Environmental protection expenditure (EPE) survey QMI

Quality and Methodology Information for the environmental protection expenditure survey, detailing the strengths and limitations of the data, methods used, and data uses and users.

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1 . Output information

- National Statistic
- Frequency: Annual
- How compiled: Environmental Protection Expenditure Survey
- Geographic coverage: UK
- Last revised: 13 June 2023

2 . About this quality and methodology information report

This quality and methodology report contains information on the quality characteristics of the data (including the European Statistical System five dimensions of quality (PDF, 3MB)), as well as the methods used to create it.

The information in this report will help you to:

- understand the strengths and limitations of the data
- learn about the existing uses and users of the data
- understand the methods used to create the data
- help you to decide suitable uses for the data
- reduce the risk of misusing data

3 . Important points

This report aims to provide users of the Environmental Protection Expenditure (EPE) Survey with information on the usability and fitness for purpose of these estimates.

The EPE Survey estimates form part of the Office for National Statistics (ONS) Environmental Accounts. This is part of a set of documents covering the UK Environmental Accounts estimates.

The EPE accounts, which capture estimates of expenditure, output, and use by government, businesses and households, are also produced by the ONS and have a separate Quality and Methodology Information report.

There is quality and methodology information available for other UK Environmental Accounts estimates, including:

- Air emissions
- Energy use
- Material flows
- Environmental goods and services sector
- Environmental taxes
- Environmental protection expenditure accounts

4 . Quality summary

Overview

Environmental protection expenditure (EPE) refers to the amount of economic resources devoted to all activities that have the prevention, reduction and elimination of pollution and of any other degradation of the environment as their main purpose. Measuring the financial commitment of an economy to environmental protection helps us to:

- evaluate how environmental protection costs influence international competitiveness
- assess the cost-effectiveness of environmental control mechanisms

The EPE accounts are also produced by the Office for National Statistics (ONS) and have a separate Quality and Methodology Information (QMI) report. Estimates from the EPE Survey are used in the EPE accounts. They form part of the environmental accounts, which are defined within the United Nations (UN) System of Environmental-Economic Accounting (SEEA) (PDF, 2.6MB). The SEEA is the internationally agreed standard for concepts, definitions, classifications, accounting rules and tables for producing accounts on the environment and its relationship with the economy. The SEEA uses concepts, definitions and classifications consistent with the UN System of National Accounts; this enables comparisons of the results of the environmental-economic accounts with the aggregates of the national accounts.

A range of EPE statistics is published and available to download from our UK Environmental Accounts publications and accompanying datasets, including:

- Environmental protection expenditure by industry, which presents estimates from the EPE Survey
- Environmental protection expenditure by general government (both central and local government)
- Environmental protection expenditure accounts (including expenditure, output and use by general government, businesses and households)

The main data source for EPE by general government is estimates of the General government annual expenditure , which are available broken down by Classification of the functions of government (COFOG).

This QMI report will primarily focus on the EPE Survey. The EPE accounts have their own QMI report.

Users and uses

The potential uses for data come from a variety of international organisations, UK and other governments, and the research community.

Environmental protection expenditure data can be used by policymakers to assess the environmental impact of economic activities (resource consumption, air or water pollution and waste production) and to assess the actions (investments, technologies and expenditure) that are taken to limit the causes and risks of pollution.

5 . Quality characteristics of the EPE data

Geography

Estimates of environmental protection expenditure (EPE) by general government and industry are available at a UK level and not further disaggregated by geography.

Coherence and comparability

Estimates of EPE by industry and general government are comparable over time. However, the time series is subject to revision if there are methodological improvements, changes to reporting requirements or data revisions from suppliers.

It should be noted that the EPE Survey, used to provide EPE by industry estimates, migrated from the Department for Environment, Food and Rural Affairs (Defra) to the Office for National Statistics (ONS) in 2015.

Prior to 2015, data were collected by a Defra survey in 1994 (pilot), 1997, and then annually between 1999 and 2013. In 2016, the survey migrated to the ONS and was despatched in September 2016 to collect data for 2015. As a result of the migration, no data were collected for 2014. Results from the EPE Survey from 2015 onwards are not comparable with previous data because of differences in the methodology between Defra and the ONS.

Specific differences include:

- the 2013 EPE commissioned by Defra sampled 1,166 companies and had a response rate of 21%; in contrast, the 2017 EPE Survey despatched by the ONS sampled around 3,000 businesses and achieved a response rate of 74%
- a number of questions were removed when the Survey migrated to the ONS
- the layout and wording of the form was changed

In 2016, a question was added to the ONS EPE Survey to obtain estimates of external operational expenditure. Before this, information was collected only on in-house operational expenditure (please see Annex 1 for definitions). From 2016, the survey collected information on the profits from the disposals of any capital assets that had been used for environmental protection purposes.

Time series of data are available in our EPE by general government dataset and our EPE by industry dataset.

Timeliness and punctuality

The ONS aims to publish EPE by general government and industry two years after the reference period. For example, 2017 data are published in 2019. The ONS aims to publish the data in the most timely manner available.

For more details on related releases, the ONS release calendar is available online and provides 12 months' advance notice of release dates. If there are any changes to the pre-announced release schedule, we will draw public attention to the change, and the reasons for the change will be explained fully at the same time, as set out in the Code of Practice for Statistics.

Concepts and definitions

The United Nations (UN) System of Environmental-Economic Accounting, the UN System of National Accounts, and the European System of Accounts (ESA) provide a framework for producing internationally comparable statistics on the environment and its relationship with the economy. EPE information is reported broken down by Classification of Environmental Protection Expenditure (CEPA) classification.

EPE supports understanding of society's response to the challenge of environmental degradation and depletion of natural resources, and the potential for economic activity to be based on environmentally friendly activities.

It is important to note that a low level of EPE does not necessarily mean that a country's government or industries are not effectively protecting the environment. If investment has been previously made in equipment that reduces or cleans waste products, then the cost of maintenance of these will be small compared with the cost of introducing new equipment.

Where investment has been made in equipment that is integrated within a production process, only the additional cost over and above equivalent but less environmentally friendly equipment is included in the estimates provided. By contrast, the total cost of any equipment that is not integrated into a production process is included in the estimates. This means that if governments or industries have more focus on reducing and cleaning pollution as part of their production process, their expenditure is likely to be less than for those that do not change their production processes and instead focus on cleaning the pollution produced by them.

6 . Methods used to produce the EPE data

We use the Environmental Protection Expenditure (EPE) Survey to provide estimates of EPE by industry.

The main data source for EPE by general government is estimates of the General government annual expenditure , which are available broken down by Classification of the functions of government (COFOG). Data on current expenditure, subsidies and capital investment are used. Our Environmental protection expenditure: general government dataset is different from the estimates of general government in the EPE accounts. The calculations used in the accounts are given in the EPE accounts Quality and Methodology Information report.

The EPE Survey was designed to collect information on how much industries spend on protecting the environment. The EPE Survey focuses on four types of expenditure (please see Annex 1 for detailed definitions), which are:

- external operating expenditure
- in-house operating expenditure
- end of pipe capital expenditure
- integrated capital expenditure

The EPE Survey also collects profits made from disposal of capital assets that have been used for environmental protection purposes.

The target population for the survey is specified by Eurostat as including the following industries:

- mining and quarrying (B)
- manufacturing (C)
- electricity, gas, steam and air conditioning supply (D)
- water collection (E36)

For more information on industry classification, please see the current Standard Industrial Classification (SIC) used in classifying businesses and other statistical units.

Paper questionnaires are sent to the approximately 3,000 UK businesses that are selected using the Inter-Departmental Business Register (IDBR) as the sample frame. The design is a stratified single-stage random sample, with the target population being stratified by industry and employment size. Sample selection occurs independently within each stratum.

All businesses with 250 employees or above are selected, together with a random sample of businesses from each of the other strata, defined by two-digit SIC 2007 industry and employment size band.

All responses that fail edit rules are investigated and queried with the respondent to validate the responses and obtain explanations for data anomalies. Sources such as IDBR and business websites are also used to investigate data. Various quality assurance exercises, such as validating nil returns via telephone calls directly with the businesses, are also carried out.

Non-response can lead to a reduction in the precision of estimates and undermine the data's usefulness for users. Unit (total) non-response is dealt with via weighting. Item (partial) non-response is dealt with through imputations.

Imputation methods are based fundamentally on other survey variables that serve to predict the values or distribution of plausible values of the target variable(s) being imputed (the imputation classifications). Typically, the imputation classifications will consist of other variables from the survey that have two fundamental properties: they should account for any non-response bias identified in the data, and they should be good predictors of the target variable(s). Poorly specified classifications will lead to error or bias in survey estimates.

Businesses that have provided valid responses are divided into imputation classes and the median value for the complete and valid returns in the imputation class is calculated. This value is used to replace the missing value for the businesses that have not provided valid responses within the class.

It is important that the imputation class has enough responders' complete returns to enable imputation calculations to give a fair result. Otherwise, one very large or small response could have a big impact on the quality of the imputed values. An imputation class has to hold at least 10 responders that have provided complete returns. Where this is not the case, the next priority order class would be applied.

Sample respondents are weighted to represent a number of non-sampled businesses within the same stratum. The expansion estimator, also known as the Horvitz-Thompson estimator, is used to estimate total expenditure on environmental protection. Expansion estimation accounts for the survey design via the probabilities of selection. The sample total is expanded up to the size of the population by multiplying the sample total by the ratio of the number of businesses in the population divided by the number of businesses within the sample. The resulting weighted responses are then aggregated.

Disclosure control

Our Statistical Disclosure Control Policy sets out the standards for safeguarding the information provided in confidence to us. "Disclosure control" refers to the methods that reduce the risk of confidential information being published in any official statistics. These methods are applied if ethical, practical or legal considerations require the data to be protected. Disclosure control involves modifying data so that the risk of identifying individuals is reduced; at the same time, it attempts to find a balance between improving confidentiality protection and maintaining an acceptable level of quality in the published data.

Accuracy

As in all surveys, the estimates in the EPE Survey are subject to various sources of error. The total error in a survey estimate is the difference between the estimate derived from the data collected and the true (unknown) value for the population. The total error consists of two main elements; these are the sampling error and the non-sampling error. The EPE Survey was designed to minimise these errors.

Sampling error

This occurs because estimates are based on a sample rather than a census of the population. The results obtained for any single sample may, by chance, vary from the true values of the population, but we would expect the variation to be zero on average over a number of repeats of the survey. Sampling error is minimised through the use of a stratified random sample.

Non-sampling error

There is potential for non-sampling errors that cannot be easily quantified. These can be caused by coverage issues, measurement and non-response. Steps are taken to minimise non-sampling error. For example, returned information is run through a series of validation checks to identify any errors. Data that fail the validation checks are queried with respondents to confirm or correct the original data. Following dispatch of the questionnaire, up to two reminders are sent to businesses that have not responded. Response-chasing exercises are also carried out to increase the response rate.

Revisions to previous data may occur. Revisions are not uncommon during the first few years of a survey being conducted. Reasons for revisions include:

- the incorporation of additional data received from businesses who have been sampled in multiple years of the survey
- changes to data as a result of businesses revising their previous submissions
- developments in methodology and changes to the questionnaire

7 . Other information

More information on environmental protection expenditure (EPE) and topics related to UK Environmental Accounts is available, including:

EPE accounts quality and methodology information (QMI) report

UN System of Environmental-Economic Accounting

UK Environmental Accounts

Eurostat manual for EPE

Eurostat EPE estimates

Classification of Environmental Protection Activities information

8 . Annex 1: Types of expenditure captured by the Environmental Protection Expenditure Survey

The Environmental Protection Expenditure (EPE) Survey focuses on four types of expenditure as well as profits made from disposals.

External operating expenditure

This refers to operating costs paid to external organisations for treatment, disposal or investigation relating to waste water management, protection of ambient air and climate, and solid waste management. All other potential types of environmental protection expenditure are captured within the "other" category and may include expenditure aimed at the protection of soil or groundwater, noise abatement, protection of biodiversity or protection against radiation.

In-house operating expenditure

This refers to on-site management costs for the treatment, disposal or investigation relating to waste water management, protection of ambient air and climate, and solid waste management. All other potential types of environmental protection expenditure are captured within the "other" category and may include expenditure aimed at the protection of soil or groundwater, noise abatement, protection of biodiversity or protection against radiation.

End of pipe capital expenditure

This refers to capital expenditure for methods, technologies, processes or equipment designed to collect and remove pollution and pollutants after their creation. This might include investment in plants or equipment that treat generated pollutants, such as an effluent treatment plant or exhaust air scrubbing system, or investment in ensuring their safe disposal, such as a solid waste compactor.

Integrated capex

This refers to investment in methods, technologies and equipment that are integrated within the businesses' overall activity, where the primary aim of the expenditure is to reduce any pollutants generated. The expenditure captured here includes only the element that specifically relates to the additional cost of the environmentally friendly process compared with a cheaper and less environmentally friendly alternative. An example here would be the difference in the cost to a business of purchasing more precise cutting machinery, that led to the production of smaller amounts of waste, compared with the business purchasing cheaper but less precise cutting machinery that might lead to the production of larger amounts of waste.

Disposals

This refers to profits from the disposal of any capital assets that have been used for environmental protection purposes.