proportion declined at a rate practically identical to that of the rise in oil until the oil price shocks. It remained around the ten per cent mark for much of the 1970's, and even increased its share in the early 1980's as people substituted away from oil into coal, while the price of oil rose to very high levels. Peat also increased its share during this time, as did electricity. Since then, however, coal's share in final consumption has fallen significantly, and in 1999 it constituted less than five per cent of final consumption.

Figure 1.6: Ratio of Energy to GNP

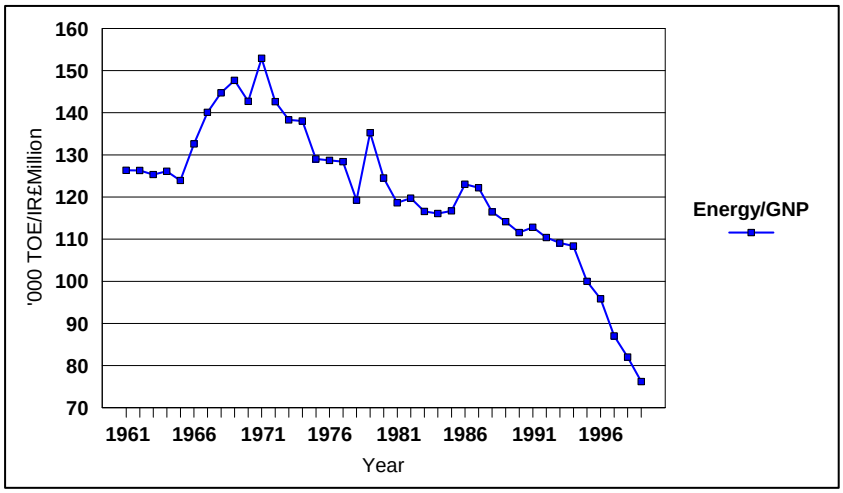
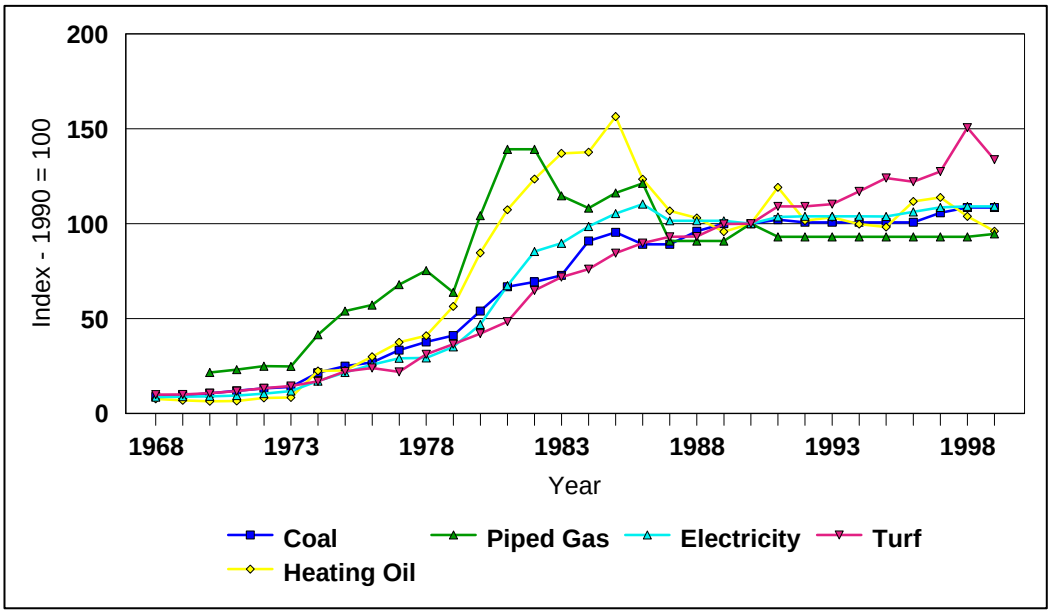


Figure 1.6 plots the ratio of total primary energy use to gross national product over the forty-year time horizon. The ratio is indexed to equal one hundred in 1995. In the period to the early 1970's, industry in Ireland became more energy intensive, causing the ratio to increase to its peak in 1971. The ratio

then began its downward trend, with the exception of some temporary blips during the 1970's and 1980's, as the economy became progressively less energy intensive. Although total primary energy demand has continued to grow throughout the 1990's (see Figure 1.1), it has not come close to matching the phenomenal rate of growth of GNP. As a result, the rate of decline in the energy to GNP ratio has accelerated, especially in the high-growth period from 1995 onwards.

Figure 1.7: Energy Prices for Households



Now, we consider energy prices. It should be noted that none of the prices are adjusted for overall inflation. Figure 1.7 plots the price of energy for households over time, with 1990 prices set to 100. Gas and oil are the most volatile, which is to be expected. Each price series demonstrates a gentle upward trend until the oil price shocks. Prices of all fuels then rise sharply, before levelling off in the late 1980's. Also in the mid-1980s the prices of oil and gas fall sharply to bring them back in line with the other fuels. In the period since then, the price of most of the fuels has remained relatively stable, with the exception of peat, which has seen its price jump in the last few years. The rise in the price of natural gas for households shows the smallest increase over the 1990s.

Figure 1.8: Energy Prices for Industry

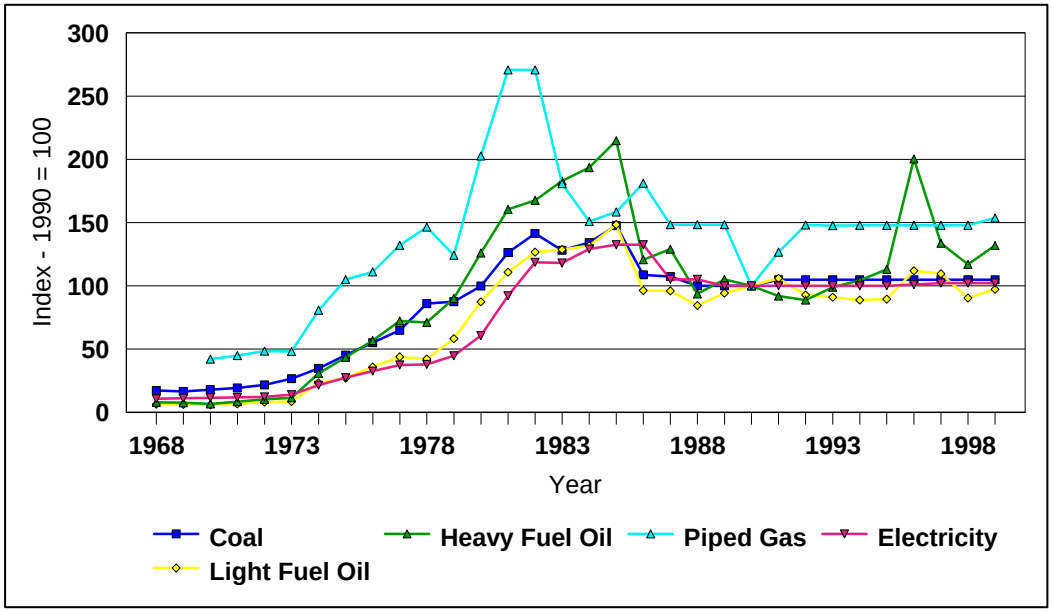


Figure 1.8 illustrates the price of energy for industry over time. The main similarity with the price for households is the fact that prices remain relatively stable after 1990, with the exception of natural gas and heavy fuel oil. The gas series is very volatile in the period before the introduction of natural gas around 1980.

Figure 1.9: Energy Consumption by Sector

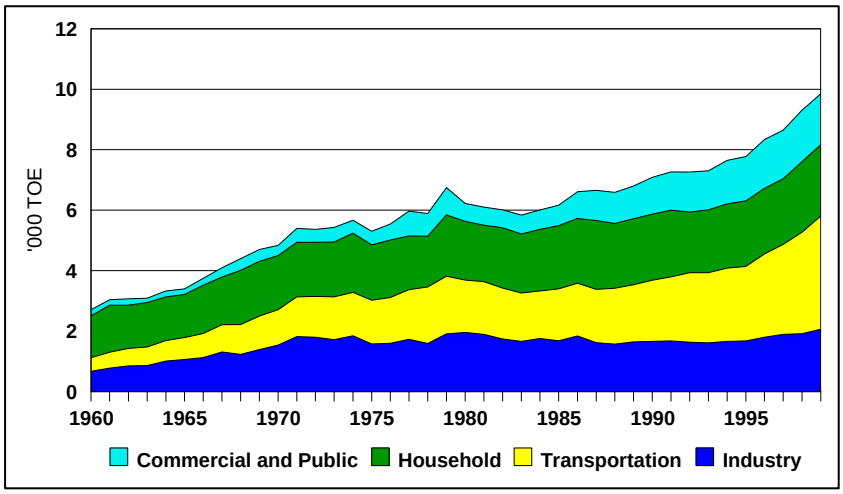


Figure 1.9 considers energy consumption by the different sectors. The commercial and public sector has increased its share significantly, especially since 1980. The commercial and public sector accounted for almost twenty per cent of energy consumption throughout the 1990's, compared with less than five per cent during the 1960's. The rising share of the commercial and public sector has resulted in significant reductions in the shares of both households and industry. It is not that these sectors are consuming less energy, but there has been such an expansion in the commercial and public sector that their relative shares have declined. The transportation sector has also seen a significant increase in its share since 1980, and it now has the largest share of total final consumption.

Figure 1.10: Energy Input Price Ratio

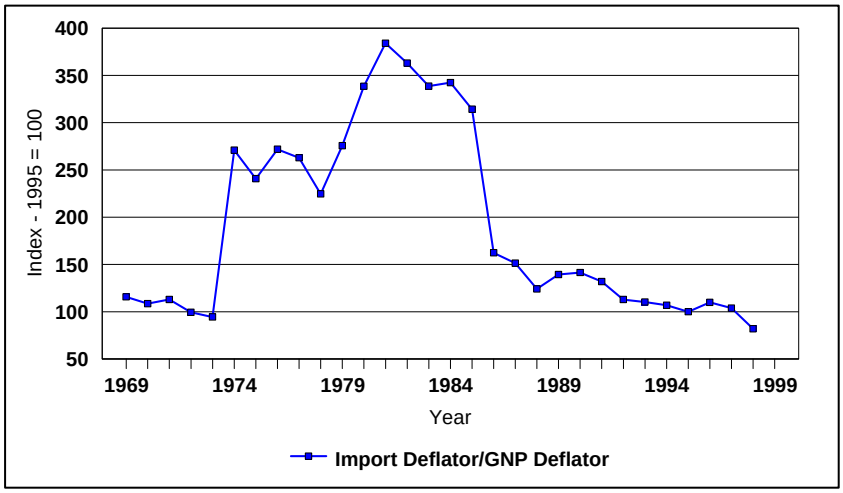


Figure 1.10 plots the ratio of the price of energy imports to the price of GNP. It is indexed to equal 100 in 1995. The price of GNP was rising marginally faster than the price of energy imports until the first oil price shock in 1973. Figures 1.2 and Figure 1.5 both illustrate Ireland's dependence on oil as a fuel and, with no indigenous production of oil, it is unsurprising to see the ratio jump in 1973 as the price of imported oil spiralled. The ratio then fluctuated at a high level until the second oil price shock in 1979, after which it continued to climb, reaching a maximum of over 380 in 1981. As oil prices fell in the mid-1980's, the ratio fell accordingly. Between 1985 and 1986 the ratio halved, and the downward trend continued until it reached its index mark of 100 in 1995.

Figure 11: Domestic Energy Price Ratios

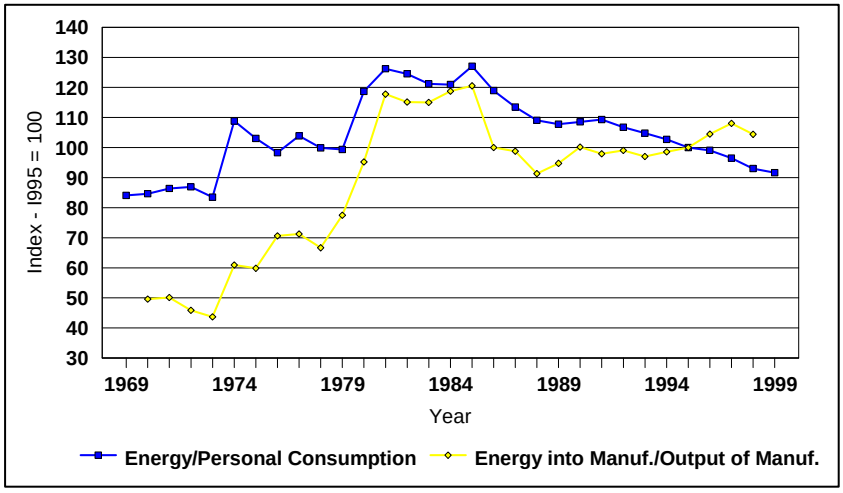


Figure 1.11 illustrates the domestic energy price ratios. The first series plots the ratio of the price of energy for consumers (excluding petrol) relative to the price deflator for personal consumption. The second series plots the ratio of the price of energy inputs for manufacturing to the price of manufacturing output. It is worth noting that although the series in both this graph and the previous one are indexed to equal one hundred in 1995, the scales are significantly different. The previous graph considered the imports of energy, primarily oil, and in the 1970s the index rose to almost four times its 1990 level. This graph considers energy consumption by the household and manufacturing sectors, and the indices never deviate more than sixty points from the 1995 base of one hundred. This is because

these indices include domestic taxes on oil, and also because of the fact that oil is not the only fuel used in Ireland: as we have seen previously, both electricity and gas have increased their shares of TFC over the previous two decades. Whereas the previous graph was strongly influenced by the price of oil, domestic consumers and industry are not as exposed, and have the ability to substitute away from oil. The previous graph considered energy imports, while this graph is concerned with the price paid by final consumers. The domestic costs of transforming primary energy into useful energy, which are less volatile, also help to explain the observed difference between them.

In 1969, the index of the energy price ratio for manufacturing lay below that for personal consumption. The two price indices converged during the early 1980's, as the price deflator for energy use in manufacturing rose significantly faster than the price of manufacturing output. Both energy price ratios shared a similar downward trend throughout the late 1980's as the price of energy for both households and industry declined with the price of oil. Both are indexed to equal 100 in 1995, but the household energy price ratio is on a downward trend, while the ratio for the price of energy in the manufacturing sector has tended to rise. The reason for this is that the personal consumption deflator has risen markedly throughout the 1990's as the economy has grown so strongly, while manufacturing output prices have changed relatively little. When coupled with small changes in the price of domestic energy, the result is a fall in the ratio of the price of domestic energy to the price of personal consumption.

1.5 Emissions to Air

We now present the data on emissions of greenhouse gases, availing of the Environmental Protection Agency's data, collected in the process of reporting to the CORINAIR programme. It should be noted that the emissions figures include emissions from processes, such as the manufacturing of cement, but exclude sequestration by forests and emissions by soil. However, the EPA has collected data on sequestration, and it is presented in Table 71 (listed in the appendix).

Figure 1.12: Greenhouse Gas Emissions

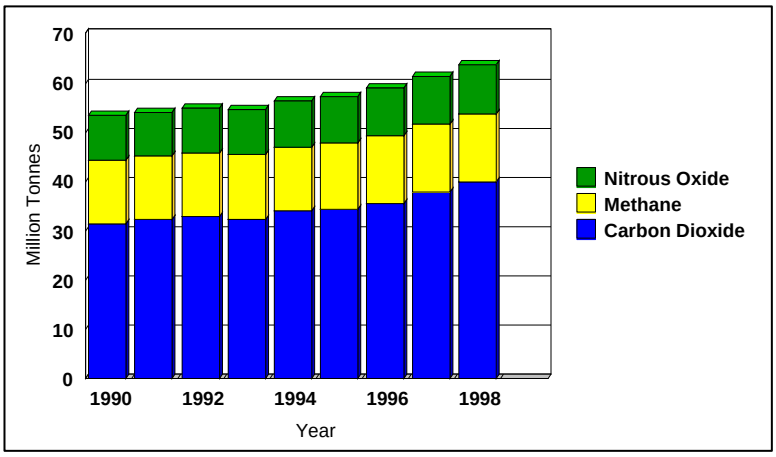


Figure 1.12 plots the level of greenhouse gas emissions in million tonnes ('000 Gigagrams). These data from the EPA cover the 1990s. Given the amount of other data collected on energy, it would be

possible to model emissions from energy use back to the 1960's, but this would require significant additional work outside the scope of this study. From the graph, it is obvious that the overall level of greenhouse gas emissions has increased significantly since 1990. Throughout the early 1990's the rate of increase was quite slow, and emissions even fell in 1993. Since then, however, the rate of increase has accelerated, especially since 1996. Greenhouse gas emissions take the form of Carbon Dioxide, Methane and Nitrous Oxide, and emissions of each of these have increased at a similar rate. Carbon dioxide emissions constitute around two thirds of total emissions throughout the nine-year period.

Figure 1.13: Greenhouse Gas Emissions relative to Real GNP (1995 prices)

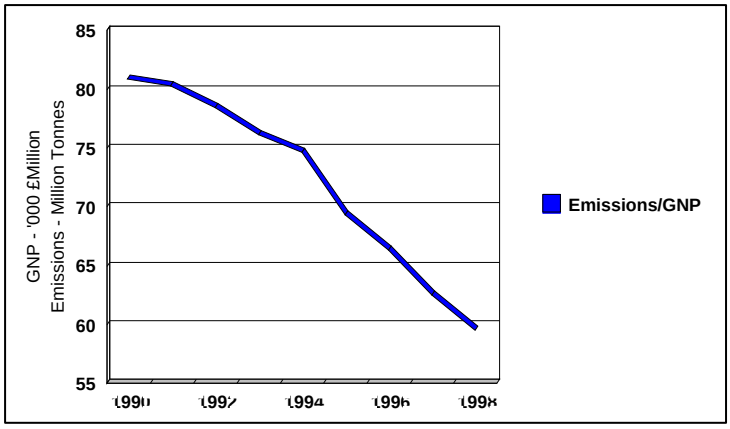


Figure 1.13 plots the overall level of greenhouse gas emissions relative to the level of real GNP at 1995 prices. This indicates that greenhouse gas emissions are rising much more slowly than the level of overall economic activity.

Figure 1.14: Carbon Dioxide Emissions per unit of Final Energy Consumption

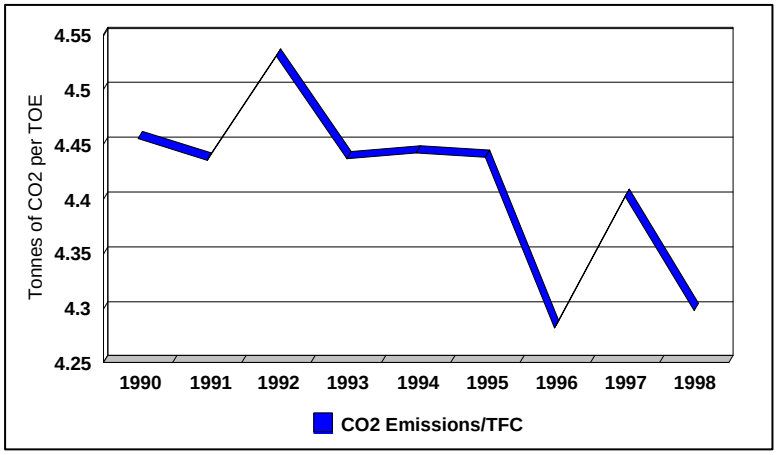


Figure 14 illustrates the ratio of carbon dioxide emissions to total final consumption of energy. The ratio is varies, but is generally declining.

Figure 1.15: Greenhouse Gas Emissions by Sector

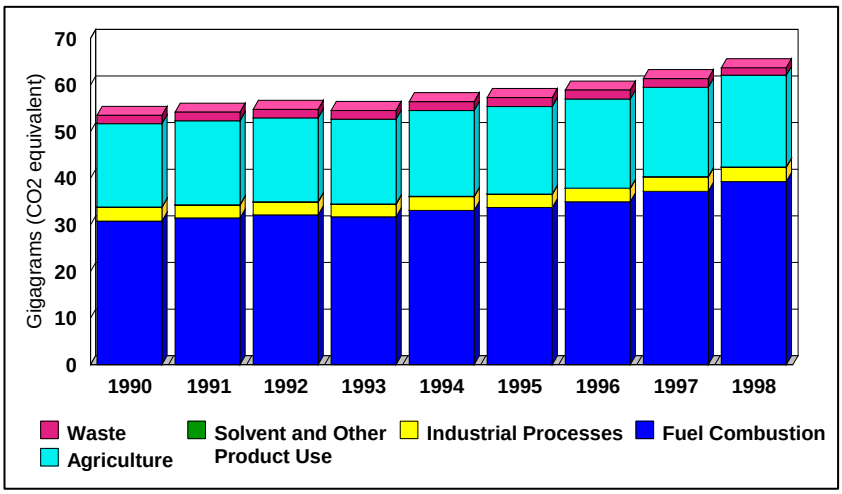


Figure 1.15 illustrates the breakdown of total emissions by sector of origin, using the EPA's classification. It is clear from the graph that the majority of emissions come from the fuel combustion sector. This includes both the transport and energy transformation sectors, accounting for over half of total emissions over the entire nine-year period. The other main polluting sector is agriculture, which has seen a ten per cent increase in its emissions since 1990. The other sectors have retained their minor shares of total emissions. Note that the 1998 Census of Industrial Production will contain energy data in reasonable detail, but is not yet available. Hence, for that year, it will be possible to reclassify and disaggregate the emissions data into sectors in more detail.

1.6 Taxes

There are very few ecotaxes in Ireland. The single most important type of ecotax is the excise tax on oil. However, it should be noted that these taxes are not primarily levied for environmental reasons. They also serve to internalise the costs of road maintenance, congestion, accidents and other costs arising from the increased consumption of oil.

Figure 1.16: Tax Revenue per TOE of Oil

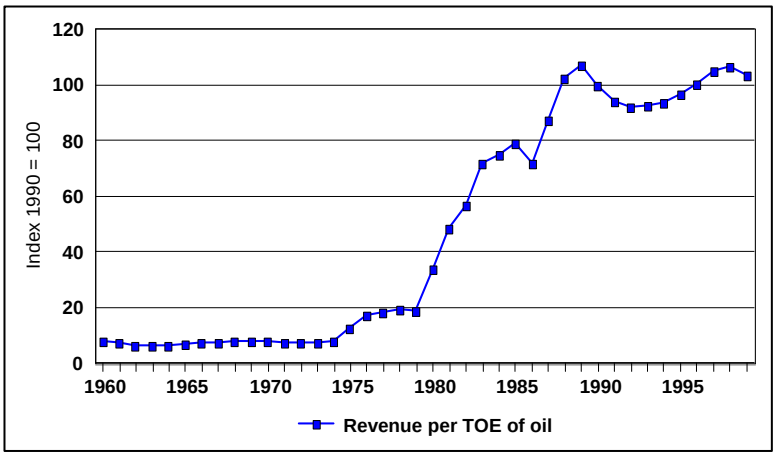


Figure 1.16 plots the ratio of the nominal revenue from taxation of oil (excise taxes only) to primary energy demand for oil from 1960 to 1999. It is indexed to equal 100 in 1995. The index remains at around ten per cent of its 1990 base until the mid-1970's, when there is a jump to about twenty per cent of its base. The index rose rapidly throughout the 1980's, reaching a peak of over 107 in 1989. Since then it has fluctuated around its 1990 base. The graph illustrates the fact that taxation of oil per TOE of primary demand rose dramatically throughout the 1980's. This is unsurprising, as it was a period of increased taxation in the economy as a whole, when both direct and indirect tax rates were increased as the country attempted to redress it's fiscal imbalance. As taxation levels have shown only a slight increase throughout the 1990's, there has been little deviation around the 1990 base.

Figure 1.17: Revenue from Excise Duty on Oil relative to GNP

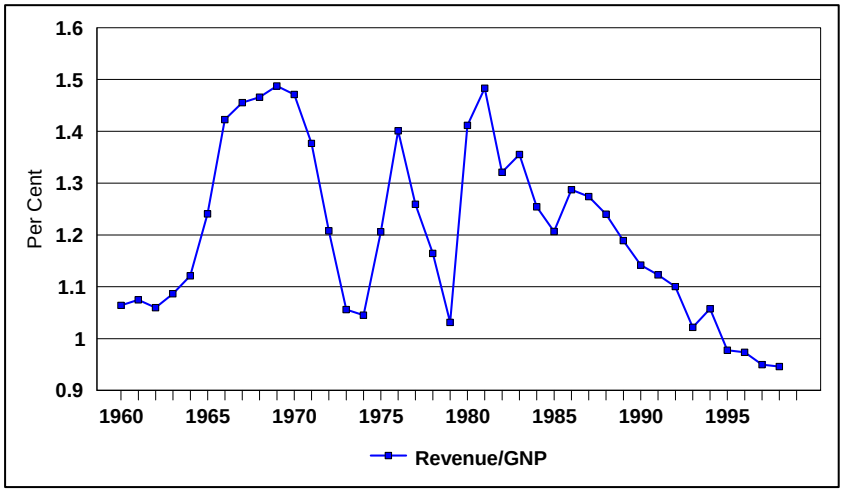


Figure 1.17 plots the ratio of revenue from excise duty on oil to GNP, all at current market prices. From the graph, it is obvious that the ratio has been very volatile, especially throughout the 1970's and 1980's. Revenue from oil represented about one per cent of GNP in 1960 and this had risen to approximately 1.5 per cent by 1970. The ratio fell dramatically around the time of the two oil price shocks, with a temporary recovery in between. This reflects underindexation at a time of rapid

inflation. Since the first half of the 1980s revenue from energy taxes has shown a downward trend and, by 1998, revenue from oil came in at less than one per cent of GNP at market prices.

Figure 1.18: Revenue Raised per Gigagram of Emissions of Greenhouse Gases

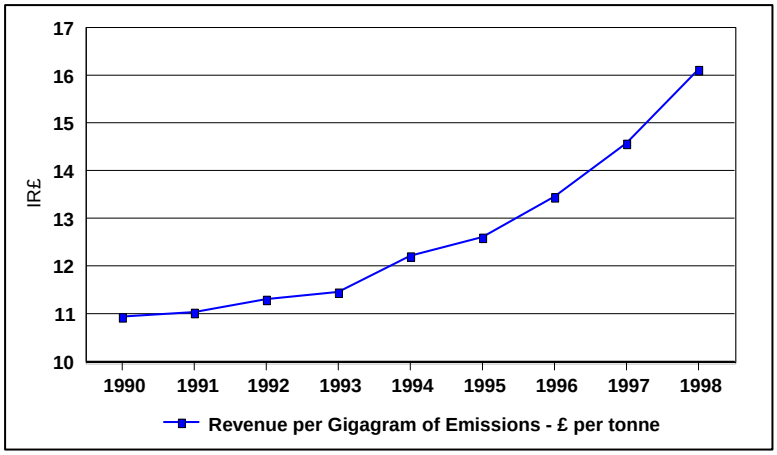


Figure 1.18 illustrates the nominal revenue from excise duties on oil per gigagram of Greenhouse Gas emissions. With the exception of a slowdown in 1993, revenue per unit of greenhouse gases has been rising for the last nine years. Revenue has increased at a faster rate than emissions, resulting in the ratio increasing over time. These rates of £11 to £16 per tonne of greenhouse gas emitted can be contrasted with the estimates of marginal damage costs in the international literature. These costs cluster in a range from £4 to £15 approximately, and do not include infrastructure use or other implications.

1.7 Conclusions

This report has assembled a consistent series for energy balances as well as energy prices. The data for energy balances run from 1960, while price data are available from the late 1960's. Data on taxes have been presented on various bases. Emissions data are only available on a consistent basis from 1990 onwards, but one avenue of future work could be to use the data from elsewhere in the databank to generate a series for emissions dating back to the 1960's, and to reclassify emissions according to broad NACE categories. Another future task is to assemble consistent data on other emissions to air, such as sulphur dioxide, nitrogen dioxides and Ammonia, which are collected by the Environmental Protection Agency.

The data still show significant shortcomings, especially in obtaining consistent price series for reasonable periods of time. The Census of Industrial Production, which in the 1970s allowed a breakdown by expenditure on different types of energy for each industrial sector, has not been available for much of the 1980s. Data for 1990 were used in the *Pilot Environmental Accounts* and similar data will be available on a once off basis for 1998. The responsibility for ensuring consistent standards in data collection and for ensuring consistency over time in data availability should, ideally, rest with the CSO. However, to date, they have not had the resources to take on such a role.

Appendix 1.

A.1. - Key to Mnemonics:

A = Agriculture
C = Domestic Consumption
E = Electricity Production
FC = Final Consumption
G = Gas Production
I = Industry
M = Imports
QD = Domestic Production
R= Refineries use of Crude Oil
S = Services – Commercial
ST = Transport
TD = Total Primary Energy Use
X = Exports

1 = Coal
3 = Crude Oil
4 = Oil
41 = Petrol
42 = Diesel
43 = Fuel Oil
44 = Refinery Gas + Kerosene + LPG + Naphta
45 = Light Oil for Heating
6 = Gas
7 = Electricity
8 = Turf
9 = Renewables – excluding Hydro

A.2. Explanation of process used to link data series

1. PEN41_L

This represents the price of a litre of petrol. Eurostat provide us with the (at the pump) price for a litre of premium unleaded petrol from 1985 to 1999 in PEN41U_L_EU. This is then linked with a similar series from the IEA spanning 1978 to 1999, PEN41U_L_IEA. We also incorporate a series from the CSO called PCPET, which is a price deflator for final consumption of petrol from 1953 to 1999. Finally, the Revenue Commissioners Statistical reports contain a series for the price of a litre of petrol going back to 1953. We link all these series to form PEN41_L, which runs from 1953 to 1999.

2. PEN42_L

This represents the price of a litre of diesel. Similarly to above, the Eurostat (at the pump) price, PEN42_L_EU, is linked with the corresponding IEA series, PEN42_L_IEA, to give a linked series from 1978 to 1999. This is then linked to a series from the CSO's Wholesale Price Index, WPAM403, which gives the price of a litre of diesel for industry from 1975. Together these yield the full series PEN42_L, running from 1975 to 1999.

3. PEN43I_L

This represents the price of a litre of light fuel oil for industry. The IEA series PEN43LI_L_IEA gives prices from 1978 to 1999. This is linked with a series from the CSO's Wholesale Price Index, WPAM 404, which gives the price of gas oil other than diesel from 1975. This series is necessary to provide a link to another IEA series, PEN45I_IEAOLD, which gives the price from 1968 to 1978. The resulting series, PEN43I_L, is a consistent series for the price of light fuel oil for industry running from 1968 to 1999.

4. PEN43C_L

This represents the price of a litre of light fuel oil for households. Eurostat provided a series for the price of heating gas for households, PEN43LC_L_EU, running from 1985 to 1999. This was linked

with a similar series from the IEA, PEN43LC_L_IEA, which runs from 1979 to 1999. Another IEA series, PEN45C_IEAOLD, gives the price between 1968 and 1978. It was necessary to use the above price for industry, PEN43I_L, to provide an overlapping year with which to link. Thus, the series PEN43C_L gives the price of light fuel oil for households from 1969 to 1999.

5. PEN44I_M

This gives the price per metric tonne of heavy fuel oil for industry. The IEA series PEN44I_M_IEA fives the price from 1979 to 1999. Another IEA series, PEN44I_IEAOLD, gives the price from 1968 to 1978. In order to link the two series, the CSO's Wholesale Price index WPAM405 is used. This gives an index of the price of fuel oil from 1975 onwards. Using this series it is possible to create PEN44I_M, the price of heavy fuel oil for industry from 1968 to 1999.

6. PEN44E_M

This gives the price of per metric tonne of heavy fuel oil for the energy sector. It links the industry price from the previous series, PEN44I_M_IEA, with a series for the price of fuel oil that is indexed to the CSO's Wholesale Price Index, PEN43, which goes back to 1975. This is then linked to the IEA series, PEN44E_IEAOLD, which runs from 1968 to 1978. The resulting series is PEN44E_M, running from 1968 to 1999.

7. PEN1C_M

This is the price per tonne of coal for households. The IEA provide a series for the domestic price of coal from 1978 to 1994, PEN1C_IEA. This is then linked with a series from the CSO's Consumer Price Index for the household price of coal, PEN1C_OLD, which runs from 1953 to 1981. The Irish Energy Centre provide a similar series from 1981 to 1999, and thus linking all these series yields PENIC_M, which runs from 1953 to 1999.

8. PEN1I_M

This represents the price per tonne of coal for industry. The Irish Energy Centre provided figures for the price of coal for industry from 1993 to 1999. Due to the absence of data on the industry price of coal, this is then linked to the price of coal for households from above, PEN1C_M, to give a series for the industry price of coal running from 1953 to 1999.

9. PEN6C_J

This represents the price of natural gas for households. Eurostat provide a series for the domestic price of natural gas from 1985 to 2000, PEN6C_K_EU. This is then linked to a similar series from the IEA, PEN6C_K_IEA, which runs from 1981 to 1999. The new series is linked to an ESRI series, PEN62, which goes back to 1970. Thus, a series for the price of natural gas for households from 1970 to 2000 is created.

10. PEN6I_K

This represents the price of natural gas for industry. The linking process is exactly the same as for households, with the Eurostat series (PEN6I_K_EU) linked to the IEA series (PEN6I_K_IEA), and then incorporating the same ESRI series (PEN62) to give a series for the price of natural gas for industry from 1970 to 2000.

11. PEN7C_K

This series gives the price of electricity for households. The IEA series PEN7C_K_IEA runs from 1978 to 1999, and this is linked with a series obtained from ESB dating back to 1955, PEN73_T. The resulting series gives the price of electricity for households from 1955 to 1999.

12. PEN71_T

This represents the price of electricity for industry, per TOE. It is generated by four linked series. The first is PEN7I_K_IEA, which is the IEA series for the price of electricity for industry running from 1978 to 1999. The Irish Energy Centre gives prices from 1981 to 1999 in PEN7I_K. The third series used in the linking process is WPAM 406 from the CSO's Wholesale Price Index. This is an index of the price of electricity for industrial users, running from 1980 to 1995. The required series, PEN71_T, is formed by linking these series with an ESB series of electricity prices for industry, running from 1955 to 1999.

13. PEN6E_K

This represents the price of natural gas for use in the generation of electricity. The IEA series PEN6E_K_IEA gives prices from 1985 to 1999. This is then linked with a series derived from data in ESB accounts, PEN6E_T, running from 1979 to 1990. By linking these two series it is possible to form the required series for the price of natural gas used in the electricity generation sector, from 1979 to 1999.

14. PEN1E_M

This represents the price of coal for use in the generation of electricity. The linking process is very similar to the previous series, with the IEA series (PEN1E_M_IEA) linked to another series derived from ESB accounts (PEN1E_T). Here, though, the series runs from 1972 to 1999.

A.3. Contents of Tables

Table 6.

C	Personal consumption at constant prices, £ million.
CAL	consumption of alcohol, constant prices, £ million.
CALB	Beer, personal consumption, constant prices. Source: Unpublished CSO data.
CALBV	Beer, personal consumption, current prices. Source: Unpublished CSO data.
CALO	Other alcohol, personal consumption, constant prices. Source: Unpublished CSO data.
CALOV	Other alcohol, personal consumption, current prices. Source: Unpublished CSO data.
CALS	Spirits, personal consumption, constant prices. Source: Unpublished CSO data.
CALSV	Spirits, personal consumption, current prices. Source: Unpublished CSO data.
CALV	Consumption of alcohol, current prices, £ million.
CCAR	Cars, personal consumption, constant prices. Source: Unpublished CSO data.
CCARV	Cars, personal consumption, current prices. Source: Unpublished CSO data.
CCLO	Consumption of clothing, constant prices, £ million.
CCLOV	Consumption of clothing, current prices, £ million.
CCVA	CCVA = CCVA1+CCVA2+CCVB2+CCVA6+CCVA5+CSV-CENEXOV
CCVA1	CCVA1 = (CNDV-CFOODV-COGOV+CENEXOV)/(1+RV1)
CCVA2	CCVA2 = CDURV/(1+RV2)
CCVA5	CCVA5 = CFOODV/(1+RV5)
CCVA6	CCVA6 = CTREQV/(1+RV6)
CCVB2	CCVB2 = COGOV/(1+RV2)
CD	Consumption of durables including transport equipment, constant prices, £ million.
CDHO	Domestic Heating Oil, personal consumption, constant prices. Source: Unpublished CSO data.
CDHOV	Domestic Heating Oil, personal consumption, current prices. Source: Unpublished CSO data.
CDUR	Consumption of durables excluding transport equipment, constant prices, £ million.
CDURV	Consumption of durables excluding transport equipment, current prices, £ million.
CDV	Consumption of durables including transport equipment, current prices, £ million.
CELEC	Electricity, personal consumption, constant prices. Source: Unpublished CSO data.
CELECV	Electricity, personal consumption, current prices. Source: Unpublished CSO data.
CENERGY	Consumption of energy at constant prices, £ million.
CENERGYV	Consumption of energy at current prices, £ million.
CENTER	Consumption expenditure on entertainment, constant prices, £ million.
CENTERV	Consumption expenditure on entertainment, current prices, £ million.
CFD	Consumption of food excluding non-alcoholic beverages, constant prices, £ million.
CFDV	Consumption of food excluding non-alcoholic beverages, current prices, £ million.
CFOOD	Consumption of food and non-alcoholic beverages, constant prices, £ million.
CFOODV	Consumption of food and non-alcoholic beverages, current prices, £ million.
CFPOW	Consumption of fuel and power, constant prices, £ million.
CFPOWV	Consumption of fuel and power, current prices, £ million.
CKER	Kerosene, personal consumption, constant prices. Source: Unpublished CSO data.
CKERV	Kerosene, personal consumption, current prices. Source: Unpublished CSO data.

CLPG	LPG, personal consumption, constant prices. Source: Unpublished CSO data.
CLPGV	LPG, personal consumption, current prices. Source: Unpublished CSO data.
CNALB	Non-Alcoholic Beverages, personal consumption, constant prices. Source: Unpublished CSO data.
CNALBV	Non-Alcoholic Beverages, personal consumption, current prices. Source: Unpublished CSO data.
CND	Consumption of non-durables, constant prices, £ million.
CNDV	Consumption of non-durables, current prices, £ million.
COFPOW	Consumption, non-durables, constant prices, £ million.
COFPOWV	Consumption, non-durables, current prices, £ million.
COGO	Consumption of other goods, constant prices, £ million.
COGOV	Consumption of other goods, current prices, £ million
COIL	Consumption of kerosene and heating oil, constant prices, £ million.
COILV	Consumption of kerosene and heating oil, current prices, £ million.
COTRAV	Consumption of travel within the state excluding petrol, constant prices, £ million.
COTRAVV	Consumption of travel within the state excluding petrol, current prices, £ million.
CV	Personal consumption, current prices, £ million, B0501.
CVRES	Consumption - residual balancing item where individual series are linked independently, current prices, £ million.
CPET	Petrol, personal consumption, constant prices. Source: Unpublished CSO data.
CPETV	Petrol, personal consumption, current prices. Source: Unpublished CSO data.
CPSER	Consumption of professional and personal services, constant prices, £ million.
CPSERV	Consumption of professional and personal services, current prices, £ million.
CRENT	Consumption, rent, constant prices, £ million.
CRENTV	Consumption, rent, current prices, £ million.
CRES	Consumption - residual balancing item where individual series are linked independently, constant prices, £ million.

Table 11.

EN1BA_T	Energy Use - Change in stocks of Coal in TOE.
EN1C_T	Energy Use - Household consumption of Coal in TOE. Source: from 1980 from DOE. Earlier data from IEA . SOURCE: Brendan O'Loughlin, Dept. of Energy.
EN1E_T	Energy Use - energy sector consumption of Coal in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN1FC_T	Energy Use - final consumption of Coal in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN1G_T	Energy Use - gas works consumption of Coal in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN1I_T	Energy Use - industry sector consumption of Coal in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN1M_T	Energy Use -Imports of Coal in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN1QD_T	Energy Use -domestic production of Coal in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN1TD_T	Energy Use - primary energy demand for Coal in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN1X_T	Energy Use -exports of Coal in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN3BA_T	Energy Use -change in stocks of crude oil in TOE. Source: from 1980 from DOE. Earlier data from IEA
EN3M_T	Energy Use -Imports of crude oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN3R_T	Energy Use - refineries consumption of crude oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN3TD_T	Energy Use - primary energy demand for crude oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN3X_T	Energy Use -exports of crude oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN41FC_T	Energy Use - final consumption of petrol in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN41M_T	Energy Use -Imports of petrol in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN41QD_T	Energy Use -domestic production of petrol in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN41ST_T	Energy Use - transportation sector use of petrol in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN41TD_T	Energy Use - primary energy demand for petrol in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN41X_T	Energy Use -exports of petrol in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN42C_T	Energy Use - Household consumption of diesel in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN42E_T	Energy Use - energy sector consumption of diesel in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN42FC_T	Energy Use - final consumption of diesel in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN42G_T	Energy Use - gas works consumption of diesel in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN42I_T	Energy Use - industry sector consumption of diesel in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN42M_T	Energy Use -Imports of diesel in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN42QD_T	Energy Use -domestic production of diesel in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN42ST_T	Energy Use - transportation sector use of diesel in TOE. Source: from 1980 from DOE. Earlier data from IEA .

EN42TD_T	Energy Use - primary energy demand for diesel in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN42X_T	Energy Use -exports of diesel in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN43E_T	Energy Use - energy sector consumption of fuel oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN43FC_T	Energy Use - final consumption of fuel oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN43G_T	Energy Use - gas works consumption of fuel oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN43I_T	Energy Use - industry sector consumption of fuel oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN43M_T	Energy Use -Imports of fuel oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN43QD_T	Energy Use -domestic production of fuel oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN43TD_T	Energy Use - primary energy demand for fuel oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN43X_T	Energy Use -exports of fuel oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN49FC_T	Energy Use - final consumption of other oil in TOE.
EN49M_T	Energy Use -Imports of other oil in TOE.
EN4BA_T	Energy Use -change in stocks of other oil in TOE.
EN4C_T	Energy Use - Household consumption of oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN4E_T	Energy Use - energy sector consumption of oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN4FC_T	Energy Use - final consumption of oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN4G_T	Energy Use - gas works consumption of oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN4I_T	Energy Use - industry sector consumption of oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN4M_T	Energy Use -Imports of oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN4R_T	Energy Use - refineries consumption of oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN4ST_T	Energy Use - transportation sector use of oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN4TD_T	Energy Use - primary energy demand for oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN4X_T	Energy Use -exports of oil in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN6BA_T	Energy Use - Change in stocks of gas in TOE.
EN6C_T	Energy Use - Household consumption of gas in TOE. Source: from 1980 from DOE. Earlier data from IEA .For 1979 from DoPE.
EN6E_T	Energy Use - energy sector consumption of gas in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN6FC_T	Energy Use - final consumption of gas in TOE. Source: from 1980 from DOE. Earlier data from IEA .For 1979 from DoPE.
EN6G_T	Energy Use - gas works consumption of gas in TOE. Source: from 1980 from DOE. Earlier data from IEA .For 1979 from DoPE.
EN6IMCHF_T	Energy Use - industry(Feedstock) consumption of gas in TOE. Source: from 1980 from DOE. Earlier data from IEA .For 1979 from DoPE.
EN6I_T	Energy Use - industry sector consumption of gas in TOE. Source: from 1980 from DOE. Earlier data from IEA .For 1979 from DoPE.
EN6M_T	Energy Use -Imports of gas in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN6QD_T	Energy Use - domestic production of gas in TOE. Source: from 1980 from DOE. Earlier data from IEA. For 1979 from DoPE.
EN6TD_T	Energy Use - domestic production of gas in TOE. Source: from 1980 from DOE. Earlier data from IEA.
EN7A_T	Energy Use -agricultural sector consumption of electricity in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN7BA_T	Energy Use - Change in stocks etc. of electricity in TOE.
EN7C_T	Energy Use - Household consumption of electricity in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN7E_T	Energy Use - energy sector consumption of electricity in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN7FC_T	Energy Use - final consumption of electricity in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN7I_T	Energy Use - industry sector consumption of electricity in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN7QD_T	Energy Use - domestic production of electricity from renewables (hydro) in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN7RES_T	Energy Use - demand for electricity from the commercial and public sectors in TOE
EN7TD_T	Energy Use - domestic production of electricity in TOE. Source: from 1980 from DOE. Earlier data from IEA.
EN8BA_T	Energy Use - Change in stocks etc. of peat in TOE.
EN8C_T	Energy Use - Household consumption of peat in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN8E_T	Energy Use - energy sector consumption of peat in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN8FC_T	Energy Use - final consumption of peat (including briquettes) in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN8I_T	Energy Use - industry sector consumption of peat in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN8QD_T	Energy Use - domestic production of peat in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN8TD_T	Energy Use - total consumption of peat in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN9C_T	Energy Use - Household consumption of Other Renewables (excluding Hydro) in TOE. Source: from 1980 from DOE. Earlier data from IEA . SOURCE: Brendan O'Loughlin, Dept. of Energy.
EN9E_T	Energy Use - energy sector consumption of Other Renewables (excluding Hydro) in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN9FC_T	Energy Use - final consumption of Other Renewables (excluding Hydro) in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN9G_T	Energy Use - gas works consumption of Other Renewables (excluding Hydro) in TOE. Source: from 1980 from DOE. Earlier data from IEA .

EN9I_T	Energy Use - industry sector consumption of Other Renewables (excluding Hydro) in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN9M_T	Energy Use -Imports of Other Renewables (excluding Hydro) in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN9QD_T	Energy Use -domestic production of Other Renewables (excluding Hydro) in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN9TD_T	Energy Use - primary energy demand for Other Renewables (excluding Hydro) in TOE. Source: from 1980 from DOE. Earlier data from IEA .
EN9X_T	Energy Use -exports of Other Renewables (excluding Hydro) in TOE. Source: from 1980 from DOE. Earlier data from IEA .
ENBA_T	Change in energy balances, thousand TOE.
ENC_T	Household energy consumption in thousand TOE.
ENFC_T	Total final energy consumption, thousand TOE.
ENIMCHF_T	Energy Use - industry(Feedstock) consumption of gas in TOE. Source: from 1980 from DOE. Earlier data from IEA - unreliable.
ENI_T	Industrial sector energy consumption in thousand TOE.
ENM_T	Imports of energy in thousand TOE
ENOL_T	Other energy loss, thousand TOE.
ENQD_T	Domestic energy production in thousand
ENRES_T	ENRES_T = ENFC_T-ENI_T-ENST_T-ENC_T
ENST_T	Energy Use - transportation sector use of oil in TOE. Source: from 1980 from DOE. Earlier data from IEA - unreliable.
ENTD_T	Primary energy demand in thousand TOE.
ENUL_T	Utilities sector consumption of energy in thousand TOE

Table 12.

ENBA_T	Change in energy balances, thousand TOE.
ENC_T	Household energy consumption in thousand TOE.
ENFC_T	Total final energy consumption, thousand TOE.
ENIMCHF_T	Energy Use - industry(Feedstock) consumption of gas in TOE. Source: from 1980 from DOE. Earlier data from IEA.
ENIMD42V_X	ENIMD42V_X = PEN44*EN42IMD_T
ENIMD42_X	ENIMD42_X = ENIMD42V_X/PEN44_X
ENIMD43V_X	ENIMD43V_X = PEN43*EN43IMD_T
ENIMD43_X	ENIMD43_X = ENIMD43V_X/PEN43_X
ENIMD4V_X	ENIMD4V_X = ENIMD42V_X+ENIMD43V_X
ENIMD4_X	ENIMD4_X = ENIMD42_X+ENIMD43_X
ENIMF42V_X	ENIMF42V_X = PEN44*EN42IMF_T
ENIMF42_X	ENIMF42_X = ENIMF42V_X/PEN44_X
ENIMF43V_X	ENIMF43V_X = PEN43*EN43IMF_T
ENIMF43_X	ENIMF43_X = ENIMF43V_X/PEN43_X
ENIMF4V_X	ENIMF4V_X = ENIMF42V_X+ENIMF43V_X
ENIMF4_X	ENIMF4_X = ENIMF42_X+ENIMF43_X
ENIMH42V_X	ENIMH42V_X = PEN44*EN42IMH_T
ENIMH42_X	ENIMH42_X = ENIMH42V_X/PEN44_X
ENIMH43V_X	ENIMH43V_X = PEN43*EN43IMH_T
ENIMH43_X	ENIMH43_X = ENIMH43V_X/PEN43_X
ENIMH4V_X	ENIMH4V_X = ENIMH42V_X+ENIMH43V_X
ENIMH4_X	ENIMH4_X = ENIMH42_X+ENIMH43_X
ENIMT42V_X	ENIMT42V_X = PEN44*EN42IMT_T
ENIMT42_X	ENIMT42_X = ENIMT42V_X/PEN44_X
ENIMT43V_X	ENIMT43V_X = PEN43*EN43IMT_T
ENIMT43_X	ENIMT43_X = ENIMT43V_X/PEN43_X
ENIMT4V_X	ENIMT4V_X = ENIMT42V_X+ENIMT43V_X
ENIMT4_X	ENIMT4_X = ENIMT42_X+ENIMT43_X
ENI_T	Industrial sector energy consumption in thousand TOE.
ENM_T	Imports of energy in thousand TOE.
ENOL_T	Other energy loss, thousand TOE.
ENQD_T	Domestic energy production in thousand TOE
ENRES_T	ENRES_T = ENFC_T-ENI_T-ENST_T-ENC_T
ENST_T	Energy Use - transportation sector use of oil in TOE. Source: from 1980 from DOE. Earlier data from IEA
ENTD_T	Primary energy demand in thousand TOE.

ENUL_T	Utilities sector consumption of energy in thousand TOE
ENX_T	Exports of energy in thousand TOE.

Table 28.

LPG1	QUANTITY OF LPG ON WHICH DUTY IS PAID FOR CARS. (000 'S OF LITRES) - FULLY DUTY PAID. SOURCE : REVENUE COMMISSIONERS REPORT (TABLE EX17 - FULL DUTY PAID)
LPG2	QUANTITY OF LPG ON WHICH DUTY IS PAID FOR OTHER THAN CARS (000 'S OF LITRES) - PARTLY REBATED. SOURCE : REVENUE COMMISSIONERS REPORT (TABLE EX17 - PARTLY REBATED)
LPGT	LPGT = LPG1+LPG2
OIL1	HEAVY OIL - DIESEL FOR ROAD USE , NON - REBATED. MILLION LITRES. SOURCE : REVENUE COMMISSIONERS REPORT - TABLE EX14 'HYDROCARBON OILS , OTHER SORTS' (OIL1 AND OIL2 ADD UP TO THE NON - REBATED QUANTITY.____ DIRECT FROM REVENUE COMMISSIONER
OIL2	HEAVY OIL - DIESEL FOR ROAD PASSENGER. MILLION LITRES. (SEE OIL1) . SOURCE : DIRECT FROM THE REVENUE COMMISSIONERS (Gerry Kinsella 01 6748044) Jump in 1998 because of school buses being included.
OIL3	RESIDUAL FUEL OIL USED FOR OTHER PURPOSES. MILLION LITRES. SOURCE : REVENUE COMMISSIONERS REPORT (TABLE 12 - FROM 1994 TABLE CE15) (1999 TABLE EX14)
OIL4	HEAVY OIL - FUEL OIL FOR USE IN ESB. MILLION LITRES. SOURCE : REVENUE COMMISSIONERS REPORT (TABLE 12 - FROM 1994 TABLE CE15) (1999 TABLE EX14)
OIL5	OIL5 = OILT-(OIL1+OIL2+OIL3+OIL4+OIL6)
OIL6	HEAVY OIL FULLY REBATED AND DUTY FREE. MILLION LITRES SOURCE : REVENUE COMMISSIONERS REPORT (TABLE 12 - FROM 1994 TABLE CE15) (1999 TABLE EX14)
OILB	OILB = OILT-OILP
OILP	OILP = COIL/PLO
OILT	THIS USED TO BE CALLED HOILT. HEAVY OIL - TOTAL CONSUMPTION M.LTRS. SOURCE : REVENUE COMMISSIONERS REPORT. TOTAL HYDROCARBON OILS AND OTHER SORTS. (1988 REPORT PAGE 72) (1989 __TABLE 12) (1994 TABLE CE15)(1999 TABLE EX14)
PET1	MINERAL HYDROCARBON LIGHT OIL (PETROL) FULLY DUTY PAID QUANTITY. (MILLION LITRES) SOURCE : REVENUE COMMISSIONERS REPORT. FROM 1994 - TOTAL LEADED PETROL) From 1996 onwards this includes super plus unleaded, Table EX11
PET2	MINERAL HYDROCARBON LIGHT OIL (PETROL) - REDUCED DUTY.MILL.LITRES. SOURCE : REVENUE COMMISSIONERS REPORT (TABLE 11A 2 + 3 ONLY) (FROM 1994 TABLE CE12 - AVIATION GASOLINE + OTHER MHLO)
PET3	AMOUNT OF MINERAL HYDROCARBON LIGHT OIL DUTY FREE. (MILLION LITRES) SOURCE : REVENUE COMMISSIONERS
PET4	QUANTITY OF UNLEADED PETROL PURCHASED IN MILLION LITRES. SOURCE : REVENUE COMMISSIONERS REPORT (TABLE CE12) (1999 TABLE EX11)
PETB	PETB = PETT-PETP
PETP	PETP = CPET/POO
PETT	PETT = PET1+PET2+PET3+PET4

Table 29.

M01	Imports SITC 0 and 1, constant prices, £ million
M01V	Imports SITC 0 and 1, current prices, £ million
M0UNADV	Imports SITC 0 unadjusted, current prices, £ million
M0V	Imports SITC 0, current prices, £ million
M0VTEMAN	IMPORTS SITC 0 CURRENT PROCES TEMPORARY IMPORTS OF ANIMALS , ADJUSTED FOR 1972 AND EARLIER. (£ M) . YEARS. SOURCE : TRADE STATS BULLETIN IMPORTS SITC 0 CURRENT PROCES TEMPORARY IMPORTS OF ANIMALS , ADJUSTED FOR 1972 AND EARLIER. (£ M)
M1V	Imports SITC 1, current prices, £ million
M24	Imports SITC 2 and 4, constant prices, £ million
M24V	Imports SITC 2 and 4, current prices, £ million
M2V	Imports SITC 2, current prices, £ million
M3	Imports SITC 3, constant prices, £ million
M32V	Imports SITC 32, current prices, £ million M32V = OVERLAY(SUBRANGE(M32V,NA,1990A),TSBA026/1000)
M333	IMPORTS OF CRUDE OIL (METRIC TONS). SOURCE: TRADE STATISTICS (December), IMPORTS SITC 33300
M333V	IMPORTS OF CRUDE OIL (METRIC TONS). SOURCE: TRADE STATISTICS (December), IMPORTS SITC 33300 IMPORTS OF CRUDE OIL (£000'S) AT CURRENT PRICES. SOURCE: TRADE STATISTICS (December)., IMPORTS SITC 33300
M33V	Imports SITC 33, current prices, £ million
M34V	Imports SITC 34, current prices, £ million
M3V	Imports SITC 3, current prices, £ million
M4V	Imports SITC 4, current prices, £ million
M59	Imports SITC 5 to 9, constant prices, £ million
M59V	Imports SITC 5 to 9, current prices, £ million
M5V	Imports SITC 5, current prices, £ million
M6V	Imports SITC 6, current prices, £ million
M7V	Imports SITC 7, current prices, £ million
M8V	Imports SITC 8, current prices, £ million
M9UNADV	Imports SITC 9 unadjusted, current prices, £ million
M9V	Imports SITC 9, current prices, £ million
MCOV	Distribution of Imports according to Main Use. Other Consumption Goods ready for use. IR£ million.
MFDTV	Distribution of Imports according to Main Use. Consumption Goods ready for use. IR£ million.
MG	Imports of goods, constant prices, £ million
MGS	Imports of goods and services, constant prices, £ million

MGSV	Imports of goods and services, current prices, £ million
MGV	Imports of goods, current prices, £ million
MMADJV	ADJUSTMENT TO MERCHANDISE IMPORTS : CURRENT PRICES. £ M. PRIOR TO 1965 , TO TAKE ACCOUNT OF NETTING OUT OF SHANNON. TRADE IN COINS ETC. (SEE PAPER BY J. FITZGERALD DEPT OF FINANCE)
MMFPAV	Distribution of Imports according to Main Use. Materials for Further Production in Agriculture. IR£ million.
MMNIRL	IMPORTS : BOP ADJUSTMENT , NON - AGRICULTURAL SMUGGLING NORTHERN IRL. SOURCE : UNPUBLISHED DATA CSO. - - TRADE SECTION DEPT. OF FINANCE
MMSMUG	IMPORTS : BOP ADJUSTMENT , AGRICULTURAL SMUGGLING NORTHERN IRL. SOURCE : UNPUBLISHED DATA CSO. - - TRADE SECTION DEPT. OF FINANCE
MMUNAD	MERCHANDISE IMPORTS AT CONSTANT1990 PRICES. £ M
MMUNAD_I85	MERCHANDISE IMPORTS AT CONSTANT PRICES. £ M UNADJUSTED FOR SHANNON TRADE PRIOR TO 1965. LINKING OF 1975. AND 1985 PRICES WAS DONE AT 1978 TO ACCORD WITH THE PRACTICE. OF THE NIE (OLD 1978 VALUE : 4895.8). All expressed at constant 1985 p
MMUNAD_I90	MERCHANDISE IMPORTS AT CONSTANT1990 PRICES. £ M
MNE	Imports of goods and services excluding energy, constant prices, £ million
MNEV	Imports of goods and services excluding energy, current prices, £ million
MOS	Imports of other services, constant prices, £ million
MOSV	Imports of other services, current prices, £ million
MPCGV	Distribution of Imports according to Main Use. Producers' Capital Goods ready for use. IR£ million.
MS	Imports of services, constant prices, £ million
MSHANV	IMPORTS INTO SHANNON : CURRENT PRICES. £ M. ADJUSTED TO TAKE ACCOUNT OF NETTING OUT OF SHANNON BACK PRIOR TO 1965. SOURCE : TRADE STATISTICS BULLETIN
MSV	Imports of services, current prices, £ million
MTADJV	ADJUSTMENT TO TOTAL IMPORTS , PRIOR TO 1965 TO TAKE ACCOUNT OF NETTING OUT OF SHANNON TRADE AND TRANSPORTATION RECEIPTS. SEE PAPER BY JOHN FITZGERALD - DEPARTMENT OF FINANCE

Table 35.

PC	Price deflator, personal consumption at constant prices
PCAL	Price deflator, consumption of alcohol, constant prices
PCALB	Price deflator, beer, personal consumption, constant prices. Source: Unpublished CSO data.
PCALO	Price deflator, other alcohol, personal consumption, constant prices. Source: Unpublished CSO data.
PCALS	Price deflator, spirits, personal consumption, constant prices. Source: Unpublished CSO data.
PCCLO	Price deflator, consumption of clothing, constant prices
PCD	Price deflator, consumption of durables including transport equipment, constant prices
PCDHO	Price deflator, domestic Heating Oil, personal consumption, constant prices. Source: Unpublished CSO data.
PCDUR	Price deflator, consumption of durables excluding transport equipment, constant prices
PCENTER	Price deflator, consumption expenditure on entertainment, constant prices
PCFD	Price deflator, consumption of food excluding non-alcoholic beverages, constant prices
PCFOOD	Price deflator, consumption of food and non-alcoholic beverages, constant prices
PCFPOW	Price deflator, consumption of fuel and power, constant prices
PCKER	Price deflator, Kerosene, personal consumption, constant prices. Source: Unpublished CSO data.
PCLPG	Price deflator, LPG, personal consumption, constant prices. Source: Unpublished CSO data.
PCNALB	Price deflator, non-alcoholic beverages, personal consumption, constant prices. Source: Unpublished CSO data.
PCND	Price deflator, consumption of non-durables, constant prices
PCOFPOW	Price deflator, consumption, non-durables, constant prices
PCOGO	Price deflator, consumption of other goods, constant prices
PCOIL	Price deflator, consumption of kerosene and heating oil, constant prices
PCOTRAV	Price deflator, consumption of travel within the state excluding petrol, constant prices
PCPET	Price deflator, Petrol, personal consumption, constant prices. Source: Unpublished CSO data.
PCPSER	Price deflator, consumption of professional and personal services, constant prices
PCRENT	Price deflator, consumption, rent, constant prices
PCS	Price deflator, consumption of services, constant prices
PCTOB	Price deflator, consumption of tobacco, constant prices
PCTREQ	Price deflator, consumption of transport equipment, constant prices

Table 37.

PEN1	PRICE OF COAL, £ PER TOE, INCL. TAXES, VAT ETC.SOURCE:SCOTT 1993
PEN11_M	Price of Coal for households, £ per tonne. Source: Irish Energy Centre leaflet Comparison of Energy Costs, House Coal
PEN12	Price of Coal for industry, £ per TOE.
PEN12_M	Price of Coal for industry, £ per tonne. Source: Irish Energy Centre leaflet Comparison of Energy Costs , Industrial Fines
PEN13_IEAOLD	Anthracite - Average price paid at 1st January for 500kg lots

PEN1C_M	Price of Coal for households, £ per tonne. Source: linked series PEN11_M PEN1C_M_IEA PEN1C_OLD
PEN1C_M_IEA	Steam Coal (price per mt) Households Price IR£ Source: IEA Energy Prices and Taxes
PEN1C_OLD	Price of coal, Index in CPI, linked. Source:CSO.
PEN1E_M	Steam Coal (price per mt) Elect. Generation Price IR£ Source: IEA Energy Prices and Taxes
PEN1E_M_IEA	Steam Coal (price per mt) Elect. Generation Price IR£ Source: IEA Energy Prices and Taxes
PEN1E_T	Price of coal used in electricity generation, £ per TOE. This is derived from data in ESB accounts for cost of fuel and balance sheet data on fuel used. ESBFUELPRICE.XLS
PEN1I_M	Price of Coal for industry, £ per tonne. Source: linked series PEN12_M PEN12 PEN1C_IEAOLD PEN1C_M
PEN41	PRICE OF PETROL, £ PER TOE, INCL. TAXES, VAT ETC.(FROM AND INCL 1989 THE SERIES IS A WEIGHTED AVERAGE OF LEADED AND UNLEADED PRICES). SOURCE: SCOTT, 1993.
PEN41A_IEAOLD	Inland Transport Gasoline (Premium) Octane RM 95 and above - Average price paid at 1st January
PEN41B_IEAOLD	Inland Transport Gasoline (Standard) Octane RM 94 and below - Average price paid at 1st January
PEN41L_L_EU	Premium leaded gasoline - IR£Price at the pump
PEN41L_L_IEA	Automotive Fuels (price per litre) Leaded Prem. Price IR£ Source: IEA Energy Prices and Taxes
PEN41U_L	Price of unleaded petrol, pence per litre. Source: Revenue Commissioners Statistical Reports
PEN41U_L_EU	Premium unleaded gasoline 95 ron - IR£Price at the pump. Source: linked
PEN41U_L_IEA	Automotive Fuels (price per litre) Unleaded Prem. (95 RON) Price IR£ Source: IEA Energy Prices and Taxes
PEN41_L	Price of unleaded petrol, pence per litre. Source: Revenue Commissioners Statistical Reports
PEN42	Price of autodiesel £ per TOE.
PEN42A_IEAOLD	Inland Transport Diesel Oil - Average bulk price paid at 1st January
PEN42_IEAOLD	Inland Transport Diesel Oil - Average retail price paid at 1st January
PEN42_L	Price of autodiesel in litres, indexed to average of monthly Wholesale Price Index Series (Excluding VAT). Base Year 1985=100. Petroleum Fuels: Autodiesel. BASE 1985=100
PEN42_L_EU	Diesel oil - IR£Price at the pump
PEN42_L_IEA	Automotive Fuels (price per litre) Automotive Diesel Price IR£ Source: IEA Energy Prices and Taxes
PEN43	Price of fuel oil per TOE indexed to average monthly Wholesale Price Index Series (Excluding VAT). Base Year 1985=100. Petroleum Fuels: Fuel Oil. BASE 1985=100
PEN43C_L	Heating gasoil - IR£ Price for Households (Deliveries between 2000 and 5000 litres annually) Source: linked series PEN43LC_L_EU PEN43LC_L_IEA PEN45C_IEAOLD PEN43I_L
PEN43I_L	Light Fuel Oil (price per 1000 litres) Industry. Price IR£ Source: Linked series PEN43LI_L_IEA COMPACT(WPAM404,0,1) PEN45I_IEAOLD
PEN43LC_L_EU	Heating gasoil - IR£Price for Households (Deliveries between 2000 and 5000 litres annually)
PEN43LC_L_IEA	Light Fuel Oil (price per 1000 litres) Households Price IR£ Source: IEA Energy Prices and Taxes
PEN43LI_L_IEA	Light Fuel Oil (price per 1000 litres) Industry Price IR£ Source: IEA Energy Prices and Taxes
PEN44	Price of Gas Oil (other than Autodiesel) per TOE indexed to average monthly Wholesale Price Index Series (Excluding VAT). Base Year 1985=100. Petroleum Fuels: Gas Oil (other than Autodiesel). BASE 1985=100
PEN44E_IEAOLD	Power Stations Heavy Fuel Oil - Average price paid at 1st January for an annual consumption of 300,000 tons
PEN44E_M	Heavy Fuel Oil (price per metric ton) Energy Sector Price IR£ Source: linked series PEN44I_M_IEA PEN43 PEN44E_IEAOLD
PEN44I_IEAOLD	Industrial Heavy Fuel Oil - Average price paid at 1st January for an annual consumption of 5,000 tons
PEN44I_M	Heavy Fuel Oil (price per metric ton) Industry. Price IR£ Source: Linked series PEN44I_M_IEA COMPACT(WPAM405,0,1) PEN44I_IEAOLD
PEN44I_M_IEA	Heavy Fuel Oil (price per metric ton) Industry Price IR£ Source: IEA Energy Prices and Taxes
PEN45C_IEAOLD	Domestic Gas/Diesel Oil - Average price paid at 1st January for 5,000 litre lots
PEN45I_IEAOLD	Industrial Gas/Diesel Oil - Average price paid at 1st January for an annual consumption of 500 tons
PEN46C	Price deflator for domestic consumption of kerosene. Source: PEN46C = CKERV/CKER
PEN46C_IEAOLD	Domestic Kerosene - Average price paid at 1st January
PEN46I_IEAOLD	Industrial Light/Medium Fuel Oil - Average price paid at 1st January for an annual consumption of 500 tons
PEN6	PRICE OF ALL GAS TO CONSUMERS, £ PER TOE, INCL. TAXES,VAT ETC. SOURCE: SCOTT, 1993.
PEN61	PRICE OF LPG TO CONSUMERS, £ PER TOE, INCL. TAXES, VAT ETC. SOURCE: SCOTT, 1993.
PEN61C	Deflator for personal consumption of LPG.PEN61C = CLPGV/CLPG
PEN61_K	PRICE OF LPG TO CONSUMERS, pence per kWh. Source: Irish Energy Centre leaflet Comparison of Energy Costs , delivered cost of propane in 47kg cylinder
PEN62	PRICE OF GAS TO CONSUMERS, £ PER TOE, INCL. TAXES, VAT ETC. SOURCE: SCOTT 1993
PEN62_K	PRICE OF GAS TO CONSUMERS, pence per kWh Source: Irish Energy Centre leaflet Comparison of Energy Costs , economy rate
PEN63	Price of gas to industry per TOE.PEN63 = PEN63_K/7.75e-005
PEN63_K	PRICE OF GAS TO Industry, pence per kWh Source: Irish Energy Centre leaflet Comparison of Energy Costs , rate for consumption 6000 to 15000 kWh.
PEN6C_J	Natural Gas for Households - IR£Price for Domestic standard consumer D3 consuming 83.7 GJ annually for cooking, water heating and central heating. Source: linked series PEN6C_J_EU PEN6C_K_IEA PEN62
PEN6C_J_EU	Natural Gas for Households - IR£Price for Domestic standard consumer D3 consuming 83.7 GJ annually for cooking, water heating and central heating
PEN6C_K_IEA	Natural Gas (average price per 10^7 kilocalories GCV) Households Price IR£ Source: IEA Energy Prices and Taxes
PEN6E_K	Natural Gas (average price per 10^7 kilocalories GCV) Elect. Generation Price IR£ Source: IEA Energy Prices and Taxes
PEN6E_K_IEA	Natural Gas (average price per 10^7 kilocalories GCV) Elect. Generation Price IR£ Source: IEA Energy Prices and Taxes
PEN6E_T	Natural gas used in electricity generation, £ per TOE. This is derived from data iN ESB accounts for cost of fuel and balance sheet data on fuel used. ESBFUELPRICE.XLS

PEN6I_K	Natural Gas for Industry - IR£ Price for Industrial standard consumer I1 consuming 418.6 GJ annually. Source Linked series PEN6I_K_EU PEN6I_K_IEA PEN62
PEN6I_K_EU	Natural Gas for Industry - IR£ Price for Industrial standard consumer I1 consuming 418.6 GJ annually
PEN6I_K_IEA	Natural Gas (average price per 10^7 kilocalories GCV) Industry Price IR£ Source: IEA Energy Prices and Taxes
PEN7	PRICE OF ELECTRICITY, £ PER TOE, INCL. TAXES, VAT ETC. SOURCE: SCOTT, 1993.
PEN71_K	Price of electricity to households. pence per kWh. Source: Irish Energy Centre leaflet Comparison of Energy Costs , general rate
PEN71_T	Price of electricity for industrial users. Average price per £ per TOE. Source: ESB. indexed to average of monthly Wholesale Price Index Series (Excluding VAT). Base Year 1985=100. Electricity BASE 1985=100
PEN72_T	Price of electricity for commercial users. Average price per £ per TOE. Source: ESB
PEN73_T	Price of electricity for household users. Average price per £ per TOE. Source: ESB
PEN7C_IEAOLD	Domestic Electricity - Average price paid at 1st January for an annual consumption of 3600 Kwh
PEN7C_K	Electricity (average price per kilowatt hour) Households Price IR£ Source: linked series PEN7C_K_IEA PEN73_T
PEN7C_K_IEA	Electricity (average price per kilowatt hour) Households Price IR£ Source: IEA Energy Prices and Taxes
PEN7I	Price of electricity for industry, £ per TOE, Source: derived from CSO wholesale price index for recent years
PEN7I1_IEAOLD	Industrial Electricity - Average price paid at 1st January for an annual consumption of 4000 Mwh
PEN7I2_IEAOLD	Industrial Electricity - Average price paid at 1st January for an annual consumption of 15 Gwh
PEN7I3_IEAOLD	Industrial Electricity - Average price paid at 1st January for an annual consumption of 60 Gwh
PEN7I_K	Electricity (average price per kilowatt hour) Industry. Price IR£ Source: linked series PEN7I_K_IEA PEN71_T
PEN7I_K_IEA	Electricity (average price per kilowatt hour) Industry Price IR£ Source: IEA Energy Prices and Taxes
PEN7_T	Price of electricity for all users. Average price per £ per TOE. Source: ESB
PEN81	PRICE OF TURF BRIQUETTES, £ PER TOE. SOURCE: SCOTT, 1993.
PEN81_M	Price of briquettes. £ per bale. Source: Irish Energy Centre leaflet Comparison of Energy Costs , briquettes, baled.
PEN82	PRICE OF BAGGED TURF, £ PER TOE, INCL. TAXES, VAT ETC. SOURCE: SCOTT 1993
PEN82_M	Price of machine turf. £ per tonne. Source: Irish Energy Centre leaflet Comparison of Energy Costs , machine turf.
PEN8C_M	Price of a tonne of briquettes: Source: derived from BnaM annual reports: PEN8C_M = QETBSV/QETBSQ
PEN8E_M	Price of a tonne of milled peat sold for electricity generation: Source: derived from BnaM annual reports: PEN8E_M = QETMSV/QETMSQ
PENC	Price deflator for domestic consumption of energy excluding petrol. Source linked series from the CSO CPI files.

Table 42.

PM01	Deflator of imports, SITC 0 & 1
PM24	Deflator of imports, SITC 2&4
PM3	Deflator of imports, SITC 3 (energy
PM3F	Deflator of imports, SITC 3 (energy), adjusted to foreign currency using effective exchange rate,
PM59	Deflator of imports, SITC 5 to 9
PMG	Deflator of imports, goods
PMGNE	Deflator of imports, goods, excluding energy imports
PMGS	Deflator of imports, goods and services
PMNE	Deflator of imports, goods and services excluding energy imports
PMNEF	Deflator of imports, goods and services excluding energy imports, adjusted to foreign currency using effective exchange rate
PMOS	Deflator of imports, other services
PMS	Deflator of imports, services
PMTO	Deflator of imports, services - tourism

Table 45.

PQE	Price deflator for energy in Ireland (the price of imported energy).
PQEIMD	Price deflator for energy inputs into the traditional manufacturing sector.
PQEIMF	Price deflator for energy inputs into the food processing sector.
PQEIMH	Price deflator for energy inputs into the high tech. manufacturing sector.
PQEIMT	Price deflator for energy inputs into the manufacturing sector

Table 49.

QEI10T4V	Energy Input, £ Million. Mining and quarrying. NACE 10 - 14. Source:CSO, Census of Industrial Production.
QEI1511V	Energy Input, £ Million. Production and preserving of meat. NACE 1511. Source:CSO, Census of Industrial Production.
QEI1512V	Energy Input, £ Million. Production and preserving of poultrymeat. NACE 1512. Source:CSO, Census of Industrial Production.
QEI1513V	Energy Input, £ Million. Production of meat and poultrymeat products. NACE 1513. Source:CSO, Census of Industrial Production.
QEI1520V	Energy Input, £ Million. Processing and preserving of fish and fish products. NACE 1520. Source:CSO, Census of Industrial Production.
QEI1531V	Energy Input, £ Million. Processing and preserving of potatoes. NACE 1531. Source:CSO, Census of Industrial Production.
QEI1532V	Energy Input, £ Million. Manufacture of fruit and vegetable juice and Processing and preserving of fruit and vegetables n.e.c. 1532+1533.. NACE 1532, 1533.

	Source:CSO, Census of Industrial Production.
QEI154V	Energy Input, £ Million. Manufacture of vegetable and animal oils and fats. NACE 154. Source:CSO, Census of Industrial Production.
QEI155V	Energy Input, £ Million. Manufacture of dairy products. NACE 155. Source:CSO, Census of Industrial Production.
QEI156V	Energy Input, £ Million. Manufacture of grain mill products, starches and starch products. NACE 156. Source:CSO, Census of Industrial Production.
QEI1571V	Energy Input, £ Million. Manufacture of prepared feeds for farm animals. NACE 1571. Source:CSO, Census of Industrial Production.
QEI1572V	Energy Input, £ Million. Manufacture of prepared pet foods. NACE 1572. Source:CSO, Census of Industrial Production.
QEI1581V	Energy Input, £ Million. Manufacture of bread; manufacture of fresh pastry goods and cakes, 1581.. NACE 1581. Source:CSO, Census of Industrial Production.
QEI1583V	Energy Input, £ Million. Manufacture of sugar and Manufacture of cocoa; chocolate and sugar confectionery, 1583+1584.. NACE 1583, 1584. Source:CSO, Census of Industrial Production.
QEI1585V	Energy Input, £ Million. Manufacture of macaroni, noodles, couscous and similar farinaceous products and Manufacture of condiments and seasonings, 1585+1587.. NACE 1585, 1587. Source:CSO, Census of Industrial Production.
QEI1586V	Energy Input, £ Million. Processing of tea and coffee. NACE 1586. Source:CSO, Census of Industrial Production.
QEI1588V	Energy Input, £ Million. Manufacture of homogenized food preparations and dietetic food. NACE 1588. Source:CSO, Census of Industrial Production.
QEI1589V	Energy Input, £ Million. Manufacture of other food products n.e.c.. NACE 1589. Source:CSO, Census of Industrial Production.
QEI158XV	Energy Input, £ Million. Manufacture of homogenized food preparations and dietetic food and Manufacture of other food products n.e.c., 1588+1589. NACE 1588+1589. Source:CSO, Census of Industrial Production.
QEI1591V	Energy Input, £ Million. Manufacture of distilled potable alcoholic beverages. NACE 1591. Source:CSO, Census of Industrial Production.
QEI1594V	Energy Input, £ Million. Manufacture of cider and other fruit wines and Production of mineral waters and soft drinks, 1594+1598.. NACE 1594, 1598. Source:CSO, Census of Industrial Production.
QEI1596V	Energy Input, £ Million. Manufacture of beer. NACE 1596. Source:CSO, Census of Industrial Production.
QEI1597V	Energy Input, £ Million. Manufacture of malt. NACE 1597. Source:CSO, Census of Industrial Production.
QEI159V	Energy Input, £ Million. Manufacture of beverages. NACE 159. Source:CSO, Census of Industrial Production.
QEI159XV	Energy Input, £ Million. Manufacture of distilled potable alcoholic beverages and Manufacture of beer and Manufacture of malt, 1591+1596+1597. NACE 1591+1596+1597. Source:CSO, Census of Industrial Production.
QEI15T6V	Energy Input, £ Million. Manufacture of food products; beverages and tobacco. NACE 15 - 16. Source:CSO, Census of Industrial Production.
QEI15V	Energy Input, £ Million. Manufacture of food products and beverages. NACE 151 - 158. Source:CSO, Census of Industrial Production.
QEI16V	Energy Input, £ Million. Manufacture of tobacco products. NACE 16. Source:CSO, Census of Industrial Production.
QEI171V	Energy Input, £ Million. Preparation and spinning of textile fibres. NACE 171. Source:CSO, Census of Industrial Production.
QEI1721V	Energy Input, £ Million. Cotton-type weaving and Worsted-type weaving, 1721+1723.. NACE 1721, 1723. Source:CSO, Census of Industrial Production.
QEI1722V	Energy Input, £ Million. Woollen-type weaving. NACE 1722. Source:CSO, Census of Industrial Production.
QEI1725V	Energy Input, £ Million. Other textile weaving. NACE 1725. Source:CSO, Census of Industrial Production.
QEI172XV	Energy Input, £ Million. Cotton-type weaving and Worsted-type weaving and Other textile weaving, 1721+1723+1725.. NACE 1721+1723+1725. Source:CSO, Census of Industrial Production.
QEI1730V	Energy Input, £ Million. Finishing of textiles and Manufacture of made-up textile articles, except apparel, 1730+1740. NACE 1730, 1740. Source:CSO, Census of Industrial Production.
QEI1751V	Energy Input, £ Million. Manufacture of carpets and rugs. NACE 1751. Source:CSO, Census of Industrial Production.
QEI1752V	Energy Input, £ Million. Manufacture of cordage, rope, twine and netting. NACE 1752. Source:CSO, Census of Industrial Production.
QEI1754V	Energy Input, £ Million. Manufacture of other textiles n.e.c.. NACE 1754. Source:CSO, Census of Industrial Production.
QEI1760V	Energy Input, £ Million. Manufacture of knitted and crocheted fabrics and Manufacture of knitted and crocheted hosiery, 1760+1771.. NACE 1760, 1771. Source:CSO, Census of Industrial Production.
QEI1772V	Energy Input, £ Million. Manufacture of knitted and crocheted pullovers, cardigans and similar articles. NACE 1772. Source:CSO, Census of Industrial Production.
QEI17T8V	Energy Input, £ Million. Manufacture of textiles and textile products. NACE 17 - 18. Source:CSO, Census of Industrial Production.
QEI17V	Energy Input, £ Million. Manufacture of textiles. NACE 17. Source:CSO, Census of Industrial Production.
QEI1810V	Energy Input, £ Million. Manufacture of leather clothes and Manufacture of other wearing apparel and accessories n.e.c., 1810+1824.. NACE 1810, 1824. Source:CSO, Census of Industrial Production.
QEI1821V	Energy Input, £ Million. Manufacture of workwear. NACE 1821. Source:CSO, Census of Industrial Production.
QEI1822V	Energy Input, £ Million. Manufacture of other outerwear. NACE 1822. Source:CSO, Census of Industrial Production.
QEI1823V	Energy Input, £ Million. Manufacture of underwear. NACE 1823. Source:CSO, Census of Industrial Production.
QEI1830V	Energy Input, £ Million. Dressing and dyeing of fur; manufacture of articles of fur. NACE 1830. Source:CSO, Census of Industrial Production.
QEI18V	Energy Input, £ Million. Manufacture of wearing apparel; dressing and dyeing of fur. NACE 18. Source:CSO, Census of Industrial Production.
QEI1910V	Energy Input, £ Million. Tanning and dressing of leather. NACE 1910. Source:CSO, Census of Industrial Production.
QEI191XV	Energy Input, £ Million. Tanning and dressing of leather and Manufacture of luggage, handbags and the like, saddlery and harness, 1910+1920. NACE 1910+1920. Source:CSO, Census of Industrial Production.
QEI1920V	Energy Input, £ Million. Manufacture of luggage, handbags and the like, saddlery and harness. NACE 1920. Source:CSO, Census of Industrial Production.
QEI1930V	Energy Input, £ Million. Manufacture of footwear. NACE 1930. Source:CSO, Census of Industrial Production.
QEI19V	Energy Input, £ Million. Manufacture of leather and leather products. NACE 19. Source:CSO, Census of Industrial Production.
QEI2010V	Energy Input, £ Million. Sawmilling and planing of wood, impregnation of wood , 2010.. NACE 2010. Source:CSO, Census of Industrial Production.
QEI2030V	Energy Input, £ Million. Manufacture of builders' carpentry and joinery. NACE 2030. Source:CSO, Census of Industrial Production.
QEI2040V	Energy Input, £ Million. Manufacture of wooden containers. NACE 2040. Source:CSO, Census of Industrial Production.
QEI2051V	Energy Input, £ Million. Manufacture of other products of wood. NACE 2051. Source:CSO, Census of Industrial Production.
QEI20V	Energy Input, £ Million. Manufacture of wood and wood products. NACE 20. Source:CSO, Census of Industrial Production.
QEI2112V	Energy Input, £ Million. Manufacture of paper and paperboard. NACE 2112. Source:CSO, Census of Industrial Production.
QEI2121V	Energy Input, £ Million. Manufacture of corrugated paper and paperboard and of containers of paper and paperboard , 2121.. NACE 2121. Source:CSO, Census of Industrial Production.

QEI2123V	Energy Input, £ Million. Manufacture of paper stationery. NACE 2123. Source:CSO, Census of Industrial Production.
QEI2125V	Energy Input, £ Million. Manufacture of other articles of paper and paperboard n.e.c.. NACE 2125. Source:CSO, Census of Industrial Production.
QEI21T2V	Energy Input, £ Million. Manufacture of pulp, paper and paper products; publishing and printing. NACE 21 - 22. Source:CSO, Census of Industrial Production.
QEI21V	Energy Input, £ Million. Manufacture of pulp, paper and paper products. NACE 21. Source:CSO, Census of Industrial Production.
QEI221V	Energy Input, £ Million. Publishing and Printing of newspapers and Printing n.e.c., 221-2222.. NACE 221-2222. Source:CSO, Census of Industrial Production.
QEI2223V	Energy Input, £ Million. Bookbinding and finishing. NACE 2223. Source:CSO, Census of Industrial Production.
QEI2224V	Energy Input, £ Million. Composition and plate-making. NACE 2224. Source:CSO, Census of Industrial Production.
QEI2225V	Energy Input, £ Million. Other activities related to printing. NACE 2225. Source:CSO, Census of Industrial Production.
QEI223V	Energy Input, £ Million. Reproduction of recorded media. NACE 223. Source:CSO, Census of Industrial Production.
QEI22V	Energy Input, £ Million. Publishing, printing and reproduction of recorded media. NACE 22. Source:CSO, Census of Industrial Production.
QEI2411V	Energy Input, £ Million. Manufacture of industrial gases, 2411.. NACE 2411. Source:CSO, Census of Industrial Production.
QEI2413V	Energy Input, £ Million. Manufacture of other inorganic basic chemicals. NACE 2413. Source:CSO, Census of Industrial Production.
QEI2414V	Energy Input, £ Million. Manufacture of other organic basic chemicals. NACE 2414. Source:CSO, Census of Industrial Production.
QEI2415V	Energy Input, £ Million. Manufacture of fertilizers and nitrogen compounds. NACE 2415. Source:CSO, Census of Industrial Production.
QEI2416V	Energy Input, £ Million. Manufacture of plastics in primary forms. NACE 2416. Source:CSO, Census of Industrial Production.
QEI241XV	Energy Input, £ Million. Manufacture of industrial gases, Manufacture of dyes and pigments and other basic inorganic chemicals, 2411+2412+2413.. NACE 2411-2413. Source:CSO, Census of Industrial Production.
QEI2420V	Energy Input, £ Million. Manufacture of pesticides and other agro-chemical products. NACE 2420. Source:CSO, Census of Industrial Production.
QEI2430V	Energy Input, £ Million. Manufacture of paints, varnishes and similar coatings, printing ink and mastics. NACE 2430. Source:CSO, Census of Industrial Production.
QEI2441V	Energy Input, £ Million. Manufacture of basic pharmaceutical products. NACE 2441. Source:CSO, Census of Industrial Production.
QEI2442V	Energy Input, £ Million. Manufacture of pharmaceutical preparations. NACE 2442. Source:CSO, Census of Industrial Production.
QEI2451V	Energy Input, £ Million. Manufacture of soap and detergents, cleaning and polishing preparations. NACE 2451. Source:CSO, Census of Industrial Production.
QEI2452V	Energy Input, £ Million. Manufacture of perfumes and toilet preparations. NACE 2452. Source:CSO, Census of Industrial Production.
QEI2461V	Energy Input, £ Million. Manufacture of explosives and Manufacture of glues and gelatines and Manufacture of essential oils, 2461 to 2463.. NACE 2461-2463. Source:CSO, Census of Industrial Production.
QEI2470V	Energy Input, £ Million. Manufacture of man-made fibres. NACE 2470. Source:CSO, Census of Industrial Production.
QEI24V	Energy Input, £ Million. Manufacture of chemicals, chemical products and man-made fibres. NACE 24. Source:CSO, Census of Industrial Production.
QEI251V	Energy Input, £ Million. Manufacture of rubber products. NACE 251. Source:CSO, Census of Industrial Production.
QEI2521V	Energy Input, £ Million. Manufacture of plastic plates, sheets, tubes and profiles. NACE 2521. Source:CSO, Census of Industrial Production.
QEI2522V	Energy Input, £ Million. Manufacture of plastic packing goods. NACE 2522. Source:CSO, Census of Industrial Production.
QEI2523V	Energy Input, £ Million. Manufacture of builders' ware of plastic. NACE 2523. Source:CSO, Census of Industrial Production.
QEI2524V	Energy Input, £ Million. Manufacture of other plastic products. NACE 2524. Source:CSO, Census of Industrial Production.
QEI25V	Energy Input, £ Million. Manufacture of rubber and plastic products. NACE 25. Source:CSO, Census of Industrial Production.
QEI2611V	Energy Input, £ Million. Manufacture of flat glass and Shaping and processing of flat glass, 2611+2612.. NACE 2611, 2612. Source:CSO, Census of Industrial Production.
QEI2613V	Energy Input, £ Million. Manufacture of hollow glass and processing of other glass including technical glassware, 2613 and 2615.. NACE 2613, 2615. Source:CSO, Census of Industrial Production.
QEI262V	Energy Input, £ Million. Manufacture of non-refractory ceramic goods other than for construction purposes; manufacture of refractory ceramic, 262.. NACE 262. Source:CSO, Census of Industrial Production.
QEI2640V	Energy Input, £ Million. Manufacture of bricks, tiles and construction products, in baked clay. NACE 2640. Source:CSO, Census of Industrial Production.
QEI265V	Energy Input, £ Million. Manufacture of cement, lime and plaster and Manufacture of plaster products for construction purposes and Manufacture of mortars and Manufacture of fibre cement and Manufacture of other articles of concrete, plaste
QEI2661V	Energy Input, £ Million. Manufacture of concrete products for construction purposes. NACE 2661. Source:CSO, Census of Industrial Production.
QEI2663V	Energy Input, £ Million. Manufacture of ready-mixed concrete. NACE 2663. Source:CSO, Census of Industrial Production.
QEI2670V	Energy Input, £ Million. Cutting, shaping and finishing of stone. NACE 2670. Source:CSO, Census of Industrial Production.
QEI268V	Energy Input, £ Million. Manufacture of other non-metallic mineral products. NACE 268. Source:CSO, Census of Industrial Production.
QEI26V	Energy Input, £ Million. Manufacture of other non-metallic mineral products. NACE 26. Source:CSO, Census of Industrial Production.
QEI274V	Energy Input, £ Million. Manufacture of basic precious and non-ferrous metals, NACE 274.. NACE 274. Source:CSO, Census of Industrial Production.
QEI27T8V	Energy Input, £ Million. Manufacture of basic metals and fabricated metal products. NACE 27 - 28. Source:CSO, Census of Industrial Production.
QEI27V	Energy Input, £ Million. Manufacture of basic metals. NACE 27. Source:CSO, Census of Industrial Production.
QEI2811V	Energy Input, £ Million. Manufacture of metal structures and parts of structures. NACE 2811. Source:CSO, Census of Industrial Production.
QEI2812V	Energy Input, £ Million. Manufacture of builders' carpentry and joinery of metal. NACE 2812. Source:CSO, Census of Industrial Production.
QEI2821V	Energy Input, £ Million. Manufacture of tanks, reservoirs and containers of metal. NACE 2821. Source:CSO, Census of Industrial Production.
QEI2822V	Energy Input, £ Million. Manufacture of central heating radiators and boilers and Manufacture of steam generators, except central heating hot water boilers, 2822+2830.. NACE 2822, 2830. Source:CSO, Census of Industrial Production.
QEI2840V	Energy Input, £ Million. Forging, pressing, stamping and roll forming of metal; powder metallurgy, 2840.. NACE 2840. Source:CSO, Census of Industrial Production.
QEI2852V	Energy Input, £ Million. General mechanical engineering. NACE 2852. Source:CSO, Census of Industrial Production.
QEI2861V	Energy Input, £ Million. Manufacture of cutlery and Manufacture of locks and hinges, 2861+2863. NACE 2861, 2863. Source:CSO, Census of Industrial Production.
QEI2862V	Energy Input, £ Million. Manufacture of tools. NACE 2862. Source:CSO, Census of Industrial Production.
QEI2871V	Energy Input, £ Million. Manufacture of steel drums and similar containers. NACE 2871. Source:CSO, Census of Industrial Production.

QEI2872V	Energy Input, £ Million. Manufacture of light metal packaging. NACE 2872. Source:CSO, Census of Industrial Production.
QEI2873V	Energy Input, £ Million. Manufacture of wire products. NACE 2873. Source:CSO, Census of Industrial Production.
QEI2874V	Energy Input, £ Million. Manufacture of fasteners, screw machine products, chain and springs. NACE 2874. Source:CSO, Census of Industrial Production.
QEI2875V	Energy Input, £ Million. Manufacture of other fabricated metal products, n.e.c.. NACE 2875. Source:CSO, Census of Industrial Production.
QEI28V	Energy Input, £ Million. Manufacture of fabricated metal products, except machinery and equipment. NACE 28. Source:CSO, Census of Industrial Production.
QEI2911V	Energy Input, £ Million. Manufacture of engines and turbines, except aircraft, vehicle and cycle engines, NACE 2911.. NACE 2911. Source:CSO, Census of Industrial Production.
QEI2913V	Energy Input, £ Million. Manufacture of taps and valves. NACE 2913. Source:CSO, Census of Industrial Production.
QEI2914V	Energy Input, £ Million. Manufacture of bearings, gears, gearing and driving elements. NACE 2914. Source:CSO, Census of Industrial Production.
QEI2921V	Energy Input, £ Million. Manufacture of furnaces and furnace burners, 2921.. NACE 2921. Source:CSO, Census of Industrial Production.
QEI2922V	Energy Input, £ Million. Manufacture of lifting and handling equipment. NACE 2922. Source:CSO, Census of Industrial Production.
QEI2923V	Energy Input, £ Million. Manufacture of non-domestic cooling and ventilation equipment. NACE 2923. Source:CSO, Census of Industrial Production.
QEI293V	Energy Input, £ Million. Manufacture of agricultural and forestry machinery. NACE 293. Source:CSO, Census of Industrial Production.
QEI2940V	Energy Input, £ Million. Manufacture of machine- tools. NACE 2940. Source:CSO, Census of Industrial Production.
QEI2952V	Energy Input, £ Million. Manufacture of machinery for mining, quarrying and construction. NACE 2952. Source:CSO, Census of Industrial Production.
QEI2953V	Energy Input, £ Million. Manufacture of machinery for food, beverage and tobacco processing. NACE 2953. Source:CSO, Census of Industrial Production.
QEI2954V	Energy Input, £ Million. Manufacture of machinery for textile, apparel and leather production and Manufacture of machinery for paper and paperboard production, 2954+2955.. NACE 2954, 2955. Source:CSO, Census of Industrial Production.
QEI2956V	Energy Input, £ Million. Manufacture of other special purpose machinery n.e.c.. NACE 2956. Source:CSO, Census of Industrial Production.
QEI295XV	Energy Input, £ Million. Manufacture of other special purpose machinery, machinery for mining, quarrying and construction, 2951,2952,2954-2956. NACE 2951+2952+2954+2955+2956. Source:CSO, Census of Industrial Production.
QEI297V	Energy Input, £ Million. Manufacture of domestic appliances n.e.c.. NACE 297. Source:CSO, Census of Industrial Production.
QEI29V	Energy Input, £ Million. Manufacture of machinery and equipment n.e.c.. NACE 29. Source:CSO, Census of Industrial Production.
QEI30T3V	Energy Input, £ Million. Manufacture of electrical and optical equipment. NACE 30 - 33. Source:CSO, Census of Industrial Production.
QEI30V	Energy Input, £ Million. Manufacture of office machinery and computers. NACE 30. Source:CSO, Census of Industrial Production.
QEI3110V	Energy Input, £ Million. Manufacture of electric motors, generators and transformers. NACE 3110. Source:CSO, Census of Industrial Production.
QEI3120V	Energy Input, £ Million. Manufacture of electricity distribution and control apparatus. NACE 3120. Source:CSO, Census of Industrial Production.
QEI3130V	Energy Input, £ Million. Manufacture of insulated wire and cable. NACE 3130. Source:CSO, Census of Industrial Production.
QEI3140V	Energy Input, £ Million. Manufacture of accumulators, primary cells and primary batteries. NACE 3140. Source:CSO, Census of Industrial Production.
QEI314XV	Energy Input, £ Million. Manufacture of accumulators, primary cells and primary batteries and Manufacture of other electrical equipment n.e.c., 3140+3162. NACE 3140+3162. Source:CSO, Census of Industrial Production.
QEI3150V	Energy Input, £ Million. Manufacture of lighting equipment and electric lamps. NACE 3150. Source:CSO, Census of Industrial Production.
QEI3161V	Energy Input, £ Million. Manufacture of electrical equipment for engines and vehicles n.e.c.. NACE 3161. Source:CSO, Census of Industrial Production.
QEI3162V	Energy Input, £ Million. Manufacture of other electrical equipment n.e.c.. NACE 3162. Source:CSO, Census of Industrial Production.
QEI31V	Energy Input, £ Million. Manufacture of electrical machinery and apparatus n.e.c.. NACE 31. Source:CSO, Census of Industrial Production.
QEI3210V	Energy Input, £ Million. Manufacture of electronic valves and tubes and other electronic components. NACE 3210. Source:CSO, Census of Industrial Production.
QEI3220V	Energy Input, £ Million. Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy. NACE 3220. Source:CSO, Census of Industrial Production.
QEI3230V	Energy Input, £ Million. Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods. NACE 3230. Source:CSO, Census of Industrial Production.
QEI32V	Energy Input, £ Million. Manufacture of radio, television and communication equipment and apparatus. NACE 32. Source:CSO, Census of Industrial Production.
QEI3310V	Energy Input, £ Million. Manufacture of medical and surgical equipment and orthopaedic appliances. NACE 3310. Source:CSO, Census of Industrial Production.
QEI332V	Energy Input, £ Million. Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except and Manufacture of industrial process control equipment, 332+333.. NACE 332 - 333. Source:CSO, Census
QEI334V	Energy Input, £ Million. Manufacture of optical instruments and photographic equipment and Manufacture of watches and clocks, 334+335.. NACE 334 - 335. Source:CSO, Census of Industrial Production.
QEI33V	Energy Input, £ Million. Manufacture of medical, precision and optical instruments, watches and clocks. NACE 33. Source:CSO, Census of Industrial Production.
QEI3410V	Energy Input, £ Million. Manufacture of motor vehicles. NACE 3410. Source:CSO, Census of Industrial Production.
QEI3420V	Energy Input, £ Million. Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers. NACE 3420. Source:CSO, Census of Industrial Production.
QEI3430V	Energy Input, £ Million. Manufacture of parts and accessories for motor vehicles and their engines. NACE 3430. Source:CSO, Census of Industrial Production.
QEI34T5V	Energy Input, £ Million. Manufacture of transport equipment. NACE 34 - 35. Source:CSO, Census of Industrial Production.
QEI34V	Energy Input, £ Million. Manufacture of motor vehicles, trailers and semi-trailers. NACE 34. Source:CSO, Census of Industrial Production.
QEI351V	Energy Input, £ Million. Building and repairing of ships and boats. NACE 351. Source:CSO, Census of Industrial Production.
QEI3520V	Energy Input, £ Million. Manufacture of railway and tramway locomotives and rolling stock and Manufacture of aircraft and spacecraft, 3520+3530.. NACE 3520, 3530. Source:CSO, Census of Industrial Production.
QEI3543V	Energy Input, £ Million. Manufacture of invalid carriages and Manufacture of other transport equipment n.e.c., 3543+3550.. NACE 3543, 3550. Source:CSO, Census of Industrial Production.
QEI35V	Energy Input, £ Million. Manufacture of other transport equipment. NACE 35. Source:CSO, Census of Industrial Production.
QEI3611V	Energy Input, £ Million. Manufacture of chairs and seats. NACE 3611. Source:CSO, Census of Industrial Production.
QEI3612V	Energy Input, £ Million. Manufacture of other office and shop furniture. NACE 3612. Source:CSO, Census of Industrial Production.
QEI3613V	Energy Input, £ Million. Manufacture of other kitchen furniture. NACE 3613. Source:CSO, Census of Industrial Production.
QEI3614V	Energy Input, £ Million. Manufacture of other furniture. NACE 3614. Source:CSO, Census of Industrial Production.
QEI3615V	Energy Input, £ Million. Manufacture of mattresses. NACE 3615. Source:CSO, Census of Industrial Production.

QEI3622V	Energy Input, £ Million. Manufacture of jewellery and related articles n.e.c. and Manufacture of imitation jewellery, 3622+3661.. NACE 3622, 3661. Source:CSO, Census of Industrial Production.
QEI3630V	Energy Input, £ Million. Manufacture of musical instruments. NACE 3630. Source:CSO, Census of Industrial Production.
QEI3640V	Energy Input, £ Million. Manufacture of sports goods. NACE 3640. Source:CSO, Census of Industrial Production.
QEI364XV	Energy Input, £ Million. Manufacture of sports goods and games and toys, NACE 3640+3650.. NACE 3640+3650. Source:CSO, Census of Industrial Production.
QEI3650V	Energy Input, £ Million. Manufacture of games and toys. NACE 3650. Source:CSO, Census of Industrial Production.
QEI3662V	Energy Input, £ Million. Manufacture of brooms and brushes and Other manufacturing n.e.c. and Manufacture of refined petroleum products and recycling, 3662+3663+232+37.. NACE 3662, 3663, 232,37. Source:CSO, Census of Industrial Production
QEI36T7V	Energy Input, £ Million. Manufacturing n.e.c.. NACE 36 - 37, 23. Source:CSO, Census of Industrial Production.
QEI4010V	Energy Input, £ Million. Production and distribution of electricity. NACE 4010. Source:CSO, Census of Industrial Production.
QEI4020V	Energy Input, £ Million. Manufacture of gas; distribution of gaseous fuels through mains and Steam and hot water supply, 4020+4030.. NACE 4020, 4030. Source:CSO, Census of Industrial Production.
QEI40V	Energy Input, £ Million. Electricity, gas, steam and hot water supply. NACE 40. Source:CSO, Census of Industrial Production.
QEI41V	Energy Input, £ Million. Collection, purification and distribution of water. NACE 41. Source:CSO, Census of Industrial Production.
QEIIV	QEIIV = QEIMTV+QEIUV

Table 51.

QE	Domestic energy production valued using an artificial oil equivalent price, constant prices, £ million.
QEEHQ	NET HYDROELECTRIC PRODUCTION , CALENDAR YEAR EXCLUDING PUMPED STORAGE , GWH . SOURCE : 1960 / 72 EC ENERGY STATS. ADJ. TO EXCLUDE AUTO PRODUCERS. 1972 - 'ENERGY IN IRELAND' (DEPT.OF ENERGY, BRENDAN O'LOUGHLIN, ISED DIVISION).
QEGQ	DOMESTIC OUTPUT OF NATURAL GAS USED IN THE ENERGY TRANSFORMATION SECTOR , 000 'S TOE. SOURCE : DIRECT FROM DEPT.OF ENERGY (USED TO BE ALISON MYERS, NOW BRENDAN O'LOUGHLIN, ISED DIVISION).
QEIMCFV	Energy inputs into industry - Clothing and footwear, current prices,£ million.
QEIMCHV	Energy inputs into industry - chemicals, current prices,£ million.
QEIMCLV	Energy inputs into industry - clothing and textiles, current prices,£ million.
QEIMD	Energy inputs into industry - traditional, constant prices, £ million.
QEIMD1V	Energy inputs into industry - traditional - coal, current prices,£ million.
QEIMD4V	Energy inputs into industry - traditional - oil, current prices,£ million.
QEIMD7V	Energy inputs into industry - traditional - electricity, current prices,£ million.
QEIMD9V	Energy inputs into industry - traditional - turf, current prices,£ million.
QEIMDTV	Energy inputs into industry - drink and tobacco, current prices,£ million.
QEIMDV	Energy inputs into industry - traditional, current prices,£ million.
QEIMF	Energy inputs into industry - food processing, constant prices, £ million.
QEIMF1V	Energy inputs into industry - food processing - coal, current prices,£ million.
QEIMF4V	Energy inputs into industry - food processing - oil, current prices,£ million.
QEIMF7V	Energy inputs into industry - food processing - electricity, current prices,£ million.
QEIMF9V	Energy inputs into industry - food processing - turf, current prices,£ million.
QEIMFDV	Energy inputs into industry - food and drink, current prices,£ million.
QEIMFV	Energy inputs into industry - food processing, current prices,£ million.
QEIMGLV	Energy inputs into industry - cement etc., current prices,£ million.
QEIMH	Energy inputs into industry - high tech., constant prices, £ million.
QEIMH1V	Energy inputs into industry - high tech. - coal, current prices,£ million.
QEIMH4V	Energy inputs into industry - high tech. - oil, current prices,£ million.
QEIMH7V	Energy inputs into industry - high tech. - electricity, current prices,£ million.
QEIMH9V	Energy inputs into industry - high tech. - turf, current prices,£ million.
QEIMHV	Energy inputs into industry - high tech., current prices,£ million.
QEIMMMV	Energy inputs into industry - metal and machinery products, current prices,£ million.
QEIMMQV	Energy inputs into industry - mining and quarrying, current prices,£ million.
QEIMOTV	Energy inputs into industry - other manufacturing, current prices,£ million.
QEIMPPV	Energy inputs into industry - paper and printing, current prices,£ million.
QEIMT	Energy inputs into industry - transportable goods industries, constant prices, £ million.
QEIMT1V	Energy inputs into industry - transportable goods industries - coal, current prices,£ million.
QEIMT4V	Energy inputs into industry - transportable goods industries - oil,current prices,£ million.
QEIMT7V	Energy inputs into industry - transportable goods industries - electricity, current prices,£ million.
QEIMT9V	Energy inputs into industry - transportable goods industries - turf, current prices,£ million.
QEIMTV	Energy inputs into industry - transportable goods industries, current prices,£ million.
QEIMTXV	Energy inputs into industry - textiles, current prices,£ million.
QEIMV	Energy inputs into industry - manufacturing, current prices,£ million.
QEIMWDV	Energy inputs into industry - wood and furniture, current prices,£ million.

QEITV	Energy Inputs. Transportable goods industry, 1 to 3.. NACE Transportable Goods Industries 1 - 3 . Source:CSO, Census of Industrial Production.
QEIUV	Energy inputs into industry - utilities, current prices,£ million.
QETBQ	PRODUCTION OF TURF BRIQUETTES. MILLION TONNES. SOURCE : CENSUS OF INDUSTRIAL PRODUCTION - BORD NA MONA ANNUAL REPORTS
QETFQ	OUTPUT OF TURF BY FARMERS , MILLION TONNES. SOURCE : ISB (IRISH STATISTICAL BULLETIN , HENRY O'MARA) OR CENSUS OF AGRICULTURAL PRODUCTION (TABLE 1)
QETMQ	PRODUCTION OF MILLED PEAT. MILLION TONNES. SOURCE : CENSUS OF INDUSTRIAL PRODUCTION - BORD NA MONA REPORTS. NOTE : IN THE BORD NA MONA REPORT THE MILLED PEAT DELIVERED TO BORD NA MONA FACTORIES IS DEDUCTED FROM THE PRODUCTION OF MILLED
QETSQ	PRODUCTION OF SOD TURF. MILLION TONNES. SOURCE : CENSUS OF INDUSTRIAL PRODUCTION . NOW BORD NA MONA ANNUAL REPORT AND FINANCIAL STATEMENTS.

Table 71.

ENVCO2_EN_GG	Greenhouse gas emissions, CO2, Gigagrams, from energy, totalSource: EPA
ENVCO2_ENIU_GG	Greenhouse gas emissions, CO2, Gigagrams, from energy consumption in energy industriesSource: EPA
ENVCO2_ENIMT_GG	Greenhouse gas emissions, CO2, Gigagrams, from energy consumption in manufacturing and buildingSource: EPA
ENVCO2_ENSMT_GG	Greenhouse gas emissions, CO2, Gigagrams, from energy consumption by transportSource: EPA
ENVCO2_ENSMO_GG	Greenhouse gas emissions, CO2, Gigagrams, from energy consumption by other sectorsSource: EPA
ENVCO2_INT_GG	Greenhouse gas emissions, CO2, Gigagrams, from industrial processes, totalSource: EPA
ENVCO2_INMIN_GG	Greenhouse gas emissions, CO2, Gigagrams, from industrial processes, mineral productsSource: EPA
ENVCO2_INCH_GG	Greenhouse gas emissions, CO2, Gigagrams, from industrial processes, chemical industriesSource: EPA
ENVCO2_SOLV_GG	Greenhouse gas emissions, CO2, Gigagrams, from solvent and other product useSource: EPA
ENVCO2_LUF_GG	Greenhouse gas emissions, CO2, Gigagrams, from land use change and forestry, netSource: EPA
ENVCO2_F_GG	Greenhouse gas emissions, CO2, Gigagrams, from forestry, netSource: EPA
ENVCO2_SOIL_GG	Greenhouse gas emissions, CO2, Gigagrams, from soil, netSource: EPA
ENVCO2_TOTALADJ_GG	Greenhouse gas emissions, CO2, Gigagrams, Greenhouse gas emissions, CO2, Gigagrams,
ENVCO2_TOTAL_GG	Greenhouse gas emissions, CO2, Gigagrams,
ENVCO2_BUNKT_GG	Greenhouse gas emissions, CO2, Gigagrams, Greenhouse gas emissions, CO2, Gigagrams, Greenhouse gas emissions, CO2, Gigagrams,
ENVCO2_BUNKAIR_GG	Greenhouse gas emissions, CO2, Gigagrams, Greenhouse gas emissions, CO2, Gigagrams,
ENVCO2_BUNKSEA_GG	Greenhouse gas emissions, CO2, Gigagrams, Greenhouse gas emissions, CO2, Gigagrams,
ENVCO2_BIOMASS_GG	Greenhouse gas emissions, CO2, Gigagrams,
ENVCH4_TOTAL_GG	Greenhouse gas emissions, CH4, Gigagrams, TotalSource: EPA
ENVCH4_ENERGY_GG	Greenhouse gas emissions, CH4, Gigagrams, total from energySource: EPA
ENVCH4_FCT_GG	Greenhouse gas emissions, CH4, Gigagrams, total from fuel combustionSource: EPA
ENVCH4_FCIM_GG	Greenhouse gas emissions, CH4, Gigagrams, from fuel combustion, manufacturing and buildingSource: EPA
ENVCH4_FCSMT_GG	Greenhouse gas emissions, CH4, Gigagrams, from fuel combustion, transportSource: EPA
ENVCH4_FCSO_GG	Greenhouse gas emissions, CH4, Gigagrams, from fuel combustion, other sectorsSource: EPA
ENVCH4_FET_GG	Greenhouse gas emissions, CH4, Gigagrams, fugitive emissions from fuelsSource: EPA
ENVCH4_FEO_GG	Greenhouse gas emissions, CH4, Gigagrams, fugitive emissions from fuels, oial and natural gasSource: EPA
ENVCH4_AGT_GG	Greenhouse gas emissions, CH4, Gigagrams, total agricultureSource: EPA
ENVCH4_AGENT_GG	Greenhouse gas emissions, CH4, Gigagrams, agriculture, enteric fermentationSource: EPA
ENVCH4_AGMAN_GG	Greenhouse gas emissions, CH4, Gigagrams, agriculture, manure managementSource: EPA
ENVCH4_WASTE_GG	Greenhouse gas emissions, CH4, Gigagrams, wasteSource: EPA
ENVN2O_TOTAL_GG	Greenhouse gas emissions, N2O, Gigagrams, TotalSource: EPA
ENVN2O_ENERGY_GG	Greenhouse gas emissions, N2O, Gigagrams, total from energySource: EPA
ENVN2O_FCT_GG	Greenhouse gas emissions, N2O, Gigagrams, total from fuel combustion, energy industriesSource: EPA
ENVN2O_FCT_GG	Greenhouse gas emissions, N2O, Gigagrams, total from fuel combustion, energy industriesSource: EPA
ENVN2O_FCIM_GG	Greenhouse gas emissions, N2O, Gigagrams, from fuel combustion, manufacturing and buildingSource: EPA
ENVN2O_FCSMT_GG	Greenhouse gas emissions, N2O, Gigagrams, from fuel combustion, transportSource: EPA
ENVN2O_FCSO_GG	Greenhouse gas emissions, N2O, Gigagrams, from fuel combustion, other sectorsSource: EPA
ENVN2O_INT_GG	Greenhouse gas emissions, N2O, Gigagrams, from industrial processes, totalSource: EPA
ENVN2O_INCH_GG	Greenhouse gas emissions, N2O, Gigagrams, from industrial processes, chemical industriesSource: EPA
ENVN2O_AGT_GG	Greenhouse gas emissions, N2O, Gigagrams, total agricultureSource: EPA
ENVN2O_AGMAN_GG	Greenhouse gas emissions, N2O, Gigagrams, agriculture, manure managementSource: EPA
ENVN2O_AGSOIL_GG	Greenhouse gas emissions, N2O, Gigagrams, agriculture, soilsSource: EPA
ENVGHG_CO2ADJ_GG	Greenhouse gas emissions, Gigagrams (CO2 equivalent), total CO2 emissions including removals by land use and forestrySource: EPA
ENVGHG_CO2_GG	Greenhouse gas emissions, CO2, Gigagrams, total CO2 emissions excluding land use and forestrySource: EPA
ENVGHG_CH4_GG	Greenhouse gas emissions, CO2, Gigagrams, total CH4 emissions excluding land use and forestrySource: EPA
ENVGHG_N2O_GG	Greenhouse gas emissions, CO2, Gigagrams, total N2O emissions excluding land use and forestrySource: EPA

ENVGHG_TOTALADJ_GG	Greenhouse gas emissions, Gigagrams (CO2 equivalent), total all greenhouse gas emissions including removals by land use and forestrySource: EPA
ENVGHG_TOTAL_GG	Greenhouse gas emissions, CO2, Gigagrams, total all greenhouse gas emissions excluding land use and forestrySource: EPA
ENVGHG_ENERGY_GG	Greenhouse gas emissions, Gigagrams (CO2 equivalent), total from energy sectorSource: EPA
ENVGHG_IND_GG	Greenhouse gas emissions, Gigagrams (CO2 equivalent), total from Industrial processesSource: EPA
ENVGHG_SOL_GG	Greenhouse gas emissions, Gigagrams (CO2 equivalent), total from solvent and other product useSource: EPA
ENVGHG_AG_GG	Greenhouse gas emissions, Gigagrams (CO2 equivalent), total from agricultureSource: EPA
ENVGHG_LUCF_GG	Greenhouse gas emissions, Gigagrams (CO2 equivalent), net total from land use change and forestrySource: EPA
ENVGHG_WASTE_GG	Greenhouse gas emissions, Gigagrams (CO2 equivalent), total from wasteSource: EPA

Table 80.

ENGY01_NC	Consumption of energy by sector, Coal£. Source: Census of Industrial Production, NACE70 classification.
ENGY02_NC	Consumption of energy by sector, Oil refining NACE 14.£. Source: Census of Industrial Production, NACE70 classification.
ENGY03_NC	Consumption of energy by sector, Production of electricity, NACE 161.£. Source: Census of Industrial Production, NACE70 classification.
ENGY04_NC	Consumption of energy by sector, Production of gas, NACE 162.£. Source: Census of Industrial Production, NACE70 classification.
ENGY05_NC	Consumption of energy by sector, Water supply, NACE 17.£. Source: Census of Industrial Production, NACE70 classification.
ENGY06_NC	Consumption of energy by sector, Extraction of non-ferous metal ores, NACE 21.£. Source: Census of Industrial Production, NACE70 classification.
ENGY07_NC	Consumption of energy by sector, Production of iron ans steel, NACE 221-223.£. Source: Census of Industrial Production, NACE70 classification.
ENGY08_NC	Consumption of energy by sector, Production, non-ferrous metals, NACE 224.£. Source: Census of Industrial Production, NACE70 classification.
ENGY09_NC	Consumption of energy by sector, Extraction of non-metallic minerals, NACE 23.£. Source: Census of Industrial Production, NACE70 classification.
ENGY10_NC	Consumption of energy by sector, Manufacture of non-metallic mineral products excluding glass and ceramic goods, NACE 241-246.£. Source: Census of Industrial Production, NACE70 classification.
ENGY11_NC	Consumption of energy by sector, Manufacture of glass and glassware, NACE 11.£. Source: Census of Industrial Production, NACE70 classification.
ENGY12_NC	Consumption of energy by sector, Manufacture of ceramic goods, NACE 248.£. Source: Census of Industrial Production, NACE70 classification.
ENGY13_NC	Consumption of energy by sector, Manufacture of basic industrial chemicals, NACE 251.£. Source: Census of Industrial Production, NACE70 classification.
ENGY14_NC	Consumption of energy by sector, Manufacture of paints varnishes and printing inks, NACE 255.£. Source: Census of Industrial Production, NACE70 classification.
ENGY15_NC	Consumption of energy by sector, Manufacture of pharmaceuticals and chemical products, NACE 256-257.£. Source: Census of Industrial Production, NACE70 classification.
ENGY16_NC	Consumption of energy by sector, Manufacture of soap, perfume and toilet preparations, NACE 258.£. Source: Census of Industrial Production, NACE70 classification.
ENGY17_NC	Consumption of energy by sector, Manufacture of other chemical products (including man-made fibres), NACE 259-260.£. Source: Census of Industrial Production, NACE70 classification.
ENGY18_NC	Consumption of energy by sector, Foundries, NACE 311.£. Source: Census of Industrial Production, NACE70 classification.
ENGY19_NC	Consumption of energy by sector, Forging, pressing and stamping of metals, NACE 312.£. Source: Census of Industrial Production, NACE70 classification.
ENGY20_NC	Consumption of energy by sector, Secondary transformation, treatment and coating of metals, NACE 313.£. Source: Census of Industrial Production, NACE70 classification.
ENGY21_NC	Consumption of energy by sector, Manufacture of structural metal products, NACE 314.£. Source: Census of Industrial Production, NACE70 classification.
ENGY22_NC	Consumption of energy by sector, Boilermaking, manufacture of tanks etc., NACE 315.£. Source: Census of Industrial Production, NACE70 classification.
ENGY23_NC	Consumption of energy by sector, Manufacture of finished metal articles, NACE 316-319.£. Source: Census of Industrial Production, NACE70 classification.
ENGY24_NC	Consumption of energy by sector, Mechanical engineering, NACE 32.£. Source: Census of Industrial Production, NACE70 classification.
ENGY25_NC	Consumption of energy by sector, Office and data-processing machinery, NACE 33.£. Source: Census of Industrial Production, NACE70 classification.
ENGY26_NC	Consumption of energy by sector, Manufacture of insulated wires and cables, NACE 341.£. Source: Census of Industrial Production, NACE70 classification.
ENGY27_NC	Consumption of energy by sector, Manufacture of electrical machinery, NACE 342,347,348.£. Source: Census of Industrial Production, NACE70 classification.
ENGY28_NC	Consumption of energy by sector, Manufacture of electrical apparatus for industrial use, NACE 343.£. Source: Census of Industrial Production, NACE70 classification.
ENGY29_NC	Consumption of energy by sector, Manufacture of equipment for telecommunications, NACE 344.£. Source: Census of Industrial Production, NACE70 classification.
ENGY30_NC	Consumption of energy by sector, Radio and TV receiving sets, NACE 345.£. Source: Census of Industrial Production, NACE70 classification.
ENGY31_NC	Consumption of energy by sector, Domestic electrical appliances, NACE 346.£. Source: Census of Industrial Production, NACE70 classification.
ENGY32_NC	Consumption of energy by sector, Manufacture and assembly of motor vehicles< NACE 35.£. Source: Census of Industrial Production, NACE70 classification.
ENGY33_NC	Consumption of energy by sector, Shipbuilding, NACE 361.£. Source: Census of Industrial Production, NACE70 classification.
ENGY34_NC	Consumption of energy by sector, Manufacture of railway rolling stock, NACE 362.£. Source: Census of Industrial Production, NACE70 classification.
ENGY35_NC	Consumption of energy by sector, Manufacture of cycles, motor cycles, aerospace equipment, NACE 363-365.£. Source: Census of Industrial Production, NACE70 classification.
ENGY36_NC	Consumption of energy by sector, Instrument Engineering, NACE 37.£. Source: Census of Industrial Production, NACE70 classification.
ENGY37_NC	Consumption of energy by sector, Margarine and other fats, NACE 411.£. Source: Census of Industrial Production, NACE70 classification.
ENGY38_NC	Consumption of energy by sector, Slaughtering and preserving meat, NACE 412.£. Source: Census of Industrial Production, NACE70 classification.
ENGY39_NC	Consumption of energy by sector, Manufacture of dairy products, NACE 413.£. Source: Census of Industrial Production, NACE70 classification.
ENGY40_NC	Consumption of energy by sector, Processing of fruit and vegetables, NACE 414.£. Source: Census of Industrial Production, NACE70 classification.
ENGY41_NC	Consumption of energy by sector, Processing of fish, NACE 415.£. Source: Census of Industrial Production, NACE70 classification.
ENGY42_NC	Consumption of energy by sector, Grain Milling, NACE 416.£. Source: Census of Industrial Production, NACE70 classification.
ENGY43_NC	Consumption of energy by sector, Miscellaneous foodstuffs, NACE 417, 418, 423.£. Source: Census of Industrial Production, NACE70 classification.
ENGY44_NC	Consumption of energy by sector, Bread, Biscuit, NACE 419.£. Source: Census of Industrial Production, NACE70 classification.

ENGY45_NC	Consumption of energy by sector, Sugar, NACE 420.£. Source: Census of Industrial Production, NACE70 classification.
ENGY46_NC	Consumption of energy by sector, Cocoa, chocolate and sugar confectionery, NACE 421.£. Source: Census of Industrial Production, NACE70 classification.
ENGY47_NC	Consumption of energy by sector, Manufacture of animal and poultry foods, NACE 422.£. Source: Census of Industrial Production, NACE70 classification.
ENGY48_NC	Consumption of energy by sector, Spirit distilling, NACE 424.£. Source: Census of Industrial Production, NACE70 classification.
ENGY49_NC	Consumption of energy by sector, Wine, cider and soft drinks, NACE 425, 426, 428.£. Source: Census of Industrial Production, NACE70 classification.
ENGY50_NC	Consumption of energy by sector, Brewing and malting, NACE 427.£. Source: Census of Industrial Production, NACE70 classification.
ENGY51_NC	Consumption of energy by sector, Tobacco, NACE 429.£. Source: Census of Industrial Production, NACE70 classification.
ENGY52_NC	Consumption of energy by sector, Wool, NACE 431.£. Source: Census of Industrial Production, NACE70 classification.
ENGY53_NC	Consumption of energy by sector, Cotton, NACE 432.£. Source: Census of Industrial Production, NACE70 classification.
ENGY54_NC	Consumption of energy by sector, Silk, flax and jute, NACE 433-435.£. Source: Census of Industrial Production, NACE70 classification.
ENGY55_NC	Consumption of energy by sector, Knitting, NACE 436.£. Source: Census of Industrial Production, NACE70 classification.
ENGY56_NC	Consumption of energy by sector, Textile finishing, NACE 437, 439.£. Source: Census of Industrial Production, NACE70 classification.
ENGY57_NC	Consumption of energy by sector, Carpets and floor coverings, NACE 438.£. Source: Census of Industrial Production, NACE70 classification.
ENGY58_NC	Consumption of energy by sector, Tanning, NACE 441.£. Source: Census of Industrial Production, NACE70 classification.
ENGY59_NC	Consumption of energy by sector, Leather products, NACE 442.£. Source: Census of Industrial Production, NACE70 classification.
ENGY60_NC	Consumption of energy by sector, Footwear, NACE 451.£. Source: Census of Industrial Production, NACE70 classification.
ENGY61_NC	Consumption of energy by sector, Ready-made clothing, NACE 453-454.£. Source: Census of Industrial Production, NACE70 classification.
ENGY62_NC	Consumption of energy by sector, Household and other textile goods, NACE 455.£. Source: Census of Industrial Production, NACE70 classification.
ENGY63_NC	Consumption of energy by sector, Furs and fur goods, NACE 456.£. Source: Census of Industrial Production, NACE70 classification.
ENGY64_NC	Consumption of energy by sector, Sawing and processing of wood, NACE 461, 462.£. Source: Census of Industrial Production, NACE70 classification.
ENGY65_NC	Consumption of energy by sector, Manufacture of carpentry and joinery components, NACE 463.£. Source: Census of Industrial Production, NACE70 classification.
ENGY66_NC	Consumption of energy by sector, Manufacture of wooden containers and other wooden manufacture, NACE 464, 465.£. Source: Census of Industrial Production, NACE70 classification.
ENGY67_NC	Consumption of energy by sector, Articles of cork, straw etc. and brushes, NACE 466.£. Source: Census of Industrial Production, NACE70 classification.
ENGY68_NC	Consumption of energy by sector, Wooden furniture, NACE 467.£. Source: Census of Industrial Production, NACE70 classification.
ENGY69_NC	Consumption of energy by sector, Pulp, paper and board, NACE 471.£. Source: Census of Industrial Production, NACE70 classification.
ENGY70_NC	Consumption of energy by sector, Processing of paper and board, NACE 472.£. Source: Census of Industrial Production, NACE70 classification.
ENGY71_NC	Consumption of energy by sector, Printing, publishing and allied industries, NACE 473, 474.£. Source: Census of Industrial Production, NACE70 classification.
ENGY72_NC	Consumption of energy by sector, Rubber products, NACE 481, 482.£. Source: Census of Industrial Production, NACE70 classification.
ENGY73_NC	Consumption of energy by sector, Plastics, NACE 483.£. Source: Census of Industrial Production, NACE70 classification.
ENGY74_NC	Consumption of energy by sector, Jewellery, NACE 491.£. Source: Census of Industrial Production, NACE70 classification.
ENGY75_NC	Consumption of energy by sector, Toys and sports goods, NACE 494.£. Source: Census of Industrial Production, NACE70 classification.
ENGY76_NC	Consumption of energy by sector, Miscellaneous manufacturing, NACE 492, 493, 495.£. Source: Census of Industrial Production, NACE70 classification.
ENGY01_OC	Consumption of energy by sector, Coal£. Source: Census of Industrial Production, ISIC classification.
ENGY02_OC	Consumption of energy by sector, Stone, slate, sand and gravel.£. Source: Census of Industrial Production, ISIC classification.
ENGY03_OC	Consumption of energy by sector, Miscellaneous.£. Source: Census of Industrial Production, ISIC classification.
ENGY04_OC	Consumption of energy by sector, Bacon factories.£. Source: Census of Industrial Production, ISIC classification.
ENGY05_OC	Consumption of energy by sector, Slaughtering and meat.£. Source: Census of Industrial Production, ISIC classification.
ENGY06_OC	Consumption of energy by sector, Creamery butter£. Source: Census of Industrial Production, ISIC classification.
ENGY07_OC	Consumption of energy by sector, Fruit and vegetables.£. Source: Census of Industrial Production, ISIC classification.
ENGY08_OC	Consumption of energy by sector, Grain milling.£. Source: Census of Industrial Production, ISIC classification.
ENGY09_OC	Consumption of energy by sector, Bread, biscuit etc.£. Source: Census of Industrial Production, ISIC classification.
ENGY10_OC	Consumption of energy by sector, Sugar.£. Source: Census of Industrial Production, ISIC classification.
ENGY11_OC	Consumption of energy by sector, Cocoa, chocolate etc.£. Source: Census of Industrial Production, ISIC classification.
ENGY12_OC	Consumption of energy by sector, Margarine£. Source: Census of Industrial Production, ISIC classification.
ENGY13_OC	Consumption of energy by sector, Miscellaneous foods.£. Source: Census of Industrial Production, ISIC classification.
ENGY14_OC	Consumption of energy by sector, Distilling£. Source: Census of Industrial Production, ISIC classification.
ENGY15_OC	Consumption of energy by sector, Malting£. Source: Census of Industrial Production, ISIC classification.
ENGY16_OC	Consumption of energy by sector, Brewing.£. Source: Census of Industrial Production, ISIC classification.
ENGY17_OC	Consumption of energy by sector, Aerated mineral waters.£. Source: Census of Industrial Production, ISIC classification.
ENGY18_OC	Consumption of energy by sector, Tobacco.£. Source: Census of Industrial Production, ISIC classification.
ENGY19_OC	Consumption of energy by sector, Woollen and worsted.£. Source: Census of Industrial Production, ISIC classification.
ENGY20_OC	Consumption of energy by sector, Linen and cotton spinning, weaving and manufactures.£. Source: Census of Industrial Production, ISIC classification.
ENGY21_OC	Consumption of energy by sector, Jute, canvas, rayon, nylon etc.£. Source: Census of Industrial Production, ISIC classification.

ENGY22_OC	Consumption of energy by sector, Hosiery£. Source: Census of Industrial Production, ISIC classification.
ENGY23_OC	Consumption of energy by sector, Boot and shoe£. Source: Census of Industrial Production, ISIC classification.
ENGY24_OC	Consumption of energy by sector, Mens' and boys' clothing£. Source: Census of Industrial Production, ISIC classification.
ENGY25_OC	Consumption of energy by sector, Shirtmaking£. Source: Census of Industrial Production, ISIC classification.
ENGY26_OC	Consumption of energy by sector, Women's' and girls' clothing£. Source: Census of Industrial Production, ISIC classification.
ENGY27_OC	Consumption of energy by sector, Miscellaneous clothing£. Source: Census of Industrial Production, ISIC classification.
ENGY28_OC	Consumption of energy by sector, Manufacture of made up textile goods.£. Source: Census of Industrial Production, ISIC classification.
ENGY29_OC	Consumption of energy by sector, Manufactures of wood and cork.£. Source: Census of Industrial Production, ISIC classification.
ENGY30_OC	Consumption of energy by sector, Furniture.£. Source: Census of Industrial Production, ISIC classification.
ENGY31_OC	Consumption of energy by sector, Paper and paper products.£. Source: Census of Industrial Production, ISIC classification.
ENGY32_OC	Consumption of energy by sector, Printing and publishing.£. Source: Census of Industrial Production, ISIC classification.
ENGY33_OC	Consumption of energy by sector, Fellmongery, tanning.£. Source: Census of Industrial Production, ISIC classification.
ENGY34_OC	Consumption of energy by sector, Leather£. Source: Census of Industrial Production, ISIC classification.
ENGY35_OC	Consumption of energy by sector, Fertilisers.£. Source: Census of Industrial Production, ISIC classification.
ENGY36_OC	Consumption of energy by sector, Oils, paints, inks.£. Source: Census of Industrial Production, ISIC classification.
ENGY37_OC	Consumption of energy by sector, Chemicals and drugs.£. Source: Census of Industrial Production, ISIC classification.
ENGY38_OC	Consumption of energy by sector, Soap, detergents£. Source: Census of Industrial Production, ISIC classification.
ENGY39_OC	Consumption of energy by sector, Glass and glassware, pottery etc.£. Source: Census of Industrial Production, ISIC classification.
ENGY40_OC	Consumption of energy by sector, Structural clay products etc.£. Source: Census of Industrial Production, ISIC classification.
ENGY41_OC	Consumption of energy by sector, metal trades.£. Source: Census of Industrial Production, ISIC classification.
ENGY42_OC	Consumption of energy by sector, Manufacture and assembly of machinery except electrical.£. Source: Census of Industrial Production, ISIC classification.
ENGY43_OC	Consumption of energy by sector, Electrical machinery.£. Source: Census of Industrial Production, ISIC classification.
ENGY44_OC	Consumption of energy by sector, Ship and boat building.£. Source: Census of Industrial Production, ISIC classification.
ENGY45_OC	Consumption of energy by sector, Railroad equipment.£. Source: Census of Industrial Production, ISIC classification.
ENGY46_OC	Consumption of energy by sector, Assembly, construction etc. of road vehicles.£. Source: Census of Industrial Production, ISIC classification.
ENGY47_OC	Consumption of energy by sector, Assembly construction etc. of other road vehicles.£. Source: Census of Industrial Production, ISIC classification.
ENGY48_OC	Consumption of energy by sector, miscellaneous manufacturing.£. Source: Census of Industrial Production, ISIC classification.
ENGY49_OC	Consumption of energy by sector, Building and construction.£. Source: Census of Industrial Production, ISIC classification.
ENGY50_OC	Consumption of energy by sector, Local authorities and Govt. Departments.£. Source: Census of Industrial Production, ISIC classification.
ENGY51_OC	Consumption of energy by sector, Canals, docks etc.£. Source: Census of Industrial Production, ISIC classification.
ENGY52_OC	Consumption of energy by sector, Railways.£. Source: Census of Industrial Production, ISIC classification.
ENGY53_OC	Consumption of energy by sector, Electricity£. Source: Census of Industrial Production, ISIC classification.
ENGY54_OC	Consumption of energy by sector, Gas works.£. Source: Census of Industrial Production, ISIC classification.
ENGY55_OC	Consumption of energy by sector, Waterworks.£. Source: Census of Industrial Production, ISIC classification.
ENGY56_OC	Consumption of energy by sector, Laundry£. Source: Census of Industrial Production, ISIC classification.
ENGY57_OC	Consumption of energy by sector, Turf production.£. Source: Census of Industrial Production, ISIC classification.

2. Discharges to Water and Use of Water Services

This section assembles the information on discharges to water and on use of water services, with the aim of linking data on quantities to their associated economic activities. A second aim is to establish the costs and revenues arising from water services. While there are no environmental taxes, strictly defined, applying to water services in Ireland, the under-recovery of costs could be viewed as a benefit-in-kind or as a form of negative environmental tax, as discussed in the Preface.

The information on water assembled here is somewhat exploratory and has been gathered by approaching several sources. Some of these sources are found to be considerably under-exploited at present. Some have the potential for being developed further and to become core sources of data in the future, with some minor alterations to procedure in certain areas. The sources are nevertheless difficult to use as they stand because the data were recorded with different purposes in mind.

The various sets of information in this section could be presented in several different ways. It would be desirable to report, separately, all information relating to discharges followed by all information relating to water supply. However, owing to the preliminary nature of this analysis and to the need for full explanation of data sources and approach, the presentation of information here will be made on the basis of the *sources of data*, in the following order.

First, information on physical **discharges to water** is investigated, availing of the EPA's data base mainly. Secondly, we present data on Public Water Services collected by the CSO in the process of assembling information on the **National Accounts**. This information covers the two activities, Public Water Supply and Waste Water Services. Combining it with, albeit hypothetical, information on quantities it will be possible to estimate highly provisional figures on subsidies per unit. Thirdly, the information collected in the course of conducting the **Census of Industrial Production** will be presented and assessed. The data discussed up to this point have been national. Fourthly and finally the results of a survey of individual water authorities are presented. The survey was undertaken especially for this project. The response rate was poor and only the results covering the **Greater Dublin area** are presented here, which comprises about a third of the state. In view of the requirement in the Water Framework Directive for EU member states to use the river basin as the unit of administration and analysis, the survey should enable one to assess the feasibility at present of recording essential economic data on a river basin basis.

2.1 Discharges to water

The EPA has assembled a detailed database of discharges of BOD, Nitrogen and Phosphorus (Cunningham, 2000). The database is constructed from information derived from various sources,

including information on agricultural activity, population size and the like as well as, in particular, information contained in the licenses issued to industrial enterprises. This database has already been used during the recent construction of *Satellite Environmental Accounts for Ireland 1996* (Eurostat 2000). It undergoes regular updates and forms part of the EPA's submission to the OSPAR Convention (Oslo and Paris conventions for the prevention of marine pollution) (EPA,1999).The database compilation follows the draft OSPAR guidelines for Harmonised Quantification and Reporting, also called HARP (OSPAR Commission, 1999).

Availing of this database represents an entirely different approach from that employed in the construction of the initial *Pilot Environmental Accounts* (CSO 1999), which related to 1994 and were assembled before the EPA's database had become sufficiently developed. In the pilot study a variety of means had been explored, and the experimental nature was emphasised with the reminder that the results were heavily dependent on the assumptions made. For example, in estimating diffuse losses of P from agriculture, forestry and erosion to water, a figure had been used that was the difference between (1) the measured P input from rivers into the sea and (2) P discharges at point sources (from industry mainly). The resulting figure for total P discharged to water consisted of a large range of between 7,580 and 9,690 tonnes. This compares with the more recent estimate of 8,911 tonnes, which falls within the range and indicates a reasonable degree of consistency between the two methods. For BOD, totals are comparable although the components differ. For N the recent estimate of losses to water from agriculture are considerably lower owing to the fact that the use of fertilisers in arable farming are omitted from the picture by the EPA in this dataset at present. Another benefit to be derived from use of the EPA's database on discharges is the level of sectoral detail given, which is based on the EPA's own coding system, listed in Appendix 2.1.

A few explanations of the EPA's method of recording the data are in order, though for a detailed description readers are referred to EPA 1999. The figures on industrial discharges are estimates, based on the license consents. It is found that companies tend to release about 25 per cent of their consent limit and this is the figure that is applied to the consent levels to give estimated discharges in the database. Licenses come under two headings, namely, the recent Integrated Pollution Control (IPC) licensing operated by the EPA and, secondly, the licensing by local authorities under the Water Pollution Legislation (called Non-IPC or WPL).

Information presented here refers to discharges generated and discharges that are lost to waters (or loads to waters). The amount *generated* is of interest because, with a given technology, this amount relates to the level of economic activity. The amount *lost to waters* is of interest because it tells us what are the loads going to the environment, given the extent and level of treatment. The actual figures are compiled as follows. Figures for generation are the sum of the amounts discharged directly to waters (that is, with no treatment subsequent to leaving the firm's premises) plus the amounts discharged to sewers (which will be subject to treatment in many cases). Figures for loss to waters are the sum of direct discharges to water plus the resulting amounts discharged to waters after treatment of that going

to sewers. Consequently the ‘unsewered industry’s’ figures for generation and for loads to waters will be the same.

The following three tables, 2.1.1, 2.1.2 and 2.1.3, give the overall situation with respect to discharges of BOD, N and P broken down by broad economic activity. As mentioned, the figures for agriculture do not include the amounts arising from fertilisers used in arable farming. A major category is ‘Urban residential including commercial’ and ideally commercial would be separated out from residential. Another important sub classification, entered for interest, is ‘urban waste water’, which consists of all sewered discharges, comprising contributions from sewered industry and from so-called urban residential and commercial establishments. ‘Urban’ means sewered. Rural households are unsewered and their contributions are estimates. The columns in the tables give the amounts generated and the loads that are lost to waters. The latter is further broken down into loads going to inland and to marine waters.

In relation to the magnitudes, it is worth noting that the figures for agriculture are very large. It is however the concentration rather than the amount of discharge that matters where damage to water quality, or pollution, is concerned. Therefore, in certain circumstances a small concentrated amount from a point-source, such as from ‘urban waste water’ may have more significance than larger but diffuse amounts emanating from agriculture.

Table 2.1.1: Estimated BOD generated and lost to waters, inland and marine, by economic activity (thousand tonnes per year, 1998/99)

BOD	Totals		of which: Loads to inland waters	Loads to marine waters
	Generated	Loads to waters		
Agriculture[1]	2046.000	Unknown		
Forestry and Peatlands	Unknown	Unknown		
Freshwater Aquaculture	0.791	0.791	0.760	0.031
Marine Aquaculture	4.422	4.422	0.000	4.422
Total industry:	11.796	9.664		
Unsewered[2] Industry	2.784	2.784	1.914	0.870
of which: Non-IPC	1.054	1.054		
IPC	1.730	1.730		
Sewered[2] Industry	9.0116	6.880		
of which: Non-IPC	4.341	3.253		
IPC	4.671	3.627		
Urban Residential incl. Commercial	54.888	40.958		
Subtotal: Urban Waste Water[3]	63.900	47.838	7.277	40.561
Rural Households	28.600	1.429	1.214	0.214
TOTAL accounted for[4]	**102.543 +**	**57.264 +**	**11.166 +**	**46.098 +**
Background Runoff	Unknown	Unknown		

Notes:

1. Agricultural BOD generated refers to animal waste and silage only. Source: table 5.1 of Cunningham (2000).
2. Unsewered means that discharges are made directly to water, sewered means that discharges are dealt with by the public supply system.
3. Urban waste water consists of the contributions from sewered industry and Urban Residential incl. Commercial.
   "Urban" means sewered. The figure for the amount generated is taken from p. 43 of the Millennium Report (EPA, 2000).
4. The total refers to BOD emanating from economic activity and excludes background runoff, unknown discharges and loads from agriculture etc.

Table 2.1.2: Estimated N generated and lost to waters, inland and marine, by economic activity (thousand tonnes per year, 1998/99)

Nitrogen	Totals		of which: Loads inland waters	Loads to marine waters
	Generated	Loads to waters		
Agriculture [1]	597	102.996	89.899	13.096
Forestry and Peatlands		2.606	2.301	0.305
Freshwater Aquaculture	0.116	0.116	0.089	0.026
Marine Aquaculture	1.609	1.609	0.000	1.609
Total industry:	4.015	3.616		
Unsewered [2] Industry	1.133	1.133	0.858	0.275
of which: Non-IPC	0.404	0.404		
IPC	0.730	0.730		
Sewered [2] Industry	2.882	2.483		
of which: Non-IPC	1.561	1.384		
IPC	1.321	1.099		
Urban Residential incl. Commercial		7.255		
Subtotal: Urban Waste Water [3]		9.738	2.209	7.528
Rural Households		2.980	2.533	0.447
TOTAL accounted for [4]		**121.178**	**97.889**	**23.286**
Background Runoff		5.364	4.441	0.922

Notes:

1. Agricultural N refers to animal waste and silage and does not adequately cover fertiliser use in arable farming.
2. Unsewered means that discharges are made directly to water, sewered means that discharges are dealt with by the public supply system.
3. Urban waste water consists of the contributions from sewered industry and Urban Residential incl. Commercial. "Urban" means sewered. The figure for the amount generated is taken from p. 43 of the Millennium Report (EPA, 2000).
4. The TOTAL refers to N emanating from economic activity and excludes background runoff, unknown discharges including unknown loads from agriculture etc.

Table 2.1.3: Estimated P generated and lost to waters, inland and marine, by economic activity (thousand tonnes per year, 1998/99)

Phosphorus	Totals		of which: Loads	Loads to
	Generated	Loads to waters	inland waters	marine waters
Agriculture[1]	96.000	4.590	4.075	0.516
Forestry and Peatlands		0.217	0.192	0.025
Freshwater Aquaculture	0.074	0.074	0.066	0.008
Marine Aquaculture	0.253	0.253	0.000	0.253
Total industry:	1.116	1.021		
Unsewered[2] Industry	0.406	0.406	0.171	0.235
of which: Non-IPC	0.109	0.109		
IPC	0.297	0.297		
Sewered [2] Industry	0.710	0.615		
of which: Non-IPC	0.381	0.340		
IPC	0.329	0.275		
Urban Residential incl. Commercial		2.088		
Subtotal: Urban Waste Water [3]		2.703	0.574	2.129
Rural Households		0.310	0.264	0.047
TOTAL accounted for [4]		**8.553**		
Background Runoff		0.358	0.296	0.061

Notes:

1. Agricultural P generated refers to animal waste and silage only.
2. Unsewered means that discharges are made directly to water, sewered means that discharges are dealt with by the public supply system.
3. Urban waste water consists of the contributions from sewered industry and Urban Residential incl. Commercial. "Urban" means sewered. The figure for the amount generated is taken from p. 43 of the Millennium Report (EPA, 2000).
4. The total refers to P emanating from economic activity and excludes background runoff, unknown discharges including unknown loads from agriculture etc.

The row for industry in Tables 2.1.1 to 2.1.3 can be further broken down into the component sectors as classified by the EPA. Table 2.1.4 gives the breakdown according to the EPA's 13 sector breakdown. Information is again given on BOD, N and P and each of these is again broken down into the amounts that are generated and the amounts lost to waters.

Table 2.1.4: BOD, N and P generated and lost to waters broken down by EPA sector, tonnes per

EPA Sectors	BOD		N		P	
	Generated	To waters	Generated	To waters	Generated	To waters
1. Minerals and other metals	280	279	1	1	2	2
2. Energy	74	74	1	1	-	-
3. Metals	1,256	992	970	840	241	218
4. Mineral Fibres and glass	53	51	68	68	3	3
5. Chemicals	3,368	2,887	1,254	1,084	480	437
6. Intensive Agriculture*	911	832	125	123	75	75
7. Food and drink	5,160	4,290	1,292	1,233	316	299
8. Wood paper, textiles, leather	1,085	810	346	320	40	36
9. Fossil fuels	28	27	2	2	0	0
10. Cement	33	27	1	1	0	0
11. Waste	21	20	0	0	0	0
12. Surface coatings	189	112	25	22	24	18
13. Other: int circuits, ceramics	130	54	45	36	8	7
TOTAL	**12,586**	**10,455**	**4,131**	**3,732**	**1,190**	**1,095**

Notes:

'Generated' includes direct discharges to waters and discharges to sewers before treatment.

'To waters' includes discharges to waters after treatment as well as direct discharges to

* Intensive agriculture consists mainly of freshwater fishfarms which are included here. Excluding these (as shown below) yields the figures for 'Total industry' in previous tables.

Fishfarms, freshwater:	791	791	116	116	74	74
TOTAL excluding freshwater fishfarms:	11795	9664	4015	3616	1116	1021

(The figure for P excluding that from freshwater fishfarms (shown in the final note to Table 2.1.4) are the same as the figures given in Table 2.1.3 in the row for Total Industry.)

This information is graphed in Figures 2.1.1, 2.1.2 and 2.1.3. Each sector in the graph is represented by two stacks, the stack at the back giving the quantities generated and the stack at the front giving the amounts lost to waters. The difference between stacks within a sector indicates the amount of BOD, N or P removed by treatment. Some of the amounts generated are discharged directly and therefore not subject to treatment. About a quarter of the BOD and N and a third of P that are generated by industry are discharged directly and this goes some way to accounting for the small amounts of removal shown in the figures.

Figure 2.1.1: BOD generated by industry and lost to waters, by EPA sector, tonnes per annum

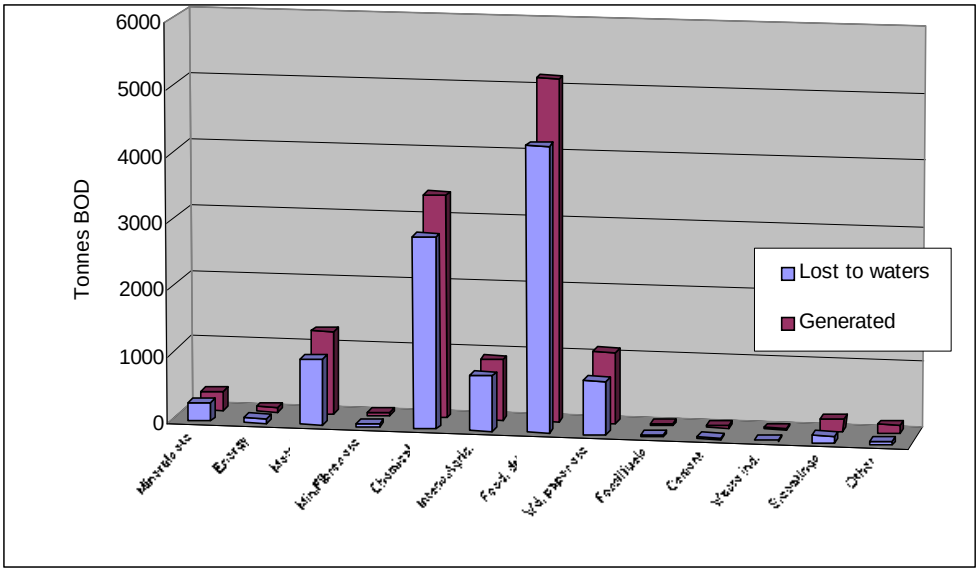


Figure 2.1.2: N generated by industry and lost to waters, by EPA sector, tonnes per annum

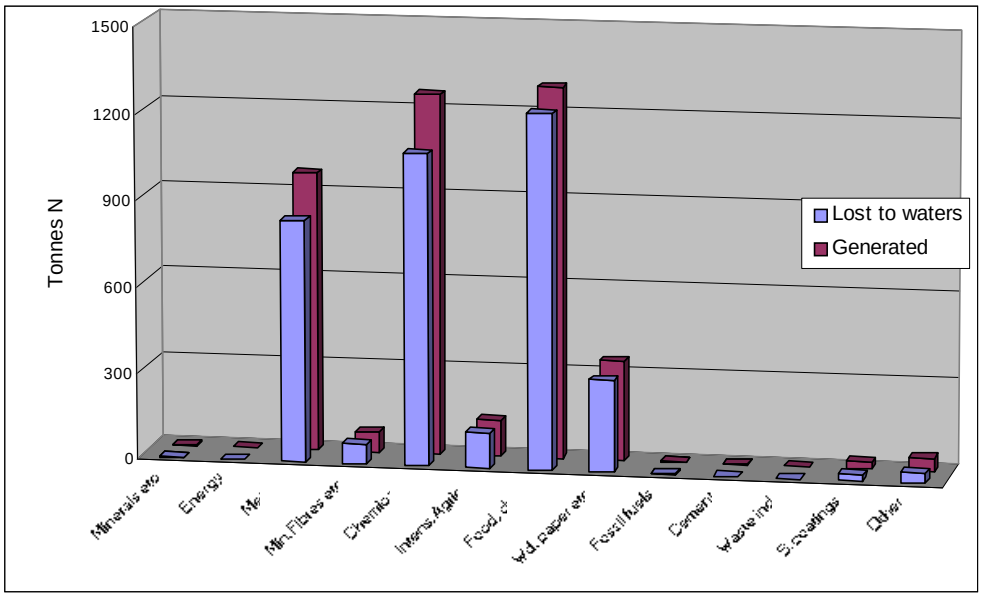
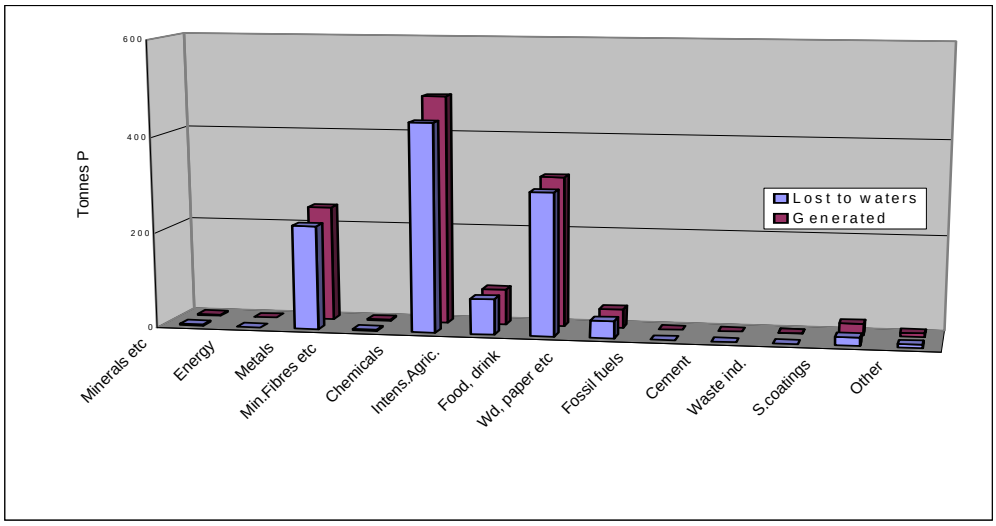


Figure 2.1.3: P generated by industry and lost to waters, by EPA sector, tonnes per annum



It can be seen that the food and drink sector, the chemicals sector and the metals sector stand out as major contributors. Intensive agriculture, which includes freshwater fishfarming, and wood and paper contribute on a smaller scale. Where BOD is concerned, food and drink and chemicals stand out and where P is concerned it is the chemicals sector that is prominent. When looking at the relative amount of treatment, or removal relative to the amounts generated, this appears to be quite small in the case of N and P removal from food and drink discharges

So far, the breakdowns of industry according to the EPA classification have been presented here. If one were to relate these quantities of discharge to economic output of the industries concerned or to numbers employed, there are two options. The first would be to obtain data on the value of output and the numbers employed in the sectors as broken down by the EPA. The second is to use figures available from the CSO based on the NACE rev1 (A60) classification and re-classify the figures on discharges accordingly. The latter option was attempted and the results are shown here. As this is the first attempt at this exercise, the results are provisional.

A concordance was constructed by the CSO that started with the EPA classification and description of sectors and then allotted the relevant NACE codes to the sectors. The resulting *Provisional Concordance between EPA and CSO Classifications* is shown in Appendix 2.1. Several EPA sectors have not yet been allotted a NACE class by CSO, though in the case of three of these that had non-zero discharges according to the EPA database, allocations had to be made and were carried out as follows. Extraction and processing of minerals was classed as NACE 13, which is mining of metal ores. Production of energy in combustion plant was classed as NACE 40, which is energy and water utilities; this classification is acceptable given that the companies in the EPA's category at present are indeed energy utilities. However if, say, a brewery installs a combustion plant that is recorded in the EPA's database as 'production of energy', then it will be necessary to classify that company's discharges in to the NACE category relevant to the drinks industry. The third allocation was marts and animal holding facilities, which were allocated to agriculture.

The resulting reclassification of the EPA's breakdown of discharges is shown in Table 2.1.5. In this table, only loads to waters are shown. Information on generation is not shown for the sake of brevity and because the figures were not hugely different, as shown in the graphs. Also in Table 2.1.5 are figures supplied by the CSO on Gross Value Added (GVA) at current basic prices and the numbers at work. Gross Value Added is a measure of the GDP arising in each sector. These economic data relate to the 1998. The figures on discharges relate in fact to 1998, 1999 and possibly to 2000 to a limited extent.

It is interesting to use the information to calculate discharges per unit of GVA and also per person employed. These can be viewed as measures of 'pollution intensity' of the sectors. The results are no more robust than the underlying data and allocations to sectors. Therefore previous comments about the

provisional nature of the figures apply - to a greater degree here because this is disaggregated data and inaccuracies could be magnified.

Figures 2.14 and 2.15 show tentative results for discharges per unit of GVA and per person at work, respectively. Leaving aside agriculture and fishing/fishfarms for a moment, it is seen that the most intensive dischargers of BOD per unit of GVA are, in descending order, (27) basic metals, (19) tanning and leather, (23) refining and coke, (17) textiles and (15) food and drink. Where N is concerned it is mainly (27) basic metals and (19) tanning and leather. Basic metals are also the most intensive in P loss to waters.

Again leaving aside agriculture and fishing/fishfarms, BOD loss to waters per person at work is highest for (27) basic metals, followed by (24) chemicals, (23) refining/coke, (15) food and drink, (14) quarrying, (19) tanning/leather and (21) paper. Losses to water of N per person employed is highest in (27) basic metals, followed somewhat behind by (24) chemicals, (15) food and drink and (19) tanning and leather. Where loss of P per person employed is concerned, (27) basic metals and (24) chemicals are prominent, with (15) food and drink and (21) paper playing minor roles.

The importance of concentrations of losses and their relevance in the case of agriculture has already been discussed above and will not be repeated here. Where fishing and fishfarms are concerned, the high amounts of BOD and N per unit of GVA and per person at work in fishing deserves some comment. The first point is that a high proportion is lost to marine waters. The second is that there is some uncertainty surrounding the numbers employed in fishing, added to which the numbers in fishfarms will have increased since 1998, the year of the economic data used (in the denominator).

Table 2.1.5: Gross Value Added and numbers at work and tentative breakdown of industry's loads to waters of BOD, N and P, by NACE rev 1 classification, 1998 (discharges refer to 1998-2000)

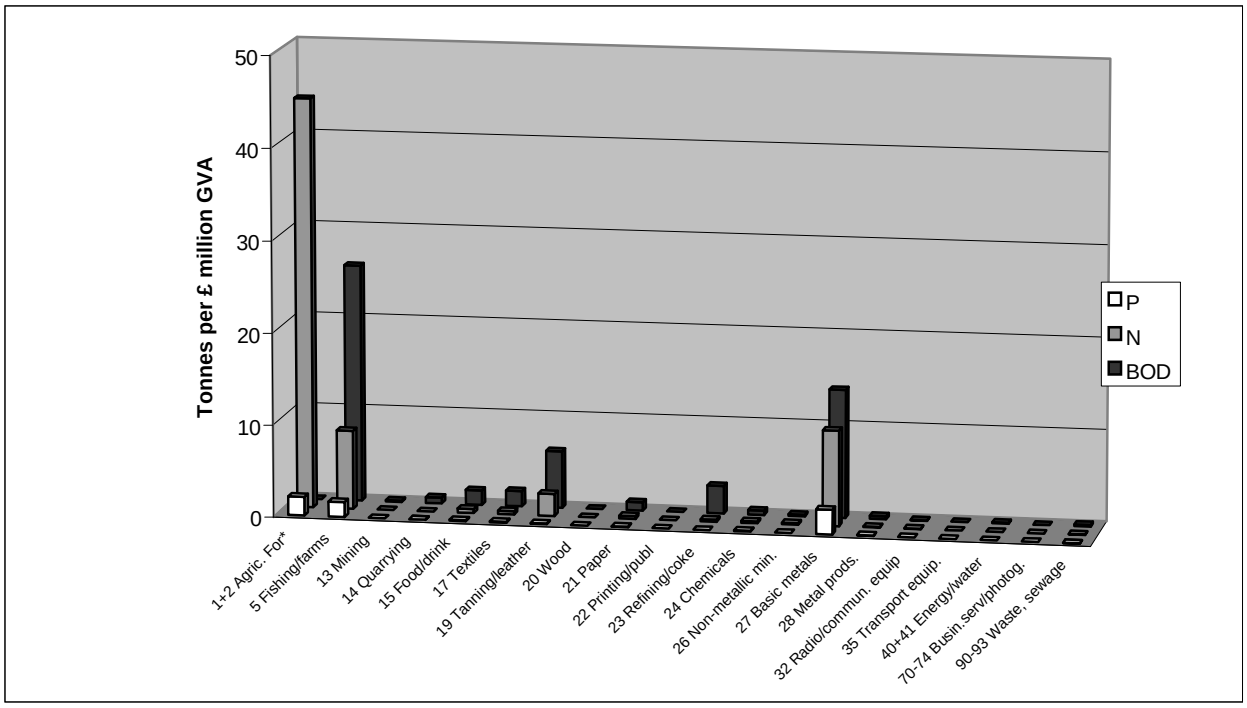
NACE rev1 i.e. A60 classification	Description	GVA at current basic[3] prices £m	Nos at work 000s	BOD 000 tonnes per year	N 000 tonnes per year	P 000 tonnes per year
1+2	Agriculture[1], forestry and related service[2] activities	2,369.82	131.4	0.041	105.609	4.808
5	Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing.	202.25	3.6	5.213	1.725	0.327
10	Mining of coal and lignite; extraction of peat.	106.07	1.7	0	0	0
11	Extraction of crude petroleum and nat. gas; service activities incidental to oil/gas extraction.	49.55	0.2	0	0	0
13	Mining of metal ores.[2]	43.67	0.9	0.006	0.001	0
14	Other mining and quarrying.	211.82	2.1	0.135	0	0.002
15	Manufacture of food products and beverages.	2,725.42	51.4	4.291	1.233	0.299
16	Manufacture of tobacco products.	641.11	1.2	0	0	0
17	Manufacture of textiles.	139.89	10.5	0.233	0.051	0.014
18	Manufacture of wearing apparel; dressing and dyeing of fur.	167.37	8.6	0	0	0
19	Tanning and dressing of leather; manufacture of luggage, saddlery, footwear etc.	14.23	1.6	0.088	0.034	0.001
20	Manuf. of wood and products of wood and cork, except furniture and other.	130.71	6.7	0.004	0.001	0
21	Manufacture of pulp, paper and paper products.	194.95	3.9	0.179	0.057	0.008
22	Publishing, printing and reproduction of recorded media.	1,292.15	18.2	0.016	0	0
23	Manufacture of coke, refined petroleum products and nuclear fuel.	8.94	0.3	0.027	0.002	0
24	Manufacture of chemicals and chemical products.	6,062.56	25.9	2.925	1.160	0.440
25	Manufacture of rubber and plastic products.	337.89	11.4	0	0	0
26	Manufacture of other non-metallic mineral products.	426.26	14.9	0.077	0.069	0.003
27	Manufacture of basic metals.	80.66	3.8	1.125	0.836	0.216
28	Manufacture of fabricated metal products, except machinery and equipment.	343.86	22.1	0.116	0.026	0.019
29	Manufacture of machinery and equipment n.e.c.	479.92	13.8	0	0	0
30	Manufacture of electrical machinery and apparatus n.e.c.	911.94	17.7	0	0	0
31	Manufacture of radio, television and communication equipment and apparatus.	550.25	8.8	0	0	0
32	Manufacture of radio, television and communication equipment and apparatus.	870.08	21	0.037	0.036	0.007
33	Manufacture of medical, precision and optical instruments, watches and clocks.	676.81	14.8	0	0	0

34	Manufacture of motor vehicles, trailers and semi-trailers.	93.98	4.9	0	0	0
35	Manufacture of other transport equipment.	157.29	5.5	0.001	0	0
36	Manufacture of furniture; manufacturing n.e.c.	392.45	18.2	0	0	0
37	Recycling	7.98	0.7	0	0	0
40+41	Energy and water utilities[2]	824.55	12.1	0.074	0.001	0
45	Construction	3,300.65	126.2	0	0	0
50-52	Retail trade services on motor vehicles and motorcycles and personal and household goods.	5,638.19	211.3	0	0	0
55	Hotel and restaurant services.	1,526.92	98.1	0	0	0
60-64	Land, Water, Air and supporting transport services	3,106.25	86.8	0	0	0
65-67	Services auxiliary to financial intermediation including insurance and pension funding	2,037.11	54.9	0	0	0
70-74	Real estate and business services	8,826.43	116.8	0.005	0.001	0
75	Public administration and defence services; compulsory social security services.	2,469.99	70.7	0	0	0
80	Education services.	2,407.05	93.2	0	0	0
85,88	Health and social work services.	3,137.49	121.2	0	0	0
90-93	Waste, sewage and other services.	1,528.03	68.6	0.283	0.098	0.010
95	Private households with employed persons.	56.23	8.4	0	0	0
99	Services provided by extra-territorial organisations and bodies.	0	0.2	0	0	0
TOTAL		54,548.77	1494.3	14.876	110.94	6.154
	Agric, Forestry and peatl. and Aquaculture (both sorts)			5.213	107.327	5.134
TOTAL less previous row (gives Total industry loads to water as in Tables 2.1.1 to 2.1.3)				**9.663**	**3.613**	**1.020**

Notes:

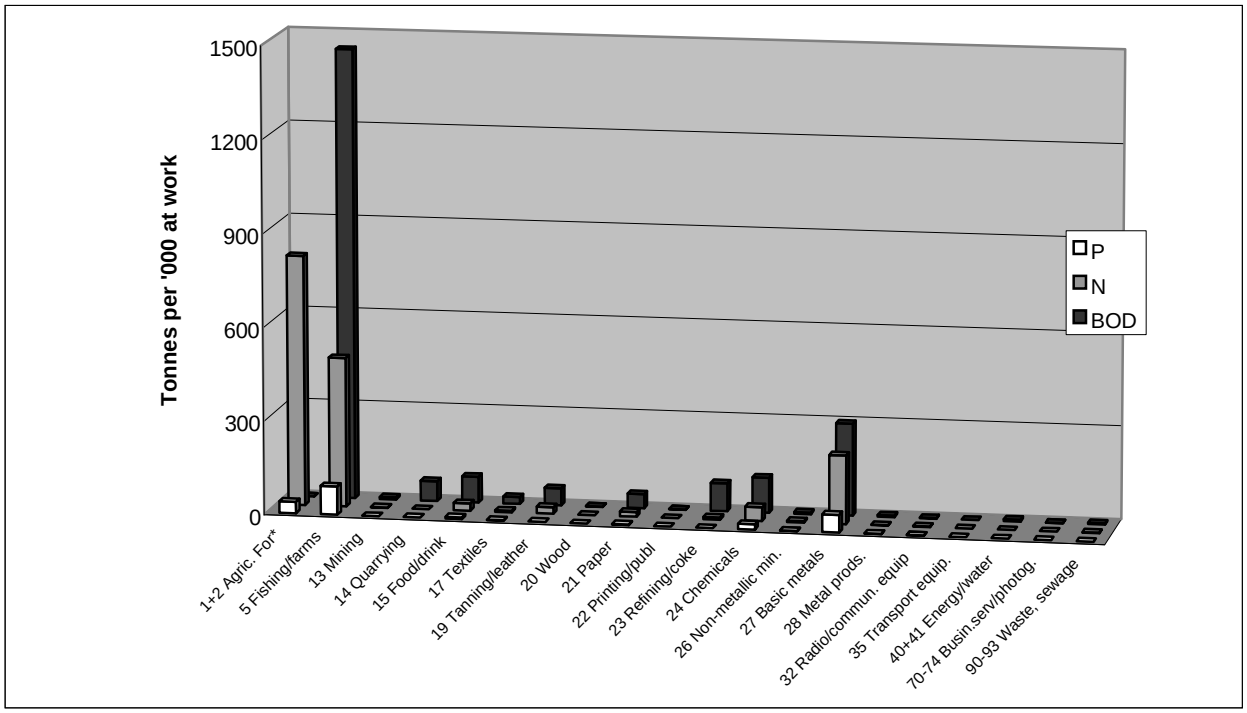
1. The figure for BOD excludes the large but unknown loads of BOD from Agriculture and Forestry and peatlands, recorded in Tables 2.1.1, 2.1.2 and 2.1.3.
2. Reclassification in this table from EPA codes to NACE rev1 A60 codes is provisional. Marts and animal holding and facilities Peatlands have been classified with Agriculture (1), extraction and processing of minerals have been classified with Mining of metal ores (13), and production of energy in combustion plant in Energy and water utilities (40).
3. Basic prices exclude VAT, import duties and excise duties. They are at factor prices plus taxes on production that are independent of quantity of output (e.g. Rates and payroll taxes). Basic prices plus taxes on products (including imports) such as VAT equals market prices.

Figure 2.1.4: Tonnes BOD, N and P lost to waters per £1 million Gross Value Added using NACE



* As shown in Table 1.1.1 the amounts of BOD from agriculture and forestry is not known.

Figure 2.1.5: Tonnes of BOD, N and P lost to waters per thousand persons at work using NACE



As shown in Table 1.1.1 the amounts of BOD from agriculture and forestry is not known.

An alternative way of obtaining figures on the amount of discharges per person employed in fishfarms is to use data on aquaculture from Bord Iascaigh Mhara (the Irish Sea Fisheries Board). They supplied

figures on the numbers employed (and tonnage of product) in Marine and Freshwater Aquaculture in 1999. Combining these with the discharges of BOD, N and P from the EPA gives the levels per person employed given in Table 2.1.6. Here we see different amounts per person employed and, as expected, higher amounts per person employed in freshwater aquaculture, than suggested in the previous graphs. (Note that the graphs are expressed per thousand persons employed.

Table 2.1.6: Loads to waters per person at work (tonnes per full-time equivalent person)

	P	N	BOD
Marine	0.176	1.119	3.075
Freshwater	0.525	0.823	5.610
Total	0.207	1.092	3.301

These figures lead one to the conclusion that as orders of magnitude the original figures for fishing and fishfarms are reasonable. The numbers involved in freshwater fishfarms are in fact quite small with only 141 fulltime equivalents in 1999.

FUTURE AVAILABILITY

It is clear that this information collected by the EPA is a rich dataset and will form a key source of information on discharges to water for the future. As the coverage is extended, in terms of both the number of enterprises that come within the licensing procedure and the precision of data collection, so it will form an important basis for describing the interaction between economic activity and environmental effects.

A point that should be stressed is the need for the reclassification from EPA codes to the NACE classification system to become routine. This is essential to ensure continuity and consistency. The reclassification that was undertaken for this paper was experimental. It would be necessary that each individual firm in the licensing records, the names of which are readily accessible to the public, be reclassified to the same category accorded by the CSO at present. Otherwise calculations that combine EPA and CSO data run the risk of being misleading and analyses of the environmental effects of economic activity will not be soundly based.

A further breakdown of the information presented in this subsection on a regional basis would be very worthwhile. Given the localised nature of pollution, the importance of the condition of receiving waters and the concentrations of discharges, disaggregation of data by region, starting with the most vulnerable regions, would be a useful analytical resource.

2.2 National Accounts data on public water services

The aim in this sub-section is to analyse public water services with a view to providing time-series, for the nineties, of costs incurred by the providers and payments made by customers. Results of such an attempt have been published by Scott and Lawlor (1997) but only for one year, 1994. Difficulties in obtaining data were mentioned during that attempt and only partial improvements in data have occurred since then. These improvements consist of more thorough estimates of leakage and firmer figures of water consumption in the Greater Dublin area. There is still some uncertainty about the amount paid by customers in some cases, with the data problems described by Scott and Lawlor (1994) still persisting. Assumptions have had to be made and in what follows we only estimate time-series of costs and payments per unit of water consumed and stop short at continuing with estimation of costs and payments per unit of waste water serviced. The procedures for finalising the calculations are in a state of readiness, however. When the missing data are supplied, therefore, it will be possible to finish the exercise. Unfortunately it is still the case that results produced so far are tentative and dependent on the assumptions made, which are described fully.

Information is assembled here on expenditures by the providers of public water supplies and waste water services, which in Ireland are the local authorities. Subtraction of payments by customers yields estimates of the cost borne by the public purse, or the subsidy. On dividing expenditures and subsidies by quantities, the cost and subsidy per unit is obtained. We will see that obtaining data on expenditures is reasonably straightforward but that assembling data on payments by customers is more difficult and that the determination of quantities is more difficult still.

Tables 2.2.1 and 2.2.2 refer to public Water Supply and Waste Water services, respectively. The basis of the expenditure information presented is the data collected by the CSO in the course of constructing the National Accounts. Table 2.2.3 gives the information prior to manipulation to produce the previous two tables, for the record, and some details of this raw information are now described.

On current account and on capital account the CSO receive data from the DoELG itemising total expenditure according to the following categories. Using 1994 for illustration, the data are in the following form.

1994 Expenditure, £m	**Current**	**Capital**
Public Water Supply	81.9	30.2
Public/Sewerage Schemes	35.8	65.5
Private Installation	0.5	00.1
Administration and Miscellaneous	26.0	0.5
TOTAL	**144.2**	**96.4**

Source: Central Statistics Office, National Accounts Section

The CSO figures shown above for Current Expenditure differ slightly from those that appear for the water supply and sewerage programme in the *Returns of Local Taxation* under the table headed "All Local Authorities Receipts and Expenditure Classified by Programme". The difference appears to be partly explained by the allocation of Inter-Authority Expenditure to the relevant function in the CSO data presented here. This suits our purposes. The final figure shown above for total Capital Expenditure is very close to the figure for water supply and sewerage combined, given in aggregate only, in the *Returns of Local Taxation* in the table headed "All Local Authorities Capital Account Summary".

Figures shown above for Private Installation refer to private water schemes in mainly rural areas. These do not form part of the system of public water services. No attempt at analysing them is made at this stage though, given their environmental impact (EPA, 2000), more attention could be focused on them in future. The item Administration and Miscellaneous approaches 20 per cent of the total but is not separately attributed to Public Water Supply and Public Sewerage Schemes. We have therefore attributed this item pro rata the share in the total of these two functions, the end results of this attribution appearing in Tables 2.2.1 and 2.2.2. As mentioned, Table 2.2.3 merely shows the raw data for 1990-1999.

At this stage the data become increasingly difficult to obtain and hypothetical in nature, and it is important for this to be borne in mind. Having established total expenditure by the providers of water services, the next step is to obtain figures of receipts from charges imposed on customers to defray the current costs of operation, and contributions mainly by industry to the capital cost. The DoELG are in a position to supply firmer data on receipts from charges for recent years than for earlier years. These include current receipts from charges (recently abolished) on the domestic household sector which are broken down between water and sewerage, and from the non-domestic or commercial sector, for which there is no breakdown between receipts for water supply and waste water services, except one rough estimate for the year 1994. Arbitrarily, the 1994 split between water supply and waste water services is applied to the other years.

Contributions to the capital cost are made by industry and estimates of the amounts paid are pending from DoELG, and again figures for earlier years are expected to be less certain. On foot of a questionnaire sent to local authorities, Scott and Lawlor (1994, 1997) gave a rough figure of £1 million apiece for industrial contributions towards the capital costs of water supply and waste water, as an order of magnitude. Recently the water authorities have been investing heavily and demanding a more realistic contribution towards their share of the capital costs from industrial customers, so that the figure is expected to have grown.

Finally and most uncertain of all are the quantities of water consumed and of waste water serviced. Several useful sources of information are to hand. The distribution input, that is, the water sent out into the public water supply system, was estimated by McCumiskey in 1991. Estimates for the Greater Dublin area have been presented in the Greater Dublin Water Supply – Strategic Study (GDWSSS) for

1994 and 1999. Incorporating the figures for 1994, McCarthaigh (1996) estimated water sent out, broken down by region and, an important step, by three consuming sectors, namely, domestic households, industry/commerce and agriculture.

Leakage figures include, in addition to leakage in distribution, estimates of operational use by the water supply system and losses of water on customers' premises. Knowing the distribution input and the percentage leakage enables one to calculate the desired figure of the amount of water consumed. Estimates of leakage have been made at various times, including by O'Connell in 1992. Leakage for the Greater Dublin area was estimated for 1994 and for 1999 in the GDWSSS. Atkins (2000) estimates leakage percentages for 1999 for the area outside Dublin. All these pieces of information on water quantities are assembled in Table 2.2.4.

Using the data described above, interpolating for the years in-between and assuming general stability of proportions, it is possible to produce a moderately coherent time-series of water consumption by the domestic sector for the 1990 to 1999 period. The result is presented in Table 2.2.5. It might be possible to produce similar time-series for water consumption by the industrial/commercial sector and agricultural sector. There is a problem however. The sectoral breakdowns for Dublin for the two years 1994 and 1999 are consistent but the breakdowns for the area outside Dublin imply that agriculture's share was 25 per cent and then 8 per cent, which throws doubt on the breakdowns. Consequently it seems prudent to leave industrial/commercial and agricultural use as one joint category and to call it "non-domestic".

The resulting graphs below show the current cost per cubic metre of water consumed. (Note that this is expected to be higher than the cost of water sent out, which is a higher volume.) The current cost is split into that part that is paid for by customers and that part that constitutes the subsidy. The first graph, Figure 2.2.1, relates to the domestic sector and the second one, figure 2.2.2, to the non-domestic sector. Money values have not been adjusted for inflation and current costs show a rise of some 3.5 per cent per year. While increased quantities supplied could be expected to be associated with economies of scale such that declining unit costs might have been predicted, there is likely to have been a concomitant rise in treatment costs to meet quality standards.

Figure 2.2.1 also shows a marked rise in the subsidy from the year 1997 onwards, which is due to the abolition of domestic water charges from the beginning of that year. In fact the less than total subsidy in 1997 and 1998 merely reflects late payments. Estimates of payments per cubic metre by customers, the object of this sub-section, are illustrated in the top section of the bars.

Figure 2.2.2 refers to industrial/commercial and agricultural consumption of water. A large share of water consumed by the industrial/commercial sector is paid for and full cost recovery is increasingly being applied. It is probably fair to say that the sector covers its costs fairly well. The subsidy shown in the graph therefore could represent a subsidy to the agricultural sector, though apparently it is charged

for water delivered by the public water supply system. It is not clear then to whom the subsidy should be attributed.

Figure 2.2.1: Current cost and subsidy per cubic metre of water consumed by the domestic sector

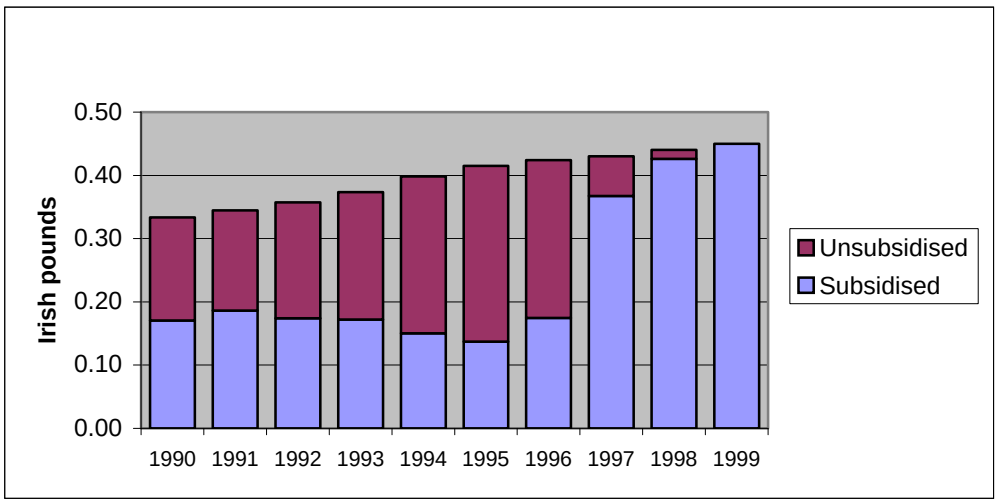
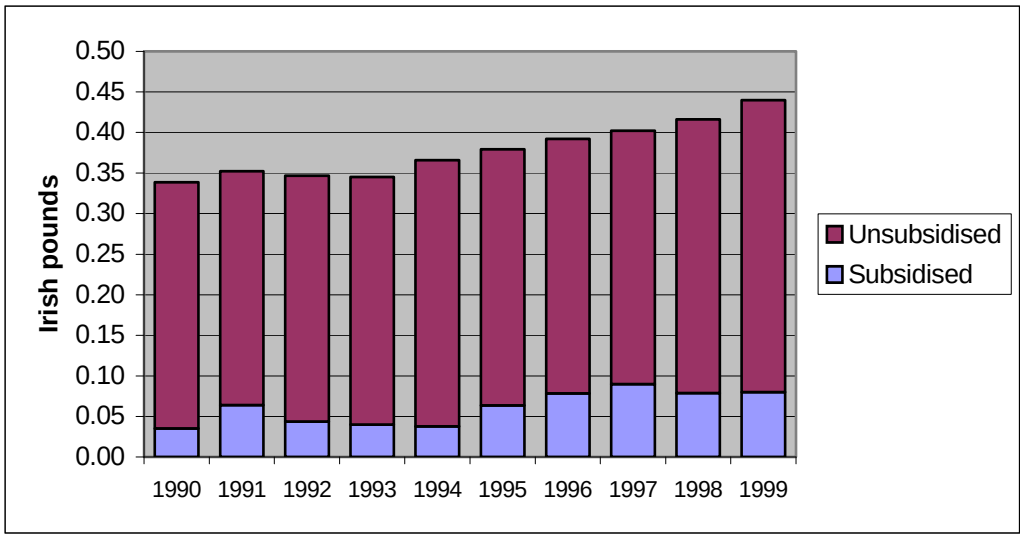


Figure 2.2.2: Current cost and subsidy per cubic metre consumed by the non-domestic sector



Capital expenditure on water supply would add between roughly a third and two thirds again on top of the current costs. This is actual capital expenditure that is not annualised, and to which financing charges have not been added. Industry will be increasingly paying a significant share of the capital costs that it imposes on the investment programme.

Turning attention from water supply to the waste water service, for reasons already outlined it is not feasible to produce illustrations similar to those above for this service yet. Constructing a time-series is not possible at this stage, however it is possible to give a few point estimates. A current cost figure of

£0.17 per cubic metre of waste water serviced with a subsidy of £0.14 per cubic metre was estimated for 1994 by Scott and Lawlor (1997). For the year 1999 Cunningham (2000) has estimated that waste water generated in the collection areas of sewerage schemes and serviced by the public waste water system, measured in terms of BOD, amounts to some 63,900 tonnes. The unit current cost, per tonne of BOD serviced in this case, therefore amounts to some £885, using the figure from Table 2.2.2 for total current expenditure in 1998 amounting to £56,518,000. The domestic component of BOD generated amounts to some 85 per cent and the entire domestic cost is subsidised in recent years. The industrial component constitutes the remaining 15 per cent, agriculture apparently not discharging to the public system. Table 2.2.2 gives receipts from current charges to industry in 1999 as £8,420,000. On this basis the subsidy to the industrial/commercial sector is perhaps small and the sector could be considered to be covering its current costs for BOD serviced. The per unit capital expenditure would of course add considerably to the cost. Contributions from industry to pay for its share of new investment are becoming more significant of late.

FUTURE AVAILABILITY

This is as far as the National Accounts information on water services in its present state can be exploited. New data could come to light along with other estimates to improve the accuracy of what has been assembled here. In particular better figures for payments and contributions, along with figures for quantities and sectoral breakdowns, would enable the picture to be completed. The remarkable persistence of problems with the data appears to mirror the underlying problem concerning the financing of water services in Ireland.

Apart from figures on expenditure, figures on revenues from charges, on quantities supplied or serviced and on unit costs of this £180 million industry (excluding capital expenditure) have not been systematically assembled before. A well-designed programme to collect data from local authorities in a thorough and consistent manner has been introduced by the DoELG recently and is described at the end of sub-section 2.4.

Table 2.2.1: National Accounts data on Public Water Supply - expenditure, receipts, subsidies and estimates per cubic metre of water consumed.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
PUBLIC WATER SUPPLY										
CURRENT ('000£)										
Total expenditure incl. Admin	78,506	83,364	87,038	91,652	99,917	106,427	112,002	116,974	123,294	
of which:										
Domestic	51,029	54,186	56,575	59,574	63,947	67,049	69,441	71,354	73,977	
Non-domesic	27,477	29,177	30,463	32,078	35,970	39,378	42,561	45,620	49,318	
Receipts from charges*	49,530	48,780	55,650	60,490	72,030	77,650	74,920	45,860	42,310	
of which:										
Domestic	24,920	24,890	29030	32110	39,780	44,880	40,870	10,400	2,310	
Non-domestic	24,610	23,890	26620	28380	32,250	32,770	34,050	35,460	40,000	
,', subsidy (current)	28,976	34,584	31,388	31,162	27,887	28,777	37,082	71,114	80,984	
of which										
Domestic	26,109	29,296	27,545	27,464	24,167	22,169	28,571	60,954	71,667	
Non-domestic	2,867	5,287	3,843	3,698	3,720	6,608	8,511	10,160	9,318	
CAPITAL ('000 £)										
Expenditure incl. Admin	35,531	55,347	47,329	27,726	30,418	68,080	66,173	82,208	n.a.	
Receipts from contrib.	n.a.	n.a.	n.a.	n.a	1,000	Estim. n.a.	n.a.	n.a.	n.a	
,', subsidy (cap)					29,418					
Quantity of water consumed (million m3)	234	240	246	252	259	265	272	279	287	294
Domestic	153	157	158	159	161	162	164	166	168	170
Non-domestic	81	83	88	93	98	104	109	113	119	124
Current cost per m3 (£)	0.34	0.35	0.35	0.36	0.39	0.40	0.41	0.42	0.43	-
Domestic	0.33	0.34	0.36	0.37	0.40	0.41	0.42	0.43	0.44	-
Non-domestic	0.34	0.35	0.35	0.34	0.37	0.38	0.39	0.40	0.42	-
Current subsidy per m3 (£)	0.12	0.14	0.13	0.12	0.11	0.11	0.14	0.25	0.28	-
Domestic	0.17	0.19	0.17	0.17	0.15	0.14	0.17	0.37	0.43	-
Non-domestic	0.04	0.06	0.04	0.04	0.04	0.06	0.08	0.09	0.08	-
Capital subsidy per m3 (£)	n.a				0.11					
Domestic	n.a.									
Non-domestic	n.a									
Total subsidy per m3 (£)	n.a.				0.22					

*Note: Receipts from current charges are from Denis McDonald for 1990, Deirdre Kearney for 1994 and from Joe Malone (all in DoELG) for other years. The shares of expenditure on domestic versus commercial/agricultural supply are taken pro rata quantities.

N.B. Receipts from charges to commercial customers are broken down between water supply and waste water treatment (in Waste Water table) pro rata the proportions in 1994 namely 84% and 16% respectively.

Commercial receipts for 1990 from Denis MacDonald, 1991-3 receipts are assumed to be 43 % of current receipts from "Goods/services" in "Returns of Local Taxation" reports, being the observed share in other years.

Table 2.2.2: National Accounts data on Waste Water Services - expenditure, receipts, subsidies and estimates per cubic metre serviced

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
WASTE WATER SERVICES										
CURRENT ('000 £)										
Total expenditure incl. admin	34,574	37,187	39,881	41,215	43,652	45,212	48,449	51,483	56,518	-
of which:										
Domestic	29,388	31,609	33,899	35,033	37,105	38,431	41,181	43,761	48,040	-
Commercial	5,186	5,578	5,982	6,182	6,548	6,782	7,267	7,722	8,478	-
Receipts from charges*	5,930	5,600	6,260	6,670	7390	9490	9230	8580	7630	
from:										
Domestic	1,240	1,100	1190	1260	1340	3250	2740	1820	10	
Commercial	4,690	4,500	5070	5410	6050	6240	6490	6760	7620	8420
,', subsidy (current)	28,644	31,587	33,621	34,545	36,262	35,722	39,219	42,903	48,888	
of which										
Domestic	28,148	30,509	32,709	33,773	35,765	35,181	38,441	41,941	48,030	
Commercial	496	1,078	912	772	498	542	777	962	858	
CAPITAL ('000 £)										
Expenditure incl. Admin	35,315	52,114	57,476	45,871	65,905	56,654	67,615	104,440	-	
Receipts from contributions	n.a.				1000					
,', subsidy (cap)					64,905					
Quantity of waste-water serviced '000 m3									63,500	t onnes BOD
Domestic									53,975	tonnes BOD
Commercial									9,525	tonnes BOD
Current cost per m3 (£)									890	/ tonne BOD
Domestic									890	/ tonne BOD
Commercial									890	/ tonne BOD
Current subsidy per m3 (£):									770	/ tonne BOD
Domestic									890	/ tonne BOD
Commercial									90	/ tonne BOD
Capital subsidy per m3 (£):										
Total subsidy per m3 (£):										

*Note: Receipts from current charges are from Denis McDonald for 1990, Deirdre Kearney for 1994 and from Joe Malone (all from DoELG) for other years.

NB Receipts from charges to commercial customers are broken down between water supply and waste water treatment (in Water Supply table) pro rata the proportions in 1994 namely 84% and 16% respectively.

Commercial receipts for 1990 from Denis MacDonald, 1991-3 receipts are assumed to be 43 % of current receipts from "Goods/services" in "Returns of Local Taxation" reports, being the observed share in other years.

Table 2.2.3: National Accounts data on Water Services - current expenditure, capital expenditure and receipts. Source CSO and DoELG

	('000 £)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CURRENT ACCOUNT	3.1 Expend. On Public Water Supply										
	262 Programme Total	64,988	68,964	71,500	75,277	81,900	88,064	93,049	96,350	101,587	
	3.2 Public Sew. Schemes										
	280 Programme Total	28,621	30,764	32,762	33,851	35,781	37,411	40,250	42,406	46,568	
	Private installations	649	704	596	543	516	477	504	697	3,106	
	Admin + miscellan.	19,606	20,969	22,788	23,857	26,001	26,263	27,254	29,851	32,321	
	GROUP Progr Total Expend.	113,864	121,401	127,646	133,528	144,199	152,217	161,058	169,303	183,582	
	(check)	113,864	121,401	127,646	133,528	144,199	152,217	161,058	169,303	183,582	
	Adding admin and misc. pro rata:										
,',	**Water Supply incl admin.**	**78,506**	**83,364**	**87,038**	**91,652**	**99,917**	**106,427**	**112,002**	**116,974**	**123,294**	
,',	**Sewerage incl. admin.**	**34,574**	**37,187**	**39,881**	**41,215**	**43,652**	**45,212**	**48,449**	**51,483**	**56,518**	
	sum of above	113,080	120,551	126,919	132,867	143,569	151,640	160,451	168,457	179,813	
	check	113,080	120,551	126,919	132,867	143,569	151,640	160,451	168,457	179,813	
Assume	Proportion Water supply serv: domestic	0.65	0.65	0.65	0.65	0.64	0.63	0.62	0.61	0.6	
	commercial	0.35	0.35	0.35	0.35	0.36	0.37	0.38	0.39	0.4	
Assume	Proportion Waste water serv: domestic	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85		
Cunningham p 44	commercial	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	
CAPITAL ACCOUNT	3.1.1 Water Supply	35,469	55,077	44,668	25,995	30,246	62,873	51,105	75,031		
	3.1.2 Sewerage	35,254	51,860	54,244	43,006	65,532	52,322	52,218	95,322		
	3.1.3 Priv installations	162	343	151	48	75	1	2	1,474		
	3.1.8 Admin + miscell.	123	526	5,903	4,600	546	9,540	30,465	16,436		
	3. Tot Capital	71,008	107,806	104,965	73,648	96,399	124,736	133,790	188,263		
	check	71,008	107,806	104,965	73,648	96,399	124,736	133,790	188,263		
,',	**Water Supply + admin**	**35,531**	**55,347**	**47,329**	**27,726**	**30,418**	**68,080**	**66,173**	**82,208**		
,',	**Sewerage + admin**	**35,315**	**52,114**	**57,476**	**45,871**	**65,905**	**56,654**	**67,615**	**104,440**		
	sum of above	70,846	107,462	104,805	73,597	96,323	124,735	133,788	186,648		
	check	70,846	107,462	104,805	73,597	96,323	124,735	133,788	186,648		
	Receipts: "Other" *										
	Water Supply + admin		1,796	997	2,270	4,476	3,753	3,310	8,825		
	Waste water treatment		1,266	1,900	1,508	3,259	1,935	4,956	4,582		

*CSO: "Other" means other than grants and loans, meaning private levies and industrial capital contributions (subject to verification).

Source: Annette Hayes, Mark O'Connor, Rod O'Mahony, Marie Carroll in CSO who receive the information from Joe Malone of DoELG.

Table 2.2 4: Water 1991-1999, distribution input, leakage and consumption

Sources			Distribution input	Leakage	Consumption Total	Sectoral breakdown of consumption		
						Domestic	Non-domestic:	
			m3/day	%	m3/day	households	Ind-commerc.	Agric.
McCumiskey	1991	National	1,290,000	49	657,900	430,925	111,843	115,133
						65.5%	17%	17.5%
McCarthaigh/	1994-1996	National	1,380,800	47.3	727,150	442,874	162,364	121,913
GDWSSS/		Gr. Dublin	437,500	41.6	255,500	164,600	86,900	4,000
W.S.Atkins		Excl. Dublin	943,300	50	471,650	278,274	75,464	117,913
	1999	National	1,451,000	44.5	805,740	466,614	230,978	108,148
GDWSSS		Gr. Dublin	461,000	38	285,000	175,000	106,000	4,000
W.S.Atkins		Excl. Dublin	990,000	47.4	520,740	291,614	124,978	104,148

Notes: This table was assembled using diverse sources. Some inconsistencies are unavoidable.

Distribution Input = Water sent out: 1991 from Mc Cumiskey (1991) p.48. 1994-6 from GDWSSS ch 1 p 12 and MacCarthaigh p 107.

1999 from GDWSSS 2000 section 2.3. Non-Dublin: see Consumption below.

Leakage includes operational use and customer losses. 1991 losses are assumed to be the same as in 1994.

1994 leakage for Dublin are taken from p 12 of GDWSSS chap1. Leakage for the non-Dublin area is assumed to be 49% (note O'Connell (1992) p 53 gave 53%).

1999 leakage for Dublin is taken from GDWSSS 2000 section 2.3. Leakage for the non-Dublin area is taken from Atkins (2000) section 5.6.

Consumption for non-Dublin in 1999 assumes 2% p.a. growth from 1994 consumption.

Sectoral breakdown of consumption used the following sources:

1991 breakdown is pro rata MacCarthaigh's national sectoral breakdown for water sent out in 1996.

1994 uses GDWSSS chap1 p 12 for Dublin sectoral breakdown

1994 non-Dublin uses MacCarthaigh's non-Dublin sectoral breakdown.

1999 uses GDWSSS 2000 section 2.3 for Dublin sectoral breakdown.

1999 non-Dublin uses Atkins' (printout) sectoral breakdown, but using a 20% share for agriculture instead of 8% with corresponding reduction in the amount used by industry/comm.

(MacCarthaigh's share for agriculture in 1996 is 25%. The discrepancies here mean that the split between industry/commercial and agriculture is notional only.)

Table 2.2.5: Water Consumption from Public Water Supply 1990-1999 (million cubic metres per year)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
NATIONAL	234	240	246	252	259	265	272	279	287	294
Domestic	153	157	158	159	161	162	164	166	168	170
Ind/Comm		41				59				84
Agric.		42				44				39
(Check total)		240				265				294

Notes:

Domestic includes municipal, that is, schools, public administration, barracks etc.

Owing to discrepancies between sources, the figures for ind/commercial and agricultural consumption should be viewed as notional only.

2.3 Water supply data based on the Census of Industrial Production

The third source of information on water services is the annual Census of Industrial Production (CIP). The CIP is an under-exploited data source at present. A special questionnaire (Form W) is sent to water undertakings and the information collected on costs of inputs and labour and on values of outputs is detailed. Respondents are asked for the value of water supplied to four types of customer, namely, to the water undertakings, for public purposes such as street cleaning, to customers for domestic consumption and, fourthly, to trade and commercial customers. Furthermore there is a question asking for the volume of water, in millions of litres, distributed by the authority during the year. Results of the CIP for the years 1973 to 1998 are given in Table 2.3, in which figures for 1997 and 1998 would appear to be inconsistent and are perhaps preliminary. Alternatively there may be changes of definition which are not specified. (Owing to the unavoidable absence of the person with knowledge about the background of CIP coverage of water undertakings, some of the comments here are provisional.)

Several issues arise in connection with this data. The first is that the CIP only covers water supply, that is, NACE rev1 41, and not waste water treatment, NACE 90. The rationale for this is that water supply is considered to be the provision of a good, whereas waste water treatment is considered to be a service. Another issue is the change over time in the manner in which items are measured. Comparing the values of gross output of water supply, given in the first row of Table 2.3, with those given previously from the National Accounts source in Table 2.2.3, we see a close correspondence. For example, a comparison between the two sources for the years 1991 to 1996 is as follows:

£ million	1991	1992	1993	1994	1995	1996
CIP Gross Output	68.3	71.7	81.2	82.8	84.2	94.2
Public Water Supply (Table 2.2.3)	69.0	71.5	75.3	81.9	88.1	93.0

This indicates that the CIP figures for gross output are consistent with the National Accounts (raw data) that exclude the cost of administration. However, there is some uncertainty with respect to the CIP data in Table 2.3 as to the interpretation of Remainder of Net Output, which changes sign. It is negative in the early years perhaps representing a subsidy. From 1987 Remainder of Net Output becomes positive and its interpretation is unclear. It possibly represents purchases of outside services and contracted work as well as an increase in capital work.

A third issue is the question of coverage. The above check suggests that coverage is comprehensive. The results of the census include responses from 53 “local units”, which have three or more persons employed. It is possible that some public water supply undertakings are excluded. There are 88 water authorities in the state but many of these do not supply water - they merely distribute water that is imported from other water authorities - in which case their exclusion is justified. Another check can be undertaken on the entries for the last two years given in Table 2.3 on the quantity of water supplied.

The figures for 1997 and 1998, converted to cubic metres sent out per day, are 1,506,000 and 1,561,000. These stand up moderately well when compared with the figure of 1,451,000 for 1999 derived by combining the figures of W.S. Atkins and GDWSSS, given in Table 2.2.4. The CIP figure is some 7½ per cent higher for 1998 but there may be double counting if water traded between authorities has not been netted out. In any event given the different sources and the circumstances of water management the results are encouraging as they are moderately close.

FUTURE AVAILABILITY

There is already a major improvement in the data collected by the CIP from water supply undertakings. In the last two years quantities of water supplied, for example, can now be reported. When the information collected is clarified it will be possible to explain some of the movements in the series more fully. It would be highly profitable if the CIP could obtain disaggregated replies on the amounts of water distributed (not just the value of sales) to the four types of customer and, if possible, ask for the amount actually charged in similar detail.

The CIP has strong potential as we have seen that the results are fairly consistent with other sources of information. It would be even more helpful if waste water services could also be covered in the survey. Given that generally the same bodies carry out the two functions of water supply and waste water services, inclusion of the latter in the data-gathering task would be an opportunity worth considering.

Table 2.3: Water Supply information from the Census of Industrial Production (CIP), NACE1970 170, NACE rev1 41

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
AIAA011 Gross Output, IR£m	3.8	4.3	5.4	6.8	8.5	10	11.9	15.1	19	23.1	32.8	35.4	38.5	41.4
AIAA161 Industrial Input, IR£m	1.7	2.4	2.9	3.5	4.6	5.5	7.3	9.7	11.9	14.8	15.3	16.7	20	21
AIAA311 Net Output, IR£m	2.1	1.9	2.5	3.3	4	4.6	4.6	5.3	7	8.3	17.5	18.7	18.6	20.4
AIAA461 Wages and Salaries, IR£m	2.4	3	4.3	5.1	5.9	6.7	8.9	10.5	12.2	14.4	16.4	18.1	19.9	21.2
AIAA611 Remainder of Net Output, IR£m	-0.3	-1.2	-1.8	-1.8	-1.9	-2.1	-4.3	-5.2	-5.1	-6.1	1.1	0.6	-1.3	-0.9
AIAA761 Persons Engaged, number	1800	1800	1800	1900	1900	2000	2245	2284	2263	2298	2278	2282	2319	2357
Volume of Water distributed, million litres														

	1987	1988	1989	1990	Change of format	1991	1992	1993	1994	1995	1996	1997	1998
AIAA011 Gross Output, IR£m	48.4	51.6	55.4	58.9	Gross Output, £m	68.271	71.746	81.156	82.773	84.248	94.235	84.866	67.694
					Materials, £m	12.933	13.421	12.474	13.12	15.175	17.999	20.165	19.966
					Energy, £m	8.752	9.067	9.824	9.469	9.103	9.179	9.13	9.237
AIAA161 Industrial Input, IR£m	20.2	19.2	22.7	23.9	Industrial input, £m	21.685	22.488	22.298	22.589	24.278	27.178	29.295	29.203
AIAA311 Net Output, IR£m	28.1	32.4	32.7	34.9	Net output, £m	46.586	49.258	58.858	60.184	59.97	67.057	55.571	38.491
AIAA461 Wages and Salaries, IR£m	21.7	20.2	22.3	23.9	Wage Bill, £m	24.353	26.209	28.131	28.22	29.491	29.42	31.313	33.847
AIAA611 Remainder of Net Output, IR£m	6.5	12.2	10.4	11.0	Rem. of net output, £m	22.233	23.049	30.727	31.964	30.479	37.637	24.258	4.644
AIAA761 Persons Engaged, number	2273	2111	2184	2261	Nos. employed '000	2.238	2.281	2.249	2.15	2.115	2.029	2.077	2.064
Volume of Water distributed, million litres					Volume of Water distributed,	million	litres					549,566	569,712

2.4 Use of water services, based on Local Authority data.

In this section our focus moves to the provision of water services by individual water authorities. Our approach here was to undertake a survey of the features of the water and waste water schemes for each authority and analyse the results (see Appendix 2.2 for questionnaire). As already mentioned, in view of the requirement outlined in the Water Framework Directive for EU member states to use the river basin as the unit of administration and analysis, this survey should enable one to assess the feasibility of obtaining information on economic aspects on a river basin basis at present.

Initially all local authorities in the Republic were surveyed. However owing to the low response, we concentrate on one region in particular, that of the area approximately covering the Greater Dublin region with some figures at the end for other areas. For the Greater Dublin region, the four local authorities were surveyed using our questionnaire. These authorities were

- Dublin Corporation
- Fingal County Council
- South Dublin County Council
- Dun Laoghaire-Rathdown County Council

Information on each will be reported in turn. There is a lot of detail and readers who are interested in the total figures for the Greater Dublin Region can skip to the end of this section.

All these Authorities responded with fairly comprehensive figures for the years 1998/9. Data for years 1995 to 1997 was available from most of the authorities but was not very detailed while for years preceding this all authorities reported that data was unavailable[2]. So our methodology will be to report the results for the years 1998/9 and then combine the figures to get total amounts for Greater Dublin. From this we will be able to infer costs. We have approximate figures for quantities, so that it is possible to derive notional costs per unit of water services. Taking account of receipts from charges, a notional subsidy per unit to consumers can be estimated. It is worth noting that only current costs will be considered here.

Dublin Corporation's Water Division produces and distributes water to the Greater Dublin area, including Dublin City, South Dublin, Dun Laoghaire-Rathdown and parts of Wicklow and Kildare. The total production of water is approximately 460 million litres per day from the water treatment works at Ballymore Eustace, Roundwood and Bohernabreena. The Ballymore Eustace Water Treatment Works provides most of the supply. Dublin Corporation handles quite a large amount of water in the Greater Dublin Region. Including its own use of 108,140,000 m^3/year, it also produces and distributes approximately 60,060,000 m^3/year to other authorities inside and outside the Greater Dublin area. The

[2] Most Local Authorities said that a lack of resources in collection of the data was the main reason for this

financial contributions from other authorities therefore account for quite a significant amount of revenue of sales at 42 per cent while receipts from local charges account for the other 58 per cent. However a breakdown of costs could not be supplied. The amount exported is 35 per cent of the total quantity and it is assumed that the costs associated per unit exported are lower than costs of distributing to local customers. Therefore *a working assumption is made* that costs of exports are 20 per cent of total costs. The remaining costs are allocated pro rata quantities distributed to domestic and non-domestic customers. From these figures we calculate our current cost per unit input for domestic and non-domestic users at £0.18/m^3 and taking revenue into account our calculated implicit subsidy is £0.18m^3 for domestic users and -£0.05/m^3 for non-domestic users (that is a negative subsidy, current only).

Table 2.4.1: Dublin Corporation - Water Supply (using working assumptions, see text)

	Water Input m^3/year	Water Input used Locally m^3/year	Current Costs(1) (£)	Current Cost per unit input (£/m^3)	Total Revenue from sales(£)(2)	% Cost Recovery	Implicit Subsidy (£/m^3)
Domestic	64,884,000	64,884,000	11,407,643	0.18	-	0%	0.18
Non-Domestic	43,256,000	43,256,000	7,605,095	0.18	9,983,152	131%	-0.05
Exported to other (3) County Councils	44,000,000	-	3,482,186	0.08	5,205,714	149%	-0.04
Exported to (4) other areas	16,060,000	-	1,270,998	0.08	1,900,085	149%	-0.04
Total	168,200,000	108,140,000	23,765,922	0.14	17,088,951	72%	0.04

(1) See discussion in text.
(2) A sum of 1,075,723 from Licences Water Pollution Acts and a sum of 3,625,833 from Central Management Support Services are not included in Total Revenue.
(3) Approximate amount of Water that is exported to South Dublin County Council and Dun Laoghaire-Rathdown County Council.
(4) This figure gives the amount of water exported by Dublin Corporation to areas outside greater Dublin. These areas include parts of Kildare and Wicklow and Bray UDC.

Table 2.4.2 for waste water unfortunately does not contain a significant amount of information. A breakdown of Quantity Discharged of waste water between sectors was not readily available but information was received about the amount of discharge into the Dublin Corporation area and especially to the Ringsend Wastewater Treatment Plant. A volume of 110,300,000 m^3/year goes to this sewage treatment plant and if we exclude 4,900,000 m^3/year of storm overflow we get the total amount of flow to treatment to the Ringsend plant at approximately 105,400,000 m^3/year. Included in this total flow are discharges from other local authority areas, which are piped to the plant to be treated. These comprise 9,000,000 m^3/year from Fingal, 26,100,000 m^3/year from Dublin South and 17,800,000 m^3/year from Dun Laoghaire-Rathdown. These are excluded from the total figure given below.

Also the following flows are discharged untreated through the Head of Howth. 17,400,000 m^3/year comes from Dublin Corporation itself and an additional 4,100,000 m^3/year comes from Fingal (which is not included in the total below).

A similar story arises with regard to revenue for waste water. About 36 per cent of revenue comes from other local authorities with the rest coming from local charges (commercial and trade effluent charges). However the cost recovery does not reflect this and is very low at 38 per cent.

Table 2.4.2 Dublin Corporation - Waste Water

Quantity Discharged in the Dublin Corporation area m^3/year	Current Costs (£)	Current Cost per unit input (£/m^3)	Total Revenue (£)	% Cost Recovery	Implicit Subsidy (£/m^3)
69,900,000	11,961,473	0.17	4,559,000	38%	0.11

Water supply to the **County of Fingal** is supplied from the County's treatment plant on the Liffey at Leixlip which is one of the largest in the Republic following extensions carried out in 1974 and 1985. Quality control of the drinking water supply is provided to ensure that it complies with E.U. and National regulations. A telemetry system relays information on reservoir levels, flows and pressures from remote sites and assists in the management of the water distribution system. A major upgrading and extension of the Telemetry System was completed in 1998.

Looking to Table 2.4.3 we see that Fingal also exports a significant percentage of its water supply (over 50 per cent) to other authorities, some going to Dublin Corportion and other amounts to other areas outside the Dublin region. As with Dublin Corporation a significant amount of revenue (48 per cent) comes from sales of water to other authorities with the remainder coming from Receipts on charges. Using these figures we calculate current cost per unit input for domestic and non-domestic users at £0.27/m^3 and taking revenue into account our calculated implicit subsidy is £0.27/m^3 for domestic users and zero for non-domestic users.

Table 2.4.3: Fingal County Council - Water Supply

	Water Input m^3/year	Water input used locally m^3/year	Current Costs[1] (£)	Current Cost per unit input (£/m^3)	Total Revenue from sales(£)	% Cost Recovery	Implicit Subsidy (£/m^3)
Domestic	12,278,000	12,278,000	3,313,529	0.27	-	0%	0.27
Non-Domestic	6,484,000	6,484,000	1,749,871	0.27	1,775,995	101%	0
Exported to other [2] County Councils	13,870,000	-	1,166,622	0.08	1,166,622	100%	0
Exported to [3] other areas	7,665,000	-	473,978	0.06	473,978	100%	0
Total	40,297,000	18,762,000	6,704,000	0.17	3,416,595	51%	0.08

(1) Pro rata water delivered. We assume that Fingal implements a non-profit policy on water exports to other authorities. Therefore current costs are equal to total revenue on water exported.
(2) This figure gives the approximate amount of water that is exported to Dublin Corporation.
(3) This figure gives the amount of water exported by Fingal to areas outside greater Dublin. These areas include parts of Kildare and Meath.

Again not a lot of information was received on Fingal's waste water service. The quantity discharged includes a figure of 1,054,029 m^3/year discharged in the Fingal area plus the amount (13,100,000 m^3/year) that is discharged into the Dublin Corporation region to the Ringsend Wastewater Treatment Plant (see previous discussion). Cost recovery is very poor at 13%, which is reflected in the small difference between the Current Cost per unit input of £0.19/m^3 and the implicit subsidy of £0.17/m^3.

Table 2.4.4: Fingal County Council - Waste Water

Quantity Discharged in the Fingal area m^3/year	Current Costs (£)	Current Cost per unit input (£/m^3)	Total Revenue (£)	% Cost Recovery	Implicit Subsidy (£/m^3)
14,154,029	2,722,800	0.19	341,000	13%	0.17

South Dublin County Council provided better detail on its water supply and waste water services. The authority receives all its treated water from Dublin Corporation which amounts to about 23M m^3/year (Table 2.4.5). This figure is broken down into its various sectors. Households account for the greater part (61 per cent) of this while commerce has 7 per cent of the share, industry also has 7 per cent of the share and finally agriculture has a very small share of around two-tenths of a per cent. Losses account for a quarter of the total water input. Of the total cost figure £2,100,000 is given to Operational Maintenance, £990,515 to Administration and Maintenance, £2,200,000 to Provision and Improvement (including a payment of £1,900,000 to Dublin Corporation for water purchased) and £324,485 for Miscellaneous. The total revenue raised of £1,686,000 relates to metered supplies. Our calculated figures indicate a current cost per unit input for domestic users at £0.20/m^3 and non-domestic users at £0.44/m^3 while taking revenue into account we get an implicit subsidy of £0.04/m^3 for non-domestic users and £0.20/m^3 for domestic users.

Table 2.4.5: South Dublin County Council - Water Supply

	Water Input used Locally m^3/year	Current Costs[1] (£)	Current Cost per unit input (£/m^3)	Total Revenue (£)[2]	% Cost Recovery	Implicit Subsidy (£/m^3)
Agriculture	52,298	22,960	0.44			
Industry	2,080,521	913,386	0.44			
Commerce	2,070,917	909,169	0.44			
of which metered	2,017,260					
unmetered	53,657					
Total Non-Domestic	4,203,736	1,845,515	0.44	1,686,000	91%	0.04
Households	18,546,264	3,769,485	0.20	-	0%	0.20
Total	22,750,000	5,615,000	0.25	1,686,000	30%	0.17

(1) Distributed pro rata water inputs. Administration and Maintenance Costs have been allocated to non domestic customers as suggested by the county council, though other allocations could be used.
(2) Information on Revenue could not be broken down between sectors.

The bulk of the County's wastewater (Table 2.4.6) is discharged to the Dublin Corporation area via the Dodder Valley Sewer and the Grand Canal Sewer and subsequently to the Ringsend Wastewater Treatment Plant (see previous discussion). The remaining 610,000 m^3/year is discharged in the South Dublin area. It was not possible to determine how much is discharged by each of the sectors agriculture, industry etc. However South Dublin County Council was able to provide some figures based on trade effluent licences for 66 industries that are monitored. The figures are based on measured discharge flow supplemented with water supply consumption figures and figures agreed between consumers and the Council as to the annual discharge. A further 80 premises are licensed for trade effluent discharges but are not monitored as they are deemed to be too small in terms of discharge. Road Drainage/Surface Water Infiltration or misconnected surface water to the foul drainage system was considered to account for approximately 15 per cent of the total average discharge. Finally Dublin South County Council does not consider that the agricultural sector discharges significant quantities.

The Total Costs incurred by waste water services amounted to £2,893,000 and is broken down as follows: Operation and Maintenance came to £2,500,000 (which includes a payment of £800,000 to Dublin Corporation for the treatment of wastewater and disposal of sludge); wastewater treatment at the Council's own plants cost £91,000; planning and design cost £126,000 and Miscellaneous came to £182,000. With the total revenue amounting to £180,000 this left a minuscule cost recovery of 6 per cent. The implicit subsidy is therefore calculated at £0.10/m^3.

Table 2.4.6: South Dublin County Council - Waste Water

	Quantity Discharged in the South Dublin area m^3/year	Current Costs[1] (£)	Current cost per unit	Total Revenue (£)[2]	% Cost Recovery	Implicit Subsidy (£/m^3)
Industry (Food)	430,394	46,617	0.11			
Industry (Pharmaceutical)	16,727	1,812	0.11			
Electronic	82,274	8,911	0.11			
Other Industries	189,636	20,540	0.11			
Road Drainage / Surface Water Infiltration	4,006,500	433950	0.11			
Other Sectors	21,984,469	2,381,170	0.11			
Total	26,710,000	2,893,000	0.11	180,000	6%	£0.10

(1) Distributed pro rata discharges.
(2) Information on Revenue could not be broken down between sectors.

Water in the **Dun Laoghaire-Rathdown County** is supplied from Dublin Corporation's water treatment plant which is located at Roundwood, Co Wicklow. This supply is augmented by Dublin Corporation's water treatment plants at Ballyboden and at Ballymore Eustace, Co. Kildare. The current cost on operation and administration amount to £4,510,000. Revenue Raised comes from charges amounting to £703,000. From these figures we calculate a current cost per unit input for both domestic and non-domestic users at £0.21/m^3 while taking revenue into account we get a small negative implicit subsidy of -£0.01/m^3 for non-domestic users and £0.21/m^3 for domestic users.

Table 2.4.7: Dun Laoghaire-Rathdown County Council - Water Supply

	Water Input used Locally m^3/year	Current Costs[1] (£)	Current Cost per unit input (£/m^3)	Total Revenue (£)	% Cost Recovery	Implicit Subsidy (£/m^3)
Domestic	17,600,000	3,834,590	0.21	-	0%	0.21
Non-Domestic	3,100,000	675,410	0.21	703,000	104%	-0.01
Total	20,700,000	4,510,000	0.21	703,000	16%	0.18

(1) Distributed pro rata water inputs.

No wastewater data is given but information from the Ringsend Wastewater Treatment Plant operated by Dublin Corporation shows a discharge from Dun Laoghaire-Rathdown of 17,800,000 m^3/year to this plant. This figure is included in Table 2.4.9 when we combine information on the waste water service for the Greater Dublin area.

COMBINING INFORMATION ON THE GREATER DUBLIN AREA

It is now possible to combine the information on the four local authorities comprising Greater Dublin. Tables 2.4.8 and 2.4.9 give the water supply and wastewater services respectively for the Greater Dublin Region. Owing to different accounting practises, these figures need to be viewed as tentative. Looking at water supply first and taking into account transfers from one authority to the next we have calculated a figure of 170,352,000 m^3/year of water input used locally in the Greater Dublin region.

Two-thirds of it goes to domestic use while one-third goes to non-domestic use. Of the total amount Dublin Corporation handles 63 per cent of water input used locally, Fingal 11 per cent, South Dublin 13 per cent and Dun Laoghaire-Rathdown 13 per cent. Costs of exporting water and payments made from one local authority to another are excluded so the figures relate to total costs incurred by and revenue raised from domestic and non-domestic customers. We calculate the current cost per unit input for domestic users at £0.20/m^3 and non-domestic users at £0.21/m^3. Taking revenue into account we derive an implicit subsidy of £0.20/m^3 for domestic users and a small negative subsidy of -£0.03/m^3 for non-domestic users.

Table 2.4.8: Greater Dublin - Water Supply (tentative figures).

	Water Input used locally m^3/year	Current Costs[(1)] (£)	Current Cost per unit input (£/m^3)	Total Revenue (£)[(2)]	% Cost Recovery	Implicit Subsidy (£/m^3)
Domestic	113,308,264	22,325,247	0.20	-	0%	0.20
Non-Domestic	57,043,736	11,875,891	0.21	13,550,147	168%	-0.03
Total Domestic & Non-Domestic	170,352,000	34,201,138	0.20	13,550,147	59%	0.12

Moving to wastewater in the Greater Dublin region we estimated that the total amount of water discharged is 146,364,029 m^3/year. Again in calculating this figure we took into account the flows from one authority to another and so the problem of double counting was eliminated. Of this total figure Dublin Corporation discharged 72 per cent of the wastewater serviced in its own area (included in this is the amount discharged to Dublin Corporation from Dun Laoghaire-Rathdown), Fingal 10 per cent and South Dublin 18 per cent. However looking at where the wastewater is discharged rather than by whom we see that Dublin Corporation receives 87 per cent of all discharged wastewater with Fingal and South Dublin taking the rest. Payments made to local authorities are netted out so with our estimates of cost and revenues we calculate cost recovery at 29 per cent and the implicit subsidy at £0.10/m^3.

Table 2.4.9: Greater Dublin - Waste Water (tentative figures)

Waste Water Serviced in the Greater Dublin area m^3/year	Current Costs (£)	Current Cost per unit (£/m^3)	Total Revenue (£)	% Cost Recovery	Implicit Subsidy (£/m^3)
128,564,029	17,577,273	0.14	5,080,000	29%	0.10

To conclude this subsection giving data on a local authority basis, information on charges is presented next. The following table shows prices of water charged to metered customers by a number of local authorities (Table 2.4.10). There are two points to note. The prices are rather higher than the cost per unit derived from previous tables, which may suggest that marginal cost pricing is employed, to some extent. Secondly the prices are broadly similar indicating that water is in some way a tradeable good. Additional evidence on this comes from our previous tables which have illustrated that water is traded between different authorities in the Greater Dublin region and brings in a significant amount of revenue

to Dublin Corporation, for example. For interest a table of water charges paid by metered customers in 1984 is also presented. Prices in nominal terms have roughly doubled between 1984 and 1999. Table 2.4.11 gives the charges for waste water treatment. The observations above apply to a lesser extent.

Note that the prices actually charged are based on the water that is delivered. On account of leakage and use by the system, prices charged are higher than the price per unit sent out or “per unit input” shown in the previous tables.

Table 2.4.10: Examples of Water Charges[1]

Year	Dublin Corporation		Fingal Co Co	S Dublin Co Co	Dun Lao. Rath. Co Co	Cork Corporation		Cork County Council (South)		Cork County Council (North)	Cork County Council (West)
	Commercial Rate (in the pound) £	Commercial Water Charges £ / m^3	£ / m^3	£ / m^3	£ / m^3	Commercial Rate (in the pound) [2] £	Commercial Water Charges £ / m^3	Industry £ / m^3	Commerce £ / m^3	£ / m^3	£ / m^3
1994	-	-	-	-	-	3.40	0.39				
1995	34.10	0.433	-	-	-	3.57	0.41				
1996	35.00	0.447	-	-	-	3.60	0.42				
1997	36.02	0.469	-	-	-	3.65	0.44			0.407	
1998	37.18	0.493	0.41	0.435	0.41	3.70	0.46	0.396	0.363	0.451	0.389
1999	38.80	0.517	0.43	0.455	0.45	3.90	0.48	0.411	0.374	0.495	0.418
2000	40.54	0.543	0.45	0.475	0.50	4.10	0.50	0.429	0.385	0.506	0.462
2001	-	-	-	-	-	4.30	0.53	0.462	0.396		0.495

(1) To convert from £ / m^3 to £ per 1000 gallons, multiply by 4.545.

(2) This Commercial Rate (£ in £ Valuation) applies to a few consumers outside the Corporation area and to Vintners not supplied by Meter.
Other business where water is supplied other than by meter pay a fixed fee per annum.

Table 2.4.10 continued: Local Authority Water Charges 1984

Leinster		**Ulster**		**Munster**		**Connacht**		**State**
County	*Price p/m^3*	*County*	*Price p/m^3*	*County*	*Price p/m^3*	*County*	*Price p/m^3*	*Price p/m^3*
Louth	17.60	Monaghan	22.00	Cork Corp	26.50	Sligo	22.00	
Meath	9.24	Cavan	24.20	Cork Co Co	22.00	Leitrim	26.84	
Dublin Corp	20.46	Donegal	11.00	Kerry	22.00	Mayo	14.30	
Dublin Co Co	22.00			Limerick Co Co	19.80	Galway	14.52	
Wicklow	15.20			Limerick Corp	17.80	Clare	23.76	
Wexford	13.20			Tipp NR	27.50	Roscommon	22.00	
Longford	11.00			Tipp SR	22.00			
Carlow	17.60			Waterford Corp	15.40			
Kilkenny Corp	17.60			Waterford Co Co	21.10			
Kilkenny Co Co	19.80							
Offaly	22.00							
Kildare	22.00							
Laois	15.40							
Westmeath	no data							
Average	17.16		19.07		21.57		20.57	**19.59**
Maximum	22.00		24.20		27.50		26.84	**27.50**
Minimum	9.24		11.00		15.40		20.57	**9.24**

NOTE: THE SECOND DECIMAL PLACE FIGURE RESULTS FROM THE CONVERSION OF SOME PRICES QUOTED IN IR£/1000 GALLONS TO P/M^3.

Compiled by the Institute for Industrial Research and Standards (forerunner of Enterprise Ireland) from a telephone survey of local authorities.
Source: R. Foley, Enterprise Ireland.

Table 2.4.11: Examples of WasteWater Charges

Year	Dublin Corporation[1]	Fingal Co Co[2]	S Dublin Co Co[3]
1998	-	-	-
1999	10.27p/m^3 + (St/303 x 2.18p/m^3)	-	£0.28/m^3
2000	10.27p/m^3 + (St/264 x 3.29p/m^3)	-	£0.35/m^3
2001	12.36p/m^3 + (St/270 x 2.81p/m^3)	£0.20/m^3	-

(1) Where St is the concentration of Suspended Solids of Trade effluent, measured in mg/l. This charge is based on the Mogden formula. St is total Suspended Solids of trade effluent
(2) Proposed for Jan. 2001 and imposed where effluent is disposed of without treatment
(3) Obtained from licensing of trade effluents.

FUTURE AVAILABILITY

The quality of local authority data that we have presented is not very comprehensive. Past data was unavailable while even present data was not very detailed. Here we discuss some of the ongoing projects that will enhance the availability and quality of future data on water and waste water services.

Presently there is a policy framework agreed by the Government and the Department of the Environment for the development of a more comprehensive and transparent system of charging for water and waste water services in the non-domestic sector (Circular L 4/00). As outlined in this circular, the Government policy framework provides that the full operational cost, including administrative, maintenance and repair costs, in respect of the provision of water and waste water services to non-domestic users, should be recovered. Recovery should be on the basis of the rate of usage using average unit costs', with universal metering of non-domestic users by 2006 at the latest. Therefore a key task for local authorities in giving effect to the policy framework will be the compilation of baseline data to permit proper quantification of the true cost of providing water and waste water services to non-domestic users. The information that will be sought by the Department of the Environment will include: -

Cost and Cost Recovery of Public Water Production

- Total Volume of Production (m^3 per annum)
- Total Cost of Production (per annum/excluding capital costs) (£m)
- Metered charge per user per annum per m^3
- Amount of flat rate charge per user per annum
- Total Costs Recovered

Cost and Cost Recovery of Public Waste Water Service

- Total Capacity of Waste Water Service (p.e.)
- Total Cost of Waste Water Service (per annum/excluding capital costs) (£m)

- Metered charge per user per annum per m^3
- Amount of Flat rate charge per user per annum

The Department of the Environment will be seeking Periodic Reports to assist in monitoring the achievement of the objectives of the policy framework. The first such report is being requested towards the end of the year 2000 with a reporting deadline of 28th February 2001.

Providing such information however is a difficult task as we have encountered. To cope with these difficulties two computer based systems have been developed to provide a database of information on water and waste water services and related activities.

One such example is the Computer Information System (CiS) for water services. This project stemmed from the Government initiative on Programme for Change, which requires that new procedures must be put in place throughout local authorities to instil the principles of efficiency, effectiveness and value in the delivery of public services. The prime function of the CiS system is the establishment of a national information and management system for water services in Local Authorities that will integrate the broad areas of Cost, Quality, Operations and Infrastructure. The system is targeted for use as the backbone of daily operations and management of water services in Local Authorities with associated local and national reporting functionality. The concept of a Complete Information System (CiS) for Water Services evolved from pilot projects undertaken in the development of Management Information Systems in Tipperary North and Donegal County Councils in the period 1994 to 1997. These projects confirmed that Water Services operations in Local Authorities needed a modern, effective and integrated operations and management information system to assist in the provision of the levels of service demanded. After those pilot schemes a special software development team was established in Kerry County Council in mid 1998 to provide for development of the system in close association with the ultimate users – local authority operational staff. It was expected that CiS National Release 2.0, the most updated version, would be completed and distributed to Local Authorities in April 2000, however it appears to us from our collection of data that the CiS has not become fully functional in many local authorities.

A more up to date example, which is along similar lines to the CiS, is *ENVISAGE*. This is a Government Information System (GIS) software package designed for the management of Water Catchment Projects. It addresses various aspects of the water catchment area including:

- Schemes (Water Supply Schemes & Waste Water Schemes)
- Rivers & Lakes
- Farms
- Water Quality (Drinking Water, Bathing Water, Ground Water, River Quality & Lake Quality)
- Discharges (Discharge Points & Pollution Incidents)

- Sludge
- Bathing water (Blue Flag Beaches and other categories)
- Geology

Using the software, detailed maps for any of the above modules (and combination of modules) can be produced. The benefits of ENVISAGE include:

- Automatic production of Water Quality reports for the Environmental Protection Agency
- Recording of Pollution Incidents including cause, severity, fish kills, details of investigation, actions taken, follow up details
- Recording of farm details including assessment of risks posed to neighbouring water sources, details of slurry/manure and silage storage and details of types and numbers of animals on farms
- Recording of Discharge Points including details of licences granted, samples taken and notices issued
- Recording of details regarding Treatment Plants, types of treatment undertaken and disposal methods.

Summary of 2.4

In summary this sub section analysed the provision of water services by individual water authorities. Due to data restraints we focussed particularly on the greater Dublin region. With regard to our project title 'Time series and Eco-Taxes', firstly, we were unable to produce any time series data. The data that we presented covered just a year and the information here was not entirely comprehensive. Price data was available for 1984 but other figures that were obtained were not informative. This led us to discuss the availability of future data and it seems that in this regard there is some progress brought on by Government initiatives and the need for a more effective and efficient operation of the public services by local authorities. Secondly we conclude from the data that we have presented that in this case Eco-taxes are not charged by local authorities. The water and waste water services are subsidised to households but not to industry and commerce. The subsidies to households could be viewed as a negative eco-tax.

2.5 Conclusion

This section presented information on discharges to water and use of water services and also assessed the scope of the data and possible developments.

In section 2.1 data on discharges to water for a recent year was presented in considerable detail with breakdowns by economic sector and by industrial sectors in particular. The industrial breakdown was converted from the classification used by the EPA, which undertakes the assembly of data, to the NACE classification, albeit with some difficulty. It was possible to present the 'pollution intensities' of various industrial sectors, that is, the amounts of BOD, N and P lost to waters per unit of value added or per person employed. The EPA's database is still evolving and it is expected that data collection and coverage will become more extensive in future. The outlook for its use as a major source of information is promising provided, that is, that the reclassification of firms into NACE categories becomes an established routine task.

Section 2.2 availed of National Accounts data and presented time series on public provision of water services, that is, water supply and waste water services, for the years 1990 to 1998. Figures were given for total current expenditure on provision of the services, on receipts from charges (current charges) and consequently on the total amount of subsidy. Only in the case of water supply was it possible to give quantities and hence cost per unit and subsidy per unit. Time series of the current cost per unit of water consumed were presented showing the extent of cost recovery from deliveries to the non-domestic and the domestic sectors. It was seen that charges for water supplied to the domestic sector were abolished from the beginning of 1997 so that there is now a 100 per cent subsidy. It might alternatively be termed a benefit-in-kind or a negative eco-tax, in so far as water consumption has environmental implications. There are indeed instances of where some options for expanding water supply could affect water levels in rivers, for example. As stated by the EPA, as a consequence of urban population growth many local authority treatment facilities are under severe pressure, and are sometimes unable to cope with increasing volumes of waste water generated.

Section 2.3 presented information for 1973 to 1998 collected in the Census of Industrial Production on the water supply industry. The interpretation of some of the components recorded is uncertain and there have been changes of definition that need to be elaborated. The Census holds out the possibility of becoming an important source of information as the questions are quite detailed, asking for costs of supplying four types of customer and for total quantity of water sent out. Extending the detail to the four types of customer in the questions to cover quantities and revenue, not to mention extension of the Census to cover waste water services, would be ideal.

Section 2.4 attempted to collect information on water services from local authorities with a view to investigating the extent to which economic data on water services could be reported on a river basin basis, as will be required under the Water Framework Directive. This Directive also requires each

individual sector, such as agriculture, industry and the domestic sector, to pay its way (though Ireland has an opt-out with respect to the domestic sector which accounts for about two thirds of the demand). Attention was focused on the Greater Dublin area by combining four constituent local authorities. The main difficulty found by authorities lay in disaggregating their expenditures by category of customer, which also includes other water authorities. This is not the type of question that they have been required to answer of late and most of them therefore do not address it. It proved difficult to assemble a coherent picture of quantities, expenditures/revenues and charges/subsidies per unit of service owing to apparent inconsistencies. While the domestic sector does not pay for water services, the non-domestic sector is probably paying its way on current costs of water supply, as suggested previously by the figures derived from National Accounts data. Major reforms to the reporting systems of local authorities are underway.

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Appendix 2.1

PROVISIONAL CONCORDANCE

between EPA and CSO CLASSIFICATIONS

D:/eurostat/EPA-CSOclassificationConcordance.doc; 29 January 2001

EPA classification is taken from: **OSPAR Screening Procedure for Eutrophication Risk in Irish Maritime Waters - Schedule of Industrial Sectors, amended from:**

Environmental Protection Agency Act, 1992, FIRST SCHEDULE

Amendments to the First Schedule, catering for non-IPC Licensable Industry, in *italics* (from P Cunningham 18 August 1999)

CSO classification is from NACE Rev1, at 99 sector level.

EPA code	EPA description	NACE Rev 1 A60 code	NACE description
1.	***MINERALS AND OTHER MATERIALS***		
1.1	The extraction, production and processing of raw asbestos.	14.50	Mining & quarrying of asbestos.
1.2	The extraction of aluminium oxide from an ore.	27.42	Production of aluminium oxide.
1.3	The extraction and processing (including size reduction, grading and heating) of minerals within the meaning of the Minerals Development Acts, 1940 to 1979, and storage of related mineral waste.	No NACE Code (used 13)	
1.4	The extraction of peat in the course of business which involves an area exceeding 50 hectares.	10.30	Extraction & agglomeration of peat.
1.5	Quarries, Aggregates	14.10	Quarrying of stone
2.	***ENERGY***		
2.1	The production of energy in combustion plant the rated thermal input of which is equal to or greater than	No NACE Code	

	50MW other than any such plant which makes direct use of the products of combustion in a manufacturing process.	(used 40+41)	
2.2	The burning of any fuel in a boiler or furnace with a nominal heat output exceeding 50MW.	No NACE Code	
3.	***METALS***		
3.0	Engineering, Garages, Manufacturing Industry		
3.1	The initial melting or production of iron and steel.	27.10	Manufacture of basic iron and steel and of ferro-alloys (ECSC)[26]
3.2	The processing of iron and steel in forges, drawing plants and rolling mills where the production area exceeds 500 square metres.	No NACE Code	
3.3	The production, recovery, processing or use of ferrous metals in foundries having melting installations with a total capacity exceeding 5 tonnes.	27.51 27.52	Casting of iron in foundries. Casting of steel in foundries
3.4	The production, recovery or processing of non-ferrous metals, their compounds or other alloys including antimony, arsenic, beryllium, chromium, lead, magnesium, manganese, phosphorus, selenium, cadmium or mercury, by thermal, chemical or electrolytic means in installations with a batch capacity exceeding 0.5 tonnes.	27.45	Other non-ferrous metal production..
3.5	The reaction of aluminium or its alloys with chlorine or its compounds.	No NACE Code	
3.6	The roasting, sintering or calcining of metallic ores in plants with a capacity exceeding 1,000 tonnes per year.	13.10	Mining of ores.
3.7	Swaging by explosives where the production area exceeds 100 square metres.	No NACE Code	
3.8	The pressing, drawing and stamping of large castings where the production area exceeds 500 square metres.	29.52	Manufacture of machinery for mining quarrying and construction.
3.9	Boilermaking and the manufacture of reservoirs, tanks and other sheet metal containers where the production area exceeds 500 square metres.	28.21	Manufacture of tanks, reservoirs and containers of metal.

4.	***MINERAL FIBRES AND GLASS***		
4.1	The processing of asbestos and the manufacture and processing of asbestos-based products.	14.50	Mining and quarrying of asbestos
4.2	The manufacture of glass fibre or mineral fibre.	26.14	Manufacture of glass fibres.
4.3	The production of glass (ordinary and special) in plants with a capacity exceeding 5,000 tonnes per year.	26.11	Manufacture of flat glass.
4.4	The production of industrial diamonds.	26.15	Manufacture & processing of other glass
5.	***CHEMICALS***		
5.1	The manufacture of chemicals in an integrated chemical installation.	24.14	Manufacture of other organic basic chemicals
5.2	The manufacture of olefins and their derivatives or of monomers and polymers, including styrene and vinyl chloride.	24.14 ?	Manufacture of other organic basic chemicals?
5.3	The manufacture, by way of chemical reaction processes, of organic or organo-metallic chemical products other than those specified at 5.2.	24.14 ?	Manufacture of other organic basic chemicals?
5.4	The manufacture of inorganic chemicals.	24.13	Manufacture of other inorganic basic chemicals
5.5	The manufacture of artificial fertilisers.	24.15	Manufacture of fertilisers and nitrogen compounds
5.6	The manufacture of pesticides, pharmaceuticals or veterinary products and their intermediates.	24.20	Manufacture of pesticides and other agro-chemical products.
5.7	The manufacture of paints, varnishes, resins, inks, dyes, pigments or elastomers where the production capacity exceeds 1,000 litres per week.	24.30	Manufacture of paints, varnishes and similar coatings, printing ink & mastics
5.8	The formulation of pesticides.	24.20	Manufacture of pesticides and other agro-chemical products.
5.9	The chemical manufacture of glues, bonding agents and adhesives.	24.62	Manufacture of glues and gelatine.
5.10	The manufacture of vitamins involving the use of heavy metals.	No NACE Code	
5.11	The storage, in quantities exceeding the values shown, of any one or more of the following chemicals (others than as part of any other activity)-methyl acrylate (20 tonnes); acrylonitrile (20 tonnes); toluene di-isocyanate (20 tonnes); anhydrous ammonia (100 tonnes);	No NACE Code	

	anhydrous hydrogen flouride (1 tonne).		
6.	***INTENSIVE AGRICULTURE***		
6.1	The rearing of poultry in installations, whether within the same complex or within 100 metres of that complex, where the capacity exceeds 100,000 units have the following equivalents-	01.24	Farming of poultry.
	1 broiler = 1 unit		
	1 layer, turkey or other fowl = 2 units.		
6.2	The rearing of pigs in installations, whether within the same complex or within 100 metres of that complex, where the capacity exceeds 1,000 units on gley soils or 3,000 units on other soils and where units have the following equivalents-	01.23	Farming of swine.
	1 pig = 1 unit		
	1 sow = 10 units.		
6.3	Fish Farming (Freshwater)	05.02	Operation of fish hatcheries and fish farms.
6.4	Marts, Animal Holding Facilities	No NACE Code (used 1)	
7.	**Food and Drink**		
7.1	The manufacture of vegetable and animal oils and fats where the capacity for processing raw materials exceeds 40 tonnes per day.	15.40	Manufacture of vegetable & animal oils and fats.
7.2	The manufacture of dairy products where the processing capacity exceeds 50 million gallons of milk equivalent per year.	15.50	Manufacture of dairy products.
7.3	Commercial brewing and distilling, and malting in installations where the production capacity exceeds 100,000 tonnes per year.	15.91, 15.96, 15.97, 15.98	Distilling, Brewing & Malting.
7.4	The slaughter of animals in installations where the daily capacity exceeds 1,500 units and where units have the following equivalents-	15.11, 15.12	Slaughtering & slaughtering of poultry.
	1 sheep = 1 unit,		
	1 pig = 2 units,		

	1 head of cattle = 5 units.		
7.5	The manufacture of fish-meal and fish-oil.	15.20, 15.41	Manufacture of fishmeal and fish oil production.
7.6	The manufacture of sugar.	15.83	Manufacture of sugar.
7.7	The rendering of animal by-products.	15.11	Production and preserving of meat.
7.8	Fish Processing	15.20	Processing and preserving of fish & fish products.
7.9	Confectionery, Bakery	15.81, 15.84	Manufacture of rusks & biscuits; manufacture of preserved pastry goods & cakes. Manufacture of cocoa; chocolate and sugar confectionery.
8.	***WOOD, PAPER, TEXTILES AND LEATHER***		
8.1	The manufacture of paper pulp, paper or board (including fibre-board, particle board and plywood) in installations with a production capacity equal to or exceeding 25,000 tonnes of product per year.	21.11	Manufacture of pulp.
8.2	The manufacture of bleached pulp.	21	Manufacture of pulp.
8.3	The treatment or protection of wood, involving the use of preservatives, with a capacity exceeding 10 tonnes per day.	20.10	Sawmilling and planing of wood, impregnation of wood.
8.4	The manufacture of synthetic fibres.	24.70	Manufacture of man-made fibres.
8.5	The dyeing, treatment or finishing (including moth-proofing and fireproofing) of fibres or textiles (including carpet) where the capacity exceeds 1 tonne per day of fibre, yarn or textile material.	17.30	Finishing of textiles.
8.6	The fell-mongering of hides and tanning of leather in installations where the capacity exceeds 100 skins per day.	19.10	Tanning and dressing of leather.
8.7	Laundrying	93.01	Washing and drycleaning of textile and fur.
8.8	Non-Synthetic Textiles	17.00?	Preparation and spinning of cotton-type fibres?
8.9	Photographic Film Processing	74.81	Photographic activities.

9.	***FOSSIL FUELS***		
9.1	The extraction, other than offshore extraction, of petroleum, natural gas, coal or bituminous shale.	11.10	Extraction of crude petroleum and natural gas.
9.2	The handling or storage of crude petroleum.	No NACE Code?	
9.3	The refining of petroleum or gas.	23.20	Manufacture of refined petroleum products.
9.4	The pyrolysis, carbonisation, gasification, liquefaction, dry distillation, partial oxidation or heat treatment of coal, lignite, oil or bituminous shale, other carbonaceous materials or mixtures of any of these in installations with a processing capacity exceeding 500 tonnes per day.	23.20	Manufacture of refined petroleum products.
9.5	Oil Storage Depots	23.20	Manufacture of refined petroleum products.
10.	***CEMENT***		
10.1	The production of cement.	26.51	Manufacture of cement.
11.	***WASTE***		
11.1	The incineration of hazardous waste.	90	Sewage and refuse disposal, sanitation and similar activities.
11.2	The incineration of hospital waste.	90	Sewage and refuse disposal, sanitation and similar activities.
11.3	The incineration of waste other than that mentioned in 11.1 and 11.2 in plants with a capacity exceeding 1 tonne per hour.	90	Sewage and refuse disposal, sanitation and similar activities.
11.4	The use of heat for the manufacture of fuel from waste.	37.10	
12.	***SURFACE COATINGS***		
12.1	Operations involving coating with organo-tin compounds.	28.51	Treatment & coating of metals.
12.2	The manufacture or use of coating materials in processes with a capacity to make or use at least 10 tonnes per year of organic solvents, and powder coating manufacture with a capacity to produce at least 50 tonnes per year.	28.51	Treatment & coating of metals.

12.3	Electroplating operations.	28.51	Treatment & coating of metals.
13.	***OTHER ACTIVITIES***		
13.1	The testing of engines, turbines or reactors where the floor area exceeds 500 square metres.	35.30	Manufacture of aircraft & spacecraft.
13.2	The manufacture of integrated circuits and printed circuit boards.	32.10	Manufacture of electronic valves and tubes and other electronic components.
13.3	Production of lime in a kiln.	26.52	Manufacture of lime in a kiln.
13.4	The manufacture of coarse ceramics including refractory bricks, stoneware pipes, facing and floor bricks and roof tiles.	26.26	Manufacture of refractory ceramic products.
13.5	Printing Industry	22.22	Printing n.e.c.

Appendix 2.2:

Questionnaire to Local Authorities requesting information on quantities, costs and revenues relating to water supply and waste water services. Included are the letter, a form to be filled out on water supply and another form on waste water services.

THE ECONOMIC AND SOCIAL RESEARCH INSTITUTE
4 BURLINGTON ROAD, DUBLIN 4, IRELAND
TELEPHONE: (+353-1) 667 1525 OR: 668 9984 EXT 438
FAX: (+353-1) 668 6231 E-MAIL: SUE.SCOTT@ESRI.IE

October 2000

Dear Mr……,

We are writing to you about a project that we are currently undertaking for EUROSTAT, the EU's Statistical Office. The project, in the *Environmental Accounts* series, includes assembly of data for Ireland on waste water arising and water consumption. In particular it entails estimation of quantities, charges, revenues and costs. We are writing to ask if you would be in a position to help us and whether you would be willing to do so.

The two tables attached provide the frame for the data that we would like to obtain relating to your water authority. The columns refer to quantities, charges, revenues and costs, and the rows give a breakdown of customers. We realise that this is a tall order as much of the information will not be to hand. Even more demanding is the fact that we are interested in obtaining the data for as many years as possible going back in time. However, we gather that some water authorities have detailed records relating to certain areas. For example, information on costs has been assembled over the years in the process of working out the charge in the Rate. In our previous work, such as our study[3] of capital charges to industry, detailed information was readily available to us in some cases and it is by consulting you again that we can see what is feasible now.

It should be added that if you think that you can help but would need assistance with extracting figures, we might be in a position to supply that assistance. We would be grateful if you could fill in the tables and return them in the enclosed s.a.e., even if sections of the tables are left blank. Please do not hesitate to telephone us with your queries or comments. We look forward to hearing from you.

Yours sincerely,

John Eakins

encl.: sae, 2 tables

[3] *Waste Water Services: Charging Industry the Capital Cost,* 1994. Economic and Social Research Institute, S. Scott and J. Lawlor, Policy Research Series no. 22.

WATER **1998** **Name of Sanitary Authority:**

……..

	Quantity used	**Charge imposed** [4]	**Total revenue raised** [5]		**Total costs incurred** [6]	
SECTOR using the water:	Cubic metres per year	In £ per cubic metre	£ million		£ million	
			Operational	Capital contributions	Operation + admin	Capital repayment
Agriculture **Industry** **Commerce** **Households**						
TOTAL						
Direct abstractions [7]						

Would it be possible to provide this information for several years going back? (Please tick) Yes % No %

[4] Please state if the charge is raised as a flat fee or if it includes a separate charge related to peaks or a capital charge recouped separately.
[5] This is the revenue accruing from charges that are specifically raised on water use, and should not include revenue raised through the Rates.
[6] These are total costs incurred by the authority in dealing with water supply.
[7] Direct abstractions would include use of water that the authority does not handle, so that total use is covered in this column.

FURTHER COMMENTS CAN BE WRITTEN OVERLEAF

WASTE-WATER **1998** **Name of Sanitary Authority:……**

	Annual quantity discharged [8]					Charge imposed [9]					Total revenue raised [10]		Total costs incurred [11]	
SECTOR making the discharges:	m^3 p.a.	BOD tonnes	SS tonnes	N tonnes	P tonnes	In £ (per whichever units apply)					£ million		£ million	
						m^3	kg BOD	kg SS	kg N	kg P	Operational	Capital contrib.	Operational	Capital repayment
Agriculture *(if relevant)*														
Industry, of which:														
Food														
Pharmaceutical														
Electronic														
Other														
Road drainage														
Commerce														
Households														
TOTAL														
Other discharges [12]														

Would it be possible to provide this information for several years going back? (Please tick) Yes % No %

[8] This level of detail is not expected to apply to all authorities.
[9] If the charge is imposed as a flat fee or if it relates to concentration or to peak capacity, please describe, briefly.
[10] This is the revenue accruing from charges that are specifically raised on discharges, and should not include revenue raised through the Rates.
[11] These are total costs incurred by the authority in dealing with waste water.
[12] Other discharges would include direct discharges that the authority does not handle, so that total discharges are covered in this column.

FURTHER COMMENTS CAN BE WRITTEN OVERLEAF

3. Disposals of Solid Waste

3.1 Data Description

The development of a national waste database by the Environmental Protection Agency (EPA) has resulted in reliable and consistent data series on solid waste streams in Ireland. Prior to the development of the database and its associated data collection structures estimates of national disposals of solid waste were quite limited, concentrating on narrow sectors and with varying accuracy. The doubts on the reliability of earlier estimates can be seen by comparing EPA estimates for 1995 and best alternative estimates for 1994, where the magnitudes of solid waste streams in the two years should be broadly equal. The best alternative estimates for 1994 of urban wastewater sludges is less than 5% of the EPA's estimate for 1995, while the hazardous waste estimate for 1994 is 41% of the EPA's estimate for 1995. For municipal waste the 1994 estimate is much closer to the 1995 estimate at 91% but the composition between household and commercial is grossly at odds between the two years. The EPA's estimates for 1995 being 45% higher for household waste and 38% lower for commercial waste than the alternative estimates for 1994.[13]

The EPA is the agency with responsibility for all waste streams generated in the country and it has the authority to gather all necessary information for this function. Since 1995 it has implemented the necessary structures to collect a consistent data series through time. It has adopted standard procedures, such as the European Waste Catalogue and Hazardous Waste List System, which will enable cross-country comparison. The development of the national waste database by the EPA will play an important role in the development of time series statistics on solid waste.

The focus in the solid waste section of this report is to describe and present the most reliable existing time series on solid waste. Almost all of the time series presented will be collected in the future and therefore represent the basic data sources for inclusion in an environmental time series database. The next section describes in some detail the solid waste data series, which will be followed by some basic analysis of the presented solid waste data. Future availability of these time series is also discussed.

3.2 Data Series

The primary source of solid waste data is the EPA's national waste database, which collates information on sources, types, recovery and disposal of solid waste. Except where otherwise specified the EPA's waste database is the source of data. The EPA database began with data for 1995 and was updated in 1998, thus far providing information for just two years.

[13] See Table 3.1 in the appendix for the actual estimates of solid waste arising in 1994 and 1995.

Estimates of Solid Waste Arisings

Aggregate estimates of solid waste are compiled in Table 3.1. This table provides an overall assessment of the level of solid waste arising in the broad sectoral categories, e.g., agriculture and manufacturing, and also estimates of specific types of waste, e.g., hazardous waste and wastewater sludges. The figures presented are for 1995 and 1998 with figures also presented for 1994, though the estimates for 1994 are from alternative sources and not consistent with EPA estimates. The 1994 figures are included to demonstrate their inconsistency with data from later years. As future solid waste data collection will be consistent with the series for 1995 and 1998 this report concentrates on the most accurate time series that will continue to be collected into the future.

Composition Estimates of Household Waste Streams

Given the relative importance of municipal waste streams in waste management, determining the constituent material in this waste stream is quite important. Table 3.2 decomposes the aggregate figure for the household sector in Table 3.1 into estimates of constituent materials such as paper, glass, metals and textiles. The figures presented include estimates of the gross quantity of waste available for collection, waste landfilled and waste recovered of each of the constituent wastes. The gross quantity of waste available for collection will be always less than the quantity of waste arising (in Table 3.1) and the difference represents an estimate of the quantity of waste arising in the household sector not provided with a waste collection service.

A supplementary table (Table 3.2a) presents the growth rate in the various household waste activities (waste available, landfilled, recovered) between 1995 and 1998. This table shows that the gross quantity of waste available for collection increased by 13% between 1995 and 1998. Also included in Table 3.2a is the percentage share of constituent materials in 1998, which shows that almost 12% of household waste landfilled constituted plastics.

Composition Estimates of Commercial Waste Streams

Municipal waste largely comprises of wastes from the household and commercial sectors. Tables 3.3 and 3.3a present a similar set of waste composition estimates for the commercial sector as was presented for the household sector in Tables 3.2 and 3.2a

Estimates of Industrial Waste Arisings by NACE Sector

The industrial sector is the largest source of non-agricultural waste in the economy but the amount of industrial waste generated differs widely between sub-sector industries. To provide more detail on waste arisings in the industrial sector estimates are dis-aggregated by one and two letter NACE codes

with estimates for both hazardous and non-hazardous wastes. These estimates are presented in Table 3.4.

Disposal/Recovery Practices in Surveyed Industrial NACE Sectors

The estimates of solid wastes from the industrial sector are based on industry surveys, however, this is not feasible for disposal and recovery practices. Disposal/Recovery practices differ significantly across firms so it may not be prudent to estimate disposal/recovery of solid waste based on partial surveys. Rather than present potentially unreliable estimates for the entire industrial sector the estimates presented are actual levels of disposal and recovery of solid wastes in surveyed firms. The table also indicates the total amount of solid waste that is covered by the survey and share of solid waste surveyed in each industrial sector, therefore, indicating the sector coverage of the presented results. The estimates are presented in Table 3.5. The total industrial sector generated 11.8m tonnes of waste in 1998 (from Table 3.4). The survey on waste disposal/recovery practices covered 7.9m tonnes of this waste. Of the 7.9m tonnes of waste surveyed 5.8m tonnes was disposed and 2.1m tonnes were recovered, as presented in Table 3.5. Table 3.5 also indicates that the 7.9m tonnes of surveyed waste in 1998 represents 67% of total solid waste arising in the industrial sector.

Within year sub-sector shares of disposal and recovery practices are presented as supplementary Table 3.5a (Sub-sector shares of Disposal/Recovery Practices in Surveyed Industrial NACE Sectors). These shares simply indicate the sub-sector shares of total industrial sector waste disposal/recovery, e.g. in 1998 the food products sector recovered 69% of all waste recovered by the industrial sector.

Household Waste Charges – 2000

There is no readily available information on prices for solid waste services in Ireland. Except for private waste management operators who set their own fees, individual local governments determine the fee for solid waste services within their own jurisdiction. Therefore, a variety of systems and pricing structures operate throughout the country without any central reporting agency. There are no environmental taxes charged on solid waste management services.

As an indication of the variety of charges for solid waste services the results of an existing one-time-only survey are presented. The Consumer Association of Ireland surveyed all local governments in 2000 requesting information on household waste collection/disposal. The results of this survey are presented in Table 3.6. Household waste service is generally charged in the following three ways: by volume (e.g. 240 litre bin), by bag (requiring a prepaid tag attached), on by an annual service fee. The table presents the fee information in these three categories for all the local authority jurisdictions for 2000 and denominated in Euro. Although the table is presented in local authority areas the fee information also incorporates charges by private operators, where the information was supplied.

Solid Waste Time Series – Analysis

Any analysis of waste streams has to consider the associated economic situation. When examining the changes in waste streams between 1995 and 1998 it is important to realise that economic activity was substantially higher in the latter year, 45% higher when using gross domestic product at factor cost as a measure of economic activity. It is not surprising therefore that solid waste has increased in the 1995-98 time period but there have been significant changes in the types of waste generated and how this waste is disposed. These changes are discussed below under the title of each main table in the appendix.

Estimates of Solid Waste Arisings

The striking feature of Table 3.1 is the very substantial increase in the total weight of solid waste arising per annum between 1995 and 1998. The 1998 estimate at 80m tonnes is almost twice the solid waste arisings in 1995. The primary source of the increase is from the agricultural sector with an increase of 33m tonnes. And the primary source of agricultural waste is animal slurries. During the 1995-98 period there was a large increase in the numbers of agricultural animals, a 17% increase in pig numbers and a 9% increase in cattle numbers, which partly explains the significant increase in agricultural wastes.

The buoyant Irish economy is reflected in several places in the figures in Table 3.1. The solid waste output of the manufacturing sector increased by 38%, while per annum waste output in the utilities sector increased by 28%. Correlated with economic growth the two areas that have seen significant solid waste increases are construction/demolition waste and discarding old vehicles. 1998 construction waste was twice its 1995 level while scrap metal waste (end of life vehicles) in 1998 was 3.5 times higher than 1995.

Composition Estimates of Household Waste Streams

Table 3.2 presents details of household waste streams from households that have a waste collection service available. Similar to other sectors of the economy the per annum level of waste has increased, overall by 13%. The types of materials that contribute most to the increase in household waste streams are glass, plastics (which is consistent with the apparent increase in packaging) and metals. Parallel with the increase in solid waste generated by the household sector is an increase in the quantity of waste being landfilled. The amount of solid wastes recovered in 1998 decreased from an already low level. The small levels of waste recovery mean that relatively minor changes in recovery lead to the large percentage changes reported in Table 3.2a for organic and plastics.

Composition Estimates of Commercial Waste Streams

The increase in waste from the commercial sector is even more dramatic and concentrated in specific materials than the household sector. Per annum waste generated has increased by 44% between 1995 and 1998 with the increase being primarily composed of paper and plastics. Quantity landfilled has increased also but waste recovery increased considerably for both paper and plastics

Estimates of Industrial Waste Arisings by NACE Sector

In the industrial sector per annum solid waste arisings increased by over 50% between 1995 and 1998 though the increase was entirely confined to non-hazardous waste streams. Estimated arisings of hazardous waste in 1998 fell below the 1995 level. Four industrial sectors account for the majority of the increase in solid waste: the mining, food products, chemicals, and construction sectors. On a lesser scale, waste from the textile and wood products sectors also increased. One sector with a significant reduction in solid waste was the non-metallic mineral product sector (NACE code DI), which reduced solid waste from 1.5m tonnes to 0.25m tonnes per annum between 1995 and 1998.

Disposal/Recovery Practices in Surveyed Industrial NACE Sectors

Table 3.5 examines the disposal/recovery practices of surveyed industrial firms. In line with elsewhere in the economy the amount of solid waste disposed is increasing and is significantly larger than waste recovered. The changes in disposals/recovery presented in Table 3.5 partially reflect changes in survey coverage with the remainder reflecting actual changes in waste management practices. In 1995 58% of industrial waste was covered in the survey and this increased to 87% in 1998. This increase in coverage is directly reflected in the increased tonnage disposed and recovered. As the coverage percentage improves in the future, this table will provide a more accurate reflection of changes in disposal/recovery practices in the industrial sector.

Household Waste Charges – 2000

Household waste collection/disposal charges are presented in Table 3.6 for all the local administration areas in the country. With the myriad of schemes and pricing structures and lack of information on actual number of households serviced by each scheme it is not possible to determine an accurate average household charge for solid waste services. However the table condenses the information into three types of charges from which we can gauge that the average cost per household is roughly between 130-170 Euro per annum. However, charges vary from a high of 229 Euro per annum to being free. Free solid waste management services were available in some of the Dublin local authority areas. Currently there are no environmental taxes included in solid waste charges.

3.3 Future Availability of Data

Except for the data on household waste charges, which was from a one-time-only survey, the data series presented will be readily available in future time periods. The source of this data is the Environmental Protection Agency's national waste database, which was established with the collection of data on waste streams during 1995. The database has since been updated with data for 1998 and it is anticipated that the database will continue to be updated in the future, though the frequency of updates is unlikely to be annual.

The national waste database consists of a number of customised sub-databases, which are the local authority/municipal database, an industry database, a waste contractors and recycling organisations database, an agricultural wastes database, a healthcare wastes database and a radioactive wastes database. The overall management and responsibility of the national waste database is with the EPA though local authorities gather information for input into the database. The EPA also gathers information directly from industrial and other sources.

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Environmental Protection Agency, 1996, National Waste Database Report 1995, P.O. Box 3000, Johnstown Castle Estate, County Wexford, Ireland

Environmental Protection Agency, 2000, National Waste Database Report 1998, P.O. Box 3000, Johnstown Castle Estate, County Wexford, Ireland

DATA

Table 3.1: Estimates of Solid Waste Arisings

	1994* tonnes	**1995** tonnes	**1998** tonnes
Agricultural		31,000,000	64,578,724
Manufacturing		3,393,576	4,876,406
Energy, Gas & Water Supply		351,849	448,674
Mining and Quarrying		2,200,002	3,510,778
Hazardous Waste	99,393	243,754	370,328
Municipal Waste:	1,678,699	1,848,232	2,056,652
:Household	*911,665*	*1,324,521*	*1,220,856*
:Commercial	*767,034*	*476,920*	*754,797*
:Street Cleaning		*46,791*	*80,999*
End of Life Vehicles/Scrap metal**		52,154	187,484
Construction & Demolition Waste		1,318,908	2,704,958
Urban Wastewater Sludges***	37,686	851,380	505,686
Drinking Water Sludges		58,095	38,988
Dredge Spoils		784,600	734,000
Total	**1,815,778**	**42,102,550**	**80,012,678**

Source: EPA(2000), and Barrett and Lawlor (1995)

* 1994 figures are not consistent with other two years
** 1995 figure relates solely to end of life vehicles
*** 1995 figure is based on a lower percentage solids than was applied in 1998

Table 3.2: Composition Estimates of Household Waste Streams

	Gross Quantity Available		Quantity Landfilled		Quantity Recovered	
	1995	1998	1995	1998	1995	1998
	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes
Paper	233,790	26,723	202,151	219,573	31,639	7,150
Glass	57,623	75,626	49,718	61,526	7,905	14,100
Plastic	100,869	134,100	100,710	133,453	159	648
Ferrous	21,326	23,854	20,958	22,793	368	1,062
Aluminium	9,346	11,711	8,406	11,231	940	480
Other Metals	3,862	5,828	3,862	5,828	-	-
Textiles	31,224	35,954	27,724	32,708	3,500	3,247
Organics	352,189	376,207	352,159	370,542	30	5,665
Others	216,022	273,213	216,022	268,046	-	5,167
Total	**1,026,251**	**1,163,216**	**981,710**	**1,125,700**	**44,541**	**37,519**

The difference between waste arisings in Table 3.1 and the amount available for collection in Table 3.2 represents an estimate of the quantity of waste arisings in households not provided with a waste collection service
Source: EPA (1996 & 2000)

Table 3.2a: Composition Estimates of Household Waste Streams - growth rates and shares

	Gross Quantity Available		Quantity Landfilled		Quantity Recovered	
	Growth rate 1995-1998	1998 (%) composition	Growth rate 1995-1998	1998 (%) composition	Growth rate 1995-1998	1998 (%) composition
Paper	-3.0	19.5	8.6	19.5	-77.4	19.1
Glass	31.2	6.5	23.7	5.5	78.4	37.6
Plastic	32.9	11.5	32.5	11.9	307.5	1.7
Ferrous	11.9	2.1	8.8	2.0	188.6	2.8
Aluminium	25.3	1.0	33.6	1.0	-48.9	1.3
Other Metals	50.9	0.5	50.9	0.5		0.0
Textiles	15.1	3.1	18.0	2.9	-7.2	8.7
Organics	6.8	32.3	5.2	32.9	18783.3	15.1
Others	26.5	23.5	24.1	23.8		13.8
Total	**13.3**	**100.0**	**14.7**	**100.0**	**-15.8**	**100.0**

Table 3.3: Composition Estimates of Commercial Waste Streams

	Gross Quantity Available		Quantity Landfilled		Quantity Recovered	
	1995	1998	1995	1998	1995	1998
	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes
Paper	275,583	415,429	223,222	328,277	52,361	87,152
Glass	40,014	41,132	19,419	19,232	20,595	21,900
Plastic	38,509	66,303	38,274	59,475	235	6,828
Ferrous		8,705		5,698		3,007
Aluminium		3,744		3,493		251
Other Metals	4,603	409	4,603	381	-	28
Textiles	-	3,434	-	3,434	-	-
Organics	90,112	84,662	90,112	84,662	-	-
Others	28,100	65,417	28,100	55,417	-	10,000
Total	**476,921**	**689,235**	**403,730**	**560,069**	**73,191**	**129,166**

The difference between waste arisings in Table 3.1 and the amount available for collection in Table 3.3 represents an estimate of the quantity waste from commercial enterprises not provided with a waste collection service
Source: EPA (1996 & 2000)

Table 3.3a: Composition Estimates of Commercial Waste Streams - growth rates and shares

	Gross Quantity Available		Quantity Landfilled		Quantity Recovered	
	Growth rate 1995-1998	1998 (%) composition	Growth rate 1995-1998	1998 (%) composition	Growth rate 1995-1998	1998 (%) composition
Paper	50.7	60.3	47.1	58.6	66.4	67.5
Glass	2.8	6.0	-1.0	3.4	6.3	17.0
Plastic	72.2	9.6	55.4	10.6	2805.5	5.3
Ferrous		1.3		1.0		2.3
Aluminium		0.5		0.6		0.2
Other Metals	-91.1	0.1	-91.7	0.1		0.0
Textiles		0.5		0.6		0.0
Organics	-6.0	12.3	-6.0	15.1		0.0
Others	132.8	9.5	97.2	9.9		7.7
Total	**44.5**	**100.0**	**38.7**	**100.0**	**76.5**	**100.0**

Table 3.4: Estimates of Industrial Waste Arisings by NACE Sector

	NACE code	Hazardous		Non-Hazardous		Total Industrial	
		1995 tonnes	1998 tonnes	1995 tonnes	1998 tonnes	1995 tonnes	1998 tonnes
Mining (excludes quarrying)	C	2	865	2,200,002	3,510,778	2,200,004	3,511,643
Food Products; Beverages and Tobacco	DA	3,653	2,343	894,931	2,356,418	898,584	2,358,761
Textiles and Textile Products	DB	101	932	53,206	116,052	53,307	116,984
Leather and Leather Products	DC	19	23	208,783	53,790	208,802	53,813
Wood and Wood Products	DD	5	1,061	21,816	287,257	21,821	288,318
Pulp, Paper and Paper Products; Printing, Publishing	DE	216	1,107	181,946	164,267	182,162	165,374
Coke, Refined Petroleum Products and Nuclear Fuel	DF	6,886	6,690	3,581	22,584	10,467	29,274
Chemicals, Chemical Products and Man-made Fibres	DG	179,809	208,592	149,695	1,324,407	329,504	1,532,999
Rubber and Plastic Products	DH	1,870	1,051	56,051	24,974	57,921	26,025
Other Non-metallic Mineral Products (includes quarrying)	DI	16,125	874	1,533,931	265,755	1,550,056	266,629
Basic Metals and Fabricated Metal Products	DJ	13,109	5,497	205,174	114,301	218,283	119,798
Machinery and Equipment not elsewhere classified	DK	539	1,975	35,601	40,118	36,140	42,093
Electrical and Optical Equipment	DL	4,157	4,385	44,492	48,401	48,649	52,786
Transport Equipment	DM	-	2,183	1,326	32,228	1,326	34,411
Manufacturing not elsewhere classified	DN	581	348	3,043	25,856	3,624	26,204
Sub-total Manufacturing		*227,070*	*237,061*	*3,393,576*	*4,876,408*	*3,620,646*	*5,113,469*
Electricity, Gas and Water Supply	E	1,458	966	351,849	448,674	353,307	449,640
Construction	F	1,212		1,318,908	2,704,958	1,320,120	2,704,958
Transport, Storage and Communication	I	13,257		136,568		149,825	-
Unspecified		756		10,082		10,838	-
Total		**243,755**	**238,892**	**7,410,985**	**11,540,818**	**7,654,740**	**11,779,710**

Source: EPA (1996 & 2000)

Table 3.5: Disposal/Recovery Practices in Surveyed Industrial NACE Sectors

	NACE code	Disposal		Recovery		Other		Total Surveyed*		Survey as a % of total waste*	
		1995 tonnes	1998 tonnes	1995 tonnes	1998 tonnes	1995 tonnes	1998 tonnes	1995 tonnes	1998 tonnes	1995 %	1998 %
Mining (excludes quarrying)	C	2,200,002	3,498,083	2	13,560			2,200,004	3,511,643	100.0	100.0
Food Products; Beverages and Tobacco	DA	215,844	188,085	142,011	1,449,218	573	0	358,428	1,637,303	39.9	69.4
Textiles and Textile Products	DB	10,741	68,636	9,806	14,442	277	5	20,824	83,083	39.1	71.0
Leather and Leather Products	DC	4,930	7,454	5,901	13,603			10,831	21,057	5.2	39.1
Wood and Wood Products	DD	865	22,882	1,608	221,377	5		2,478	244,259	11.4	84.7
Pulp, Paper and Paper Products; Printing, Publishing	DE	16,291	5,212	63,843	14,287			80,134	19,499	44.0	11.8
Coke, Refined Petroleum Products and Nuclear Fuel	DF	3,566	22,598	6,901	6,676			10,467	29,274	100.0	100.0
Chemicals, Chemical Products and Man-made Fibres	DG	149,209	1,320,233	121,029	178,757	216	70	270,454	1,499,060	82.1	97.8
Rubber and Plastic Products	DH	23,463	9,535	5,264	8,123	26		28,753	17,658	49.6	67.9
Other Non-metallic Mineral Products (includes quarrying)	DI	401,741	204,405	42,336	8,482	534		444,611	212,887	28.7	79.8
Basic Metals and Fabricated Metal Products	DJ	60,082	19,667	9,563	67,023		86	69,645	86,776	31.9	72.4
Machinery and Equipment not elsewhere classified	DK	15,039	1,253	525	2,491	72		15,636	3,744	43.3	8.9
Electrical and Optical Equipment	DL	16,125	14,915	6,607	8,829	281	1	23,013	23,745	47.3	45.0
Transport Equipment	DM	5	5,903	5	1,341			10	7,244	0.8	21.1
Manufacturing not elsewhere classified	DN	265	4,552	560	8,017	137		962	12,569	26.5	48.0
Sub-total Manufacturing		*918,166*	*1,895,330*	*415,959*	*2,002,666*	*2,121*	*162*	*1,336,246*	*3,898,158*	36.9	76.2
Electricity, Gas and Water Supply	E	262,540	377,757	60,746	71,883			323,286	449,640	91.5	100.0
Construction	F	152,090		280,764		824		433,678	-	32.9	
Transport, Storage and Communication	I	106,295		953		21		107,269	-	71.6	
Unspecified		6,506		4,060		272		10,838	-	100.0	
Total		**3,645,599**	**5,771,170**	**762,484**	**2,088,109**	**3,238**	**162**	**4,411,321**	**7,859,441**	**58%**	**67%**

Source: EPA (1996 & 2000)

* Data on disposal/recovery practices is survey based. The figures in the final two columns represent the percentage of waste arisings for which disposal/recovery data is available through survey

Table 3.5a: Sub-sector shares of Disposal/Recovery Practices in Surveyed Industrial NACE Sectors*

	NACE code	Disposal		Recovery		Other	
		1995 % share	1998 % share	1995 % share	1998 % share	1995 % share	1998 % share
Mining (excludes quarrying)	C	60.3	60.6	0.0	0.6	-	-
Food Products; Beverages and Tobacco	DA	5.9	3.3	18.6	69.4	17.7	0.0
Textiles and Textile Products	DB	0.3	1.2	1.3	0.7	8.6	3.1
Leather and Leather Products	DC	0.1	0.1	0.8	0.7	-	-
Wood and Wood Products	DD	0.0	0.4	0.2	10.6	0.2	-
Pulp, Paper and Paper Products; Printing, Publishing	DE	0.4	0.1	8.4	0.7	-	-
Coke, Refined Petroleum Products and Nuclear Fuel	DF	0.1	0.4	0.9	0.3	-	-
Chemicals, Chemical Products and Man-made Fibres	DG	4.1	22.9	15.9	8.6	6.7	43.2
Rubber and Plastic Products	DH	0.6	0.2	0.7	0.4	0.8	-
Other Non-metallic Mineral Products (includes quarrying)	DI	11.0	3.5	5.6	0.4	16.5	-
Basic Metals and Fabricated Metal Products	DJ	1.6	0.3	1.3	3.2	-	53.1
Machinery and Equipment not elsewhere classified	DK	0.4	0.0	0.1	0.1	2.2	-
Electrical and Optical Equipment	DL	0.4	0.3	0.9	0.4	8.7	0.6
Transport Equipment	DM	0.0	0.1	0.0	0.1	-	-
Manufacturing not elsewhere classified	DN	0.0	0.1	0.1	0.4	4.2	-
Sub-total Manufacturing		25.2	32.8	54.6	95.9	65.5	100.0
		-	-	-	-	-	-
Electricity, Gas and Water Supply	E	7.2	6.5	8.0	3.4	-	-
		-	-	-	-	-	-
Construction	F	4.2	-	36.8	-	25.4	-
Transport, Storage and Communication	I	2.9	-	0.1	-	0.6	-
Unspecified		0.2	-	0.5	-	8.4	-
		-	-	-	-	-	-
Total		100.0	100.0	100.0	100.0	100.0	100.0

* Data on disposal/recovery practices is survey based. The figures in the Disposal, Recovery and Other columns give industry shares of total disposal/recovery practices surveyed.

Table 3.6: Household Waste Charges - 2000

Authority	Type[1]	per year overall[2] (Euro)	per 240 litre bin yearly (Euro)	per tag or bag (Euro)
Council Councils				
Carlow	p		152-198	1.65-1.90
Cavan	pc	122-127		
Clare	pc		152	
Cork	pc	152		2.03
Donegal	p	na		
Dun Laoghaire/Rathdown	c	191		
Fingal	c	free		
Galway	p	229		
Kerry	c		178	
Kildare	p		146	
Kilkenny	p		190-198	1.59-1.90
Laois	p		152	1.65
Leitrim	p	152		
Limerick	pc	83-165		
Longford	p		152	1.27
Louth	p		213	
Mayo	pc		152	
Meath	p		190-213	1.97-2.03
Monaghan	p		122-213	
Offaly	p			1.65
Roscommon	p		152-213	
Sligo	p		145-184	
South Dublin	pc	free		
Tipperary North	p	145-190		1.65-2.16
Tipperary South	pc	152		
Waterford	pc		183	1.52-1.65
Westmeath	b		54	
Wexford	c		152-190	1.97
Wicklow	p		152-178	1.52-2.03
County Borough Corporations				
Cork	c	152		
Dublin	c	free		
Galway	pc	152		
Limerick	p	na		
Waterford	c			2.54
Borough Corporations				
Clonmel	c	140		
Drogheda	c	140		
Kilkenny	c	152		
Sligo	c	127		
Wexford	c	124		

Authority	Type[1]	per year overall[2] (Euro)	per 240 litre bin yearly (Euro)	per tag or bag (Euro)
Urban District Councils				
Arklow	p	165		1.90
Athlone	c	95		
Athy	p	na		
Ballina	pc	152		
Ballinasloe	p		141	
Birr	p		190	1.65
Bray	p			1.90
Buncrana	p	99		1.90
Bundoran	p	na		
Carlow	p	193		1.27
Carrickmacross	p	122		
Carrick-on-Suir	pc	121		
Cashel	c	133		
Castlebar	pc		152-165	2.22
Castleblaney	p	122		
Cavan	p	127		
Clonakilty	c	152		
Clones	p		122	
Cobh	pc	152		
Dundalk	p	127		
Dungarvan	c	132		2.54
Ennis	c		114	
Enniscorthy	c		210	
Fermoy	c			2.03
Kells	p	190		
Killarney	pc	146		
Kilrush	p		127	
Kinsale	pc	152		
Letterkenny	p	na		
Listowel	c	157		
Longford	p		152	
Macroom	p	140		
Mallow	c	102		
Middletown	c	152		
Monaghan	c	114		
Naas	p		152	
Navan	p		190	1.97
Nenagh	p		145-165	1.65-2.16
New Ross	c		204	
Skibbereen	c	152		
Templemore	p		145-190	1.65-2.16
Thurles	pc			1.59
Tipperary	c	121		
Tralee	c	184		
Trim	p		190-213	1.97-2.03
Tullamore	p		190-198	1.65
Westport	c		152	
Wicklow	p	178		
Youghal	c	152		

1. Type refers to the source from which the data derives. 'p' refers to a private operated waste service and 'c' refers to a council operated waste collection service.
2. Where information was not available/supplied, this is indicated by 'na'.

Source: Consumer Choice, October 2000