An Phríomh-Oifig Staidrimh
Central Statistics Office

Standard Report on Methods and Quality for Environment Taxes 2020

Standard Report
on
Methods and Quality

For

Environment Taxes

This documentation applies to the reporting period:

2020

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1 Overview

Environmental Accounts is a satellite account within the European System of Accounts (ESA), a satellite account provides additional information on selected areas of specific interest. Environment taxes are a subdivision within Environmental Accounts concerned with estimating the amount of environment taxes paid annually by households and industries in the state. Environment taxes are compiled under EU Regulation (EU) 691/2011 and its amendment EU Regulation (EU) 538/2014. The official estimates of environment taxes for Ireland covering the years 2011 to 2020 are published in 2021 in this release. The principal environment tax statistics made available in this release relate to annual total taxes paid when Energy, Transport, Pollution or (natural) Resources are used in the state.

An environment tax is defined by the regulation as:
"A tax whose tax base is a physical unit (or a proxy of a physical unit) of something that has a proven, specific negative impact on the environment, and which is identified in the European System of Accounts as a tax."

In Ireland the source for environment tax data is the National Tax List (NTL) compiled for National Accounts. Using the definition certain taxes in the NTL are classified as environment taxes. Using a variety of data sources overall environment tax amounts are allocated to households and industries, with the industry amount further distributed across NACE Rev. 2 sectors at 2-digit (division) level – NACE Rev. 2 is the Statistical Classification of Economic Activity in the European Communities. Importantly, for national economic purposes this shows where the tax burden falls and how that burden changes over time. It also ensures that Ireland's classification of environment taxes is comparable with those of other EU member states. Accordingly, this information is particularly useful for informing policy on sustainable development goals and the green economy both nationally and at the EU level and more generally for monitoring developments in the wider economy.

2 General Information

2.1 Statistical Category

Environment Taxes are based on taxes classified as environment taxes in the NTL, this data is combined with internal CSO data sources and data from other miscellaneous sources to arrive at the detailed environment taxes estimates.

2.2 Area of Activity

Environment Accounts (EA).

2.3 Organisational Unit Responsible, Persons to Contact

Environment and Climate Division

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2.4 Objectives and Purpose; History

Environmental policy aims to reach national and international environmental and sustainable development goals. In this context the European Action Programme to 2020 calls for applying the polluter-pays principle more systematically, through phasing out environmentally harmful subsidies and shifting taxation away from labour and towards production. Here environment taxes can serve to discourage behaviour that is potentially harmful to the environment and can provide incentives to lessen the burden on the environment and preserve it by 'getting the price right'. The economic rationale for environment taxes comes from their ability to influence markets in a cost-effective way, unlike regulatory or administrative approaches aimed at changing how we impact on the environment. Accordingly, detailed environment tax data are needed to enable policy makers assess the environmental impact of a certain tax, such as the reduction in pollution resulting from the introduction of a new tax, and more importantly assess the proportion of overall tax burden that is environmental. This release provides key data within the overall framework of environment statistics that contributes to addressing these needs for Ireland.

2.5 Periodicity

Environment tax estimates are compiled annually.

2.6 Client

Environment tax estimates are compiled under EU Regulation (EU) 691/2011 and its amendment EU regulation (EU) 538/2014 for Eurostat. This release makes the estimates available nationally and internationally.

2.7 Users

National users: CSO, Environmental Protection Agency, Department of the Environment, Climate and Communications, Department of Finance, economic commentators, the media, third level educational institutions, the public at large.

International users: Eurostat, IEA and OECD.

2.8 Legal basis

The legal basis for the compilation of Environment Taxes statistics is under EU Regulation (EU) 691/2011 and its amendment in EU Regulation (EU) 538/2014. This provides a framework for the development of various types of environmental accounts (also called modules). Other modules cover air emissions, economy wide material flow accounts, energy accounts, environmental protection expenditure and environment goods and services sector accounts. In addition to these mandatory modules, there are two voluntary environmental accounts on forests and environmental subsidies and similar transfers.

3 Statistical Concepts, Methods

3.1 Subject of the Statistics

The basic data is taken from the NTL. It is the overall amount of tax paid under headings defined as environment taxes. The taxes statistics produced cover the following four main base categories:

- **Energy taxes (including fuel for transport):**

  This category includes taxes on energy production and energy products, including taxes on fuels for transport and stationary purposes. By definition, Carbon taxes are included as an Energy tax rather than a Pollution tax, largely to aid international comparability. In Ireland's case, taxes on transport fuels make up the bulk of energy taxes.

- **Transport taxes:**

  This category includes taxes related to the ownership and use of motor vehicles. In Ireland this mainly relates to Vehicle Registration Tax (VRT) and Motor tax.

- **Pollution taxes:**
  This category includes taxes levied on emissions to air and water, management of solid waste and noise. Carbon taxes are not included in this category.

- **Resource taxes:**
  Included are taxes linked to the extraction or use of natural resources. Taxes on land are generally not included, nor are taxes designed to capture the resource rent from the extraction of natural resources.

3.2 Units of Observation/Collection Units/Units of Presentation

There is no unit level data. Input data included are annual macro-economic NTL tax aggregates for the economy of Ireland classified by main tax base and further broken down by tax type. These aggregates are distributed across NACE Rev. 2 sectors to provide the outputs; these are a detailed estimate of annual environment taxes for households and industries at NACE Rev 2, 2-digit (division) level across the state.

3.3 Data Sources

The main data sources are the NTL, the Use table from Supply-Use tables compiled by National Accounts and the Business Energy Use (BEU) survey results. National Accounts Division in the CSO compile the NTL and Use tables while BEU statistics are available internally in Environment and Climate division. All these data sources are aggregate data.

BEU statistics available from 2009 onward replace certain estimates previously compiled using CO_2 Emissions data from that point forward. These survey estimates provide a more robust distribution of fuel use in the Irish economy. Nonetheless, this methodological improvement has introduced a significant discontinuity in the Environment Taxes estimates between 2008 and 2009.

3.4 Reporting Unit/Respondents

Not applicable. No unit level data is collected.

3.5 Type of Survey/Process

Environment Taxes are estimates compiled by a process that involves weighting NTL aggregates using weights derived from Supply-Use tables and BEU aggregates for the relevant year. The weights applied depend on the type of tax, for example Energy taxes use both aggregates as weights while BEU aggregates are applied to fuels only.

3.6 Characteristics of the Sample/Process

The key characteristic of the estimation process is that it is primarily based on the methodology set out in the Eurostat publication, “Environmental taxes - a statistical guide, 2013 edition”. The guide emphasises an administrative data approach to estimate environment taxes based on applying the Use table; the Supply-Use tables are published annually by CSO - see https://www.cso.ie/en/statistics/nationalaccounts/supplyandusetablesforireland/

The Use table associates products (on rows) with the industries (on columns) that use those products. It gives the amount spent (in thousands of Euros) in making a product or providing a service by a specific industry. Both the product and industry classification used is NACE Rev. 2 at 2-digit level. Thus, for example, a cell in the Use table might specify the amount spent in delivering say rental and leasing services (NACE 77) by say the wholesale trade (NACE 45) industry.

More specifically, only relevant products (rows) are selected from the Use table to create weights for distributing NTL aggregate tax amounts. For example, for certain energy taxes Electricity and Gas (NACE 35) production is the row of the table chosen to compute weights to distribute the aggregate amount of tax across each industry using that product. This approach will be elaborated further below.

3.7 Survey Technique/Data Transfer

Not applicable.

3.8 Questionnaire (including explanations)

Not applicable.

3.9 Participation in the Survey

Not applicable.

3.10 Characteristics of the Survey/Process and its Results

The key characteristics of the estimation process are outlined in subsection 3.6 above.

The results published and disseminated are a distribution of NTL environment tax aggregate amounts paid by type of tax at NACE Rev. 2 at 2-digit sector level of the tax payer. The results are publicly available on the CSO's website - see https://www.cso.ie/en/statistics/environmentaccounts/environmenttaxes/

3.11 Classifications used

NACE Rev. 2 classification.

3.12 Regional Breakdown of Results

The statistics compiled and published refer to Ireland as a single regional unit.

4 Production of the Statistics, Data Processing, Quality Assurance

4.1 Data Capture

Not applicable.

4.2 Coding

Not applicable.

4.3 Data Editing

Not applicable.

4.4 Imputation (for Non-Response or Incomplete Data Sets)

Not applicable.

4.5 Grossing and Weighting

Not applicable.

4.6 Computation of Outputs and Estimation Methods Used

4.6.1 General observations

Detailed annual estimates of environment taxes are compiled in two parts as follows:

- Non-Fuel taxes
- Fuel taxes

These are added together to arrive at annual estimates of environment taxes classified by environment tax type and NACE Rev.2 industry sector of the payee. All computations and analysis involved are undertaken using SAS software.

4.6.2 Non-Fuel Taxes

Table 1 shows how individual NTL tax base headings within NTL environment tax types are associated with NACE Rev 2. product headings. The identification of individual tax bases by type of tax was accomplished jointly by National Accounts Division and Environment and Climate Division in CSO.

For each tax listed in the body of Table 1 the associated NACE Rev 2. product manufactured or service delivered that is primarily responsible for the tax burden is identified, specifically the column heading in Table 1. The corresponding row in the Use table (UT) is extracted and weights for each NACE Rev. 2 industry involved in making this product or delivering this service are computed. Specifically, the weights are the contribution in the relevant row of UT of each industry to the total for that row including the household amount. Denoting the (€'000) amount in cell (i, j) of the UT by u_{ij}, the industry weight w_{ij} for industry j ($j = 1 \cdots J$) relating to the use of the product in row i is

$$w_{ij} = \frac{u_{ij}}{\sum_{j=1}^{J} u_{ij} + h_i}$$

where h_i is the amount spent in household consumption (Personal Consumption Expenditure) of product in row i. Where tax exemptions exist, or the use is clearly not related to final consumption of the product the amount in cell (i, j) of the Use table (u_{ij}) is set to zero, the use of motor vehicles within the motor trade being an example. The zeroing of Use table components in the computations is accomplished via multiplying the u_{ij} value by a corresponding binary indicator value (0 or 1) separately maintained in an 'inclusion table'. With the appropriate weight computed for a specific tax in each row k and product in column i in Table 1 (e.g. cell $(2,1)$ is Carbon tax), the amount of this tax attributable to industry j, denoted by tax_{kij}, is

$$tax_{kij} = w_{ij} * tax_{ki}$$

This provides a breakdown of environment taxes by tax type, product and industry, aggregating over products i we obtain estimates of tax paid by industry sector of payee for non-fuel taxes. Note the use of the inclusion table permits this procedure to be applied *mutatis mutandis* to pure household taxes such as Motor Tax (households), here in the inclusion table we simply set all industry indicator values to zero and the household value to 1, this automatically assigns the full tax to households within the estimation procedure.

Table 1: NTL Tax headings classified by NTL Environment Tax Type and NACE Rev 2. Product

		NACE Rev 2. Product					
		Coke and refined petroleum products (19)	**Motor vehicles, trailers and semi-trailers (29)**	**Electricity, gas, steam and air conditioning supply (35)**	**Waste collection, treatment and disposal activities; materials recovery (38)**	**Air transport (51)**	**Households**
NTL Environment Tax Type	**Energy**	National Oil Reserves Agency Levy		ElectricityTax			
		Carbon Tax		Public Service Obligation Levy			
	Transport		Vehicle Registration Tax			Air Travel Tax	Motor Tax (Households)
			Motor Tax (Business)				Vehicle Driving Licence Expenses
	Pollution				Land Fill Levy		Plastic Bag Levy
	Resource						Fishery Levy

4.6.3 Fuel Taxes

Fuel taxes are designated as a type of Energy tax. Estimates of fuel taxes follow along similar lines to non-fuel taxes outlined above subject to a few notable differences. Firstly, the business versus household distribution of a fuel tax is computed from Personal Consumption Expenditure data. For their own purposes Personal Consumption Expenditure within the National Accounts separately allocate fuel taxes to businesses or households. We take the relative proportions of these amounts and apply it to each tax, *e.g.* excise duty on petrol (light hydrocarbon oils) – Personal Consumption Expenditure data is not directly used in our computations as our tax amounts are compiled on an accrual's basis while taxes in Personal Consumption Expenditure are based on receipts, the differences are however small. The business portion of the tax is then estimated using the Use table procedure outlined above (with households excluded) for fuels for heating or powering stationary machinery. Motor vehicle fuel taxes are estimated using weights derived from the BEU survey results from 2009 forward – BEU results by fuel-type (petrol or auto-diesel) are available by NACE Rev. 2 (2-digit division level). Here the fuel weights, labelled fw, are straightforwardly computed from the estimated value of BEU fuel-type, labelled e_j, in industry j ($j = 1 \cdots J$) as

$$fw_j = \frac{e_j}{\sum_{j=1}^{J} e_j}$$

The business amount of fuel tax of type m ($m = 1: Petrol,\ 2: Diesel$) attributable to industry j, denoted by tax_{mj}, is then computed as

$$tax_{mj} = fw_j * tax_m$$

4.6.4 Final environment tax estimates

Estimated non-fuel and fuel environment taxes are added to arrive at overall estimated environment taxes. Resulting estimates are held as Excel files and are available by environment tax type and NACE Rev.2 industry division of the payee. The outputs required for the release and for Eurostat are generated from these Excel files.

4.7 Other Quality Assurance Techniques Used

A key aspect of the estimation is that the overall environment tax amounts are taken from the NTL, these control totals are maintained throughout the estimation procedure.

Year-on-year comparisons are made to the estimates produced to ascertain whether continuity of the estimate may raise concerns. When this occurs, intervention to adjust the weights in the process is considered. In 2016 an intervention of this form was deemed necessary for certain industries using products from the Renting & Leasing (NACE 77) division due to local year-on-year movement in certain Use table cell values.

Prior to publication, some further manual checking is also carried out to ensure the robustness of the estimates.

5 Quality

5.1 Relevance

The key driver for the compilation of environment tax estimates comes from the need of policy makers to assess the environmental impact of a certain tax, such as the reduction in pollution resulting from the introduction of a new tax, and importantly assess the proportion of overall tax burden that is environmental. This release provides key data within the overall framework of environment statistics that contributes to addressing these needs for Ireland.

In the international context these data are needed to fulfil Ireland's requirements under EU Regulations (EU) 691/2011 and (EU) 538/2014, specifically the 'module' on environment taxes. This contributes to the development of a satellite account for the environment sector. The principal environment tax statistics are annual total taxes paid for Energy, Transport or Pollution and Resources uses in the state.

5.2 Non-sampling effects

5.2.1 Quality of data sources used

The data used by the procedure comes from administrative source within CSO. Accordingly, these data sources are highly reliable.

5.2.2 Register coverage

Not applicable.

5.2.3 Non-response

Not applicable.

5.2.4 Measurement errors

Not applicable.

5.2.5 Accuracy and Reliability

5.2.5.1 General Observations

The estimation is based on maintaining overall environment tax amounts from the NTL as control totals throughout the estimation procedure. The procedure itself follows the guidelines set out in the Eurostat publication, "Environmental taxes - a statistical Guide, 2013 edition". The Irish specific estimation procedure has been coded in SAS, this approach ensures the data and programming are maintained separately (unlike an Excel based solution). Thus, new data that might involve revisions can be readily incorporated without contaminating the procedural aspects of the estimation. Accordingly, the estimates are considered reliable

5.2.5.2 Forecasts

Use tables are normally compiled 3 years after the period in question in accordance with Eurostat requirements. Accordingly, for taxes estimates provided in this release for 2020 the latest available Use table relates to the year 2017. This means that it is necessary to forecast Use tables for the most recent three years, namely 2018 through 2020. Forecasts ahead for each cell in the Use table, that is for each product by industry cell combination (both at NACE Rev.2, 2-digit division level) are made; about 8,000 individual series are forecast. A simple univariate forecast procedure based on an Integrated Moving Average Model of Order 1 (IMA (1)) has been found most stable and reliable given the very short length of the series (18 annual data points from 2000 to 2017). We generate a sequence of IMA (1) values for each cell in each year and take the growth rate from the final two years (e.g. 2016 to 2017) to forecast future cell values for the years 2018 through 2020. Thus, if T denotes the last year the Use table has been compiled, we compute the forecast of the value in product by industry cell (i, j) of the UT at time $T + k$ as

$$u_{ij,T+k} = u_{ij,T+k-1} * g_{ij,T} \qquad (k = 1,2,3)$$

where the growth rate in the cell computed from the IMA (1) model. We further smooth the forecast cell values by applying a Quasi-Independence model to each forecast Use table to dampen noise associated with very small unstable forecast values in each annual forecasted Use table.

We note this procedure is an improvement on the simpler weighted growth rate procedure used prior to 2019, as it incorporates a smoothed growth rate estimation from the IMA (1) model followed by Quasi-Independence table fitting to reduce the influence of shocks arising from estimating small cell growth rates.

5.2.5.3 Back-casts of Use Table and environment tax estimates

Back-casts to years prior to 2011 are available in earlier releases.

By way of background, the procedure to generate back-casts for the year 2000 through 2007 is outlined in the following two paragraphs.

To comply with the spirit of EU Regulation (EU) 691/2011 and its amendment EU Regulation (EU) 538/2014 we have endeavoured to make available a continuous series of environment tax estimates from 2000 onward. To facilitate this, it has been necessary to compile the Use tables for 2000 to 2007 under the NACE Rev. 2 classification as Use tables for those years are currently only published in Ireland under the older NACE Rev. 1.1 classification of economic activity.

The methodology used to compile Use tables under NACE Rev. 2 for 2000 to 2007 is not trivial. Manifestly, values for activity codes headings with a one-to-one match are copied directly, about 2/3rd's of all matches are of this type. Where mismatches occur two methods are adopted. Specifically, many-to-one matches from NACE Rev. 1.1 to Rev 2. are simple aggregations. For one-to-many activity code headings matched from Rev. 1.1 to Rev 2 a split of the Rev. 1.1 amount was needed. The weights used to allocate the single NACE Rev. 1.1 amount in the Use table to many NACE Rev 2 amounts was derived from the corresponding split of the United Kingdom's Use table for the relevant year. Because of the two-way structure of the Use table the allocation was applied both row wise and column wise to arrive at a valid two-way allocation. This highly intricate procedure was programmed in SAS to ensure the structure of the two-way transformations applied were identical across all years 2000-2007, in other words only the within year weights changed from year to year. The resulting NACE Rev. 2 Use table was then used as described earlier to compile the environment taxes estimates for the years 2000 to 2007.

5.3 Timeliness and Punctuality

5.3.1 Results

The results arising from this procedure are required to be sent to Eurostat within 21 months of the end of the year to which the figures relate. We endeavour to make available the release of the estimates nationally as soon as practicable before the 21 month deadline has elapsed. Indeed, estimates for 2014 and subsequent years have been released in under 8 months from the end of relevant year.

5.4 Coherence

As stated earlier a key aspect of the estimation is that the overall environment tax amounts are taken from the NTL, these control totals are maintained throughout the estimation procedure. Year-on-year comparisons are made to the estimates to ensure reasonable continuity over time.

5.5 Comparability

The statistics are compiled to meet, to the greatest extent possible, the recognised statistical standards recommended by Eurostat as set out in their publication, "Environmental taxes - a statistical Guide, 2013 edition". Accordingly, they are

regarded as being methodologically sound and therefore comparable over time and between those countries subscribing to the methodology. However, Use tables are country specific and so reflect specific shocks that occur in that economy, irrespective of whether those shocks are anticipated or not. Statistical comparisons over time and across countries should therefore be made with care.

5.6 Accessibility and Clarity

5.6.1 Assistance to Users, Special Analyses

The release and background notes are available on the CSO website at 11am on the release day.
The release calendar is published on the CSO website:
https://www.cso.ie/en/csolatestnews/releasecalendar/

The release presents data across 5 Tables. Table 1 presents the total environment taxes from 2011, broken down by category of environment tax and individual tax type. Tables 2 to 5 present the environment tax categories broken down by the NACE Rev. 2 economic activity of the payee.

5.6.2 Revisions

Revisions are made annually as more up to date Use tables become available. Indeed, the need for annual revisions based on more up to date Use tables is highlighted in the Eurostat publication, "Environmental taxes - a statistical Guide, 2013 edition".

The National Car Test levy now includes the Commercial Vehicle levy from 2013 forward, while an updated method for calculating Carbon Credits within the National Accounts has led to a revision of the Carbon Credits figures from 2012 forward.

5.6.3 Publications

5.6.3.1 Releases, Regular Publications

The Environment Taxes Release is available at:
https://www.cso.ie/en/statistics/environmentaccounts/environmenttaxes/

5.6.3.2 Statistical Reports

None

5.6.3.3 Internet

https://www.cso.ie/en/statistics/environmentaccounts/

5.6.4 Confidentiality

Certain key data used to compile environment taxes, such as the Supply-Use table, are available on the CSO website. Other data are available internally in CSO, these are confidential and so in accordance with Statistics Act, 1993 cannot be accessed under the terms of the Freedom of Information Act, 1997. Such data are not disclosed by the CSO to any other Government Department or outside body.

6 Additional documentation and publications

The Eurostat publication, "Environmental taxes - a statistical Guide, 2013 edition" is available at

http://ec.europa.eu/eurostat/documents/3859598/5936129/KS-GQ-13-005-EN.PDF