METHODS AND NOMENCLATURES

2002 EDITION

SERIEE

Environmental Protection Expenditure Accounts —

Compilation Guide

EUROPEAN COMMISSION

eurostat

THEME 2 Economy and finance

A great deal of additional information on the European Union is available on the Internet.
It can be accessed through the Europa server (http://europa.eu.int).

Luxembourg: Office for Official Publications of the European Communities, 2002

Table of Contents

List of figures

List of boxes

Elements of the Worked Example

List of tables

Preface

This user-friendly compilation guide to the 1994 SERIEE manual is one of the outputs of Eurostat's Environmental Accounting work. It contributes to various EU-wide and international activities in the context of national and environmental accounts, including the implementation of the European System of Accounts (ESA 1995) and the revision of the System of Integrated Environmental and Economic Accounting (SEEA).

This guide is designed to help compilers in the practical construction of environmental protection expenditure accounts. The guide shows how the SERIEE framework can be implemented in practice and what to do with available data. The guide also summarises the new developments since the publication of the 1994 SERIEE, including the new CEPA 2000, recommendations on connected and adapted products or the new NACE Rev. 1.1 and in this regard replaces the 1994 SERIEE manual.

Eurostat is publishing the results of SERIEE pilot applications in several countries together with this guide ('Environmental Protection Expenditure Accounts - Results of SERIEE pilot applications – forthcoming). Recently, Eurostat also published 'Environmental tax statistics - A Statistical Guide' (catalogue number KS-39-01-077-EN-N) which can be downloaded from the Eurostat website http://europa.eu.int/eurostat.html.

Both the pilot applications and the development of this Guide benefited from financial support provided by the European Commission's Directorates General Environment and Regional Policy, in the context of the Communication from the Commission to the Council and the European Parliament on Directions for the EU on Environmental Indicators and Green National Accounting - The Integration of Environmental and Economic Information Systems (COM(94) 670).

The development of the Guide was only possible due to the essential contributions made by the members of the Eurostat SERIEE Task Force. The Task Force met in January 1996, February 1997, March 1998, March 2000 and November 2000 to discuss issues related to SERIEE and to develop this Guide.

Special thanks are therefore due to the members of the SERIEE Task Force. Eurostat is particularly grateful for contributions provided by:

- Ole Gravgaard Pedersen (Statistics Denmark)
- Wolfgang Riege-Wcislo and Bernd Becker (German Federal Statistical Office),
- Daniel Desaulty, Nathalie Saillaux and Philippe Calatayud (IFEN - French Environment Institute),
- Federico Falcitelli (ISTAT - Italian Statistical Office),
- Egon Dietz and Henk Verduin (Statistics Netherlands),
- Ulf Johansson (Statistics Sweden),
- Gábor Valko (Hungarian Statistical Office).

This Guide greatly benefited from the results of a review of a draft version by Federico Falcitelli (ISTAT), Heike Mall (UK Office for National Statistics), Julie Hass (Statistics Norway) and last but not least Ulf Johansson (currently on detachment to Eurostat). The draft final version was used as training material at a TES course on environmental protection expenditure statistics and accounts in October 2001. Jenny King and Stephen Reynolds (UK DEFRA) and Federico Falcitelli, Gianna Greca and Giusy Vetrella (ISTAT) reviewed this draft final version. The Guide was prepared by Gerard Gié of Planistat Europe and Anton Steurer of Eurostat B1.

The work on environmental protection expenditure accounting is continuing at Eurostat together with the SERIEE Task Force. Work is focusing on further methodological development of SERIEE, on the links to physical data and on collecting data more regularly from more Member States.

Brian Newson
Head of Unit
National accounts methodology,
statistics of own resources

1. Introduction

1.1 Purpose and scope of the guide

In 1994 Eurostat published the SERIEE[1] manual which follows the recommendations of the Chapter XXI of the 1993 System of National Accounts (Commission of the European Communities et al 1993). The primary purpose of the 1994 SERIEE manual was to set out the conceptual framework for a monetary description of environmental protection activities. The 1994 SERIEE manual was elaborated under the auspices of Eurostat by a working group composed of representatives of Germany (StBA), Italy (ISTAT), The Netherlands (CBS) and France (IFEN).

Following the publication of the 1994 SERIEE manual, several countries engaged in pilot exercises in order to test the implementation of the SERIEE framework and in particular the Environmental Protection Expenditure Account (EPEA). In parallel, Eurostat started to collect data on environmental expenditure by industries and government from Member States. The EPEA pilot exercises showed that in statistical practice it is difficult to fully transpose and implement the 1994 SERIEE framework. Adjustments and simplifications are necessary for making compilation more practical.

This user-friendly compilation guide to the 1994 SERIEE manual is designed to help compilers in the practical construction of expenditure accounts. The guide shows how the SERIEE framework can be implemented in practice and what to do with available data.

The guide describes the tasks that a compiler of expenditure accounts normally performs. While the details will vary from country to country, these tasks will typically include the following:

- identify existing data sources,
- extract and organise these data,
- re-arrange the data and compile the EPEA tables and main expenditure aggregates,
- manage, publish and disseminate the EPEA data,
- evaluate data sources and contribute to their improvement,
- establish and maintain relations to basic data providers and to users.

The guide also summarises the new developments since the publication of the 1994 SERIEE, including the new CEPA 2000, recommendations on connected and adapted products or the new NACE Rev. 1.1 and in this regard replaces the 1994 SERIEE manual.

1.2 Uses of the guide

This guide was prepared to assist compilers in setting up the environmental expenditure accounts and the underlying data structure. The guide also helps compilers in understanding the various compilation methods and primary data sources and their links with the EPEA framework. EPEA compilers are typically either national accountants or environmental statisticians. This poses a challenge in that ideally compilers should be familiar with the conceptual background of both areas that are brought together in expenditure accounting. As this is not always the case, the guide explains the basics of both how to interpret and treat raw statistical data and how to produce expenditure accounts. Often, this guide will be sufficient as a reference handbook for compilers. References are provided to the 1994 SERIEE manual and to other publications to assist compilers. The 1994 SERIEE will be of particular use for setting up accounts by environmental domains. Compilers that are not yet familiar with national accounts will have to acquire a basic understanding of key national accounts concepts or obtain assistance from national accountants.

This guide is also addressed to providers of basic data and may be helpful to further improve the data. The guide may also be of interest to advanced users who wish to better understand the nature and quality of data sources and methods underlying the EPEA aggregates and figures, how the EPEA tables and aggregates are constructed and what they mean and how to use the results in analysis.

---

[1] European Commission 1994a. SERIEE stands for European System for the Collection of Economic Information on the Environment. The acronym comes from the French *Système Européen pour le Rassemblement des Informations Economiques sur l'Environnement. The SERIEE manual is available in French, English, German and Spanish.*

The need for a national compilation guide

Available data sources and their characteristics differ across countries. It is not possible to offer a standard EPEA compilation method that can be applied to the circumstances of all countries without adaptation. Instead, the guide outlines the various options that may be available. Countries have developed specific compilation procedures tailored towards policy demand and data availability at national level. Some patterns of best practices have emerged from experience so far but the focus can differ across countries, e.g., from a systematic use of national accounts data, to estimation procedures that make extensive use of physical data. Therefore, it is strongly recommended to document the country-specific characteristics of data sources and compilation methods in a national compilation guide.

1.3 Organisation of the guide

Chapter 2 briefly reviews the EPEA framework and its relationship with the System of National Accounts.

Chapter 3 focuses on the main methodological and practical developments since the publication of the 1994 SERIEE manual: lessons learnt from pilot exercises, classification issues and the relative importance of environmental protection domains.

Chapter 4 reviews the main data sources along four main axes: data derivable from national accounts, production statistics, government data and specific environmental expenditure surveys to industries. Other data sources, including physical data, are also explored.

In Chapter 5 the compilation of the EPEA tables is explained, starting from the primary data available. Specific attention is given to the supply and use of environmental protection services in the EPEA tables and to the calculation of the consumption of fixed environmental protection capital (needed to compile the monetary value of those environmental services that are not marketed).

Chapters 6 through 8 deal with the compilation process, including the EPEA statistical process, the publication of EPEA results and the ways for improving the EPEA.

1.4 A worked example

In this guide a realistic but fictitious worked example is presented. This presentation includes:

- organisation of environmental protection (Worked Example 1 in section 4.1.1)
- general description of data sources (Worked Example 2 in section 4.1.2)
- available data:
  - results of industrial surveys (Worked Example 3 in section 4.3.1)
  - other production statistics (Worked Example 4 in section 4.3.2)
  - analysis of government finance statistics (Worked Example 5 in section 4.4.1)
  - a database of municipal accounts (Worked Example 6 in section 4.4.1)
  - description of transfers (Worked Example 7 in section 4.4.1)
  - environmental tax data (Worked Example 8 in section 4.4.5)
  - results of expenditure survey (Worked Example 9 in section 4.5.1)
  - miscellaneous data (Worked Example 10 in section 4.6.6)
- the compilation of the tables:
  - the capital stock (Worked Example 11 in section 5.1.4)
  - calculating the uses of waste management services (Worked Example 12 in section 5.1.7)
  - calculating the uses of wastewater management services (Worked Example 13 in section 5.1.7)
  - compiling the production table (Worked Example 14 in section 5.1.7)
  - compiling the supply-use table (Worked Example 15 in section 5.2.2)
  - compiling the national expenditure table (Worked Example 16 in section 5.6)
  - compiling the financing table (Worked Example 17 in section 5.7.1)
  - compiling the net cost and environmental burden table (Worked Example 18 in section 5.9.2)
- worksheets and detailed calculation of EPEA tables (Annex 4).

In the Worked Examples the monetary values are in million euro. Differences may occur due to rounding. The tables presented in the Worked Examples are available in the form of linked Excel sheets on the Circa website (http://forum.europa.eu.int/Public/irc/dsis/pnb/library). The classifications mentioned in this guide can be viewed on Eurostat's Ramon server (http://europa.eu.int/comm/eurostat/ramon).

2. A quick overview

The EPEA provides a conceptual framework closely linked to the national accounts that describes environmental protection expenditure. Just like for expenditure on, e.g., research and development or health, one key purpose of the EPEA is to provide a consistently constructed and complete aggregate indicator of the total economic resources that a country uses for protecting the environment. This aggregate expenditure indicator is presented showing its key components and its evolution over time. Key components are environmental domains (air, waste, water, etc.), sectors of the economy (government, enterprises, households) and types of expenditure (current and capital expenditure).

The economic resources devoted to environmental protection are most easily measured in the form of *environmental protection services* (*EP services* for short) which are produced by units of the domestic economy and then used by resident units. Such EP services are e.g. waste and wastewater management services produced by specialist public and private units and purchased by households and firms, but they also include in-house measures undertaken by producers in order to reduce the negative impact of their activity on the environment, as well as non-market activities of government and non-profit institutions for environmental protection.

The main data sources are closely related to these three types of activities and cover: production statistics (production and supply of e.g. waste and wastewater management services by market producers), specific surveys on environmental protection expenditure by firms (in-house measures) and financial statistics and accounts (for the description of government outlays for environmental protection).

The guide explains how to go from the basic data to the tables and aggregates of the EPEA: current and capital environmental protection expenditure, financing of the expenditure and the net cost of environmental protection. Main data transformation steps are the transition from the outlays of government or producers to the output (the value of production) of EP services, then from output to uses and finally from uses to financing.

2.1 Indicators derivable from the data structure and accounts and other uses

The EPEA is structured in order to allow various indicators to be derived from the accounts. The first indicator is the basic aggregate of the EPEA: the national environmental protection expenditure with its two main components: current and capital expenditure. These aggregates can be related to national accounts aggregates such as GDP, final consumption and gross fixed capital formation to indicate the importance of environmental protection expenditure as a share of the overall resources and uses of the economy.

Environmental protection expenditure aggregates are also presented by environmental domain (e.g. air, waste, wastewater, etc.), by industry (e.g. environmental protection expenditure by the chemical industry), etc. Expenditure should also be related to physical data such as the amount of waste treated or the level of air emissions.

In order to serve the users of EPEA data it is essential to show how expenditures are related to environmental protection policies. Expenditure data should allow to follow, e.g., a country's waste or wastewater policies showing the changes in the costs for the collection and treatment of waste due to more stringent regulations, changes in government expenditure due to privatisation of wastewater management, or the changes in the structure of expenditure when new legislation leads to higher investments, etc.

2.2 Planning the work

Defining the statistical process for the compilation is essential. The statistical process covers all the steps from data extraction and collection to publication and analysis. This process should be integrated within the normal work of the national statistical system.

The key data sources used in the compilation have to be available in due time. Agreements for the delivery of data with the providers of data can be useful. These agreements may specify the type and structure of data, (eventual) treatment of basic data, time of delivery, etc. When data result from a survey conducted by the unit in charge of the compilation, it is important to include the planning of the survey (sending

questionnaires, reminders, entering and verifying data, etc.) within the planning of compilation work. Estimation procedures should be defined for missing data.

The planning of the work includes also the revision processes. Due to delays in the results of basic surveys or other statistics it may be useful to make provisional estimates. E.g. first estimates of national expenditure for reference year 'n' may be published at the end of year 'n+1'. These first estimates may then be revised, e.g. in the following year ('n+2'), when the final results of surveys or financial statistics are available, in order to arrive at the final expenditure data for year 'n'. Major revisions may occur from time to time, e.g. when compilation methods are adapted or new data sources become available. Major revisions typically require revision of longer time series of at least the main aggregates.

2.3 Finding data sources

Identification of data sources begins with a description of environmental protection activities and their organisation and institutional arrangement. Based on this the organisations and statistical units (or classes of units) involved in environmental protection are identified.

For government, this kind of information is often available in published form and can be refined based on government organisation charts and budgets. The names of departments or budget lines or articles give a first idea of the administrative bodies involved in environmental protection. Many institutions may be involved in environmental protection activities, although environmental protection is not their primary function (e.g. the Ministry of Agriculture may subsidise environmentally friendly agricultural practices, or the Ministry of Transport may finance the construction of anti-noise walls, etc.).

In a second step annual activity reports, budgetary documents or financial statistics for these departments or institutions are collected. Some information may be readily available (e.g. environmental R&D expenditure). The Government Accounts section of the national accounts department may have useful data as well. Sometimes it may be necessary to organise specific surveys about expenditure for environmental protection, covering, e.g., local governments.

For enterprises specialised in producing EP services such as waste or wastewater management services the main data sources are industrial production surveys and compilers have to approach the departments in charge of these surveys in order to know what data are available, their timeliness and periodicity. Most producers of EP services are classified in division 90 - Sewage and refuse disposal services, sanitation and similar services - of the NACE. It is important to check with the people in charge of industrial surveys whether producers classified in other divisions (e.g. division 41 – water supply) contribute substantially to the provision of environmental services.

Specific environmental expenditure surveys to industries are another main data source for enterprises. These surveys provide the primary data for in-house ('internal' or 'own account' or 'ancillary') environmental protection activities. Specific surveys often cover current and capital expenditure for environmental protection of the mining, manufacturing and electricity supply industries. As far as possible these surveys should be complemented with information and estimates for other industries (e.g. agriculture, construction, transport).

2.4 Arranging data into accounts

In general, the raw statistical data have to be treated and re-arranged into the EPEA accounts except when data from national accounts departments are available at a sufficiently detailed level.

In the case of specific industrial surveys, treatment may consist in grossing-up or expanding results to cover the whole field the compiler is interested in. As an example, for waste or wastewater management it may occur that some (groups of) producers are not covered by the surveys. In this case a specific assessment of these producers is necessary, e.g. based on the share of the population served or other information.

An essential step in data treatment is to estimate the value of environmental services produced (the output) in a way consistent with national accounts. Industry production statistics and national accounts data will directly provide the value of the output. For government and in-house activities of producers, the data

sources may only provide current and capital outlays. These outlays must be converted into the components of a national accounts production account, i.e. outlays for materials, energy or rent into intermediate consumption, wages and salaries into compensation of employees. In order to calculate the total value of output the consumption of fixed capital has to be estimated as well, e.g. using the national accounts procedures and assumptions.

In order to ensure consistency of the estimates, data have to be organised according to national accounts practices: systematic comparison of supply and uses, elimination of double counting when subcontracting is important, etc. Subsidies paid by government for environmental protection also have to be identified, as they may modify the value of the recorded output.

As for the compilation of any account, EPEA compilers will have to complement existing data with their own estimates based on all available information. This includes e.g. the use of physical data or of expert knowledge.

It is recommended to clearly document the transition process from raw data to accounts, including the sources, methods and assumptions used for grossing up the raw data, data conversion or correction coefficients and the procedures for estimating missing data.

2.5 Establishing a system

The compilation of EPEA tables and aggregates involves a series of steps:

- extraction and collection of raw data from internal or external providers,
- verification and storing raw data in databases,
- treatment of raw data and conversion to inputs for the EPEA tables,
- filling in EPEA tables and calculation of aggregates,
- analysis and verification of results,
- preparing the publications,
- revision of time series.

The use of computers allows to run some of these steps almost automatically. In particular, automatic procedures should allow the inter-linking of databases, worksheets and aggregate results, so that compilers can concentrate on the verification of raw data, analysis of results, assessing accuracy and preparation of the publications.

The usefulness of data sources may be enhanced by adapting classifications or definitions used, the coverage or timeliness of surveys, or simply by adjusting the way the data are encoded and aggregated originally.

3. The EPEA framework

3.1 Some key features of the EPEA framework

3.1.1 Objectives and main definitions

Main objectives

The main objective of the EPEA is to assess the actual expenditure for environmental protection made by the total economy, i.e. the economic resources actually used in order to prevent degradation or to restore the environment. This expenditure is presented by the sectors of the economy and by environmental domains. Such information provides indicators of the response of society to reduce pollution and is useful e.g. for explaining changes in pressures and in the state of the environment. One may suppose that, other conditions being equal, the pressures are lower and the state of the environment is better when measures are taken in order to prevent degradation.

The EPEA is a satellite account to the national accounts, designed to describe in a way consistent with the national accounts the transactions related to environmental protection and to allow links with physical data. The EPEA uses the national accounts concepts because the national accounts system makes sure that aggregate expenditure indicators are compiled in a consistent way, are complete and free of double counting. Simply adding up raw data would not achieve this purpose because of gaps in the coverage of primary data sources, overlaps in the expenditure recorded by different sources and differences in the price concepts used.

For policy purposes, additional information is necessary: who finance the expenditure, what are the consequences on production and employment, what is the net cost burden for different industries. E.g. the demand for wastewater collection and treatment leads to investments, intermediate consumption, employment, etc. Information on the expenditure for environmental protection can be used to analyse the consequences of a given policy on the level of different activities, the costs of production, employment, etc. In this way environmental policies can be based on sound cost-benefit analysis.

Definition and scope of environmental protection

Environmental protection groups together all actions and activities that are aimed at the prevention, reduction and elimination of pollution as well as any other degradation of the environment (1994 SERIEE § 2006). This includes measures taken in order to restore the environment after it has been degraded due to the pressures from human activities.

This definition implies that to be included under environmental protection, actions and activities or parts thereof must satisfy the primary purpose criterion (*causa finalis*), i.e. that environmental protection is their prime objective. Actions and activities which have a favourable impact on the environment but which serve other goals do not come under environmental protection. Hence, excluded from the field of environmental protection are activities which, while beneficial to the environment, primarily satisfy technical needs or the internal requirements for hygiene or security of an enterprise or other institution (1994 SERIEE § 2007).

Activities like water supply or the saving of energy or raw materials are regarded as the management of natural resources and are excluded from environmental protection. However, such activities are considered environmental protection activities to the extent that they mainly aim at environmental protection. An important example is recycling which is included to the extent that it constitutes a substitute for waste management (1994 SERIEE § 2008).

Definition and scope of aggregate national environmental protection expenditure

In a national accounts perspective, environmental protection expenditure (EPE) includes:

a) The domestic uses of EP products (goods and services). These EP products are either EP services (e.g. waste or wastewater collection and treatment services) or connected and adapted products (e.g. refuse containers, catalytic converters, lead free gasoline, etc.). Uses are either final uses (final consumption or capital formation) or intermediate consumption. EPE also includes the value of the EP

services produced in-house for internal use to reduce the environmental impact of the main production activities.

b) Domestic gross capital formation for environmental protection (investments for EP).

c) Those transfers for EP that are not already reflected in the expenditure recorded under the two previous categories. These are in particular subsidies, which lower the prices paid by the users of EP services. Ignoring these subsidies would result in an underestimation of total expenditure. However, in practice such subsidies are often not very important. In practical accounting transfers without a counterpart in basic data may also be important (e.g. government transfers designed to fund environmental protection to non-profit institutions, farmers or others when the expenditure of these beneficiaries are not surveyed). These transfers are also to be included in EPE when data on the EP expenditure of the beneficiaries are not available.

The sum of these components gives total domestic EPE. Adding transfers (financing) to the rest of the world and deducting transfers received from the rest of the world leads to total national EPE. This aggregate is constructed in a way that avoids double counting and makes the sum comparable with standard national accounts aggregates such as gross domestic product (GDP) or gross national income (GNI)[2].

Limitations

EPE measure the total economic resources devoted to environmental protection but there are measurement and data availability problems. Limitations due to lack of data are treated in detail in chapter 4 and are not further addressed here. Limitations due to measurement problems are briefly summarised below.

Not all environmental protection measures translate into actual expenditure. For example, limiting production in order to diminish the environmental degradation does not translate into expenditure recorded in national accounts, except when transfers are explicitly designed to compensate any corresponding economic losses (e.g., compensation for the reduction in income).

EPE do not describe all expenditure and activities that have a positive (side-)effect on the environment. A clear distinction must be made between purpose and effect. Actions undertaken for other than environmental purposes can have positive environmental effects. For example, new production equipment that is installed solely in order to increase productivity and reduce costs may use energy and materials more efficiently and as a side effect the discharges to the environment may also be reduced. The expenditure for this new equipment would not be included in EPE.

Actions that serve several purposes at the same time are either classified according to the principal purpose using a predominance principle or the environmental component (and the share of environmental expenditure in the total expenditure) must be estimated. This can pose measurement difficulties. For example, the assessment of expenditure related to integrated technologies (i.e. investment in cleaner production equipment which has both a normal production and an environmental protection purpose) or cleaner products (products that are cleaner when used, e.g. unleaded gasoline) may only be possible in comparison with the expenditure for ‘normal’ (i.e. dirtier) technologies and products. For international comparisons these reference products and technologies would ideally be the same. For inter-temporal comparisons they would ideally remain stable, even when changes occur (e.g. when leaded gasoline becomes prohibited).

3.1.2 An integrated supply-use framework

The objective of environmental expenditure accounting is not only to measure the economic resources used for environmental protection but also who is financing the use of these resources and which are the consequences in terms of production, employment, exports and imports and competitiveness for firms due to the environmental protection cost burden.

[2] For most countries the difference between GDP and GNI is very small and comparison with GDP will be sufficient. A more careful analysis may be appropriate for countries where the differences are large.

A set of integrated tables: supply, uses, financing and 'net cost'

The EPEA applies the principles of national accounts to provide a complete picture of environmental expenditure and activities. National accounts are a systematic way of recording economic transactions that occur in the economy. Due to the double entry accounting system, all flows are recorded twice, once as a resource and once as a use. It means that all transactions that enter environmental expenditure (the use side) are also recorded from the supply (resource) side: the goods and services must have been produced or imported, the transfers not only benefit a given unit, they also originate from another unit.

The EPEA provides a framework for the consistent integration of all available basic data on environmental expenditure and activities. It links the uses of goods and services with their supply, following the model of the national accounts supply-use tables. For each main category of EP services the supply and the use have to be equal. This identity is a powerful aid for consolidating data sources and compiling the accounts.

Often it is easier to find data on the production of EP services, e.g. from surveys of industry. In a few cases is easier to observe the uses (through e.g. household budget surveys). When supply and uses are both known, the combination of the two approaches allows to verify the consistency of the data. When only one source is available the aggregate picture can still be set up based on the identity of supply and uses, although in this case the reliability of this single data source cannot be verified.

The same considerations apply to the financing aspect. The unit that makes the expenditure may benefit from subsidies or capital transfers. In environmental protection, investment grants may be particularly important. Government, acting on behalf of the whole community, may choose to support the units that invest in environmental protection activities. The EPEA describes also the financing of EP expenditure. This allows to assess the application of the polluter-pays-principle. Transfers for environmental protection may be known from government budget analysis or from the databases of environmental funds. In some domains (e.g. protection of landscape and biodiversity) compensation transfers (e.g., specific transfers to farmers) are the only way to value the costs of environmental protection measures.

Links to national accounts

The EPEA applies the principles, rules and classifications of national accounts. This includes the valuation concepts and the definitions of transactions and aggregates used in the national accounts. Therefore, EPE results can be related with similar categories of national accounts. When the national accounts data are sufficiently detailed it is possible to use them directly for the EPEA. Basic data have to be converted in order to match national accounts definitions. For example, primary data on environmental protection outlays from public budgets often include items related to production and supply (e.g., salaries, income from sales of EP services), to uses (e.g., purchases of EP services) and to financing (e.g., investment grants given). These different categories must be allocated to the appropriate tables of the EPEA (i.e., supply, uses and financing). As another example, the consumption of fixed capital is not directly observed by statistical surveys, but is an important component of EPE for the part that is determined by the cost of production and also for the EPEA's net cost table (Table C1, see Figure 1 below). The consumption of fixed environmental protection capital is thus estimated, e.g. based on historical time series of investment following the same procedures as in the national accounts.

The elaboration of the EPEA may also help improving the national accounts. The detailed analysis of environmental protection can be used as a data source by national accountants, who generally have no time for such detailed examination of all domains.

Integration in environmental and economic accounting frameworks

The EPEA focuses on environmental protection expenditure, i.e. on a specific category of the relations between the environment and the economy. It is an integral part of wider environmental and economic accounting frameworks. As far as these frameworks are based on national accounts principles, they all start with the identification of the transactions related with environmental protection. The NAMEA–type approach directly integrates the expenditure for environmental protection within its representation of economic transactions. A separate chapter of the new Handbook on integrated Environmental and Economic Accounting (SEEA 2000) is devoted to environmental protection and resource management expenditure (London Group 2001). The OECD framework for Pollution Abatement and Control Expenditure (PACE) follows the same basic principles as the EPEA, although in a reduced form.

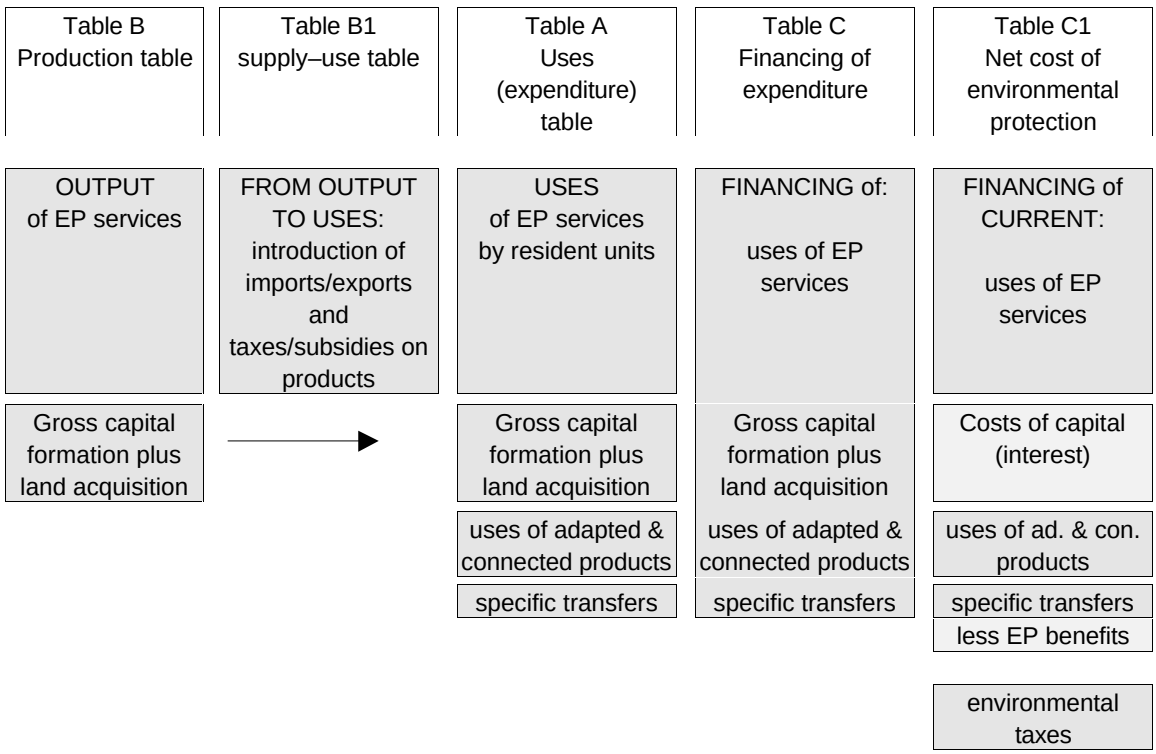
3.1.3 The set of EPEA tables

The EPEA framework includes a set of five interrelated tables (1994 SERIEE § 2168-2232) which describe:

- the supply (production) of EP services, and the way they are produced (Table B),
- the EP expenditure, i.e. the expenditure for the uses (consumption) of EP services and of connected and adapted products, for gross capital formation (investment) and some other transactions related with environmental protection (capital transactions and certain transfers) (Table A),
- a table integrating supply and uses of EP services (Table B1),
- the financing of EP expenditure (Table C),
- the net cost burden of environmental protection for the various sectors of the economy (Table C1).

The national expenditure aggregate is derived from Table A. In practice, compilation usually starts with the analysis of the production and supply of EP services and the investment needed for this production (Table B) because such information is most widely available and most reliable. Table B determines the supply of EP services. This supply is then complemented with available information on the uses in the integrated supply-use table (Table B1). These uses, together with some additional information (on certain transfers, on expenditures for connected products etc.) then allow to complete Table A and to determine national expenditure. Based on Table A, the financing and the net costs can be analysed (Tables C and C1). This compilation sequence (B -> B1 -> A -> C -> C1) follows a natural progression from a minimum set of data most often available in countries to more complete accounts that require additional sets of data and is known as the 'magic formula', originally developed by Mr. Lionel Doisneau at IFEN. Following this sequence, the set of EPEA tables is presented in Figure 1 below.

Figure 1 The set of EPEA tables



The starting point is the Table B which describes the domestic production of EP services and the gross capital formation (i.e., investment) of the producers. This gross (fixed) capital formation (GFCF) also includes the net acquisition of land. Except if otherwise specified, in the following, GFCF means GFCF + net acquisitions of land. Practical experience suggests that net acquisition of land is not very important at the aggregate level (less than 5% of GCF) but may be of some importance for a few domains (e.g., land purchased for nature protection in some countries).

The EP services produced are presented by type of output (market, non-market and ancillary output) and by main categories of producers of EP services: specialised and non-specialised producers. The upper part of Table B presents the inputs necessary for the production of EP services, i.e. the structure of the cost of production.

Table B1 presents supply and uses of the different categories of EP services. Some additions, subtractions and revaluations are made starting from domestic production:
(a) in principle imports are added and exports subtracted (for EP services rarely important),
(b) the value of output is made consistent with the value of uses by adding taxes on EP services (mainly by adding non-deductible VAT) and subtracting subsidies on these services (if any). This is necessary as uses are measured at purchasers' prices in statistics (i.e., the prices consumers pay) whereas output is observed at basic prices (the price the producer receives, excluding e.g. VAT).

Table B1 has two functions:
(a) it enables checking the consistency between data on the supply and data on the uses of EP services when these data come from different sources,
(b) it allows determining the uses when direct and independent data on uses are not available (or, which is far less frequent in practice, to determine the supply when data on uses are available but production data are missing).

Table A describes first the uses of EP services by categories of users and gross capital formation for EP activities. Then connected and adapted products and specific transfers not already included in the uses are added. Financing by the rest of the world is deducted in order to arrive at the **national expenditure for environmental protection** for each category of users or beneficiaries.

Table C describes the financing of national expenditure for environmental protection (calculated in Table A) for each category of user or beneficiary. Usually, the users finance their consumption themselves – deviations from this principle are mostly due to government transfers (e.g. investment grants for EP activities, subsidies) or due to taxes earmarked for environmental protection.

Table C1 calculates the net costs of environmental protection. Starting from the financing of current expenditure (Table C), the cost of capital are added and benefits derived from environmental protection deducted. Payments of environmental taxes are also described and may be added to the net costs of environmental protection in order to calculate the total cost burden of environmental protection for each sector of the economy.

3.1.4 Some key concepts of the EPEA framework

In the following, some key concepts and definitions of the EPEA are summarised. For more detail see the 1994 SERIEE manual, Chapter 2.

Environmental protection (EP) activities and producers

EP activities (the 1994 SERIEE manual calls these 'characteristic' activities, see 1994 SERIEE § 2010) are activities whose purpose is environmental protection. These activities are classified according to the CEPA classification (see section 3.3). They are *executed* by EP (characteristic) producers. EP producers may be:
- Specialised producers, i.e. environmental protection is their main activity (e.g. producers whose main activity is the collection and treatment of wastewater). Government specialised producers are distinguished from other specialised producers (mainly enterprises).
- Producers that undertake environmental protection as a secondary activity (e.g. a cement producer which also sells services for burning waste in its furnace, recycling companies that also treat waste).
- Producers that undertake EP activities in-house for own use (ancillary activities) in order to limit the negative environmental effects of their main production activity (e.g. a refinery or electricity producer that treats its exhaust gases or effluents).

The Table B of the EPEA (see 1994 SERIEE § 2197) describes the production of EP services by EP producers.

The production of EP services is valued in accordance with national accounts conventions for the valuation of output. Marketed output is valued at basic prices, i.e. the price received by the producer from the purchaser less any tax on products plus any subsidy on products (in the EPEA compilation practice this means that the basic price excludes VAT, whereas the price paid e.g. by households includes VAT). Non-market output is EP services that are provided free, or at prices that are not economically significant, to other units and is valued by the total costs of production. By analogy ancillary output is also valued by the total costs of production.

National expenditure for environmental protection

One objective of the EPEA is to calculate an aggregate: the national expenditure for environmental protection (see 1994 SERIEE §§ 2070 seq.). This aggregate gives the total of the economic resources that a nation uses for environmental protection.

As shown in Figure 1 (column related to Table A), the national expenditure aggregate consists of:
- uses of EP services by resident units (except specialised producers to avoid double counting),
- gross capital formation for environmental protection,
- uses of connected and adapted products by resident units (except specialised producers),
- specific transfers for environmental protection (those transfers not already captured above).

Starting from the production of EP services the EPEA describes in Table A (see 1994 SERIEE § 2174 seq.) the uses of EP services by the resident units of the national economy. The three main categories of users of EP services are: producers which use EP services as intermediate consumption, households (final consumption) and general government as collective consumer (i.e. when EP services produced by government are not sold – e.g., the value of EP administration services produced by the environment ministry).

Other items that enter national expenditure are the gross capital formation (investment) for producing EP services, the uses of connected and adapted products and some EP transfers.

Gross capital formation for producing EP services
Corresponds to the investments made by EP producers for producing EP services. It includes gross fixed capital formation and acquisition of land. Gross capital formation is recorded for each category of producers, as indicated above.

The uses of connected and adapted (cleaner) products
Connected and adapted products are not EP services but their use serves an environmental protection purpose (see 1994 SERIEE § 2024 seq.). They are e.g. catalytic converters, trash bags, noise reduction windows, lead-free gasoline, etc. For details see section 5.4.

EP transfers
EP transfers are unrequited payments that contribute to the financing of EP activities and of the purchase of connected and adapted products. In national expenditure only some specific transfers are included, namely those that lower the prices paid by purchasers of EP services (in national accounts terminology these are subsidies on production) or that compensate for income or capital losses related with EP as otherwise total expenditure would be underestimated (see 1994 SERIEE § 2039 seq.).

The uses of EP services are closely related with the production of these services. Usually, describing the production and determining the output of EP services is the basis for assessing the uses. Three tables or parts of tables are closely related:
- identification of output in Table B,
- transition from output to uses in Table B1,
- description of uses in the upper part of Table A.

Capital formation for environmental protection and any specific transfers related to uses or production of EP services are also closely related to the description of production and uses.

The other elements of the national expenditure for environmental protection (uses of connected and adapted products and any remaining specific transfers) are less integrated in the EPEA tables. They are

only recorded once (in Table A) and there is no explicit supply-use table for these expenditure items. Practical experience suggests that these elements are often rather small. Therefore, compilation effort should concentrate on capital formation and on the supply and use of EP services.

Financing of national expenditure

The units that use EP services, or connected and adapted products, or invest for EP, do not always finance the total of their uses or investments because they benefit from EP transfers. Table C of the EPEA (see 1994 SERIEE § 2212 seq.) describes the financing of national expenditure. Subsidies on the production of EP services and adapted products, investment grants and other transfers are financed either from government budgets or from specific – earmarked or hypothecated – taxes. In the financing table, only those taxes that contribute to the financing of national expenditure are shown. Other environmental taxes (those that are not earmarked for EP) are recorded in a complementary table (Table C1 – see 1994 SERIEE § 2229 seq.).

3.2 Uses of results

One of the immediate benefits of assembling information about environment-related activities and constructing accounts is the production of indicators. These indicators identify and highlight in relatively simple terms key changes that are taking place - for example in environmental protection expenditure by domain, in terms of 'pressures' exerted on the environment, the state of the environment or 'responses' by governments, businesses etc. to improve environmental quality. Particular care is necessary when deriving and interpreting indicators on EPE. Indicators should result from an accounting structure so as to ensure completeness and avoid double counting and other biases. For effective interpretation, the EPE indicators should be related to data on physical pressures (e.g. air emissions, waste generation, etc.), the state of the environment (e.g. quality of air or water bodies) and general economic development.

Increased spending on environmental protection could occur because the environment is seriously polluted and much money needs to be spent to avoid further deterioration, or could be an indication for significant environmental improvements. Just as expenditure on health or education do not measure the health or education status of the population, EPE do not measure environmental quality. Expenditure data are a measure of economic resources devoted to a certain purpose. Expenditure data alone do not measure effectiveness. Effectiveness can only be assessed by comparing changes in EPE with changes in pressures.

While there is no direct link between the state of the environment and the level of environmental spending which in itself is a response indicator, environmental policy-making and the setting of environmental objectives (in terms of pressures or state) require an assessment of the corresponding expected costs. These costs have to be related to actual costs, the way they are financed and the consequences they have on economic activity.

EP Indicators essentially identify the effort made by society to prevent or to reduce pressures on the environment. A set of indicators of environmental protection might include the following:

- the demand and supply of EP services and EP-related products,
- the net cost of environmental protection,
- the contribution of environmental protection activities to economic growth, exports and employment,
- the contribution to environmental protection made by different economic sectors and regions,
- the impact of environmental protection on eco-efficiency (waste minimisation and resource conservation).

EP Indicators can be developed at various levels, for example:

- by environmental domains: air, water, wildlife protection, etc.,
- for environmental products or technology,
- by sector: government, businesses, households,
- by region.

Links to physical data

Linking of monetary and physical data is a key characteristic of satellite accounts. Linking EP expenditure with physical data is important. For example, relating expenditure for wastewater management with the stock of wastewater collection networks, or with wastewater treatment plants by type of treatment, or with the changes in emissions and in water quality, contributes to assessing whether the amounts spent have been used efficiently and whether spending is at an adequate level in relation to emissions and water quality.

Linking of monetary and physical data may involve describing installations and equipment in place (wastewater treatment plants, filters etc.), the changes in emissions, pollution treated and/or avoided, etc. In the latter case the factors that explain changes in emissions need to be identified: level and structure of economic activity, emission coefficients, etc. Linking expenditure with physical data is the only way to assess the efficiency of environmental protection policies.

Uses for generating other data sets

EPEA data can be used for other environment-related analyses. For example, for the analysis of economic development there is a growing need of data on the environment industry. The EPEA provides an assessment of the core environment industry, through the description of the supply of EP services and of gross fixed capital formation of the producers of EP services (see OECD/Eurostat 1999 and Annex 3).

The collection of data about economic instruments for environmental protection (taxes, subsidies, etc.) is developing in the framework of the revision of taxation systems within EU. Some of these data can be directly extracted from the EPEA. Finally, the EPEA may also improve the quality of national accounts in certain areas and other statistics.

3.3 The classification of environmental protection activities and expenditure (CEPA 2000)

3.3.1 Presentation of the CEPA 2000

CEPA 2000 is a generic, multi-purpose, functional classification for environmental protection. It is used for classifying activities but also products, actual outlays (expenditure) and other transactions. The classification unit is often determined by the units of the primary data sources that are being classified and by the presentation formats used for results. For example, the analysis of government budgets and accounts requires the coding of items of government environmental protection expenditure into CEPA. Some of these expenditure items will be transfers such as subsidies or investment grants whereas others will be inputs into an environmental protection activity (e.g., wages and salaries). The compilation of environmental expenditure accounts requires determining environmental protection activities and their output of environmental protection services by categories of CEPA.

CEPA is designed to classify transactions and activities whose primary purpose is environmental protection. The management of natural resources (e.g., water supply) and the prevention of natural hazards (landslides, floods, etc.) are not included in CEPA. Resource management and prevention of natural hazards are covered in broader frameworks (e.g., SERIEE, SEEA 2000 or the OECD/Eurostat environment industry manual). Separate classifications for e.g. resource management should be set up which, together with the CEPA, would be part of a family of environment-related classifications.

Environmental protection activities are production activities in the sense of national accounts (see e.g. SNA § 6.15 or ESA § 2.103), i.e. combining resources such as equipment, labour, manufacturing techniques, information networks or products to create an output of goods or services. An activity may be a principal, secondary or ancillary activity.

Environmental protection products are
- the environmental protection services produced by environmental protection activities,
- adapted (cleaner) and connected products.

The expenditure recorded are the purchasers' prices of environmental protection services and connected products and the extra costs over and above a viable but less clean alternative for cleaner products.

Expenditure for environmental protection are outlays and other transactions related to

a) inputs for environmental protection activities (energy, raw materials and other intermediate inputs, wages and salaries, taxes linked to production, consumption of fixed capital),
b) capital formation and the purchase of land (investment) for environmental protection activities,
c) outlays of users for the purchase of environmental protection products,
d) transfers for environmental protection (subsidies, investment grants, international aid, donations, taxes earmarked for environmental protection, etc.).

For the presentation of aggregate results and indicators of expenditure, care is needed when adding up expenditure of different types. Available frameworks such as the SERIEE or the OECD/Eurostat PAC framework offer ways to avoid double counting of items of expenditure. In particular, they offer guidance on how to avoid mixing transfer payments with the expenditure that are financed by the transfers, and purchases of environmental products with the expenditure for their production.

Classification structure

The level 1 structure of CEPA (the 1-digits) are the *CEPA classes*. CEPA classes 1 to 7 are also called *(environmental) domains*. The main function of most 2-digits and 3-digits in CEPA is to guide classification into the classes. Selected 2-digits and 3-digits may also be used for data collection and coding as well as for publication purposes. In statistical practice, countries will have to adapt the CEPA structure to some extent, reflecting national policy priorities, data availability and other circumstances. Examples include separate 1-digit headings for traffic, international aid, energy savings programmes, general administration of the environment or soil erosion. For international comparison purposes the level 1 structure of CEPA should be fully respected.

Table 3.1 presents the level 1 structure of the CEPA 2000. For the detailed classification and the explanatory notes see Annex 1.

Table 3.1 CEPA 2000 classes: first digit classification of environmental protection activities

1	Protection of ambient air and climate
2	Wastewater management
3	Waste management
4	Protection and remediation of soil, groundwater and surface water
5	Noise and vibration abatement
6	Protection of biodiversity and landscape
7	Protection against radiation
8	Research and development
9	Other environmental protection activities

General classification principles

Classification should be made according to the main purpose taking into account the technical nature as well as the policy purpose of an action or activity. Multi-purpose actions, activities and expenditure that address several CEPA classes should be divided by these classes. Classification under the heading 'indivisible expenditure and activities' should only be made as a last resort.

Classification of individual items cannot be based solely on the technical nature of the items. For example, the purchase of double-glazed windows in warm countries will typically relate to issues of noise protection, whereas in colder countries they will be a standard energy saving device. Measures to reduce fertiliser use may primarily fall under CEPA 4 (protection of groundwater), CEPA 2 (prevention of runoff to protect surface waters) or CEPA 6 (prevention of nutrient enrichment to protect biotopes) depending on the main purpose of measures and policies. Measures against forest fires will be unimportant or purely serve economic purposes (and thus fall outside of CEPA) in some countries whereas in others the main aspect of forest fires will be an environmental one related to landscape and habitat preservation rather than protection of a natural resource.

Classification of transversal activities and expenditure

Transversal activities are R&D, administration and management as well as education, training and information. All R&D should be allocated to CEPA 8. Administration and management as well as education, training and information should, to the extent possible, be allocated to the 'Other' positions in CEPA 1-7. Ideally, transversal activities would be identified separately, as well as by CEPA class but primary data sources related to CEPA 1-7 often do not allow this. R&D, education and training or administration and management are often either not separable from other actions relating to another class (administration or training as part of waste management, for example) or cannot be split by class (R&D data collected by industry expenditure surveys, for example). If such identification problems are considered substantial, data on R&D, administration and management and on education, training and information should not be published at the 2-digit level.

The classification of R&D in CEPA 8 follows the NABS 1993 (the Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets). CEPA 8 should be used when primary data following the NABS are available from R&D statistics. When this is not the case, other data sources employed (e.g., budget analysis) may not allow a systematic separation of R&D from other actions and activities. R&D may then be included under several CEPA classes.

The above considerations will apply differently across countries, depending on the availability and level of detail of primary data sources. Often, differences in the main data sources will result in different practices for coding transversal activities and expenditure, and international comparability for these may be limited.

3.3.2 Main links to other classifications

Until recently, there have been few direct relations between the standard classifications of activities and products and CEPA, partly because activities described in the CEPA are internal (ancillary) activities not described in central classifications and partly because the central classifications are not sufficiently detailed. In the NACE Rev. 1 (the official classification of economic activities in the European Union), the main environmental protection activities are grouped together in one class (NACE 90.00 – Sewage and refuse disposal, sanitation and similar activities), therefore comparable economic statistics will be available only for the whole class. However, in virtually all countries there are national sub-divisions of NACE 90.00 that are more detailed.

The new NACE Rev. 1.1 that replaces the NACE Rev. 1 from statistical year 2003 onwards, subdivides division 90 into 3 classes, thus providing more detail EU-wide. These classes are (see Annex 5.2 for detail):

- Class 90.01 Collection and treatment of sewage
- Class 90.02 Collection and treatment of other waste
- Class 90.03 Sanitation, remediation and similar activities

The COFOG is another central classification of national accounts. It classifies general government transactions according to purposes. Until recently this classification had only one position for environmental protection (7.3 sanitary affairs and services including pollution abatement and control) which means that COFOG provided only a global estimate of the transactions for environmental protection. The new COFOG (United Nations 2000) provides more detail and is more closely linked to CEPA (see Annex 5.3 for detail).

For compilation purposes these improvements of important standard classifications are a major step forward and the implementation of these new classifications a chance to simplify compilation work. Establishing historical time series of expenditure accounts, however, will require using estimation procedures, e.g. based on key items from public budgets or on physical data.

There are other classifications related to environmental protection. E.g. the Environment Industry Manual (see OECD/Eurostat 1999) includes a classification of the environmental industry, where the first group (Pollution management) is based on CEPA, but adapted to the specific objectives of that manual.

3.4 Developments since the publication of the 1994 SERIEE manual

3.4.1 General presentation

Since the publication of the 1994 SERIEE manual, several countries have compiled pilot or regular EPE accounts. In the EU, France publishes yearly a complete report on EPE accounts, which also includes a presentation of the environment industry and of environmental employment. Austria produces EPE accounts regularly (Statistics Austria 2001). Australia has recently released its expenditure accounts (Australian Bureau of Statistics 1999). Pilot applications have also been made in e.g. Japan (Fukami 2000) and the Czech Republic (Ministry of the Environment of the Czech Republic 1998).

Progress has also been made in related fields:

- on the 'eco-industry' with the Environmental Industry Manual published by OECD/Eurostat in 1999,
- on environmental taxes and other economic instruments with the publication of 'Environmental taxes in the EU 1980-1997' (European Commission 2000a), the publication of 'Environmental taxes – a statistical guide (European Commission 2001a) and the creation of a database by OECD (see http://www1.oecd.org/env/policies/taxes).
- on data collection where - following the publication of SERIEE 1994 - Eurostat has established a system of regular data collection and publication on environmental protection expenditure (see e.g. European Commission 2001b and 2001c).

The main lessons from this accumulated experience are presented below.

3.4.2 Relative importance of domains and elements of national expenditure

From the pilot exercises, it is possible to make an estimate of the magnitude of environmental protection expenditure. EPE amounts to around 2.3% of GDP in the EU (calculated based on EPEAs for 8 EU countries (DK, D, F, NL, A, FIN, S, UK) representing 75% of EU GDP plus Switzerland); 1.6 % in Australia and 2.4% in Japan. This shows that environmental protection is a significant economic activity, similar in size to agriculture.

Distribution of expenditure

The pilot exercises also allow to calculate an average distribution of expenditure by CEPA classes.

Table 3.2 Distribution of total EPE by CEPA class, in %

Protection of ambient air and climate	13.5%
Wastewater management	42.5%
Waste management	29.8%
Other	14.2%
Protection of soil and groundwater	*2.0%*
Noise and vibration abatement	*4.2%*
Protection of biodiversity and landscape	*3.5%*
Protection against radiation	*-*
Research and development	*1.5%*
Other environmental protection activities	*3.0%*
Total	100.0%

Source: Eurostat calculations on the basis of pilot exercises, 'Other' may be underestimated due to incomplete coverage. Results refer to the CEPA 1994 (see 1994 SERIEE – Annex 1).

Table 3.2 shows that the three main domains are water, waste and air which account for about 85% of total expenditure. Efforts should therefore concentrate on these domains to arrive at a good estimate of total environmental expenditure. These domains are also often simpler to cover because more data are available. The results of the pilot exercises also allow to assess the relative importance of some particular items of the expenditure.

Connected and adapted products

Their share in total expenditure is small: between 5% and 10%. Even for countries that made a substantial effort to evaluate many connected and adapted products, the share hardly exceeds 10%. However, the share varies considerably across environmental domains. In the air domain the share of connected and adapted products (mainly catalytic converters, exhaust gas measurement services for vehicles) is above 10% of EPE and may represent more than 40% of current expenditure in some countries. In the noise abatement domain, anti-noise windows may represent a significant share of expenditure.

The SERIEE Task Force developed a shortlist of the most important connected and adapted products (see section 5.4.2). The identification of expenditure related to this shortlist is important, especially for international comparison and for a proper evaluation of household expenditure.

Specific transfers without a counterpart in uses

Specific transfers without a counterpart in uses are those that enter the national expenditure aggregate - mainly subsidies to producers intended to lower the price or cost of production of EP services or connected and adapted products. According to the pilot exercises these specific transfers without a counterpart are very small, in general less than 1% of total EPE. The same applies to transfers to the rest of the world.

The SERIEE Task Force at its 20-22 March 2000 meeting concluded that subsidies on production of EP services (i.e. those lowering prices as recorded in the EPE accounts) were of minor importance in EU Member States but it was difficult and labour-intensive to get data on. These subsidies could be ignored. Transfers to the rest of the world could also be ignored except in countries where they are important. Data on transfers to the rest of the world are more easily available.

Specific transfers other than those mentioned above are important for the analysis of financing flows. In particular, analysis of the transfers between different levels of government (intra-governmental transfers) was considered absolutely necessary for consolidating government expenditure. Also, analysis of investment grants and of preferential loans allows estimating the investment supported by these instruments when basic data on investment are incomplete.

Clarification of some aspects of the 1994 SERIEE manual

The SERIEE Task Force identified some issues to be clarified. The most important refer to the existence of negative net operating surplus for specialised producers (generally specialised producers belonging to the general government institutional sector), to the separation of taxes and fees, to the treatment of anti-noise walls, and to the classification of improvement of land. These problems were submitted to the 1-2 February 1999 National Accounts Working Party. The conclusions of the Working Party are presented at the appropriate points in this Guide.

Simplification of EPEA tables

For presentation purposes the tables can be simplified, in particular as concerns the classification of user categories in the columns of Table A - see section 5.2.1 for details. Specialised producers can be grouped together instead of being disaggregated according to the institutional sectors to which they belong. The ‘Non-specialised characteristic producers’ (i.e. those executing secondary and/or in-house/ancillary activities) and ‘non-characteristic producers’ (i.e. those without any ancillary environmental protection activity) do not need to be separated. Whatever the subdivision of ‘Non-specialised producers’ adopted in the columns of Table A, the uses of ancillary output should always be distinguished as a ‘product category’ (i.e. as a component of national expenditure in the rows of Table A).

The general trend towards privatisation or establishment of public corporations made the separation of specialised producers in Table B (see section 5.1.1) into units belonging to government (e.g., municipal waste departments) and units belonging to the corporations sector less meaningful. For constructing the accounts, a distinction of general government, government-owned corporations and other corporations can be useful if this corresponds to different data sources. When data are organised in this way, also data for an expanded ‘Public Sector’ can be presented by adding government-owned corporations to general government (see section 4.4 for details).

4. Main data sources for the EPEA

This chapter describes the data sources for the compilation of the EPEA. Starting with a summary overview of the main sources, a detailed description of the main sources follows: national accounts data, production statistics, analysis of government transactions, specific surveys on industry environmental protection expenditure and other data sources.

4.1 How to start

4.1.1 Organisation of environmental protection

It is useful to start with a description of the way environmental protection is organised in a country, i.e. to identify the role of the institutional sectors in the different classes of CEPA.

In general the primary responsibility for environmental legislation and regulation is with the Ministry of the Environment. Other Ministries, e.g. Ministries of Agriculture, Energy, Transport, etc., are also involved in environmental protection. In some federal (or federal-type) countries, the States or lower levels of public administration also have legislative or regulatory tasks. In many countries specialised central government units (e.g. national environmental agency, institutes for environmental research and development, agencies for the protection of landscape and biodiversity, etc.) are involved in the implementation of government policy.

The control or provision of important EP services (waste collection, treatment and disposal or wastewater collection and treatment) is often the responsibility of local governments (municipalities, associations of municipalities). In some countries local governments delegate the actual provision of environmental services to private or public corporations. In other countries the local governments themselves provide these services, either directly or through specialised departments. In other domains (noise abatement, soil protection, etc.) local governments have specific responsibilities they exert through their general services or delegate to specialised departments.

Private or public corporations are in charge of producing EP services mainly in the wastewater and waste management domains. These services are produced for use by households or by other corporations (e.g. specialised private companies that treat industrial waste).

Producers in different industries undertake ‘internal’ measures in order to diminish the environmental impacts of their productive activities (e.g. measures in order to reduce the emissions of atmospheric pollutants).

Households, as consumers, buy EP services (payments to local government or specialised enterprises for the collection and treatment of waste or wastewater) or connected products (refuse bins, catalytic converters, composters, etc.) or adapted products (lead free gasoline, etc.).

Finally, various non-profit institutions are active in the field of environmental protection (mainly for the protection of landscape and biodiversity, or as general environmental lobby groups).

Financing is an important issue to be investigated. For wastewater and waste collection and treatment the users generally pay charges in relation to the services rendered. However, in some cases these services are financed via the general budget of local governments. In some countries specific agencies are in charge of collecting taxes and redistribute them to the entities that provide the services as capital grants or subsidies. Financing mechanisms must therefore be described in detail: transfers between the different levels of government, earmarked funds from which subsidies and capital grants are paid, etc.

Analysis of taxes related to the environment (who pays taxes, how much, for what?) can be used as a source of indirect information on the financing flows.

The following table gives an overview of the different situations that may coexist in a country.

Table 4.1 Organisation of environmental protection

CEPA class / Type of unit/type of intervention	CEPA 1 Air	CEPA 2 Wastewater	CEPA 3 Waste	CEPA 4 Soil, ...	CEPA 5 Noise	CEPA 6 Biodiversity	CEPA 7 Radiation	CEPA 8 R&D	CEPA 9 Other
Central and State government									
Ministry of the environment, other ministries: legislation, regulation, collection of taxes, payment of transfers	x	x	x	x	x	x	x	x	**X**
Central government specialised agencies: implementation, payment of transfers, technical aid, etc.	x	x	x	x	**X**	**X**	**X**	**X**	**X**
Local governments									
Municipalities/associations of municipalities:									
control	x	x	x	x	x	x			**X**
supply of EP services		**X**	**X**						
Other local governments, local government specialised agencies: implementation, control, (maybe) supply, transfers		x	x	x	x	**X**			**X**
Corporations									
All: purchase of EP services	x	**X**	**X**	x	x	x		x	x
Specialised EP producers: production of public utilities services and EP services for the other producers		**X**	**X**	x				x	x
Other EP producers: internal measures to reduce the environmental impact of their activity, including environmental management, R&D, etc.	**X**	**X**	**X**	x	**X**	x	x	**X**	**X**
Non-profit institutions: support environmental activities, raise funds, educate, finance, etc.		x			x	**X**	x	x	**X**
Households: pay for EP services		**X**	**X**						
pay for connected and adapted products	x	**X**	**X**	x	x				

X … typically an important component of activities and expenditure

x … typically a small component of activities and expenditure

In many countries the organisation of activities between the public administration and the private sector is evolving rapidly. The private sector is growing in importance due to a trend towards privatisation and outsourcing. Within the 'public' sector, activities are more and more undertaken by public enterprises rather than government departments.

It is also important to follow the changes in political priorities, as these changes translate into the adoption of new laws, the creation of new agencies or government bodies, new waves of environmental investment and new taxes and funding mechanisms, in part as a result of adapting national legislation to EU regulations.

Worked Example 1: Organisation of environmental protection

General government

Central and local governments, including specialised bodies, are active in the environmental protection field, as follows:

Central government: Ministry of the Environment, Ministry of Agriculture and specialised agencies

The Ministry of the Environment is responsible for the administration and regulation of environmental protection. Specialised agencies are the Environmental Protection Agency (EPA), National Environmental Research Institute (NERI) and the Board for Nature (BfN).

The EPA undertakes actions in air protection (operation of a network for urban air pollution measurement) and soil protection (depollution of soils) and provides investment grants for environmental protection in the wastewater and waste management domains. These investment grants are financed by earmarked pollution taxes. The NERI is funded by the general budget and undertakes environmental research and development (R and D) activities. The BfN manages

natural reserves and provides, together with the Ministry of Agriculture, subsidies for less harmful agricultural practices. It is funded by the general budget.

Local government: regions and municipalities

Municipalities have the legal responsibility for the provision of wastewater and waste collection and treatment services. This includes municipal waste collection (from households and small industries, services and trade) and the collection and treatment of wastewater from urban residents. For small cities (less than 2000 inhabitants) these services are provided directly by a municipal department (but paid by users). For large cities (over 2000 inhabitants), separate administrative bodies are in charge of the provision of the services. These services are provided either at the level of a single municipality, or at the level of several municipalities by the Public Establishments for Inter-municipal Co-operation (PEIC). They may also be provided by private firms, which sell their services to municipalities or directly to the users.

Municipalities are also responsible for various environmental issues at local level. Municipal environmental departments are in charge of the implementation of environmental regulation at local level. Regional boards for nature (funded by municipal general budgets) may subsidise various non-profit associations.

Firms

Producers of the various industries pay for the municipal waste and wastewater management services and for the treatment of hazardous waste by specialised firms. They also take internal measures for abating pollution, avoiding or cleaning up environmental degradation, for environmental management or for environmental R and D activities. They pay taxes on emissions of pollutants which either feed the EPA (earmarked receipts) or the central government budget.

Specialised firms are mostly active in the collection and treatment of wastewater and waste from other firms or from private households (in the latter case the specialist firms are often sub-contracted by municipalities).

Households

Households pay for the municipal waste and wastewater services. Some households use autonomous wastewater treatment systems, and some invest in noise insulation of their houses.

Finally, many non-profit associations are active in the field of nature protection. They are funded by the regions and by donations from households.

4.1.2 Types of data sources

National accounts

Where the national accounts are sufficiently detailed much of the data necessary for compiling expenditure accounts is directly available. The national accounts process includes the establishment of tables at a very detailed level (e.g. production accounts for detailed positions of the NACE Rev. 1, supply-use tables for specific products of the CPA – the Classification of Products by Activities), and the construction of comprehensive databases on the various sectors of the economy (turnover and commercial accounts for corporations by detailed NACE Rev. 1 positions, disaggregation of government transactions, etc.). It is important for the compilation of the EPEA to have access to these database and tables.

Production statistics

Specialised EP producers are subject to regular surveys in the general statistical process (production statistics). These producers are mainly found in class 90.00 of the NACE Rev. 1. Through these surveys several variables are collected: sales (by product according to the CPA or specific national classification of products), intermediate consumption, compensation of employees, taxes paid on production, subsidies received for production, investments, employment, etc.

Surveys of producers of other classes of the NACE Rev. 1 could also be useful. Although the principal activity of these producers is not environmental protection, they may produce EP services as secondary output (e.g. producers classified under recycling, construction, water distribution, etc.). Specific Environment Industry surveys can provide useful data on secondary output of EP services as well as data on producers

of equipment and facilities specific to environmental protection (e.g. pipes for sewage systems, incineration plants, etc.) which constitute a source of data for the assessment of gross fixed capital formation for EP.

Analysis of accounts of government and finance statistics

As concerns activities of government units several data sources exist. The most widely used is the detailed analysis of budgets (in particular for central and regional governments and large cities) or government finance statistics. This analysis is part of the process of compilation of national accounts for the general government institutional sector. However, generally the results are rather aggregated and a specific analysis has to be made for assessing environmental protection outlays of government. Starting from the list of the government units involved in environmental protection, the objective of this analysis is to derive the outlays for the production of EP services as well as other outlays and receipts (transfers given and received, receipts from fees and charges, etc.).

If government finance statistics do not provide enough detail, the results of surveys of municipalities or associations of municipalities may provide data on e.g. waste and wastewater collection and treatment activities. These data may cover various variables, from the physical quantities to the prices, and the inputs used, including installations and facilities, investment, etc.

Annual reports of government agencies or funds for environmental protection also provide data on the activities and outlays of these agencies, as well as their receipts (either from central or local government budgets or from specific environment-related taxes, charges or fees) and the flows of funds to other units (subsidies, capital grants and other transfers).

Industry expenditure surveys

As concerns ancillary activities, i.e. the measures undertaken by firms to reduce their environmental impact, specific surveys are the main data source. These surveys provide data on investments made for environmental protection (end of pipe equipment or installations, extra cost of integrated technologies) and often also on current EP expenditure (intermediate consumption, compensation of employees, etc.). Data from business associations and engineering estimates could also be a useful data source.

Other sources

Household surveys may constitute a source for assessing the consumption expenditure of households for waste and wastewater collection and treatment services. Expenditure on connected and adapted products (e.g. anti-noise windows, refuse bins, emptying services for septic tanks, car exhaust measurement, etc.) will rarely be surveyed and may be estimated based on production statistics, market analysis or specific studies. The annual reports of the main environmental non-profit institutions provide information on their activities, expenditure and receipts. Data on their financing by government and EU institutions may also be available.

Various other sources allow to complement the previous data. Examples are construction statistics (investments in sewerage systems, wastewater treatment or incineration plants, anti-noise walls, etc.), business associations (domestic production or domestic market of connected and adapted products, level of environmental protection in the main industries), environmental reports of large firms (e.g. in the noise domain transportation firms or airport management entities; in the air domain refineries, power plants, etc.). Other sources may be R&D statistics, physical data on sewage networks and waste disposal facilities to estimate capital stocks, environment industry market estimates, price statistics, employment statistics, etc.

Some of the data needed will have to be based largely on estimates and calculations. For example, expert knowledge and specialised literature may offer coefficients for the costs of adapting vehicles to meet environmental requirements. The total expenditure can then be calculated based on the total number of new vehicles.

Worked Example 2: Data sources available

Main data sources available for the Worked Example are:

Industrial survey of the NACE 90 industry. This survey covers only corporations (i.e., it does not cover the independent departments of municipalities etc.). Firms are classified under two separate sub-positions: 90.1 wastewater collection and treatment; 90.2 waste collection and treatment. Firms with more than 30 employees are subject to a detailed survey, the other firms receive a simple questionnaire covering only the main variables (output and gross fixed capital formation).

Analysis of government finance statistics. For central government, the general budget and the specialised agencies are covered. For local governments, only transactions related to their general budgets are concerned. Municipalities with 2000 or more inhabitants have specialised waste and wastewater management departments. These departments are recorded separately (see below), which means that government finance statistics covers only transactions related to waste and wastewater management of municipalities with less than 2000 inhabitants.

A central database of the accounts of the specialised municipal or inter-municipal bodies. A specific accounting department centralises the accounts of specialised municipal departments or inter-municipal bodies, including the domains of waste and wastewater management.

An expenditure survey covering the mining, manufacturing and electricity and water supply industries (NACE C; D and E) gives the current and capital expenditure of firms for environmental protection.

Other data sources are:

- a capital stock model,
- household budget surveys,
- various production surveys,
- foreign trade statistics,
- the tax revenue database of the tax statistics department,
- various physical environmental statistics.

4.1.3 Cross-categorisation of data sources and environmental domains

Table 4.2 on the following page gives an overview of the main data sources for the different environmental protection domains and activities. Production statistics for class 90.00 of the NACE Rev. 1 provide the supply of waste and wastewater collection and treatment services as well as soil decontamination activities. Production statistics for other classes of NACE may provide data on secondary output, the production of connected or adapted products, etc. Specific surveys provide the expenditure of industries related either to their ancillary activities (investments and operating expenditure) or to their purchases of waste and wastewater management services. Analysis of government budgets and financial statistics provide the data to compile the output of non-market services (e.g., public environmental administration services). Other sources may be useful as well, including foreign trade statistics, household panel data or waste statistics.

Table 4.2 Main sources by CEPA class

	Production statistics		Industry expenditure surveys	Analysis of accounts of government	Other sources
	NACE 90	other			
CEPA 1 - Protection of ambient air and climate		production of catalytic converters	current and capital expenditure for ancillary activities	management of public networks for the measurement of air quality, environmental taxes (air domain),	foreign trade data (catalytic converters)
CEPA 2 - Wastewater management	data on the production of wastewater management services	production of wastewater services by other producers, production of septic tanks	current and capital expenditure for ancillary activities, purchase of external services	outlays of municipal wastewater departments, transfers for wastewater management, environmental taxes	purchases of sewage services by households, wastewater generation (m3)
CEPA 3 – Waste management	data on the production of waste management services	production of waste treatment services by recycling, production of trash bags etc.	current and capital expenditure for ancillary activities, purchase of external services	outlays of municipal waste departments, transfers for waste management, environmental taxes	waste generation (tonnes), administrative registers
CEPA 4 – Protection and remediation of soil, groundwater and surface water	data on the production of soil decontamination services	data on the production of soil decontamination services	current and capital expenditure for ancillary activities, purchase of external services	purchases of soil depollution services	
CEPA 5 – Noise and vibration abatement		production and installation of double windows, anti noise walls	current and capital expenditure for ancillary activities, purchase of external services		
CEPA 6 – Protection of biodiversity and landscape			current and capital expenditure for ancillary activities, purchase of external services	management of natural reserves, subsidies to agriculture	Protected areas
CEPA 7 – Protection against radiation		Treatment of high level radioactive waste	current and capital expenditure for ancillary activities, purchase of external services	Public observation networks	Generation and storage of radioactive waste
CEPA 8 – R and D		R and D activities	current and capital expenditure, purchase of external services	outlays for environmental R&D	R&D statistics
CEPA 9 - Other activities		production of environmental management services	current and capital expenditure for ancillary activities, purchase of external services	outlays for general environmental protection administration	

4.2 Data derivable from national accounts

National accounts data

When the national accounts are sufficiently detailed many of the data for the compilation of expenditure accounts are directly available. See Box 1 for an illustration. The main gap would be the ancillary activities, as these are not separated in national accounts. Unfortunately the level of aggregation of national accounts is often rather high and transactions related to environmental protection are not always separately identified.

The national accounts process includes the establishment of tables at a detailed level (e.g. production accounts for detailed positions of the NACE Rev. 1, supply-use tables for specific products), and the construction of comprehensive databases for the various sectors of the economy (turnover and commercial accounts for corporations by detailed NACE Rev. 1 positions, disaggregation of government transactions, etc.). For the compilation of the EPEA it is important to have access to these database and tables.

When the level of disaggregation is sufficient, three types of national accounts data can almost directly be used for the compilation of EPEA: the production and generation of income accounts, the general government transactions and the supply-use tables.

The production and generation of income accounts

Production and generation of income accounts describe on the one side the output of industries, on the other side the inputs necessary for the production of this output. This corresponds almost exactly to the upper part of Table B of the EPEA, although differently presented (see 1994 SERIEE, page 60).

Table 4.3 The production and generation of income accounts

Uses	Resources
Intermediate consumption Compensation of employees Consumption of fixed capital other taxes on production less other subsidies on production	Output at basic prices/cost of production Of which: product 1 market non-market product 2 market non-market
Net operating surplus/mixed income (balancing item)	
Total (total uses = total resources)	Total (total uses = total resources)

When these accounts are available for national subdivisions of class 90.00 of the NACE Rev 1 (or for the classes of the new NACE Rev 1.1) they provide directly the data necessary for establishing the Table B for the specialised producers of waste and wastewater management. In order to have a complete description of the production of the domestic output of waste and wastewater management services, they have to be complemented with information on the secondary output of these services in other industries if available.

General government transactions

Analysis of general government transactions is an integral part of the national accounts process. The main objective is to assess the value of the output of government units (i.e. units that produce mainly non-market output - see section 4.4 below) and to distribute it according to the various products: public administration and defence, education services, health services, etc.

Like all other units of the national economy, the units of the government sector are classified according to their main activity. However, except when detailed government accounts are available to identify different activities so that the main activity is easy to determine, most units of the government sector may be classified in the 'public administration and defence' industry (division 75 of the NACE Rev. 1). For example, municipalities may be classified within this division, although part of their activity is to provide waste or wastewater management services (which would fall under NACE 90).

The transactions of government units are also classified according to the classification of the functions of the government (COFOG) by their purpose which allows to compile the corresponding production and generation of income accounts.

The old COFOG classification only had one separate position 07.3 'sanitary affairs and services including pollution abatement and control' for environmental protection. A new COFOG has been developed, which is more detailed as concerns environmental protection (see Annex 5.3 for detail). However, when the COFOG is not applied at a sufficient level of detail, a specific analysis has to be made for EPEA purposes (see section 4.4.2).

The supply-use tables

A specific step of the compilation of national accounts is the establishment of supply-use tables. These tables describe for the main categories of products their origins (domestic production or imports) and their uses (intermediate and final consumption, capital formation and exports), according to the following scheme, which corresponds almost exactly to the Table B1 of the EPEA (see 1994 SERIEE, page 61).

Table 4.4 The supply-use table

Supply	
1.1 Domestic output (at basic prices or cost of production) by industries	
1.1.1 market output	
1.1.2 non-market output	
1.2 Imports	
1.3 Trade and transports margins	
1.4 Taxes on products	
1.5 less subsidies on products	
1.6 Total supply at purchasers' prices	
Uses	
2.1 Intermediate consumption by the various industries	
2.2 Households final consumption	
2.3 General government final consumption	
2.4 Gross capital formation	
2.5 Exports	
2.6 Total uses = total supply	

Although not published, supply-use tables are sometimes drawn at a detailed level, e.g. for the products corresponding to the class 90 of CPA: 90.00.1 sewage services, 90.00.2 refuse disposal services. Such tables provide a direct input for the assessment of the uses of EP services.

Box 1: Derivation of EPE accounts from national accounts in Denmark

In some cases it is possible to avoid labour intensive data collection and treatment by using the information which already exists in the national accounts, either directly or in the data structures (formal databases or other existing basic data used for the yearly national accounts). This holds at least for a major part of the output and use of EP services. Furthermore, the need for highlighting environmental expenditure data can be taken into account when the national accounts systems are designed and when new classifications are introduced in the national accounts.

A first step in using national accounts information is to look at the classifications used in the national accounts and to select those industries which appear to be more or less 'pure' producers of EP services. As an example can be mentioned sewage and refuse disposal services, sanitation and similar services (NACE Rev. 1 90.00). Many countries disaggregate this industry e.g. into one industry for sewage removal and disposal, one industry for refuse collection and sanitation, and one industry for refuse dumps and refuse disposal plants.

As a second step it is necessary to find out which information on the production of EP services is embedded in - and separable from - industries which produce EP services as well as non-environmental services or products. Often 'hidden' information on EP services can be found in the basic statistics and databases underlying the national accounts. In the Danish national accounts information on the output of EP services is separable from the information on output of non-environmental services from general government by using the information in the database on public finance accounts which are used as an integrated part of the national accounts.

This direct and 'hidden' information on environmental services in the national accounts includes typically:

- Output of EP services (and its components: intermediate consumption, compensation of employees, taxes and subsidies on production, consumption of fixed capital and net operating surplus),
- Current transfers and capital transactions.

Third step. On the basis of this information the EPEA Table B can be filled in with respect to the output of EP services by specialised producers.

Countries which have input-output tables (or supply and use tables) available can now go on to look at the use of the output of environmental services. Thus, a fourth step could involve the isolation of the rows in input-output tables (or entries in the use tables) which concerns the industries in question (or part of their output). The kind of information which, ideally, should be isolated from the input-output tables (or supply-use tables) includes the total use of EP services broken down into basic prices, VAT and other product taxes less subsidies.

The fifth step is to build the EPEA B1 Supply and use table for EP services. This can be done on the basis of the information derived in step four and the EPEA B table.

Sixth step. The information given by the previous steps are more or less sufficient also for the completion of the remaining EPEA tables i.e. Tables A, C and C1. Most of the content of these tables can be derived from tables B and B1 by 'reclassification' of the information. In the case of some entries in the tables it is necessary to extract further data. Most of these will also be available in the national accounts or the underlying data basis.

Source: Ole Gravgaard - Statistics Denmark

4.3 Production statistics

When national accounts data are not sufficiently detailed it is necessary to use basic statistics data. This section describes the production statistics which may be used for compilation. It first describes production statistics for specialised producers.

4.3.1 Specialised producers

Within the EPEA framework, specialised producers are those units the principal activity of which is the production of EP services (see 1994 SERIEE § 2022). The main part of these EP services consists in services for the collection and treatment of waste and wastewater. They are generally produced by specialised units which are grouped together under the NACE 90 class. As concerns these producers the situation of production statistics may differ across countries.

Use of registers

Council Regulation n° 2186/93 on Community co-ordination in drawing up business registers for statistical purposes regulates the set-up of harmonised registers for statistical purposes. It specifies in particular that registers must include:

- all enterprises carrying out economic activities contributing to gross domestic product at market prices,
- the legal units responsible for those enterprises,
- the local units dependent on those enterprises.

The 'enterprises' as they are defined in the regulation do not correspond to the 'firms' or corporations as generally understood. They also include government units, the only criterion being that they produce goods and services and enjoy autonomy of decision. These units are generally classified as quasi-corporations. Registers record all producers of the economy (with the exception of households and non-market producers of the general government sector) and classify them according to their main activity and category.

The first step is to examine the registers in order to identify the number of units which are classified in the class 90.00 of NACE Rev. 1, i.e. to describe accurately the universe of specialised producers.

Table 4.5 Data from registers

	Number of units			
	quasi-corporations general government	public corporations	private corporations	quasi-corporations NPISH*
Class 90.00 of NACE Rev. 1				
subdivision 1				
subdivision 2				
Total				

* Non-profit institutions serving households

Often the registers are linked with other databases (e.g. VAT database, or the establishment (i.e., local kind of activity unit) database when the register is made on the basis of 'enterprises'). This allows to obtain also some economic variables (e.g. turnover) which can be used for the description of the specialised producers.

A limitation of registers may be the type of units that are considered. Registers may be drawn on the basis of enterprises and not of establishments. In this case the producers of environmental services can be found in other classes of the NACE Rev. 1. In France, for example, the main part of the production of wastewater management services is recorded under the division 41 of the NACE Rev. 1 (production and distribution of water) because water supply and wastewater management is undertaken by integrated enterprises (see also section 4.3.2 production statistics for other producers).

Industrial surveys

Production statistics are generally derived from industrial surveys. The first step is therefore to explore the scope of these surveys, the way they are organised and in particular which type of units are surveyed. Information about the scope and type of units can be obtained from the statistical services in charge.

In some cases only enterprises (either private or public) or establishments (local kind of activity units) are surveyed. Usually surveys are restricted to units above a given size (number of employees, etc.), in which case the results of the surveys must be extrapolated, using some variable (employment, sales, etc.). This grossing-up process entails correction for units which have not answered, for under-reporting, for the units which were not surveyed because they are below a given size or because they are not part of the field of the survey. This extrapolation is generally done by the statistical service in charge of the survey, otherwise the grossing-up should be done by the compiler following the normal procedures of the industrial statistics or the national accounts department.

A key task is to verify whether or not the field of the survey corresponds to the whole universe of specialised producers as defined in EPEA and national accounts: i.e. all local kind of activity units with a main activity in class 90.00 of the NACE Rev. 1. In practice government units (departments of local government in charge of waste or wastewater collection and treatment) may be listed under class 90.00 in the registers but may not be surveyed by industry statistics.

Other limitations of industrial surveys mainly refer to the level of detail. In the NACE Rev. 1, there is no disaggregation of the class 90.00, which means that EU-wide the data are available for all producers of the class together, which does not allow to draw production accounts by environmental domain. In particular, waste and wastewater treatment cannot be separated and only the sales (from the product classification) but not the costs will be separately identified for these two activities. However, most countries make surveys at a lower level of disaggregation and waste collection and disposal and wastewater collection and treatment are often distinguished so that the compilation is easier at national level.

Worked Example 3: Results of industrial production surveys

The statistical office conducts every year a survey of NACE 90 firms. Two sub-positions of NACE 90 are defined at national level: 90.1 (wastewater collection and treatment services) and 90.2 (waste collection and treatment services). The survey only covers corporations (either public or private), which means that quasi-corporations (such as autonomous municipal departments) are not surveyed.

The general (simplified) questionnaire of the survey covers all firms, whereas the detailed questionnaire is only for firms with more than 30 employees. The general questionnaire asks for the turnover (sales) by products, which allows to separate environmental protection from non-environmental protection sales. Some firms specialised in wastewater also produce and sell water, whereas firms specialised in waste collection and treatment sell materials recovered from sorting and heat generated from waste incineration.

The detailed questionnaire asks for the detailed costs (intermediate consumption, salaries and social security costs, taxes paid, etc.). For wastewater management the detailed questionnaire indicates that there is a high recourse to sub-contracting, whereas no sub-contracting exists in the waste management industry.

Comparing with the fiscal database (fiscal declarations of firms) and other available data (registers), the statistical office estimates that the survey has an exhaustive coverage, and that there is no need for grossing-up the results. However, the details on current and capital transactions available for firms with more than 30 employees can be grossed up to all firms using the ratio of output of firms with more than 30 employees to total output of all firms. Some firms in other industries also produce wastewater and waste management services (see Worked Example 4). Data on

producers of soil decontamination services are not directly available and will be estimated from the uses of these services (see Worked Example 4).

Data available from production surveys

	Survey results		Grossed up to all firms	
	Wastewater (NACE 90.1)	Waste (NACE 90.2)	Total wastewater	Total waste
Current transactions (firms with more than 30 employees)				
Output	**5 210.0**	**2 130.0**	**5,630.0**	**3,050.0**
sales	5 138.0	2 120.9	5,552.2	3,037.0
EP services	**4 525.3**	**1 641.2**	**4,837.3**	**2,525.6**
other products	684.7	479.7	714.9	511.4
changes in inventories (work in progress, finished products)	7.1	7.6	7.7	10.9
own account gross fixed capital formation	64.9	1.5	70.1	2.1
Intermediate consumption	**3 183.0**	**425.6**	**3,439.6**	**609.4**
purchases of goods and services	3 183.0	425.4	3,439.6	609.1
changes in inventories (materials and supply)	0.0	0.2		0.3
gross value added	**2 027.0**	**1 704.4**	**2,190.40**	**2,440.57**
wages and salaries	632.2	620.4	683.16	888.37
social security costs	325.1	365.1	351.31	522.80
taxes paid	69.7	83.4	75.32	119.42
subsidies received	3.9	1.4	4.21	2.00
operating surplus (gross)	**1 003.9**	**636.9**	**1,084.83**	**911.99**
depreciation and provisions	207.1	126.1	223.80	180.57
profit	796.8	510.8	861.03	731.43
Capital transactions (firms with more than 30 employees)				
gross fixed capital formation (net acquisitions)	1,193.00	512.80	1,289.17	734.29
Total output (all firms)			5 630.0	3 050.0
environmental protection services			4 837.3	2 525.6
other products			792.7	525.4
Employment (all firms)				
number of employees (full time basis)			3 250	5 275

The use of industrial survey data

For the purpose of EPEA compilation, and in particular for the production (supply) table (Table B), the most important information is the sales (or turnover) by product. For market producers, the sales determine the output. Analysis of the sales by products allows identifying the part of the output that corresponds to EP services.

It is also important to analyse the purchases of products and subcontracting. The value of EP services within these positions should be estimated if important. For example, a firm may subcontract all or part of its activity to another specialised producer or an important share of a specialised producer's purchases of products may be EP services. This is especially the case for waste collectors which may have to pay substantial amounts for waste disposal when this is undertaken by another unit (e.g. a private or municipal landfill or incineration plant operator). Another case worth to be analysed is when departments of local government control and supervise the production of EP services but do not produce these services themselves. These departments may collect, on behalf of the local government, the payments for the services and pay the producer to which the provision of the EP services has been delegated (i.e. subcontracted). In this case it is necessary to check how these flows are recorded in the local government accounts and in finance statistics (see section 4.4.1 for detail on the government side of this issue). Local government units may also own the installations and put them at the disposal of the (private) producers of EP services. These producers may then have to pay rent for the use of the installations. If such deliveries between specialised producers are not identified, the total supply of EP services to final users may be overestimated.

Data on gross fixed capital formation can be directly used in the EPEA tables A (uses) and B (supply). If necessary, also these variables have to be grossed up to cover all specialised producers.

Consumption of fixed capital

In national accounts the consumption of fixed capital measures the decrease in the value of fixed assets due to their use in production. The consumption of fixed capital differs from the depreciation recorded in commercial accounting. Depreciation in commercial accounting is generally valued at historic costs (i.e. the value of fixed assets at the date of acquisition) and is greatly influenced by fiscal considerations. Therefore, consumption of fixed capital is not directly available from industrial surveys but is calculated by national accountants, e.g. on the basis of the stock of fixed capital at replacement costs and assumptions as concerns the service life of the assets using the perpetual inventory method.

Data on the consumption of fixed capital will normally be available from the national accounts but EPEA compilers may have to split these data (e.g., when splitting NACE 90 data by environmental domain). For this, or when it is necessary to directly estimate the consumption of fixed capital, compilers are advised to first investigate the methods and assumptions normally used by national accountants. E.g., for the different categories of fixed capital (infrastructure, buildings, transport equipment, other equipment, etc.) and for the various industries, national accountants make assumptions as concerns the average service life of the assets, the distribution of retirements (discards) around the average service life as well as the way the assets contribute to production during their useful life. Section 5.1.4 below provides detail on the practical estimation for purposes of the EPEA. Further information on the measurement of the consumption of fixed capital and on capital stock accounting may also be found in OECD (2001).

The relationship between local governments and specialised producers may be complex. In France, for example, local governments own the installation for wastewater collection and treatment which they may put at the disposal of specialised producers. Therefore, the consumption of fixed capital has to be imputed in the accounts of local government and not the accounts of the private (or public) specialised firms.

4.3.2 Production statistics – other industries

Characteristic producers may also be found in statistical surveys of industries other than class 90.00 of the NACE Rev. 1.

As an example, in France water supply and the collection and treatment of wastewater are integrated: the same firms provide the two types of services. As the main activity of these firms is water supply, they are classified in class 41.00 of NACE Rev. 1 (Collection, purification and distribution of water). The industrial surveys are organised on the basis of firms and not establishments. Therefore, most of the output of wastewater collection and treatment services appears as a secondary output of the water supply firms.

Table 4.6 France: production of wastewater collection and treatment services[3] in 1997

	Sales (million FFR)	In % of the total sales of the NACE class
secondary output of firms classified in class 41.00 of NACE Rev. 1	13.308	26.3%
principal output of firms classified in class 90.00 of NACE Rev. 1	3 843	13.3%[4]

Source: production surveys for NACE classes 41.00 and 90.00

Firms classified in classes 37.10 and 37.20 of NACE Rev. 1 (Recycling) also provide some EP services in the waste management domain. Surveys covering these firms should distinguish between the production of recovered/recycled materials (sales of secondary raw materials) and waste treatment services (i.e. income from payments for accepting waste for recycling). Only the waste treatment services should be entered in the EPEA. An example with data for NACE 37 is given in Box 2 below, based on Dutch production statistics. The example shows that payments by the disposers to recycling companies can be substantial.

[3] Also includes sewer maintenance, emptying of cesspools, etc.

[4] In France, division 90 of NACE Rev. 1 mainly includes collection and treatment of waste.

Box 2: Recycling industries (NACE 37): Dutch Example

Transactions related to waste and scrap received and to secondary raw materials produced by the Dutch recycling industry, 1997, million HFL

Waste and scrap received	**Paid to** disposer	**Received from** disposer	**Secondary raw materials sold**	Sales
Photographic waste	34	19	Crushed glass	60
Glass	38	12	Granulate, mix from plastics	200
Cable waste	18	4	Granulate, mix of stone, concrete	100
Plastics	75	13	Ferrous metals	223
Metals	195	5	Non-ferrous and precious metals	134
Construction&demolition waste [1)]	8	169	Other [3)]	15
Other [2)]	25	83	Final products	27
Total	**393**	**305**		**759**

1) including grit from drilling activities, slags and fly ashes, asphalt.
2) including waste rubber, waste from dismantling computers and other electronics, waste paper.
3) including granulate mix from rubber, metal mix from electronics waste.

Source: Egon Dietz - Statistics Netherlands

Firms belonging to the class 51.57 (wholesale of metal and non-metal waste and scrap and materials for recycling) of NACE Rev. 1 may also have some secondary output of waste treatment services. Analysis of subsidies or other government transfers may be important. In several countries systems exist where government or other institutions guarantee the price paid for waste materials collected for recycling (paper, glass, used oil, packaging waste, etc.). Countries have also sometimes organised specific systems for the collection and treatment of certain types of waste. Subsidies are generally paid from specific funds, which collect taxes or contributions from packaging, battery or oil producing or selling enterprises. The way these systems are organised and financed should be analysed, in order to correctly treat the results of the production surveys for positions 37 and 51.57 of NACE Rev. 1.

Other secondary producers may be found in the construction industry and in particular in the class 45.11 (demolition and wrecking of buildings; earth moving) of NACE Rev. 1. Although treatment of polluted soils is often classified under 90, this activity may also be carried out by construction firms specialised in 'demolition and wrecking of buildings; earth moving'. Dredging is made by firms of class 45.24 (construction of water projects) of NACE Rev. 1. Firms in many manufacturing classes of NACE Rev. 1 (e.g. class 25.12: retreading and rebuilding of rubber tyres) may collect and transport waste for recovery.

Environmental consultancy as well as environmental testing and analysis firms are mainly classified in NACE division 74 (other business activities). As EP services are few in the CPA product classification, their output is only known when production surveys use more detailed national classifications or when specific data sources exist (e.g., from enterprise associations or specific environment industry surveys).

Producers that undertake an environmental protection activity as a secondary activity can be found also in NACE divisions and classes other than those quoted above (see also Box 3 below for illustration).

Worked Example 4: Other production statistics

From production statistics (from official statistics or from industrial associations) it is possible to identify:
a) secondary output of environmental protection services of some industries
- recycling firms (NACE 37) have a secondary activity in waste management services,
- water firms (NACE 41) have a secondary activity in wastewater treatment.

b) production of connected products
- the turnover in septic tanks installation, including the price of the septic tank itself (wastewater management),
- the turnover in installation of double glazed windows, including the value of the windows (noise abatement),
- production of trash bags, bins, rubbish containers, etc. (waste management),
- production of catalytic converters (air protection).

	Turnover
Secondary output	
waste treatment services by recycling firms	125.2
wastewater treatment by water firms	258.4
Various production statistics (connected products)	
septic tanks	325.1
double glazed windows (of which 40% for noise abatement)	440.2
trash bags, etc.	303.9
catalytic converters	61.5

In the EPEA the value of the production of connected products is mainly useful in order to estimate the expenditure for the use of these products. For these products, as well as for adapted products, only the use is accounted for in Table A, while the output is not recorded in Table B (see section 3.1.4).

As there is no direct information on the supply of soil decontamination services from production statistics (see Worked Example 3) the central government purchases of these services (47.9 – see Worked Example 5) are used to estimate the supply. From the specialised agencies (see Worked Example 5) that purchase these services the addresses of the largest producers can be obtained and identified in the business register. From the data for these firms, an estimate of the main components of the production account can be derived. Intermediate consumption is 35%, compensation of employees is 30%, consumption of fixed capital is 20% and net operating surplus is 15% of the output.

4.3.3 Other data sources on production

In most countries trade or industrial associations make their own surveys or estimates as concerns their output or employment. When the official statistical system does not cover (through registers or surveys) with a sufficient level of detail the output of EP services or of connected and adapted products, data from these industrial associations may be used when available.

For example, Statistics Sweden has done a survey on EP expenditure in municipalities for the year 1991. A large part of EP expenditure in municipalities regards municipal wastewater treatment plants. For this activity, the Swedish Water and Wastewater Association (VAV) conducts an annual survey. After comparing the results of the two surveys, a double counting of about five percent was found in the VAV survey. No further survey by Statistics Sweden is planned. Instead the data from the VAV survey are used as a source.

Industrial associations may have specific registers of their members according to detailed specialisation (e.g. environmental design companies in the membership register of the association of design and consulting agencies). Environmental yearbooks or reviews (sales catalogues) or environmental associations may provide lists of firms specialised in EP services which may allow to identify producers of environmental services in national business or VAT registers.

In general, however, such data are mainly used for the assessment of the production of connected and adapted products. Typical examples are sales of spare parts for cars (catalytic converters), sales of unleaded gasoline, waste bins and septic tanks, for which official statistics rarely exist. Production and sales data for connected and adapted products are a basis for estimating the expenditure of the users of these products, to be accounted for in Table A.

Box 3: Information on municipal waste and wastewater management in Hungary

Every year the Hungarian Central Statistical Office sends out questionnaires to each municipality. The municipalities are asked to provide the names and addresses of the organisations that provide municipal waste, water supply, sewerage and TV cable services. The Hungarian Central Statistical Office matches the addresses with the business register and uses the resulting address lists to select the respondents of the surveys on municipal waste and wastewater collection and treatment. This system provides a full picture of the organisations providing municipal waste and wastewater services in Hungary.

The tables below show the results of these surveys. The results indicate that in Hungary in the year 2000 25% of the organisations (institutional units) involved in municipal waste collection were classified under NACE 90. These organisations collected 84% of the waste volumes. 41% of the organisations were classified under NACE division L

(mostly small municipalities) but these collected only 5% of the waste. For wastewater collection, 14% of the organisations were classified in NACE 90 which collected 49% of the wastewater. 50% of the organisations were classified in NACE 41 (water supply) which collected 48% of the wastewater. Such results can be very useful for the compilation of EPE accounts. The data give information on how municipal waste and wastewater management is organised. The link to the business register allows deriving economic data directly. The physical quantities can be used as a proxy for the secondary output of waste and wastewater services.

Organisations providing municipal solid waste services and volume of waste collected, Hungary 2000

NACE category		Number of organisations	%	Waste collected 1000 m^3	%
A	Agriculture, hunting and forestry	35	4.7	93	0.5
D	Manufacturing	4	0.5	31	0.1
E	Electricity, gas, steam and water supply	23	3.1	794	3.9
F	Construction	23	3.1	414	2.0
G	Wholesale and retail trade; repair of motor vehicles, etc.	18	2.4	275	1.3
H	Hotels and restaurants	1	0.1	4	0.0
I	Transport, storage and communication	125	16.7	359	1.8
K	Real estate, renting and business activities	9	1.2	146	0.7
L	Public administration and defence; compulsory social security	306	40.9	970	4.8
M	Education	11	1.5	177	0.9
N	Health and social work	2	0.3	5	0.0
90	Sewage and refuse disposal, sanitation and similar activities	186	24.9	17,133	83.9
other O	Community, social and personal services (except NACE 90)	5	0.7	10	0.0
Total		**748**	**100.0**	**20,410**	**100.0**

Organisations providing wastewater services and volume of wastewater collected, Hungary 2000

NACE category		Number of organisations	%	Wastewater collected 1000 m^3	%
A	Agriculture, hunting and forestry	10	3.6	640	0.1
C	Mining and quarrying	1	0.4	1	0.0
D	Manufacturing	23	8.3	5,890	1.1
40	Electricity, gas, steam and hot water supply	7	2.5	2,157	0.4
41	Collection, purification and distribution of water	139	50.2	251,935	47.5
F	Construction	13	4.7	3,986	0.8
I	Transport, storage and communication	1	0.4	266	0.1
K	Real estate, renting and business activities	7	2.5	565	0.1
L	Public administration and defence; compulsory social security	28	10.1	2,640	0.5
N	Health and social work	4	1.4	433	0.1
90	Sewage and refuse disposal, sanitation and similar activities	40	14.4	261,737	49.3
other O	Community, social and personal services (except NACE 90)	4	1.4	233	0.0
Total		**277**	**100.0**	**530,484**	**100.0**

Source: Gábor Valko – Hungarian Central Statistical Office

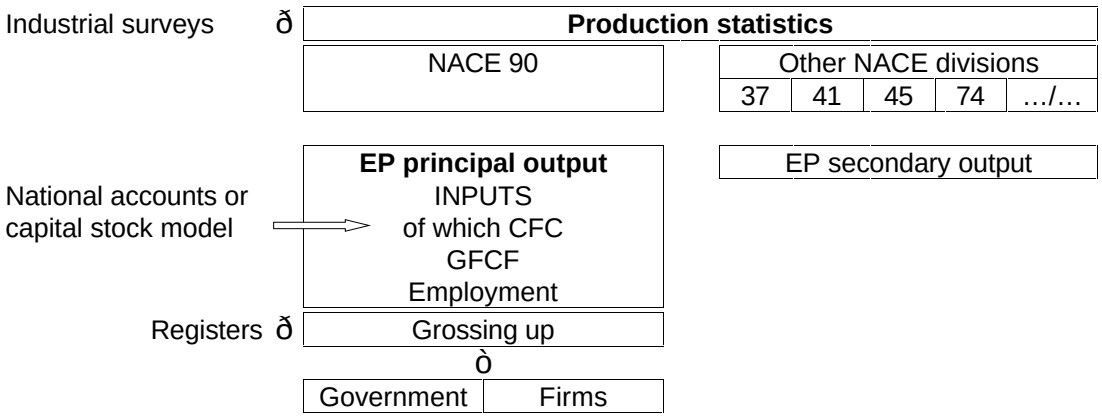
4.3.4 Summary on production statistics

Production statistics are a primary source for the compilation of the EPEA that allow to estimate the value of the production of EP services and the gross fixed capital formation for EP. The examination of the production statistics for the firms or establishments of class 90.00 of NACE Rev. 1 should be complemented by the examination of secondary EP output of units in other NACE classes.

There are four main tasks:

- the population of units covered by industrial surveys and production statistics has to be checked for completeness - grossing up is sometimes necessary,
- the classification detail is often insufficient for obtaining data by environmental domains - extra breakdown of existing data may have to obtained from data providers or estimated,
- consumption of fixed capital may have to be split by domain or calculated in co-operation with national accountants,
- an analysis of the extent of deliveries among the units identified should be made (sub-contracting, purchases of waste treatment services by units that collect waste, etc.).

Figure 2 Use of production statistics



Box 4: Use of production statistics and industry surveys for the compilation of the EPEA in France

Current expenditure and/or production

Wastewater management

For this domain main sources are the national accounts supply-use table of 90.0A (wastewater management services) made by INSEE, the annual survey of NACE 41 firms by the department of industrial statistics and the annual survey of NACE 90 firms by INSEE.

Uses of the data sources: the supply-use table allows to estimate the supply and use of collective wastewater management services. The distribution of output between government and corporations is made using the turnover of specialised firms from the department of industrial statistics survey. Output of government units is obtained by difference between the total and the corporations' output. As concerns septic tanks, the INSEE survey gives the output of services for emptying septic tanks. The whole output is considered to be used by households (final consumption).

Availability of data sources: The supply-use table is given every year by INSEE and available for the compilation of definitive national accounts. Results from annual surveys are available only at the beginning of year 'n+2'.

Waste management

Main sources are:

- an inventory (ITOMA) made by a specialised public organism (ADEME) on the 1300 installations in charge of treatment of municipal waste (physical quantities by type of treatment),
- sources that give the cost of collection and treatment services per tonne,
- an inventory of municipalities that describes the distribution of the provision of waste management services between corporations and general government units,
- annual surveys of firms in NACE 90,
- data from the general government accounts department.

Uses of the data sources: Output of waste management services for the various types of waste is obtained by multiplying quantities by unit costs. Output is distributed between producers using the municipalities inventory. Results are then compared to the results of the annual surveys and general government accounts.

Availability of data: the ITOMA inventory is annual but results are only available at the beginning of year 'n+2'. Data on unit costs are calculated starting from a base year estimate, using indexes.

Gross fixed capital formation for wastewater management

Main sources are:

- annual surveys of firms of the construction and manufacturing industries,
- data provided by professional associations of firms that construct wastewater treatment installations (SNITER) and pipes or sewer systems (Syndicat des canalisateurs),
- the municipalities inventory,
- a specific survey on EP capital expenditure by manufacturing industry.

Specialised producers

Gross fixed capital formation for wastewater treatment is known through SNITER, which covers more than 90% of the turnover of the industry. Gross fixed capital formation for sewerage systems are derived from the annual surveys on construction firms. For provisional estimates, the data from the Syndicat des canalisateurs are used. Distribution between government units and corporations is made according to the ratios taken from the municipalities inventory.

Ancillary producers

Gross fixed capital formation for ancillary activities is known through the annual survey made by the Department of Industrial Statistics (ANTIPOL survey). When the results of the survey are not yet available, estimates are made on the basis of the investment grants paid by the Water Basin Agencies.

Septic tanks

Expenditure in septic tanks is calculated on the basis of the statistics concerning the construction of individual dwellings (a specific survey – CITADEL - is made by the Ministry of Housing). The number of septic tanks is estimated and multiplied by a cost per unit. This cost is updated every year by the construction price index.

Source: Daniel Desaulty, Nathalie Saillaux and Philippe Calatayud (IFEN)

4.4 Government

In most countries public administrations are a key actor of EP (see section 4.1.1). Public administrations are in charge of the legislation, regulation and control of environmental affairs. Historically, local governments also had the responsibility of providing most of the external EP services: wastewater and waste management or of correcting private failure in environmental issues (e.g. decontamination of soil). This situation is evolving (e.g., due to privatisation) but the role of government units in the supply of EP services remains strong.

In the national accounts the sector 'general government' groups together all institutional units which as their main activity produce services delivered free or at price not economically significant for individual and collective consumption, and which are mainly financed by compulsory payments (e.g., taxes) made by units belonging to other sectors, and/or all institutional units principally engaged in the redistribution of national income and wealth. A more commonly used term is public administration which corresponds to administrative bodies and agencies at various geographical levels (central, regional or local) and their groupings (e.g. inter-municipal bodies) whose activities are mainly financed by taxes or by transfers from public budgets.

In order to be able to extract and interpret data from the national accounts, business registers and survey databases (and in order to ask the right questions to the units responsible), compilers should be aware of the following issues.

Government and public sector

For the purpose of the compilation of EPEA, and in order to obtain consistency with national accounts data, it is important to distinguish between 'general government' and 'public sector'. Public corporations and quasi-corporations, i.e. market producers with autonomy of decision that are subject to control by government units, are not part of the general government sector, but of the corporation sector.

In some countries (Netherlands, Denmark, Germany, etc.), local government have set up municipal or inter-municipal corporations, e.g. government-owned enterprises for waste or wastewater management. In others

(e.g. France), separate departments with autonomy of decision are in charge of the provision of these services and recover their costs from the users. These units are quasi-corporations controlled by local governments which often finance their investments. In some countries (e.g. Austria or Germany) municipal corporations and separate departments exist in parallel. Such public corporations or quasi-corporations may be subject to specific public finance rather than commercial accounting rules.

The two categories (public corporations and public quasi-corporations) are distinguished in business registers (see also Table 4.5 above). Public corporations are independent legal entities, either in the form of incorporated enterprises or of government agencies with an own legal status, but controlled by government either through public ownership (e.g., holding more than 50% of the shares) or by special legislation.

These units may be part of 'enterprise' registers (see section 4.3 above) and can be subject to the same surveys as e.g. private corporations (especially the public corporations). In that case they should not be included in budget or public finance statistics. However, this point needs to be verified, as it is essential not to take these corporations into account twice.

Public corporations are not included in the government sector. However, they are controlled by government and may act in rather different ways than private corporations (in particular as concerns the financing of their investments). For some presentations it may be useful to separate these public corporations from private corporations so as to aggregate them with government to an enlarged 'public sector'.

Classification of government units

Local governments (municipalities, associations of municipalities, provinces, etc.) or technical bodies of government often produce market EP services, i.e. they sell EP services at economically significant prices (whatever the name given to the price, including 'fees' or 'charges'), that is with sales covering more than 50% of the production costs. This is mainly the case for waste and wastewater management services sold to users (households and firms within a given geographical or administrative area). In this case there are two possibilities for their classification:

- the government departments (e.g. the wastewater or waste departments) have autonomy of decision and are separated from other activities within the local government accounts. In this case a separate unit classified as public corporation or quasi-corporation should be created in national business registers under the corresponding NACE position (division 90 of NACE Rev. 1). However, it is not sure that such units will be surveyed by general industry surveys. When extracting data from industrial surveys this question should be clarified with those responsible for the survey.
- the government departments do not enjoy autonomy of decision but do have separate accounts. In this case, they are not separated from the institutional unit they belong to (e.g. a municipality), although a separate statistical unit exists (a local kind of activity unit) that allows to describe the production of market EP services. This local kind of activity unit may be registered in national statistical registers under the corresponding position, but will rarely be covered by general industry surveys. Rather, the corresponding data will be obtained from budgetary statistics in the national accounts.

The table below exemplifies this for a wastewater department that belongs to a municipality and produces market wastewater management services. Table 4.7 shows how this department may be classified.

Table 4.7 Classification of government units

Autonomy of decision	Classification
enjoys autonomy of decision and sells the services at economically significant prices	a separate institutional unit should be created and classified as corporation or quasi-corporation (non-financial corporations sector)
does not enjoy autonomy of decision and sells the services at economically significant prices. The accounts of the municipality allow to identify at least the value of production, intermediate consumption, compensation of employees, employment and gross fixed capital formation	no separate institutional unit is created but for the purpose of industry classification a local kind of activity unit may be created, which although being a market producer belongs to the general government sector
does not enjoy autonomy of decision and the accounts of the municipality do not allow to identify at least the value of production, intermediate consumption, compensation of employees, employment and gross fixed capital formation	no separate institutional unit and no local kind of activity unit can be created. The department will be included with other administrative activities and classified e.g. in NACE 75 (public administration)

Payments to be considered when classifying general government units

Payments to government made by users for the services rendered may be called charges, fees, levies or even taxes. The name of these payments may be misleading as concerns their real nature. E.g. local taxes may cover, partially or entirely, the cost of municipal refuse collection and treatment services. The problem is to fix criteria for distinguishing between taxes on the one hand and fees that relate to the purchase of public services on the other hand. This aspect was discussed by the SERIEE Task Force as well as by the National Accounts Working Party at its 1-2 February 1999 meeting.

The National Accounts Working Party concluded that in many countries units classified in the general government sector are involved in sewage and refuse disposal. These activities are often financed by user fees or charges but in some countries by a mix of taxes and user fees. Discussion is summarised as follows:

- the treatment of government receipts as either taxes or sales of services can be adapted to the specific needs of the satellite account;
- the delimitation of taxes and sales of services is a general difficulty in national accounts when classifying government receipts. The ESA 95 moved the balance towards a classification as sales of services. Traffic congestion fees or fees linked to car ownership (road use charges) were noted as environment-related issues that could also constitute a borderline case;
- in general, if no link between the payment and the service rendered can be established the transaction should be classified as a tax (taxes on pollution not linked to any service being a case in point). If such a link exists, the transaction should be treated as sales of services.

Getting data on government expenditure for EP

There are two main ways to obtain data on government expenditure for EP. The first is to make an analysis of the government budgets or accounts, to identify with the help of these documents those units which act in the sphere of EP and to record their transactions. The second way relies on COFOG, a classification of all transactions of government units by function. The first way is presented in section 4.4.1 below, whereas the second (functional analysis) is described in section 4.4.2. Other important sources of data can be the annual reports and accounts of government agencies (see section 4.4.3) and the specific surveys for local government or local public utilities (see section 4.4.4).

4.4.1 Accounts of government, government finance statistics and budget analyses

Budget analysis is a method of deriving data directly from the budgetary documents published by the various government units. Economic information on government transactions in these budgetary documents includes the receipts and uses of funds by the various government units. Budgetary documents at the central or state government level are typically presented by ministry. For local governments (provinces, municipalities) they may be presented by departments. Specific bodies and groupings of municipalities also have the obligation to establish and publish separate accounts. Within each ministry, province or municipality the various departments (general directorates, etc.) have their own budget which is presented under various subdivisions (chapter, paragraph, articles, etc.) as well as following an economic classification (current and capital expenditure, salaries, purchase of goods and services, transfers, etc.).

Budget analysis is quite labour intensive and will in practice only be made when more aggregated data sources do not provide sufficient detail for compiling the expenditure accounts. Within these sources, a distinction is usefully made between government budgets, accounts of government, government finance statistics and the government sector accounts of the national accounts.

The *budget* presents the previsions of receipts and uses of funds for the current or next year. The period covered by the budget (budgetary year) may be different from the civil year. *Accounts of government* describe the results of the actual execution of the budget presented in the same way as it was voted. Accounts of governments are generally available at a detailed level well after the closing of the budgetary year. Often, budgetary documents presented to parliaments or municipal councils for voting in year n show in separate columns the accounts of government for the latest year completed (year n-1), the budget as it was voted for the current year (year n) and the budgetary provisions for voting for the next year (year n+1). In *Government finance statistics* the results from the accounts of governments are presented in an aggregate form but using essentially the same presentational form as used in budgetary document (by ministries, departments, chapters, economic categories, etc.). Government finance statistics often include

aggregate data on municipalities and associations of municipalities (often based on surveys or electronic data exchange). *Government sector accounts* are the accounts established by the national accounts department for the general government. These data are rather different. National accountants treat the basic financial statistics from the accounts of government in order to calculate the value of the transactions as defined in national accounts and by national accounts categories (output, intermediate consumption, compensation of employees, fixed capital formation or consumption, etc.). These transactions do not exactly correspond with the elementary flows of the accounts of government, e.g. due to time adjustments (e.g., cash versus accrual base for tax receipts). Some transactions may be imputed or may replace entries as recorded in the budgetary documents. For example, consumption of fixed capital is compiled by national accountants and may replace depreciation data shown in some countries in budgetary documents. Social security payments such as contributions to pension funds may also be imputed.

National accounts data are often quite aggregated. If the data exist in a functional classification, the data from national accounts may be directly used (see below section 4.4.2). It is nevertheless important to know how national accountants treat the individual items of financial statistics when they make the general government part of national accounts.

For the compilation of the government part of the EPEA, accounts data should be used in preference to budget data (as the former refer to actual transactions). Budget data may be useful for forecasts and for establishing the first estimates of environmental expenditure accounts. However, in the remainder of this section expressions like “budget”, “budgetary documents”, “budget analysis”, etc., are used regardless of the kind of data that can be used for the compilation of the EPEA, i.e. accounts data or budget data.

Central and state government

The first step is to identify within the budget the ministerial departments and specific agencies which act in the sphere of EP. For this a full examination of the budget is necessary. Apart from the Department of the Environment, other Ministries (Agriculture, Transport, Energy and Industry, etc.) may intervene in EP. An analysis of the titles of the lines of the budgets (chapter, paragraphs, articles) of the various departments or general directorates allows to allocate the expenditure to the various domains of EP and to classify expenditure according to their nature (salaries, purchase of goods and services, investments, etc.).

Applying the method of budgetary analysis often means to run a ‘syntactic analysis’ in order to code the various items of the budgetary documents. This means that each expenditure item is analysed based on the information available in the budgetary documents (the name and description of the expenditure item, title of the law the item refers to, etc.) as to whether or not the item falls within the field of analysis, its nature and the domain it belongs to. This work requires a detailed list of activities by domain.

In some cases expenditure items must be split in order to allocate them to environmental protection or to individual CEPA classes. For some institutions whose main activity cannot be fully related to EP it is necessary to estimate the part of the institution's activities that is related to EP. This can be done through an analysis of the detailed information from the documents of the corresponding department or agency. As an example, in Denmark it has been estimated that, in 1994, 47 per cent of activities by the ‘Geological Survey of Denmark and Greenland’ were related to EP activities, while the remaining 53 per cent were related to natural resources management and research, which falls outside the CEPA classification. For important items a direct contact with the responsible departments will help in understanding the purposes of the expenditure (see also Box 5 below on the ISTAT methodology for budget analysis).

It is particularly important to maintain a list of budgetary codes and the corresponding ‘transition to domain’ table as well as keys for the allocation of expenditure in a way that allows to follow the changes in the organisational structure of the central or state government.

Expenditure by central and state government are more significant in some domains. Namely:

- Protection and remediation of soil, groundwater and surface water (CEPA 4): in most countries ‘orphan’ polluted sites are decontaminated with public funding.
- Protection of biodiversity and landscape (CEPA 6): apart from the action of ministerial departments a specific agency in charge of buying land for protection or financing specific operations may exist.
- Research and Development (CEPA 8): public institutes devoted totally or partially to EP research.

- Other environmental activities (CEPA 9): general administration, formation and education (environment ministry, environment agency, etc.) It may be possible to split the budget of the ministry or agency by CEPA class but this requires detailed data. In practice, these budgets are often classified in CEPA 9.

Categories of expenditure

Once the analysis of the budget documents has been done, the second step is to treat the individual budgetary data items selected. Basically four economic categories of expenditure should be distinguished:
- purchases of goods and services,
- salaries and social security contributions,
- capital expenditure (gross fixed capital formation and acquisition of land),
- current and capital transfers (subsidies and investment grants).

Purchase of products may cover the purchase of goods and services for government own production activities (energy, etc.) or the purchase of EP services produced by specialised industries under contract with the administration. In the latter case there is a risk of double counting, when the output of this specialised industry is recorded under the corporation sector. Transfers may correspond to the mere allocation of funds to a specialised unit of the general government sector (e.g. Environmental Agency) the budget of which has to be separately analysed. Salaries and social security contributions are not always easy to identify by department, as they often constitute a global allocation for a ministry or even the whole administration. The terms ‘current’ and ‘capital’ in budgetary documents may not have the same meaning as in national accounts.
Key differences between accounts of government and government sector accounts:
- time of recording is the time of payment and not the time of the execution of the works (the difference may be important for investments and for receipts from taxes and fees),
- the contents of some items may differ (e.g., ‘salaries’ may be narrower in scope than ‘compensation of employees’),
- disaggregation may be different e.g. salaries may be shown as a single item for a whole Ministry, and the only information for an allocation to individual departments may be the number of civil servants,
- current and capital may have a different meaning.

The income side of the budget documents also provides data that are useful for the EPEA. For example, revenues from the sales of EP services (including fees or charges) or transfers received.

Some of the flows recorded in the accounts of government are of no further use for the EPEA. This includes for example expenditure such as repayment of loans, payment of interest, depreciation allowances or additions to reserves and on the income side flows such as withdrawals from reserves or new loans.

Local governments

For central government a direct analysis of budgetary documents is often manageable due to the limited number of units (and their accounts) that must be analysed. For local governments, the number of municipalities, and/or associations of municipalities may be very substantial. Furthermore, for small municipalities the level of disaggregation in their accounts may be rather low so that only very aggregated data are available. For local governments, the use of existing sources (government finance statistics, databases held by Finance Ministries, data collected by the association of municipalities, etc.) or the use of a sample survey may be considered. A combination of different sources and methods may be useful (e.g., budget analysis for large cities, sample survey for small municipalities).

Certain transactions or the full accounts of the departments of local governments or of specialised units depending on local governments in charge of waste or wastewater management may be available from government finance statistics or are sometimes centralised in the directorate in charge of public accounts of the Ministry of Finance. In this case the data for the description of the activity of local governments in the field of waste and wastewater management are directly available.

A careful analysis of these data is necessary to avoid double counting. It is in particular necessary to verify:
- that these units are not already covered by industrial surveys
- whether or not subcontracting or delegation of public services to private or public enterprises plays an important role and how this subcontracting can be retraced in the data.

Box 5: The ISTAT system of government budget analysis

ISTAT is engaged in calculating government environmental protection expenditure. One objective of the work is to produce a database for constructing EPEA. In this context a systematic approach towards conducting budget analysis was developed.

Steps needed to collect information from a generic government unit:

1. Identification and selection of EP expenditure within the budget of the government unit,
2. Classification of the selected expenditure under CEPA,
3. Analysis and identification of relevant features of the selected expenditure, e.g. the role of the units involved in the environmental protection transactions (characteristic producer, beneficiary, etc.), the type of EP expenditure (production costs for characteristic activities, purchase of specific products, specific transfers, etc.).

This analysis involves scrutinising each item of expenditure included within each account, in order to establish from the information available (description of the item, law cited in the description of the item, position of the item within the structure of the account), whether the item falls within the field of analysis of EPEA and the CEPA class within which to classify the item of expenditure.

Two main problems are to be resolved: problems due to the information source (one single expenditure item can include *environmental protection and non-environmental protection* expenditures, environmental protection expenditure in the same item can belong to *different CEPA categories*, the information on the expenditure item may *not be enough* to decide whether the expenditure item includes environmental protection expenditure) and problems due to the risk of introducing subjective criteria in the choice made.

The two stages of data collection

Under ISTAT's methodology the data collection is subdivided into two stages:

1) 'sift' or 'scan' the budget in order to:
   - exclude the expenditure items that definitively do not include environmental protection expenditures (NEPE),
   - select and classify the expenditure items that definitively do include environmental protection expenditure and are homogeneous enough to be classified under CEPA (EPE),
   - identify the expenditure items which are:
     - non-homogeneous with respect to the expenditure, i.e. which include both environmental protection expenditure and non-environmental protection expenditure (NHE),
     - uncertain, i.e. for which there is not enough information to exclude or select them (UE).
2) look for additional information to:
   - quantify and qualify the environmental protection expenditure extracted from non-homogeneous expenditure items,
   - exclude or select and, where appropriate, classify the uncertain expenditure items.

On this basis all the expenditure items from a given government budgetary document are partitioned into intermediate groups. The next step consists in emptying the uncertain and non-homogeneous expenditure groups in order to allocate them either to environmental protection expenditure or to non-environmental protection expenditure groups. For this ISTAT developed a decision tree based on formal and substantial criteria, as well as on the hierarchical order of the substantial criteria. This minimises the effect of subjective choices in the analysis and ensures consistency of data over time.

An operational tool for classifying the selected expenditure items under CEPA

The CEPA classification is not only an instrument for classifying expenditure, it also plays a part in the actual process of selecting the expenditure items which include environmental protection expenditure. Nine *operational tables* were produced which give detailed and structured descriptions of each CEPA class and provide an operational support resource for selecting and classifying expenditure items. These tables are arranged in two parts:

- overall information on the CEPA class concerned (title, description, domain, special characteristic of the environmental domain and implications with particular reference to involvement of general government)
- description of the content of the individual activities included within the CEPA classes, providing details (title, description, comments on exclusions and possible position of these in other CEPA classes, comments on general government involvement in the field of activity).

Source: ISTAT Environmental Accounting Unit

Tabulating the results of the analysis of accounts of government

The analysis of accounts of government based on budget analysis or on government finance statistics gives typically the kinds of results as presented in the tables in the Worked Example 5 below. In practice, these data are often much more detailed, distinguishing as many layers of government units as is useful for tracking the flows of money between them (e.g., ministries, central government environmental funds, regional funds, associations of municipalities, etc.) and distinguishing environmental domains (waste, water, air, noise, general administration, etc.) and should be organised in worksheets or databases.

The intermediate consumption of EP services, i.e. in particular the purchase by government units of e.g. waste or wastewater management services from subcontractors, should be identified when important (this information will be useful for avoiding double counting with data on these subcontractors). The same applies to rent income from letting EP installations (in some countries the subcontractors pay a rent for using EP installations and infrastructure owned by local governments).

Worked Example 5: Analysis of accounts of government and of government finance statistics

The environmental accounts unit maintains a database of government environmental expenditure. Data refer to:

- the accounts of central government by department,
- the accounts of various specialised agencies involved in environmental protection, namely the Environmental Protection Agency (EPA), the National Environmental Research Institute (NERI) and the Board for Nature (BfN),
- the accounts of local governments.

For central government and specialised agencies a labelling of the expenditures and revenues is made which enables a division into CEPA classes. This labelling focuses directly on the EPEA accounts and CEPA classification. It is carried out by going through all the accounts of central government and specialised agencies. It is not possible, however, to identify environmental protection activities embedded in other activities from the accounts of central government unless they have been stated explicitly in the explanatory text belonging to the accounts.

Reported transactions include the purchases of goods and services, salaries and social security costs (payments for retirement schemes of civil servants, etc.), transfers paid and received, capital expenditure (direct investments) and revenues from sales, fees, etc.

Within central government only two ministries were found to have identifiable expenditure for environmental protection: the ministry of the environment and the ministry of agriculture. All expenditure of the ministry of the environment were classified in CEPA class 9 under general administration of the environment (except transfers received from the EU for the protection of biodiversity and landscape, which were partially transferred to local government units). Expenditure of the ministry of agriculture consists in subsidies paid to farmers in compensation of the extra costs for more environmental-friendly agricultural practices.

Central government	Air	Waste-water	Waste	Soil	Biodiv. & Landscape	R&D	General Admin.	Total
Ministry of the environment					**-4.5**		**370.0**	**365.5**
Purchases of goods and services							74.1	74.1
Salaries and social security costs							99.3	99.3
Transfers paid					6.0		178.6	184.6
Transfers received					10.5		0.1	10.6
GFCF and net land acquisitions							18.3	18.3
Revenues from sales								0.0
Ministry of agriculture					**151.3**			**151.3**
transfers paid					151.3			151.3
Specialised agencies*	**3.0**	**201.9**	**129.4**	**47.9**	**617.0**	**352.3**	**25.7**	**1 377.2**
Purchases of goods and services	3.0			47.9	264.2	114.7	12.2	442.0
Salaries and social security					112.8	194.3	13.5	320.6
Transfers paid		201.9	129.4		163.1			494.4
Transfers received					15.0			15.0
GFCF and net land acquisitions					91.9	43.3		135.2
Revenues from sales				15.9	16.7	77.3		109.9

* EPA, NERI, BfN

As concerns local government, the environmental accounts unit has access to an analysis of financial statistics for general budget transactions. These transactions cover the environmental directorates of municipalities and regions, as well as non-autonomous wastewater and waste departments for small cities (under 2000 inhabitants). Transfers are almost negligible, except transfers paid by regions for biodiversity and landscape protection (which in fact are contributions to the financing of natural reserves managed by the Board for Nature) and transfers paid by

municipalities to environmental non-profit institutions. Available data do not allow classifying the activities of the environmental departments under a specific class of the CEPA. Therefore they are classified under CEPA 9 – General administration.

Local Governments	Air	Waste-water	Waste	Soil	Biodiv. & Landscape	R&D	General Admin.	Total
Municipalities general budget		**581.8**	**449.4**		**9.0**		**412.1**	**1452.3**
Purchases of goods and services		334.7	179.9				118.4	633.0
Salaries and social security		122.1	206.5				158.9	487.5
Transfers paid					15.0		186.3	201.3
Transfers received					6.0		75.1	81.1
GFCF and net land acquisitions		125.0	63.0				23.6	211.6
Receipts from sales		602.1	425.0				19.6	1046.7
Regions general budget					**75.5**		**62.1**	**137.6**
Purchases of goods and services							22.0	22.0
Salaries and social security							29.6	29.6
Transfers paid					75.5			75.5
Transfers received								
GFCF and net land acquisitions							10.5	10.5

Worked Example 6: Central database of the accounts of specialised municipal bodies

The Ministry of Finance centralises the accounts for specialised municipal and inter-municipal bodies involved in the provision of collective wastewater and waste management services (as well as other services not related to environmental protection: municipal transportation, electricity production and distribution, etc.). These bodies include the autonomous departments for waste and wastewater management in large municipalities (over 2000 inhabitants), as well as public establishments of inter-municipal co-operation (PEIC). The central database of accounts is deemed to be exhaustive. Recording of transactions follows the specific rules of public accounting. Current and capital transactions are distinguished. Within 'current receipts' the following items are distinguished:

- 'sales': refer to the payments by the purchasers of the services. For waste management they correspond to the purchases by industrial firms of services for the treatment of their industrial waste, in the installations for municipal waste treatment. For wastewater they correspond to the wastewater collection and treatment part of the water bill.
- 'transfers and taxes': refer to the paying to concerned municipal departments, via the fiscal bodies that collect these, of specific fees and taxes related to the provision of services.
- 'property revenues': refer to the payments of other specialised producers to municipal departments for the leasing of installations owned by the municipality and used by these other specialised producers.

These sales, transfers and 'taxes' are, on the whole, considered as sales of EP services.

Within 'current outlays', 'purchases' corresponds to intermediate consumption. However, when a municipal department does not produce the services itself, this item includes the purchase of waste and wastewater management services from either firms or other municipal departments. As concerns 'capital transactions', the only data that will be used are those on direct investment.

	Wastewater			Waste		
	Cities > 2000	PEIC	Total	Cities > 2000	PEIC	Total
Current receipts	2,129.8	1,458.7	3,588.5	1,888.4	1,292.8	3,181.2
sales	1,971.5	1,385.8	3,357.3	725.6	155.4	881.0
transfers	25.6	54.1	79.7	884.0	888.4	1,772.4
taxes	11.2	0.0	11.2	153.2	164.0	317.2
property revenues	121.5	18.8	140.3	125.6	85.0	210.6
Current outlays	1,718.4	997.2	2,715.6	1,654.1	1,189.3	2,843.4
purchases	739.3	519.7	1,259.0	987.5	666.3	1,653.8
compensation of employees	203.3	142.9	346.2	410.8	356.2	767.0
Interest payments	325.6	289.8	615.4	113.5	69.2	182.7
depreciation	450.2	44.8	495.0	142.3	97.6	239.9
Capital outlays	827.4	1,135.4	1,962.8	213.5	391.0	604.5
direct investment	501.2	777.9	1,279.1	125.7	295.6	421.3
repayment of loans	300.6	297.0	597.6	75.2	65.1	140.3
other	25.6	60.5	86.1	12.6	30.3	42.9
Capital receipts	210.5	747.1	957.6	263.1	379.8	642.9
loans	55.3	263.8	319.1	79.4	238.6	318.0
other	155.2	483.3	638.5	183.7	141.2	324.9

Transfer payments should be analysed in some detail distinguishing the beneficiaries. For example, within the transfers paid by the environment ministry, transfers to environmental funds, to municipalities, to private companies, to households, to other countries, etc. can often be distinguished. When government grants preferential loans (i.e., loans at a reduced interest rate) for environmental protection investment, this information should be distinguished. When the average rate of reduction can be estimated, also the cash equivalent of the preferential interest rate can be compiled. Data on preferential loans can be used together with data on capital transfers to cross-check the investment data reported by the beneficiaries or even to estimate their investment when data on the beneficiaries are missing.

A complementary table should be set up to describe the transfers between the different levels or units of government, in order to avoid double counting. This table can also be used for publication purposes as it illustrates the flows of funds among different levels of government and between government units and other sectors (private enterprises, households).

Table 4.8 Example of a transfers summary table

	Donors							
Beneficiaries	Federal government	Federal funds	Regional governments	Regional funds	Municipalities	Other units	Total received (1)	Transfer balance (1)-(2)
Intragovernmental transfers								
Federal government								
Federal funds								
Regional governments								
Regional funds								
Municipalities								
Other								
Total given (2)								
Of which current transfers								
Of which capital transfers								
Preferential loans to other sectors								
Industries								
Households								
Total preferential loans								
Cash grant equivalent of loans								
Transfers to other sectors								
Industries								
Households								
Rest of the world								
Total transfers to other sectors								
Of which current transfers								
Of which capital transfers								
Total capital transfers and loans								

Accounts of governments and government finance statistics generally do not provide data on the consumption of fixed capital but may include e.g. data on depreciation allowances, interests paid and/or financial transactions (repayments of loans, etc.). When the units are market producers, the output is given by the sales, and the value of the consumption of fixed capital is not necessary for the valuation of EP output. When the units are non-market producers the value of output is compiled by summing up intermediate consumption, compensation of employees, taxes on production and consumption of fixed capital.

Even for market producers, the calculation of the consumption of fixed capital may be necessary. It has been found in several countries (France, Austria, Germany) that the net operating surplus of government market producers is negative. The net operating surplus is the difference between output (i.e. sales) and

intermediate consumption, compensation of employees, net taxes on production and consumption of fixed capital. A negative net operating surplus indicates that part of the production costs is not covered by sales. One reason for such a result may be that government units, when calculating the prices of EP services (e.g., the level of fees to be paid for waste services) are legally required to avoid a net profit and to base the depreciation allowances on historic rather than replacement costs. This issue has been submitted to a National Accounts Working Party the recommendations of which were to compensate such negative net operating surplus by other subsidies on products in the accounts (i.e. an implicit subsidy by the government; see section 5.2.2 for detail). The issue of consumption of fixed capital is treated in detail in section 5.1.4.

Worked Example 7: A table for transfers

From the analysis of financial statistics, it is possible to draw a table that describes the transfers between the various units of the economy, including transfers from and to the rest of the world.

Transfers (described in Worked Example 5) include:

- central government transfers to the rest of the world (international co-operation in the field of environmental protection)
- capital transfers from the Environmental Protection Agency to specialised producers in the waste and wastewater management domains. These transfers correspond to investment grants for Public Establishments for Inter-municipal Co-operation (PEIC). The funds for the investment grants originate in earmarked taxes.

	From				
To (by domain)	**Central government**	**Local government**	**Specialised agencies**	**European Union**	**Total (received)**
Central government				10.6	10.6
biodiversity				10.5	10.5
other				0.1	0.1
Local government	81.1				81.1
biodiversity	6.0				6.0
other	75.1				75.1
Total government	***81.1***	***0.0***	***0.0***	***10.6***	***91.7***
Specialised producers		201.3	331.3		532.6
waste (capital)			129.4		129.4
wastewater (capital)			201.9		201.9
biodiversity		15.0			15.0
other (current)		186.3			186.3
Non-specialised producers	151.3	75.5	163.1		389.9
biodiversity	151.3	75.5	163.1		389.9
Total producers	***151.3***	***276.8***	***494.4***	***0.0***	***922.5***
RoW other	103.5				103.5
Total (given)	**335.9**	**276.8**	**494.4**	**10.6**	**1117.7**
waste	0.0	0.0	129.4	0.0	129.4
wastewater	0.0	0.0	201.9	0.0	201.9
biodiversity	157.3	90.5	163.1	10.5	421.4
other	178.6	186.3		0.1	365.0

4.4.2 National accounts – COFOG

Within the process of establishing the national accounts, one step is the allocation of the transactions of government to functions by identifying and classifying actual or imputed expenditure made in connection with particular functions or to achieve particular purposes. An international Classification of Functions of Government (COFOG) has been developed for this purpose. Many countries make this type of disaggregation although the classifications used are not necessarily identical to COFOG.

COFOG also allows examining the trends in government outlays on particular functions over time. Conventional government accounts are usually not suitable for this purpose since they reflect the organisational structure of governments and time series may be distorted by organisational changes. For example, if a government establishes a new department that brings together some of the functions previously administered by several departments or at several levels of government, it will not be possible to use conventional government accounts to compare expenditure on these functions over time.

The old COFOG only offered one position for environmental protection: 07.3 (Sanitary affairs and services including pollution abatement and control). A newly adopted version of COFOG includes a full Division dedicated to environmental protection. Within this division 6 groups are distinguished. The breakdown is based upon the CEPA. Groups are presented below.

05.1 Waste management: collection, treatment and disposal of waste; includes: collection, treatment and disposal of nuclear waste.
05.2 Wastewater management: sewage system operation and wastewater treatment.
05.3 Pollution abatement: activities relating to ambient air and climate protection, soil and groundwater protection, noise and vibration abatement and protection against radiation.
05.4 Protection of biodiversity and landscape.
05.5 R&D environment protection.
05.6 Environment protection n.e.c.

Within each group the following items should be covered:
- administration, supervision, operation or support of related activities (which corresponds to the units' own production);
- grants, loans or subsidies to support the related activities (i.e., transfers to other units).

However, as all expenditure (outlays) should be classified under one and only one position of the classification, in some cases EP expenditure or multi-purpose activities may be classified under another item. As a consequence, some other positions of the COFOG may also be relevant for the identification of EP expenditure: e.g.:
- 01.2.1 Economic aid to developing countries and countries in transition may include aid that is intended to finance projects in the environmental protection area, such as wastewater collection and treatment facilities, or to promote biodiversity protection etc.
- 01.3.2 Over-all planning and statistical services (e.g. the part of statistical offices that relates to environmental statistics).
- 04.2.1 Agriculture (includes compensation, grants, loans or subsidies to farmers in connection with agricultural activities, including payments for restricting or encouraging output of a particular crop or for allowing land to remain uncultivated).
- 04.7.4 Multi-purpose development projects
- 06.1.0 Housing development (includes grants, loans or subsidies to support the expansion, improvement or maintenance of the housing stock).
- 08.2.0 Cultural services (includes operation or support of facilities for cultural pursuits, zoological and botanical gardens, aquaria, arboreta, etc.).

Other functions may also contain some secondary environmental elements: economic intervention, education, etc. However, it will in general be difficult to identify this EP part in data sets based on COFOG. Typically the result of a functional analysis of government expenditure will be as shown in Table 4.9.

Table 4.9 Data from functional analysis

	05.1	05.2	05.3	…/…
Current transactions				
Outlays				
purchases of products				
(of which EP services)				
salaries				
social security costs				
taxes on production				
subsidies paid				
Receipts				
sales				
subsidies received				
revenues of property				
Capital transactions				
investment				
capital transfers				

4.4.3 Annual reports and accounts of government agencies

In most countries government agencies exist that take care of specific environmental issues. These agencies may for example be in charge of the implementation of public policy, collecting taxes and funding investments, helping local government with technical expertise, funding environmental protection research and development, etc. These agencies may cover one or several domains or sub-domains: waste collection and treatment, radioactive waste, etc. They may cover a specific geographical area (e.g. a water basin, a national park), general or specific issues (agencies for the environment, for health-related environmental aspects, for environmental research, etc.). They may supervise non-profit institutions (hunters or fishermen associations), or collect taxes whose revenue is used for environmental protection. When the national organisation of environmental protection is described (see section 4.1) a list of these agencies has to be drawn. Table 4.10 shows examples of such agencies.

Annual reports and accounts of these agencies may be collected and analysed, in complement to the accounts of government. The analysis of these reports may be useful because:

- the analysis of the reports is a source for the description of the environmental sector, the identification of environmental legislation and the establishment of a detailed classification of activities. The reports also allow to identify other units involved in environmental protection and to assess their financial involvement.
- the analysis allows to go deeper in the allocation of expenditure and in particular to distribute multipurpose expenditure between environmental protection and other purposes, and environmental expenditure between domains.
- the analysis also allows to assess the use of subsidies and other transfers paid by central government: from the reports one can reconstitute the uses, either administration services (the own production of the agencies) or purchase of services, of land for biodiversity protection, funding of other units etc.
- the analysis allows to allocate the receipts of specific taxes and other income to environmental protection.

Table 4.10 Examples of central government agencies

Denmark	France
Environmental agency	Institute for the Environment
Geological survey	Agency for waste and energy control
National Forest and Nature Agency	Agencies for water basins
Risø National Laboratory	Agency for radioactive waste
National environment research institute	National Office for Hunting
Environment complaints board	Agency for littoral protection

It may also be useful to study reports and accounts of other public institutions that may intervene in environmental matters (e.g. agency for housing improvement that may finance noise insulation of houses).

For these government agencies or funds the data will be of the same kind as for government. Their reports generally also provide physical data (volume of waste and wastewater collected and treated, area of land purchased for protection, number or researchers etc.).

4.4.4 Specific surveys of local government or local public utilities

In some countries specific surveys are directed to local governments (municipalities and associations of municipalities). These surveys may be general surveys or inventories for local governments, e.g. surveys in order to assess infrastructure or services existing at local level. In this case some questions may refer e.g. to the way the waste and wastewater collection and treatment services are organised (see e.g. Box 3 above). Are they provided directly by the municipality itself, against payment? Are they provided by a specific inter-municipal body that directly collects the charges from the users? Are they provided by a private or public corporation that sells services to the municipality, the latter being in charge to recover the costs of the services from the users, etc.? Such information is also useful to verify that the data from other sources (corporations, government finance statistics) are consistent with the institutional organisation of these domains.

These surveys may also collect monetary information. Two types of surveys may be considered, which do not provide the same information.

- Surveys that only ask for expenditure in general terms, without detailed disaggregation by type of transaction: e.g. total outlays without description of the activities but with a classification by domain. Government finance statistics may directly provide such information.
- Detailed surveys that ask for quantities of waste or wastewater collected and treated, the operating costs for collection and treatment, the receipts from sales, the investments and capital and current transfers. These surveys may be sample surveys. The data allow to set up detailed production accounts, to link monetary and physical data and to explore in detail the organisation of the sector.

4.4.5 Summary for general government

The first step is to determine precisely the coverage of general government by establishing the central and state government units involved in environmental protection activities and the type of environmental protection activities carried out by local government or units under their control.

The second step is to analyse the relationships between government and corporations in some domains (mainly waste and wastewater management): which units are responsible for what, which are the transactions between the units? Based on this, the data available from various sources can be identified, extracted and arranged in worksheets similar to tables 4.8 and 4.9.

Worked Example 8: The environmental tax database

Information on tax revenue is available from the national financial authority. In conformity with the OECD/Eurostat definition of environmental taxes, all taxes levied on tax bases with environmental relevance are identified. They are categorised into four different groups: taxes on energy, taxes on pollution, taxes on natural resources and taxes on transport. These taxes are also allocated to CEPA classes. Energy and transport taxes are considered to be related to the air domain, as well as some pollution taxes. Other pollution taxes relate to the protection of biodiversity (taxes on fertiliser and pesticides), to the protection of water (tax on water pollution) or waste management (tax on packaging).

All pollution taxes are paid by non-specialised producers. The EPA receives a part of the revenue which is earmarked for investment grants to municipal specialised producers (201.9 for wastewater and 129.4 for waste – see Worked Examples 1, 5 and 7).

Environmental taxes

Energy taxes		**7,115.4**
energy tax (on mineral oil, natural gas)	air	4,939.4
other production taxes on electricity	air	372.8
tax on carbon dioxide	air	1,803.2
Pollution taxes		**1,839.5**
tax on sulphur dioxide	air	25.2
tax on pollution from domestic flights	air	28.4
tax on fertiliser	biodiversity	53.9
tax on water pollution (partly earmarked)	water	1,269.0
tax on packaging waste (partly earmarked)	waste	456.2
tax on pesticides	biodiversity	6.8
Transport taxes		**885.2**
tax on vehicles (annual)	air	618.2
sales tax on vehicles	air	267.0
Resource taxes		**231.5**
water withdrawal tax	water	231.5
Total environmental taxes		**10,071.6**
VAT rate on wastewater management services		6.0%
VAT rate on waste management services		4.5%

4.5 Data on environmental protection expenditure by industries

4.5.1 Surveys of environmental protection expenditure

Introduction

An important source of data for the EPEA is surveys of environmental protection expenditure by industries. In many countries such surveys are made since a long time. These surveys basically cover the expenditure made by the various industries for the reduction of pressure on the environment due to their production activity, i.e. what is called in the EPEA the ancillary (or internal) environmental protection activities. Purchases of EP services may also be covered as part of current expenditure.

The scope of these surveys varies across countries. The surveys may cover only capital expenditure (or costs) or current expenditure or both. Capital expenditure may include only end-of pipe investment or also investment in integrated technologies. As an example, the industry expenditure questionnaire that was used in Germany in 2000 is provided in Annex 2. The questionnaire used by Statistics Canada can be found in 'Environmental Protection Expenditures in the Business Sector, 1998' (Statistics Canada 2001).

Also the industries covered and the type and size of the units surveyed may vary across countries. Generally only the mining, manufacturing and electricity, gas and water supply industries (sections C to E of NACE Rev. 1) are covered, which leaves aside agriculture, construction transport and other services. The environmental domains covered may be limited to air protection, wastewater management, waste management, and noise and vibration abatement. In some countries, expenditure on soil and ground water protection, landscape protection and environmental R and D are also covered.

Capital expenditure surveys – how they are done

Capital expenditure surveys are most common and regular (yearly basis) and made since numerous years in some countries. The last feature allows to establish time series of investment and therefore to calculate the stock of environmental protection fixed capital and the consumption of fixed capital.

<u>The purpose criterion</u>
When undertaking surveys of investments for environmental protection one has to specify to the firms surveyed the criterion to apply for deciding whether investments are for environmental protection. Often the 'purpose criterion' is used. An investment is included when made for environmental protection purposes. The 'regulation compliance' criterion (i.e. investment made to comply with environmental legislation) could appear more operational, but is more restricted.

The 'net cost criterion' is also used in some countries. According to this criterion, an investment for environmental protection is included when it gives rise to a net cost for the firm, taking into account the side effects – receipts from by-products (energy from the incineration of waste or materials recovered), savings on energy, raw materials, productivity gains, etc. A study by Statistics Netherlands has shown that the difference between the purpose criterion and the net cost criterion is very small (1,5%).

Types of investment

Two main types of investment are generally distinguished: end-of-pipe and integrated investment. The expenditure associated with integrated investments (e.g. changes in processes) are more difficult to identify than end-of-pipe investments (dedusting equipment, settling tanks, etc.) but measuring integrated investments increases the significance of environmental protection investment data and allows analysing trends towards more preventive actions. Several sub-types of integrated investment may be distinguished and their measurement may differ, for example:

- adaptation of existing production equipment (total cost of adaptation),
- integrated investments where the main purpose is environmental protection (total investment or a share),
- investments with significant environmental characteristics (environmental share of total investment),
- investments where the environmental characteristics are of minor importance (share of total investment or excluded).

The share that environmental protection represents within the investments in new production equipment is often estimated by the extra-cost in relation to a 'normal' investment (i.e. an investment which would provide the same services, except the environmental protection function). Determining the 'normal' investment that should be compared to the investment actually done ('reference' technology) can be difficult.

Box 6: Capital expenditure surveys: example of France

From the beginning of 1980s, the annual survey of manufacturing industry included a question about investments for environmental protection. In 1992 (with 1991 as the reference year) a specific survey was launched: 'the annual survey on investments protecting the environment'. The survey covers a sample of establishments (all establishments with more than 100 employees, 50 for building materials, para-chemistry, and 20 for the most polluting activities: basic metal and chemical industry). In this survey the establishments (i.e. more or less the local KAU) are asked for their investments during the previous year.

A distinction is made between:

- specific anti-pollution investment – more or less 'end-of-pipe' – which is disaggregated between investments for measurement and control, recycling and recovery, purification, treatment and elimination activities, for the main four domains (water, air, waste and noise),
- investments for a change in process or adoption of clean technology (questions are asked for the total amount of the investment and the part of environmental protection within this total amount),
- investments for the prevention of incidental pollution risk,
- investments for the protection of sites and landscapes.

Furthermore, a question is asked for studies for environmental protection (of which realised internally and purchased). 8000 establishments are surveyed (of a total of 36 000 establishments with more than 20 employees). Raw results are published (not corrected for non-answering establishments). The results are published by industry and by region and several comparisons are made with total investment of industry.

Results of capital expenditure surveys can be directly entered in the EPEA under the GFCF for ancillary activities. The results are also used for estimating the stock of environmental protection capital. This fixed capital stock allows compiling the consumption of fixed capital and even estimating the operating expenditure of the EP capital stock, which is a substantial part of the current expenditure for ancillary activities.

Table 4.11 Typical data from a capital expenditure survey

	NACE …	NACE …	NACE …
End of pipe investments for			
Air protection			
Wastewater management			
Waste management			
../..			
Investments in new processes			
for air protection			
for Wastewater management			
for waste management			
etc.			

Grossing up of results

Surveys rarely cover the whole universe of firms. There are two types of restrictions: coverage of industries and size of firms, and non-response. For manufacturing industries the surveys tend to cover only enterprises (or establishments) over a certain size (e.g. with more than 10, 20 or 50 employees) and sampling rates may be different according to the size class. Also there is a need for correction for non-answering firms. Therefore a grossing up of results may be necessary.

In 1997 Statistics Norway made a pilot survey on environmental protection expenditure for manufacturing industry. The pilot study covered the variables related to environmental expenditure from the Council Regulation 58/97 for the following environmental domains: air, water, solid waste, noise and 'other'. On a total of 250 establishments that had 50 or more employees, 192 responses could be used. Statistics Norway calculated the data covering the entire NACE groups for the 'end of pipe' and 'integrated' investment variables. These estimates were made using two different grossing up variables: employment and total investments. Due to the small sample the grossing up of end-of-pipe investment using employment and gross investment increased the raw data by 77% and 61 % respectively. For integrated investment the difference in the results of the grossing up according to the two variables was higher: 75% and 117% respectively. Statistics Norway has not taken a definitive position as concerns the best variable to use for the grossing up of results. An investigation of the effects of grossing up was also undertaken in the UK (see Ecotec 1996). It was found that using employment and turnover as the basis for grossing up provided similar results. It is recommended to conduct a sensitivity analysis (i.e. analysing the differences in results by industry, size class of enterprises and environmental domain) when determining the grossing up method.

Current expenditure or operating costs surveys

They are less common. A prototype is the Dutch survey. This survey was launched in the early 1980s. It consisted of an annual written questionnaire to firms with 20 or more employees in the mineral extraction, manufacturing industry and public utilities sectors. Annual data were collected on environment related fixed capital formation and on expenditure on waste and wastewater disposal, environment related licence fees, noise levies, pollution penalties, environmental research and co-ordination (administration) and cleanup of polluted soil.

Until 1989 the survey included an extra question once every five years on the operating expenditure of all existing anti-pollution installations. This sub-section was replaced as from the 1989 reference year by an annual question on the operating expenditure in the first year of operation of new installations only. This information is used by Statistics Netherlands to calculate the operating expenditure of all existing environmental protection installations. Operating expenditure includes intermediate consumption and labour costs.

Apart from their own environmental protection activities, firms are also faced with pollution taxes and expenditure on anti-pollution activities contracted out, such as waste collected by a municipality or another firm.

Table 4.12 The current expenditure data collected through the Statistics Netherlands survey

Operating expenditure of anti-pollution installations (by domain) staff costs for operation, maintenance and supervision energy costs costs of raw and auxiliary materials	
Subsidies for operating expenditure	
Purchase of external EP services wastewater management waste management other (consultancy, etc.)	
Pollution taxes	

It is worth noting that in the survey, depreciation (and interest payments) are not asked for, but are calculated on the basis of environmental investment data and price indices, assumptions on the lifetime of fixed capital and assumptions on their age-efficiency profile (and an increase of maintenance and repair expenditure over the lifetime of the installations is assumed).

Box 7: The French survey on operating expenditure

In 1996 (reference year 1995) the survey on environmental protection investments (see Box 6) was extended to operating expenditure. This survey will be repeated every five years. The questionnaire asks for the total current expenditure for all specific installations and equipment – i.e. of the end-of-pipe type – for environmental protection (domains covered are water, waste, air and noise), for risk prevention, for the protection of landscape and biodiversity and for environmental studies.

A useful categorisation of current expenditure

Total current expenditure can be separated into internal (or 'own account') current expenditure and purchases of environment protection services (EP services for short).

Internal current expenditure includes costs for energy, material and own personnel for measures made by the enterprise to reduce its pollution. Maintenance services, rent, insurance and overhead costs may be included. A large part of internal expenditure is related to operating environment protection equipment (operating expenditure). There are also other internal expenditure not directly related to the operating of equipment such as general administration, education, information, environmental management and certification, research and development and e.g. some waste management activities not involving the use of equipment.

Purchases of EP services are payments to public and private producers of EP services. These payments are linked to an environment protection activity done outside the enterprise. These purchases include payments to private producers of waste and wastewater collection and treatment services (mainly specialised producers in NACE 90) and payments to environmental consultants linked e.g. with environmental management and education. These payments also include payments to public bodies for waste and wastewater collection and treatment (whatever the name of the payments – fees, charges etc.) as well as permits and surveillance fees. Fines and penalties for the violation of environmental laws should be excluded.

Earmarked environmental taxes contribute to financing abatement expenditure. They are not part of current expenditure for environmental protection. Payments of these taxes are however useful for analysing the financing of environmental expenditure (see section 5.7).

Table 4.13 Categories of current expenditure

Current expenditure for environmental protection			
Internal current expenditure		Purchases of EP services	
Operating (of EP equipment) expenditure	Other internal expenditure	Payments to private (specialised) producers	Payments to public entities

Separating operating expenditure from purchases of external EP services

If the current expenditure survey covers both operating expenditure and the purchase of external EP services, these two items must be separated. This is necessary to avoid double counting of the purchases of external EP services as a cost element of the ancillary activities (and thus as EP output) and as EP output of market producers. The separation will also help in assessing the uses (and users) of the external EP services sold by specialised producers. Ideally, the purchases of external EP services are identified separately in the questionnaire (see Annex 2 for an example). When this is not the case, estimates must be made during compilation.

External EP services will usually be purchased as an input for the principal activity of a firm but some may serve as input to ancillary activities (e.g. purchase of waste disposal services for the dust removed by dedusting equipment). However, these external EP purchases are usually not identified separately as this would require a very detailed questionnaire. It is thus recommended (see SERIEE §§ 2079-2080) to relate all purchases of external EP services to the principal activity of the firm rather than trying to incorporate some of these as intermediate consumption in the cost structure of the ancillary activities.

Consumption of fixed capital

Consumption of fixed capital is a cost element of ancillary activities which is not identified through surveys but is calculated. The information necessary for this calculation comes from the surveys on investment for environmental protection (see above) and from other sources. For detail see section 5.1.4 on environmental protection capital stock accounts.

Worked Example 9: Results of the environmental expenditure survey

Results are from a pilot environmental expenditure sample survey covering 10 000 firms of the NACE codes C, D and E (mining and quarrying, manufacturing, electricity, gas and water supply). The anticipated rate of response is 70% useable returns. The sample is drawn from the Business Register, at the firm level. For large firms, available disaggregated business reporting units are used. The sample is stratified according to available estimates of environmental expenditure and by firm size. In addition to the postal questionnaire, telephone interviews to validate responses are made in 5 % of the cases.

After an analysis of various possible grossing-up methods (number of firms, turnover, etc.) it was chosen to calculate the expenditure for each category (size class and NACE class) by multiplying the response by the ratio of employment of the responding firms to total employment in each category. This procedure assumes that there is no systematic bias in the non-response. Confidence intervals are calculated. For the total expenditure they are estimated to be +/- 5%. They are higher for the detailed breakdowns by domains and by industry.

	Water	Air	Waste	Noise	Biodiv. & landscape	Other	Total
Capital expenditure	397.3	702.5	175.9	35.9	152.0	128.0	1591.6
End of pipe	365.0	507.4	70.6	35.9	152.0	128.0	1258.9
Integrated investment	32.3	195.1	105.3				332.7
Current expenditure	2196.3	1686.5	1160.0	1.2		153.0	5197.0
Own account	1444.2	1686.5	726.8	1.2		153.0	4011.7
Payments to others	752.1		433.2				1185.3
Total gross expenditure	2593.6	2389.0	1335.9	37.1	152.0	281.0	6788.6
Subsidies received							
Revenues	27.3	17.9	105.3	0.8		3.1	154.4

Note: grossed-up results.

Capital expenditure are available in a breakdown into machinery and other equipment, and buildings.
Own account expenditure refer to intermediate consumption (excluding purchases of environmental protection services) and compensation of employees related to the operation of equipment. Overhead costs are included. No further detail breakdown was asked for these cost categories.
Payments to others include payments for waste and wastewater management services.
Revenues include annual income and savings attributed to environmental investment. Reported subsidies were found to be insignificant.

4.5.2 Other sources on industry expenditure

In many countries trade associations, specialised consultants, organisations for the measurement of emissions, environmental funds or engineering firms may collect and publish data on the environmental protection measures undertaken by firms. These data are often collected for lobbying or market research purposes and include e.g. the % of establishments in a certain industry equipped with specific anti-pollution devices, estimates of the costs of environmental protection for a given category of producers, etc.

Other information can be derived from the 'environmental reports' of big firms, e.g. electricity producers, refineries, iron and steel companies, etc. The progress of 'eco-management', with the eco-certification of a growing number of firms also provides new information.

Data from the above sources may be incomplete with regard to coverage and may use definitions that differ from those used in surveys conducted by statistical offices. The contents, coverage and definitions of these sources must be analysed and any biases corrected when the data are used for compiling EPEAs.

4.6 Other useful data sources

4.6.1 Household surveys

Surveys on households final consumption expenditure are regularly made in many countries. Their aim is to follow the consumption of various categories of products by households, which allows to complement the use side of supply and use tables. Household budget surveys extend the coverage to all outlays by households, including contributions to non-profit institutions and taxes paid. These surveys are generally exhaustive (all expenditure are asked for) and provide information on:

1. the use of EP services by households (payments for waste and wastewater services), and
2. the use of connected and adapted products by households,

when these goods and services are separate items of the classification used in the survey.

The use of EP services by households

Expenditure on EP services are mainly the payments made by households for waste and wastewater management services. The situation differs across countries. In some cases, the surveys only give information for a broad category of expenditure related with housing: rents, water supply and other services, which include waste and wastewater fees and charges (see the COICOP categories listed in Annex 5.3).

These expenditure can only be identified by the households surveyed when shown separately on invoices. In some cases (e.g., multi-appartment houses) the rent paid by households to the owners or operators of the buildings may cover also other charges (e.g. heating, water supply and waste removal). In other cases, the water bill may include wastewater removal. It is therefore necessary to examine in detail the exact content of this item in household consumption surveys.

As for production statistics, a problem is to estimate the purchases of all households and not only of a part of them. Therefore, it is necessary to check the scope of the data collected through household surveys: which are the households covered, are the data grossed up, how are multi-appartment houses treated?

With these verifications and the necessary corrections, household surveys may provide the value of final consumption of EP services by households. VAT has to be separately recorded. The VAT rate is generally known, but may differ according to the units that provide the services (government or private firms).

The use of connected and adapted products by households

Although final consumption of connected and adapted products by households is included in household expenditure, generally they are not separated in surveys. They are grouped together in wider categories (e.g. operation of personal transport equipment includes replacement of catalytic converters, measurement services of exhaust gases of cars, etc.). As a consequence expenditure related to such products will have to be assessed in other ways. See section 5.4 for detail.

Contributions to non-profit institutions by households

Household budget surveys may give indications of the contributions made by households to non-profit institutions serving households (NPISH) involved in environmental protection. However, such detail is unlikely to be available in practice and contributions of households to NPISHs, if considered important, may best be estimated from the data on sources of income of NPISHs (see section 4.6.2 below).

Table 4.14 Data tabulation of household environmental expenditure

	Amounts
Final consumption expenditure	
wastewater management services	
(of which non-deductible VAT)	
waste management services	
(of which non-deductible VAT)	
adapted products (by product)	
connected products (by product)	
contributions to NPISH for environmental protection	
payments of environmental taxes (by tax)	

4.6.2 Annual reports of non-profit institutions

Non-profit institutions are mainly active in a few environmental protection domains: landscape and biodiversity protection, radiation protection and general administration and education. Usually they provide information services but may also produce other types of services (inventories, measurement, control etc.). Their expenditure may be of some importance in some countries but the results of the EPEA pilot exercises suggest that non-profit institutions are not a very important factor in terms of expenditure, but are rather difficult to assess.

The classification of the purposes of the non-profit institutions serving households (COPNI) distinguishes a separate item for environmental protection: class 08.1.0 Environment protection services. This class covers the following non-profit institutions:

- organisations set up to prevent or remedy environmental damage,
- associations that seek to protect wild animals or preserve particular species of animals, birds, fish, insects etc.,
- organisations that seek to preserve forests, wetlands and areas of natural beauty.

This class excludes the political parties mainly concerned with environmental issues, as well as associations that seek to prevent cruelty to domesticated animals.

The COPNI also distinguishes a class for research and development for environmental protection: 08.2.0. This class covers the organisations that undertake applied research and experimental development on subjects related to environmental protection and trust funds and charitable organisations set up to finance such activities.

Large non-profit institutions may publish annual reports, which give information on their activities and financing. When they are mainly financed by the general government, NPISH are classified with the general government in national accounts[5]. It is therefore necessary to identify the subsidies paid by general government units to NPISH.

[5] In the same way NPI mainly financed by contributions of corporations are to be classified in the corporations sector. This is the case of some institutions engaged in selective collection of packaging waste, or in measurement networks for air pollution.

Table 4.15 Data on NPISH

	Amounts
Outlays	
intermediate consumption	
salaries and social security costs	
other current outlays	
Receipts	
contributions by households	
current transfers from general government	
current transfers from EU institutions	
Capital transactions	
gross fixed capital formation	
acquisition of land	
capital grants received	

4.6.3 Physical data

One objective of satellite accounts is to allow linking of physical and monetary data. E.g. to relate the expenditure for waste management with the quantities of waste collected and treated, the emissions avoided with the prevention measures, etc. Two types of physical data are generally distinguished: data on installations (number and capacity of wastewater treatment plants or landfills, % of power stations equipped with exhaust gas filtering equipment, etc.) and data on pollution: quantities of waste or wastewater collected and treated, reduction of atmospheric emissions, etc. Other examples of physical data or indicators are: % of population served by public wastewater and waste collection and treatment services, according to the type of treatment (mechanical, biological and advanced wastewater treatment; separate collection, incineration, etc. of waste) and by type of unit that provides the service (private companies, municipalities).

Physical data may also be helpful for estimating certain items of expenditure when no other data are available or to expand estimates made for a part of the EP services. For example, when only the supply of municipal waste management services by government units (or only by private firms) is known, subject to verification, the total supply of waste services can be calculated using information about the share of the population which is served by these producers.

As another example, when the total supply of EP services is known, but there is no direct economic information on the distribution of uses between e.g. households and producers, physical data may be used to distribute the uses according to the quantities of e.g. waste or wastewater produced, adjusted for price differences among user groups if required.

Physical data may also be used for the construction of time series. When monetary data are only available for certain years, physical data may allow to calculate the expenditure for missing years. Physical data can also contribute to the projection of the expenditure when provisional accounts are compiled.

Using physical data to calculate expenditure

Physical data may be used for calculating expenditure. This is in particular the case for waste management, wastewater management, but also for some elements of noise abatement, research and development, etc. The general procedure is to select a physical indicator and to multiply it by a unit price or cost. This method is called the ‘price-times-quantity’ method.

For example, in France, no complete data were available on the waste management activities of municipal departments, whereas the total quantity of waste and the type of treatment were fairly well known. Therefore, per unit costs were used for estimating the cost of the management of municipal and industrial waste. Costs of collection and treatment are known by surveys. The expenditure was calculated multiplying the quantities by the costs. The result was compared with two other sources: payments of municipal waste tax (which is used to fund waste management but not directly related to the costs of waste management) and data from surveys of private specialised waste management firms available in the statistical office.

In some countries, private firms are in charge of the construction and management of motorways. This includes noise abatement and protection of landscape and biodiversity. These firms may not be covered by surveys on EP expenditure by industries but their EP measures (anti noise walls, tunnels or bridges for wild animals, etc.) can be important items of the accounts for noise and for biodiversity protection. The investments may be estimated on the basis of physical data: length of anti-noise walls, length of highways constructed, number of bridges for animals, etc. by using unit prices or ratios to total investment.

Research and development expenditure for environmental protection may be calculated on the basis of the personnel involved in such activities, using a unit cost.

This approach should only be used when monetary data are not available. One reason is of course that this approach makes it difficult to derive any new information or conclusion from the comparison of expenditure and physical data, as the former is calculated on the basis of the latter.

Physical data are also important for the assessment of the fixed capital stock. When inventories of installations (wastewater treatment plants, sewage networks, landfills or incineration plants etc.) and equipment (number of garbage trucks) exist, it is possible to estimate the value of the fixed capital stock. Ideally, the type of installations, their capacity and their age would be tabulated and complemented with indicative prices for these installations and equipment.

Physical data are also useful for verifying the completeness of monetary data. For example, when specialised producers are distributed between the government and the corporation sector, and when physical data show the share of each sector in the provision of the services, it is useful to verify whether the monetary share is more or less in line with the physical one or to identify the reasons for any discrepancies.

Table 4.16 Physical data

	Quantity	Price or value per unit	Value of EP services, investment or capital stock	of which for/serving households
Waste collected (by type, origin and kind of collection)				
Waste treated (by type, origin and kind of treatment)				
New and existing installations				
sewage networks (km by type)				
wastewater treatment plants (capacities by type)				
septic tanks (number)				
waste incineration plants (capacities)				
landfills (capacities)				

4.6.4 Price data

Over the past decade the prices of marketed EP services increased a lot in most European countries. When price indices are available from price statistics or other sources for key EP services (waste and wastewater) this allows to separate the increase in the value of expenditure between a ‘volume (incl. quality) component’ and a ‘price component’ and also to compile expenditure in constant prices. Price data are also useful for estimating expenditure on the basis of physical data.

In many countries price indices for EP services exist, at least for the part that corresponds to final consumption by households. These indices may cover:

- fees or charges for refuse collection and treatment,
- fees or charges for wastewater collection and treatment.

As for many other services, analysis of the price changes of EP services is not easy. Changes in the nature of the services provided may explain the changes in prices, and must be analysed as a change in volume (e.g. a quality increase of the service due to advanced treatment) and not a change in price. A correct interpretation of the evolution of environmental expenditure requires that price data are carefully examined.

4.6.5 Using data from construction statistics

Most countries make specific surveys on the construction sector. These surveys cover the activity of establishments classified under division 45 of the NACE Rev. 1. They give information on the production of these establishments as well as, sometimes, information on the type of works or on the purchasers.

For the compilation of the EPEA these surveys may be useful when they allow to distinguish the output by products at a detailed level, providing e.g. the sales of pipes for wastewater, sewage networks, incineration plants, etc.

The most interesting products in the division 45 of the CPA classification are:
- 45.21.32 General construction work for other long-distance pipelines, including for water,
- 45.21.41 General construction work for local water and sewage pipelines, including ancillary works,
- 45.21.64 General construction work for engineering works n.e.c. (which includes general construction work for water treatment and purification plants).

Note: although not specified in the explanatory notes of the CPA, it is probable that general construction work related to incineration plants is also included within this category.

As a complement to civil construction statistics, engineering services are also worth to be examined. CPA subcategory 74.20.34 (Engineering design services for the construction of civil engineering works) includes:
- engineering design services for the construction of civil engineering works, such as:
  · bridges and viaducts, dams, catchment basins, retaining walls, irrigation systems, flood control
  · tunnels, highways and streets, including interchanges and related works
  · locks, canals, wharves and harbour works
  · water supply and sanitation works, such as water distribution systems, sewage
- industrial and solid waste treatment plants and other civil engineering projects
- drawing-up of preliminary drafts, project development, specification of plans of execution or exact specifications on behalf of the contracting authority for the construction of civil engineering works.

Construction statistics are often more detailed than the CPA position which allows to distinguish, e.g. construction of pipes for water supply and construction of sewage networks. In some cases, information is also available about the type of institutional unit which orders the construction (local government, corporations, etc.).

Associations of construction firms or specialised civil engineers may make specific surveys (e.g. firms specialised in the construction of purification or wastewater treatment plants, incineration plants etc.).

General surveys on the environmental goods and services industry (see next section) may also collect information on the construction of specialised facilities and corresponding equipment, e.g. by listing different types of building works that serve exclusively for environmental protection; construction of loading installations for wastes, dumps for domestic and industrial waste, thermal waste treatment plants, etc., as well as the corresponding project management.

Table 4.17 Typical data from construction surveys

	Value of works	Uses by market segment (if available)
Investments		
sewage systems		
wastewater treatment plants		
waste treatment facilities		
dump sites		
incineration plants, etc.		

These data may be compared with the gross capital formation of specialised and ancillary producers, when this gross capital formation is described by categories of products (building and civil works, machinery and equipment, transport equipment).

4.6.6 Environment industry surveys

There is substantial policy interest in the environmental goods and services industry (environment industry for short), its growth, employment and export potential. In 1999, OECD and Eurostat published 'The environment goods and services industry - Manual for data collection and analysis'. This manual offers a definition and classification of the environmental goods and services industry and provides a set of guidelines on best practices and methods for data collection and analysis (see Annex 3 for more detail). Several EU countries organise environment industry surveys.

In Germany, e.g., the survey on goods and services for environmental protection has two parts:

(1) for a representative sample of establishments in the industries that produce products and undertake construction works serving exclusively for EP and firms of architects the survey covers annually:
   a) sales by types of goods, construction and services (for domestic customers, EU customers and other countries)
   b) investment and value of additionally rented and leased goods

(2) for a representative sample of establishments every four years
   a) the nature and value of the equipment serving environmental protection purposes
   b) nature, quantity and value of the goods, building work and services used in the making of EP equipment.

The questionnaires provide a list of goods, construction work and services, including a rather exhaustive list of connected products including capital goods.

In France a similar survey was done which covered more than 10 000 firms with more than 20 employees in manufacturing industry and services (construction was excluded).

In order to be used for the EPEA, these surveys have to be carefully analysed. The main use is the information which can be derived as concerns the equipment (investment) and the EP services produced.

Worked Example 10: Miscellaneous data

Physical data will be used for distributing municipal waste management services among users (see Worked Example 12) and for expanding partial results (industrial wastewater management, see Worked Example 13).

Data come from the Environmental Protection Agency which is in charge of collecting data on the generation of waste and wastewater and on emissions to air. Other data available refer to imports and exports of connected products. These data (from the customs authority) are used for the calculation of domestic uses of trash bags and catalytic converters. Finally, from regular household budget surveys the statistical office estimates the consumption of water-related services by households. These services are later broken down into distributed water and wastewater charges using an average decomposition of the total water bill.

Waste generation (million tonnes)		quantities	%
municipal waste		20.30	100.0%
of which households waste		15.15	74.6%
of which small producing units		5.15	25.4%
Wastewater generation (million m^3)		quantities	%
Total industrial wastewater		6 254	100.0%
of which NACE C, D, and E		1 576	25.2%
of which other NACE (except agriculture)		4 678	74.8%
Foreign trade data (million euro)		imports	exports
trash bags, etc.		25.2	150.2
catalytic converters		43.8	12.5
Water expenditure in households final consumption		10 767.2	
of which water supply	55.2%	5 943.5	
of which wastewater charge	44.8%	4 823.7	

5. Compilation of EPEA tables

A general overview of the system of EPEA tables was provided in section 3.1.4. The main data sources were reviewed in chapter 4. In this chapter, detail is provided on the EPEA tables and on the compilation of these accounts.

5.1 The domestic supply of environmental services (Table B)

5.1.1 The production table

Classification of producers

The upper part of Table B describes the production of EP services by domestic producers. Different categories of producers and output may be distinguished. The two main categories are:

- Specialised producers (with corresponding market and non-market output),
- Non-specialised producers (with corresponding secondary and ancillary output).

In the SERIEE manual, specialised producers are defined as those producers which execute an EP activity as their principal activity (1994 SERIEE § 2022). They correspond mainly to producers classified in the class 90.00 of the NACE Rev. 1 classification. However, in practice this definition is applied with some flexibility, because:

a) Some government units that carry out EP activities cannot really be classified as specialised producers, because their main activity is not environmental protection. 'In relation to much of the activity by general government it can be questioned whether the (environmental protection) activity is a main activity or not. Within general government it is obvious that the Ministry of the Environment, the Environmental Protection Agency and the National Environmental Research Institute carry out environmental activities as their main activity. It is not obvious, however, that e.g. environmental research is a main activity if the Ministry of Agriculture carries it out. For the sake of simplicity, however, in the present context all characteristic activities carried out by government are considered as main activities of general government as a whole' (see Gravgaard 1999). Therefore, although not exactly in line with the 'formal' classification of statistical units in the SERIEE manual, all environmental protection activities carried out by general government units are classified as being produced by specialised producers.[6]

b) As has been explained in chapter 4, the classification of producers is sometimes confusing. For example, some government units that carry out wastewater or waste management activities may be classified in division 75 (general administration) of NACE Rev. 1. As another example, in France almost all producers of wastewater management services are classified in division 41 (water supply) of the NACE Rev. 1 because these producers are responsible for both water supply and wastewater management. As a consequence, industrial surveys only provide data on the cost structure and on gross capital formation for the whole division 41. The share of wastewater management must be estimated using additional information. In theory, these producers would be classified as secondary (non-specialised) producers in the EPEA tables. However, due to the importance of these producers, they were classified as specialised.

Classification of specialised producers

Specialised producers are classified into two categories according to the institutional sector they belong to. The first category groups together specialised producers of the general government and NPISH sectors. The second category groups together the specialised producers of the corporations and households institutional sectors. In practice, the first category corresponds to general government and the second one to the corporations. It is useful to separate government specialised producers by the level of government: central government, local government, with a specific category for municipalities. This separation is also useful for presentation purposes, although it is not shown in the standard format of Table B (see Table 5.1 below). The way the government data are obtained allows making this breakdown without supplementary work as the categories typically correspond to separate data sources.

[6] Please note that this is just a practical way of classifying government EP producers without any impact on the costs of production and the value of EP output. This method is particularly useful when the data on government environmental protection transactions result from budgetary analysis as the method avoids having to identify the precise nature of each government unit.

Current transactions in the production table

Table 5.1 Upper part of the production table (Table B)

TRANSACTIONS	CHARACTERISTIC PRODUCERS				
	Specialised producers		Non-specialised producers (by industry)		Total
	Government sector	Corporations sector	with secondary EP output	with ancillary EP output	
1 Intermediate consumption	X	X	-	X	X
1.1 of which EP services	X	X	-	nr	X
1.2 of which ad. & con. products	(x)	(x)	-	nr	(x)
2 Compensation of employees	X	X	-	X	X
3 Taxes on production	x	x	-	(x)	x
4 Less subsidies on production	(x)	(x)	-	(x)	(x)
5 Consumption of fixed capital	X	X	-	X	X
6 Net operating surplus	x	X	-	-	x
7 Output (basic price or cost of production)	X	X	-	X	X
7.1 Non-environmental output	x	x	-	-	x
7.2 Environmental protection output	**X**	**X**	**x**	**X**	**X**
7.2.1 non-market	X	(x)	(x)	-	X
7.2.2 market	X	X	x	-	X
7.2.3 ancillary	nr	nr	nr	X	X
8 Current EP resources	X	X	x	x	X
8.1 market output (sales)	X	X	x	-	X
8.2 current transfers	x	-	x	x	x

X…important item. x…often small. (x)…often very small/may be ignored. -…not relevant or zero by definition. nr…not recorded here to avoid double counting.

The upper part of Table B presents current transactions in the rows, first inputs to production (the cost structure) and then output according to its nature. The last rows (current EP resources) show the receipts of EP producers corresponding to their production of EP services. This information is used later, when analysing financing.

The data sources for Table B differ according to the categories of producers and the nature of output. Output of specialised producers of the government sector is available from the national accounts or is calculated on the basis of finance statistics or budgetary analysis. Output of specialised producers of the corporations sectors and secondary producers is taken from production statistics. Ancillary output is calculated based on the data from surveys on environmental expenditure by industries. When the data sources described in sections 4.3, 4.4 and 4.5 do not provide data it is necessary to resort to other sources (e.g. physical and price data) and estimate these data, e.g. using the price-times-quantity method.

Table 5.2 Data sources by category of producers

Category of producer	Main data sources
Specialised producers, general government	National accounts, analysis of finance statistics or of accounts of government
Specialised producers, corporations	industrial surveys, production statistics, national accounts
Non-specialised producers, secondary output	industrial surveys, production statistics, national accounts
Non-specialised producers, ancillary output	specific surveys on environmental expenditure

The most important information in the upper part of Table B is the value of output of EP services, i.e. row 7.2. Other rows (inputs and distribution of output by category) may be inferred from row 7.2. Only if output is not directly available, the data on inputs are essential for calculating the output based on the cost of production. Systematic data on inputs are however useful for assessing the effects of EP activities on the economy (wages and salaries, demand to other industries, estimation of associated employment, etc.).

5.1.2 Output as given by existing sources

There are two cases where the output of EP services is directly given by existing sources:

- when national accounts data are detailed enough to give the supply of these services by specialised (and secondary) producers,
- when production surveys cover the whole field of specialised producers in detail.

In these cases, the value of output of EP services may be directly entered in row 7.2 for the respective categories of producers. The only specific work is to determine the values to be entered in rows 1 to 6. Industrial surveys generally provide the data for rows 1 to 4, including in some cases the value of the intermediate consumption of EP services by specialised producers (which in the context of the EPEA is an intra-industry intermediate consumption leading to double counting). Generally, however, this 'intra-industry intermediate consumption' is only available when detailed input-output or supply-use matrices are available. In most cases it has to be estimated based on the information on the organisation of the supply of EP services (sub-contracting, concessions, waste collection and treatment when done by different units).

Data to be entered in rows 5 and 6 are generally not available except when the complete production account for specialised producers can be taken from the national accounts. When this is not the case, the consumption of fixed capital (row 5) must be calculated. This issue is dealt with in section 5.1.4.

5.1.3 Output calculated via cost of production

For some categories of producers the output is not directly available through surveys, e.g. because the output is not sold on markets. This is the case for non-market producers of the general government sector and for ancillary activities. In these cases the value of the output is determined by the cost of production, i.e. the sum of intermediate consumption, compensation of employees, taxes less subsidies on production and consumption of fixed capital. The net operating surplus is assumed to be zero (for details see § 2064 and annex II to chapter 2 of SERIEE).

For producers of the government sector, finance statistics or analysis of the accounts of government will only give the first three items of the cost of production (rows 1-3 of table 5.1) and data on rows 8.1 and 8.2 (see also table 4.9 above). The same is valid for specific surveys on current EP expenditure by industries (see e.g. table 4.13). For non-market and ancillary activities the net operating surplus is zero by definition so that only the consumption of fixed capital has to be calculated. Section 5.1.4 shows how to calculate the consumption of fixed capital from time series of investment or from estimates of the capital stock in place.

For government producers it has to be assessed whether the revenues from sales (row 8.1) cover more or less than 50% of the cost of production. If sales cover more than 50% of the cost of production, the producers are market producers and the output is determined by the sales. The operating surplus is derived as a balancing item and may be negative (see section 5.2.2 for detail).

If sales cover less than 50% of costs, the producers are non-market producers. Total output is then determined by the cost of production and the receipts from sales of this non-market output are called *partial payments* (see SERIEE § 2066-2067). In practice, partial payments will often be small and are best put in row 7.2.2 (market output) and only the difference between the cost of production and the partial payments is put in row 7.2.1 (non-market output). This is not strictly in line with the national accounts (see ESA 95 § 3.45 and 3.56) but facilitates setting up the supply-use table (table B1) and comparing the sales of producers with the purchases of users (see section 5.2.2 for detail). If partial payments are a major issue in a country (e.g. if waste management activities recover less than 50% of the costs) it may be useful to add a row in Table B (and a column in Table B1) showing the partial payments separately.

Determining for each government unit whether it is a market or a non-market producer will be difficult due to lack of individual data and is usually not necessary (see also the issues of classification described in section 5.1.1 above). In practice certain groups of government units could be considered market or non-market depending on the level of government and the CEPA class (see Table 4.1). Experience suggests that government units mainly involved in environmental administration, R and D, biodiversity and landscape protection or air and noise protection are generally non-market producers. This would include e.g. the

central government units and the environmental departments of regional governments. On the other hand, the municipal waste and wastewater departments will typically recover enough of their costs to be classified as market producers.

In the case of anti-noise walls the total cost of production is largely determined by the consumption of fixed capital because there are very few other costs of production (some maintenance perhaps). In the EPEA the operating of anti-noise walls is treated as an activity generating an output of 'noise abatement services'. The National Accounts Working Party at its 1-2 February 1999 meeting expressed the following views:

- the construction of anti-noise walls constitutes gross fixed capital formation;
- therefore, consumption of fixed capital should be calculated;
- the output of non-market producers directly includes the output from these anti-noise walls;
- in the national accounts no distinction is made between transport infrastructure and anti-noise walls, therefore the same lifetimes are applied when calculating the consumption of fixed capital;
- for satellite accounts purposes it is possible to identify anti-noise walls separately, at least to some extent (e.g. for central government);
- in a satellite account, anti-noise walls could be treated as giving rise to an activity. Following the ESA 95 definition of gross fixed capital formation, additional inputs (e.g. labour) is not a precondition for an asset to provide services.

The stock of fixed capital is also important when no data are available on current EP expenditure by industries. In this case it is possible to estimate operating expenditure based on data on the fixed capital stock. The ratios of fixed capital stock to operating expenditure can be based on expert assessment, existing studies, etc. These ratios should be updated regularly. Adding the consumption of fixed capital gives an estimate of the ancillary output of EP services. This estimate will be a lower bound, as some internal expenditure is not linked to the use of equipment (e.g. administration, education or certification).

Table 5.3 Calculating output via cost of production

Government non-market output	Ancillary output (1)	Ancillary output (2)
from analysis of accounts of government or finance statistics: intermediate consumption compensation of employees taxes	from specific surveys on environmental expenditure: operating and other internal expenditure	ratios to the stock of fixed capital give an estimate of operating expenditure
+ consumption of fixed capital (from capital stock models)	+ consumption of fixed capital (from capital stock models)	+ consumption of fixed capital (from capital stock models)
= value of output	= value of output	= value of output

5.1.4 Environmental protection capital stock accounts

In order to calculate the consumption of fixed capital and for linking expenditure data to physical accounts, capital stock accounts should be set up. They can be based on long time series of investment using the perpetual inventory method. If long time series of environmental investment are not available, an initial estimate of the capital stock in place (and its age structure) can be based on other data. Such data include:

- physical environmental data related to capital stock – e.g. population served by sewerage networks, number, capacity and treatment category of wastewater treatment plants, length of sewage networks, number and capacity of waste incineration plants, power plants equipped with flue gas scrubbers etc.,
- physical environmental data related to pollutant releases – e.g. waste arisings can be used as basis to estimate the cost of treatment and the capital stock needed for this treatment and collection, time series of air emissions may – together with data on energy use and output – allow to better understand environmental protection measures that were undertaken,
- legal and administrative information – e.g. the coming into force of major environmental laws gives an indication of past patterns of investment, permit and supervision data may be helpful,
- if environmental investment is supported by government via investment grants or preferential loans, such information can be a useful basis for estimates of past investment,
- engineering estimates and expert assessment may be used to determine past investment,
- data on operating expenditure may be used to estimate the capital stock in place.

The initial capital stock must be estimated by categories of capital goods (vehicles, infrastructures, machinery) and by age class. The national accounts assumption of the lifetime for these categories may then be applied (unless more specific information is available) to calculate the consumption of fixed capital.

Capital stock accounts also allow estimating the operating expenditure related to the gross stock of capital in place. For this, case studies and expert assessment may be used to estimate average ratios of operating expenditure to the stock of environmental capital, ideally by age classes and types of equipment. For such estimates to be reliable, detailed breakdowns of the capital stock by environmental domain and by type of capital goods as well as detailed categories of operating expenditure (wages and salaries, energy, maintenance, etc.) are recommended. Detailed breakdowns also permit to apply detailed price indices to each category when updating the estimates. The average ratios will change over time, e.g. because new, more efficient, equipment may have lower ratios. Therefore, the average ratios should be regularly updated with the help of experts (e.g., following a 5-year revision cycle).

The table below presents some of the results of the pilot exercises as concerns ratios between the gross capital stock, the value of output and the consumption of fixed capital.

Table 5.4 Consumption of fixed capital in % of output and capital stock

	Wastewater		Waste		Air	Noise
	Specialised producers	Other (ancillary)	Specialised producers	Other (ancillary)	Other (ancillary)	Other (ancillary)
CFC as a % of output						
Austria 1995	51.3	17.7	12.1	7.2	23.3	71.6
France 1994	47.5	40.3	14.5	17.3	41.7	98.6
Netherlands 1991	56.1	50.2	13.3	42.2	57.4	na
Germany 1995	47.0	23.7	9.9	18.7	38.5 (1)	-
Output as a % of capital stock						
France (in % of NCS)	13.5	31.4	na	na	6.1	na
Germany (in % of GCS)	4.0	22.6	62.0	35.3	15.4 (1)	-

(1) includes noise

When specialised producers are separated between government and other, the results are the following:

	Wastewater		Waste	
	Government spec. prod.	Other spec. producers	Government spec. prod.	Other spec. producers
CFC as a % of output				
Austria 1995	70.2	12.4		
France 1994	95.8	5.2	13.8	15.3
Netherlands 1991	58.3	8.2	50.2	13.1
Germany 1995	57.1	28.0	6.9	14.1

These ratios can also be used for a first – very rough – estimate of CFC when a capital stock model is not yet available for some categories of producers and output. For this, the above ratios can be re-calculated and expressed in percent of current uses other than CFC – i.e. the sum of compensation of employees, intermediate consumption and other taxes less other subsidies. When data on current in-house expenditure are available, average ratios of CFC to current in-house expenditure could for example be:

- Wastewater management: 50%,
- Waste management: 20%,
- Protection of ambient air: 70%.

As the table above illustrates, the ratios differ quite a lot across countries probably reflecting differences in preferred technologies used (e.g. waste or wastewater treatment methods), industrial structure, main energy sources used, average age of equipment, etc. Therefore, using rough average ratios can be helpful in completing a first set of pilot accounts but cannot produce very reliable results and should therefore be replaced by better estimates based on a capital stock model as soon as possible. When using the rough

average ratios, they should be adjusted to the situation in a country (e.g. taking account of whatever is known about the time paths of investment, the importance of different treatment techniques for waste or wastewater, the organisation of environmental protection, the industrial structure, etc.).

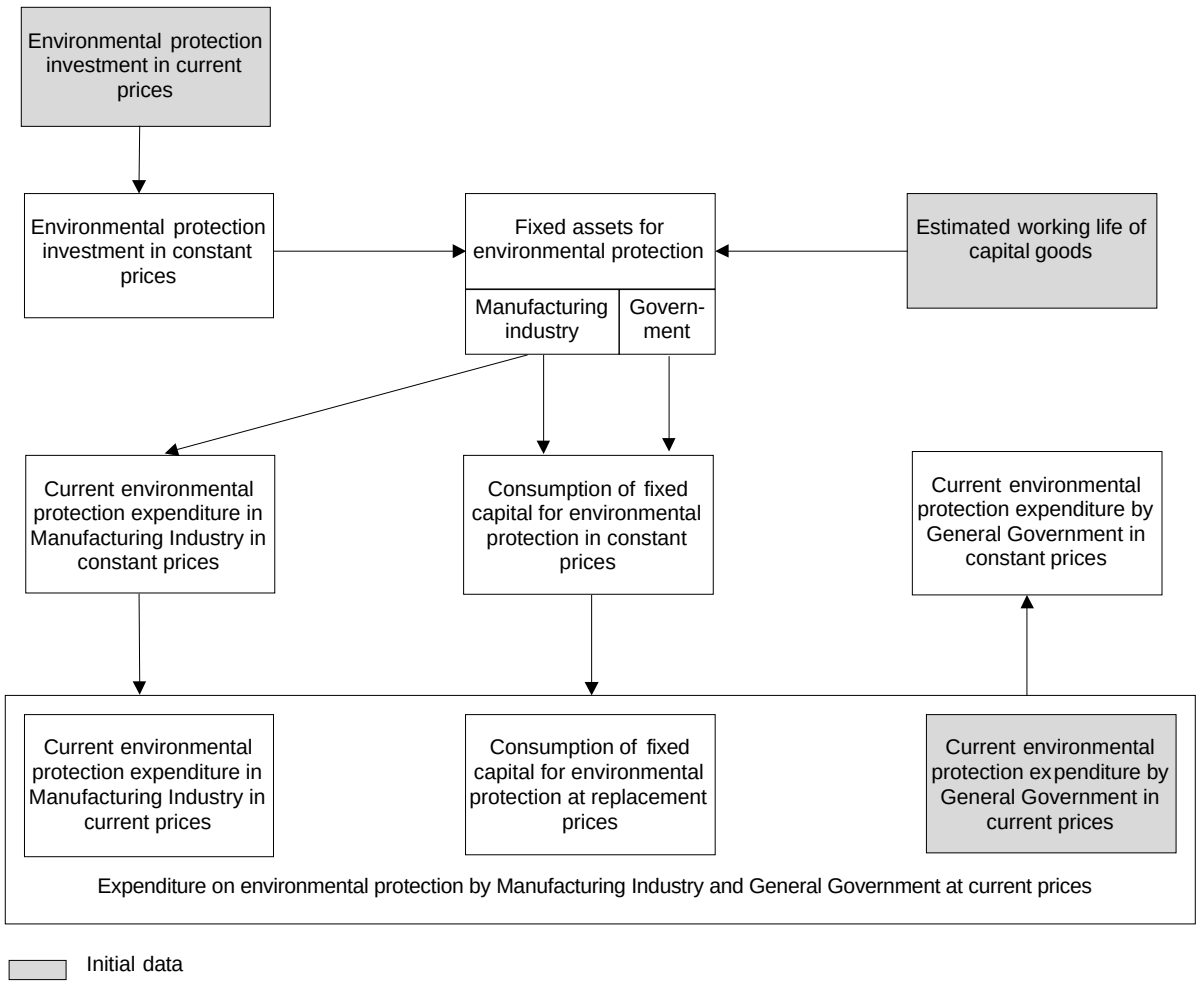
Box 8 below describes the German system of stock of fixed capital accounts which is part of the German Environmental Economic Accounts System. This box also illustrates how such a system can be set up, even when long time series of investment are not available.

Box 8: Stock of fixed capital accounts – the German system

Stock of fixed capital accounts (SFC accounts for short) for environmental purposes offer data especially for the consumption of fixed capital of ancillary and non-market activities, required to calculate their output for Table B. For another important variable of Table B, namely operating expenditures, an important part can be estimated from SFC accounts if no primary data source is available. With the help of average ratios (given by experts) of operating expenditure to the stock of environmental fixed capital, time series of operating expenditure can be derived.

The most prominent method for SFC accounting is the perpetual inventory method (PIM). According to this method, the inventory of fixed capital is calculated by cumulating the additions, that is the environmental protection investments of previous years, having regard to the specific working life of the fixed capital goods. The starting point is therefore time series of environmental protection investments in current prices reaching far back into the past, and these are price-adjusted by dividing them into categories of goods and applying specific price indices to each category.

The basic statistical data about environmental protection investment should be available for different type of goods, at least for the two broad categories equipment and buildings. For the different types of capital goods one needs assumptions about their specific lifetime. As a starting point the regular national accounts assumptions of lifetime for these categories/goods may be applied, later stepwise modified by more detailed assessments given by experts.



The basic statistical data about environmental protection investment should be available for different type of goods, at least for the two broad categories equipment and buildings. For the different types of capital goods one needs assumptions about their specific lifetime. As a starting point the regular national accounts assumptions of lifetime for these categories/goods may be applied, later stepwise modified by more detailed assessments given by experts.

The inventory of fixed capital at constant prices is then calculated from the investment time series in constant prices according to a well-defined mathematical-statistical procedure. For Germany that procedure was directly taken over from the national accounts. The German SFC account offers yearly data about gross and net capital stock, capital expenditure, retirements and consumption of fixed capital for main environmental domains and for main industries and the government sector. The figure above presents the calculation sequence of the German SFC accounting system for compiling expenditure and fixed capital for manufacturing industries and for government.

If long time series of environmental investments are not available, alternatively an initial estimate of the capital stock in place can be the starting point of the SFC account. Such an initial estimate can be based on a variety of monetary and physical data, including physical environmental data related to capital stock, physical data related to pollutant releases, legal and administrative information, engineering estimates etc.

According to the PIM-methodology the initial capital stock must be determined by main categories of capital goods and by age class to allow in the end a yearly extrapolation of the capital stock by the linkage with recent environmental investment data.

In Germany, such an initial monetary estimate via physical data was done for 1990 for the environmental capital stock in place in the former German Democratic Republic (i.e., the New Länder). In a second step this initial inventory was linked to new investment data available from 1991 onwards and extrapolated. Finally, the SFC accounts for the old and new Länder were merged into figures for Germany as a whole.

Source: Wolfgang Riege-Wcislo, German Federal Statistical Office

Worked Example 11: Capital stock data

The national accounts department calculates the stock of fixed capital and the consumption of fixed capital for the NACE 90 industry as a whole, using the perpetual inventory method (PIM). The environmental accounts unit distributes these variables among the different categories of specialised producers, using the data on GFCF of firms and municipal or inter-municipal bodies. These data are available at a detailed level (machinery and other equipment, transport equipment and buildings) and for several years through industrial surveys and the central database of municipal capital expenditure.

For ancillary producers, the level and the composition of the stock of fixed capital are estimated from studies. These studies indicate the proportion of the firms equipped with either waste management, wastewater management or air pollution abatement devices and installations. The stock of fixed capital for noise and biodiversity and landscape protection is estimated on the basis of the length (in kilometres) of anti-noise walls along motorways, buried electricity lines (energy sector) and the number of tunnels and bridges for animals (motorways, railways, etc.) given by the firms or administrative departments. These numbers are then distributed over age classes and multiplied by a price estimate. The PIM method is used to estimate consumption of fixed capital.

	Net fixed capital stock	Consumption of fixed capital	Gross fixed capital formation
Specialised producers			
Wastewater management			
Firms	9 525.4	476.3	1 289.2
Cities < 2000 inhabitants	11 592.0	187.2	125.0
Cities > 2000 inhabitants	38 250.7	1 201.8	501.2
PEIC	30 250.6	950.5	777.9
Total	89 618.7	2 815.8	2 693.3
Waste management			
Firms	6 923.8	646.0	734.3
Cities < 2000 inhabitants	960.0	89.6	63.0
Cities > 2000 inhabitants	2 921.7	272.6	125.7
PEIC	2 533.4	236.4	295.6
Total	13 338.9	1 244.6	1 218.6
Ancillary activities			
Waste	2 532.9	167.2	175.9
Wastewater	8 665.1	255.6	397.3
Air	17 184.8	1 079.3	702.5
Noise	1 020.0	51.0	35.9
Biodiversity & landscape	3 221.0	173.9	152.0
General administration, other	1 540.6	153.2	128.0
Total	34 164.4	1 880.2	1 591.6
General Government			
Air	5.1	0.3	0.0
Biodiversity and landscape*	659.6	37.7	91.9*
R&D	231.5	30.9	43.3
General administration	1 161.8	52.8	52.4
Total	2 058.0	121.7	187.6

* of which land acquisition 73.5

5.1.5 Other ways for calculating output

When the value of output is not directly available from existing sources or cannot be calculated via the cost of production it is necessary to apply other methods.

One method is to calculate the value of output using data on physical volumes and prices or costs (see also sections 4.6.3 and 4.6.4 above). This 'price times quantity' method applies mainly to waste and wastewater management but can be used also for other cases. When the quantities of waste and/or wastewater collected and treated and estimates of the average prices or costs of the collection and treatment services are available, it is possible to estimate the value of output multiplying the quantities by the unit price of the services.

The method is most relevant when detailed information on quantities and prices is available. It can also be applied when the value of output is known only for a subcategory of producers. E.g., industrial surveys may cover only units of the corporation sector, leaving aside local government units. When the quantities of waste or wastewater collected by these two categories of units are known, it is possible to extrapolate the results from one category to the total. Similarly, the output of secondary producers of waste management services may not be available but the waste volumes they collect may be known (as illustrated by Box 3 above) and could be used to estimate the secondary output.

The 'price times quantity' method is also useful to verify the consistency of the results of other methods. The ratio of output over physical quantities gives as a result the implicit prices of the services which may be compared with the prices of EP services derived from other sources.

5.1.6 Identification of non-environmental output and current EP resources

Identification of non-environmental output

In Table B, total output (row 7) is separated into non-environmental (row 7.1) and environmental output (row 7.2). Specialised producers are defined by their main activity which means that they may have some non-environmental secondary output. Industrial surveys distribute the output according to products (see table 4.6) and the separation is fairly simple. However, when this information is not available a specific calculation must be done. In the case of e.g. incineration of waste with heat recovery or selective waste collection, that part of output which corresponds to the sale of heat or recovered products (called 'related products' in SERIEE, see § 2023 and § 2100) is not considered environmental output. When the value of these products is not given by the industrial surveys it has to be estimated (e.g. through a 'price-times-quantity' method) and deducted from the total output in row 7.

This issue is of particular importance for producers classified in division 37 (recycling) of NACE Rev. 1. In this case the main part of the output is non-environmental output (i.e., secondary raw materials). It is necessary to deduct the value of the recovered materials from total output in order to get the value of the environmental protection part of the output. As recovered materials are classified as goods (secondary raw materials), a proxy of the value of the EP services may be given by the total output of services of NACE Rev. 1 37 producers (see also section 4.3.2). A similar treatment has to be made for other secondary producers, e.g., those classified in NACE Rev. 1 51.57 (wholesale of waste and scrap).

Current environmental protection resources

Rows 8, 8.1 and 8.2 record the current environmental protection resources, i.e. the receipts of the EP producers. These receipts correspond to the market EP output (i.e. EP output which is sold, whatever the name given to the price and including the partial payments) and current transfers (i.e. payments without counterpart by government units to other units: subsidies and other current transfers) for the production of EP services. The objective is to identify that part of total EP output that is financed by payments from other units, and by difference that part which has to be financed by the producers. This latter part refers to:

- the value of total non-market output less partial payments and current transfers to producers of the government sector,
- the value of ancillary output of other producers, less the subsidies received from government units.

When analysing the financing of current environmental protection expenditure (in Table C), these items are entered as financing by the producers themselves. Implicit subsidies that offset a negative net operating surplus are not recorded in Tables B and B1 but only in Tables A and C (see section 5.2.2 for detail).

5.1.7 Supplementary information

The lower part of Table B summarises supplementary information (see Table 5.6 below). This information includes gross capital formation and net acquisition of land and its financing (e.g., via investment grants), as well as the stock of fixed assets and the labour inputs. Data about gross fixed capital formation come from various sources, as shown in Table 5.5.

Table 5.5 Data sources for the gross fixed capital formation and other capital uses

Government units	Corporations	Ancillary producers
from analysis of finance statistics or analysis of accounts of government	from annual industrial surveys	from specific surveys on environmental expenditure

Whereas the gross fixed capital formation is a standard variable of industrial surveys, other capital uses, which correspond to changes in inventories and net acquisitions of non-produced non-financial assets (i.e. mainly net acquisitions of land) may be more difficult to assess. Changes in inventories may be assumed to be insignificant for environmental protection activities. Acquisition of land is particularly important in the biodiversity and landscape protection domain (acquisition of land for protection purposes) for which data may be available from government reports.

Data on investment grants and other capital transfers come from financial statistics or budget analysis of government outlays (see tables 4.8 and 4.9). Data on labour inputs are either directly available e.g. from surveys or from the analysis of budgetary documents (number of civil servants) or can be estimated using average ratios on the basis of output (or operating expenditure) or using average labour costs on the basis of compensation of employees.

Table 5.6 Lower part of the production table (Table B)

TRANSACTIONS	CHARACTERISTIC PRODUCERS				Total
	Specialised producers		Non-specialised producers (by industry)		
	Government sector	Corporations sector	with secondary output	with ancillary output	
9 Capital transactions	X	X	-	X	X
9.1 Gross fixed capital formation	X	X	-	X	X
9.2 Other capital uses (land)	x	x	-	x	x
9.3 Investment grants received	X	X	-	X	X
9.4 Other capital transfers received	x	(x)	-	(x)	x
10 Labour inputs	X	X	-	X	X
11 Stock of fixed assets	X	X	-	X	X
12 Financing by producers	X	x	(x)	X	X

X…important item. x…often small. (x)…often very small/may be ignored. -…not relevant or zero by definition.

Table B includes a calculated item: the financing by producers (row 12). Calculation is the following: current and capital uses are added and all current and capital resources are subtracted. The formula is: row 7.2 minus row 8 plus row 9.1 plus row 9.2 minus row 9.3 minus row 9.4. The balance represents the part of total EP expenditure financed by the producer and can be directly entered into Table C. As will be seen (see section 5.7), the description of financing in the EPEA is rather simple. The recording of investment grants and other capital transfers as a way of financing the capital uses in Table B allows to calculate the part of the capital uses that is financed by the producers themselves.

Worked Example 12: Calculating the uses of waste management services

Output of waste management services

PEIC	1 207.8
Specialised firms	2 525.6
Cities < 2000	425.0
Cities > 2000	1 762.8
Recycling	125.2
Total	6 046.4

See Worked Example 3 which shows how this figure is obtained

The total output of municipal bodies is: 3 395.6 (= 1 207.8 + 425.0 + 1 762.8). Part of this output is covered by the sales of municipal bodies corresponding to the treatment of non-municipal (i.e., industrial) waste: 881.0. The remaining part of the output of municipal bodies is covered by transfers and taxes which correspond to the treatment of municipal waste: 2 514.6. Within municipal waste a part corresponds to waste generated by productive units (small industries and services); this part is estimated to 25,37% (see Worked Example 10) and represents, for these units, an intermediate consumption of waste management services. The output of municipal bodies related to the treatment of municipal waste (2 514.6) is therefore used for intermediate consumption: 637,9 (=25.37% of 2 514.6) and for final consumption: 1 876,7 (=2 514.6 - 637.9).

Municipal bodies subcontract a part of the treatment to firms. This part has to be estimated. Firms do not subcontract and the ratio between intermediate consumption and compensation of employees for specialised firms is considered representative of the normal situation. This ratio is 0,432 and is applied to the compensation of employees of municipal bodies in order to estimate the value of the intermediate consumption of products other than waste management services. The intermediate consumption of these EP services is then calculated as a residual item by deducting the value estimated from the total amount of intermediate consumption.

	Cities < 2000	Cities > 2000	PEIC	Firms	Total
Intermediate consumption	179.9	987.5	666.3	609.4	2 443.1
of which other	89.2	177.4	153.8	609.4	1 029.8
of which EP	90.7	810.1	512.5	0.0	1 413.3
Compensation of employees	206.5	410.8	356.2	1411.2	2 384.7
Gross operating surplus	38.6	490.1	270.3	912.0	1 711.0

Shaded figures come from Worked Examples 5 and 6

Therefore, from the total production of specialised firms (2 525.8), 1 413.3 are purchases of waste management services by municipal bodies.

this leaves	1 112.6	for the treatment of industrial waste by specialised firms
plus	881.0	sales of industrial waste management services by municipal bodies
plus	637.9	part of industrial waste in municipal waste
plus	125.2	from recycling
giving	2 756.5	total intermediate consumption of waste management services, excluding purchases by municipal bodies

Summary

total output	6 046.6
total industrial use of external services	2 756.5
final consumption	1 876.7
purchases by municipal bodies	1 413.3

Calculation of net operating surplus (gross operating surplus less consumption of fixed capital from the capital stock model - see Worked Example 11) gives:

	Cities < 2000	Cities > 2000	PEIC	Firms	Total
Net operating surplus for waste management	-51.0*	217.5	33.9	266.0	466.4

*… negative net operating surplus of producers belonging to government will be treated as an implicit subsidy.

Worked Example 13: Calculating the uses of wastewater management services

Total output of wastewater services

Cities < 2000	602.1
Cities > 2000	1 971.5
PEIC	1 385.8
Spec. firms	4 837.3
Water firms	258.4
Total	9 055.1

Worked Example 3 shows how this figure is obtained

Final consumption of households is known from the household budget survey: 4 823.7 including VAT; the VAT rate is 6% and the value of final consumption excluding VAT is thus 4 550.7.

Intermediate consumption of manufacturing industries (NACE C, D, E) is known by the expenditure survey: 752.1 (see Worked Example 9). According to physical data, wastewater from these industries represent 25.2% of total industrial wastewater (see Worked Example 10). Total intermediate consumption is thus estimated at 2 984.4 (752.1 / 0.252), and the total uses of wastewater management services are estimated at 7 535.1 (=4 550.7+2 984.4).

Purchases of wastewater management services by specialised producers are the difference between total output and total uses (9055.1 – 7535.1), i.e. 1 520.0. Assuming that the compensation of employees is a good indicator of activity, and that secondary producers (water firms) have no sub-contracting, these purchases are distributed by categories of specialised producers as follows. For all categories of producers the ratio between intermediate consumption (excluding EP services) and compensation of employees is kept constant and equal to the overall ratio. This overall ratio is 2.34 ((5033.3-1 520.0)/1 502.8). This gives:

	Cities < 2000	Cities > 2000	PEIC	Firms*	Total
Sales of EP services	602.1	1,971.5	1,385.8	4,837.3	8,796.7
Other output	0.0	0.0	0.0	792.7	792.7
Intermediate consumption	334.7	739.3	519.7	3,439.6	5,033.3
of which EP services	49.2	264.1	185.6	1,021.1	1,520.0
of which other products	285.5	475.3	334.1	2,418.5	3,513.3
Compensation of employees	122.1	203.3	142.9	1,034.5	1,502.8
Taxes less subsidies	0.0	0.0	0.0	71.1	71.1
Operating surplus (gross)	145.3	1,028.9	723.2	1,084.8	2,982.2

Shaded figures come from Worked Example 6

*..The figures for firms are derived from Worked Example 3.

Calculation of net operating surplus (gross operating surplus less consumption of fixed capital from capital stock model - see Worked Example 11):

	Cities < 2000	Cities > 2000	PEIC	Firms*	Total
Net operating surplus for wastewater management	-41.9*	-172.9*	-227.3*	608.5	166.4

*… negative net operating surplus of public producers will later be treated as an implicit subsidy – see Worked Example 14.

Worked Example 14: Compiling the production table for wastewater management

Once the uses of wastewater services have been calculated (and in particular the intermediate consumption of EP services by specialised producers) the various steps for the compilation of the production table are straightforward.

Intermediate consumption, compensation of employees: for government and public producers (i.e. small cities and large cities plus PEIC) data come from the central database of municipal bodies (see Worked Examples 5 and 6), for private producers (i.e. firms) data come from the industrial survey (see Worked Examples 3 and 13) and for non-specialised producers data come from the expenditure survey (see Worked Example 9).

Consumption of fixed capital comes from the capital stock data (see Worked Example 11).

Net operating surplus was calculated as a balancing item (see Worked Example 13).

Implicit subsidies were calculated as the difference between costs of production and sales, for government and other public units (see Worked Example 13).

Output in EP services (and gross fixed capital formation) come from the same sources as intermediate consumption and compensation of employees. The secondary output in wastewater services by water firms is introduced in the non-specialised producers column, market output row.

Capital grants come from the analysis of financial statistics (investment grants received by large cities wastewater departments from the EPA).

The format of the table below is an adapted version of Table 5.1. Under government, the data for the Cities<2000 are included as these do not enjoy autonomy of decision (see Worked Example 5). The statistical units that make up the Public Corporations are the Cities>2000 and the PEIC. These units enjoy autonomy of decision (see Worked Example 6) and are classified as corporations or quasi-corporations.

Wastewater	Specialised producers			Non-specialised producers	Total
	Government	Corporations			
		Public	Private		
Intermediate consumption	334.7	1,259.0	3,439.6	1,011.5	6,044.9
of which EP services	49.2	449.7	1,021.1		1,520.0
Compensation of employees	122.1	346.2	1,034.5	432.7	1,935.4
Net taxes			71.1		71.1
Consumption of fixed capital	187.2	2,152.3	476.3	255.6	3,071.4
Net operating surplus	-41.9	-400.2	608.5	0.0	166.4
Output	602.1	3,357.3	5,630.0	1,699.8	11,289.2
Output of EP services	602.1	3,357.3	4,837.3	1,930.9	10,727.6
Non-market				1,672.5	1,672.5
market	602.1	3,357.3	4,837.3	258.4	9,055.1
Sales	602.1	3,357.3	4,837.3	258.4	9,055.1
Implicit subsidies	41.9	400.2			442.1
GFCF and land acquisition	125.0	1,279.1	1,289.2	397.3	3,090.6
Capital grants received		201.9			201.9

Ancillary output (incl. 27.3 non-environmental revenue)

Ancillary EP output

Secondary EP output was put here

5.2 The use of environmental services (upper part of Table A)

5.2.1 Objectives of Table A

Objective of Table A is to derive the aggregate 'national expenditure for environmental protection' and describe it by its components and by the categories of units to which the expenditure is allocated.

The various components have been described in section 3.1.4. They mainly consist in:
- uses of EP services (except by specialised producers)
- capital formation for environmental protection (including net acquisition of land)
- uses of connected and adapted products
- specific transfers for environmental protection.

The categories of units to which the expenditure is allocated are:
- households as actual consumers of individual EP services and connected and adapted products, or as beneficiaries of specific transfers
- government in its capacity as consumer of collective services (i.e., as collective consumer of non-market output)
- specialised producers of EP services for their investment for environmental protection
- other producers as they use EP services (including the use of EP services produced in-house, i.e. ancillary EP services) and connected and adapted products for their intermediate consumption, invest for their ancillary environmental protection activities and benefit from specific transfers
- the rest of the world as it benefits from specific transfers.

The table below summarises the Table A of the EPEA. For the clarity of exposition, the order of rows has been slightly modified in relation to the original table (see SERIEE § 2196) and the classification of users has been simplified.

Table 5.7 Summary Table A

	USERS/BENEFICARIES					
	Producers		Consumers		Rest of	Total
Components of national expenditure	specialised	other	households	government	the world	
1 Uses of EP services						
final consumption	-	-	X	X	-	X
intermediate consumption	nr	X	-	-	-	X
capital formation (land improvement)	nr	x	-	-	-	x
2 Capital formation for EP	X	X	-	-	-	X
3 Uses of adapted & connected products						
final	-	-	X	-	-	X
intermediate	nr	x	-	-	-	x
capital formation	nr	x	-	-	-	x
4 Specific transfers	(x)	x	x	-	x	x
5 Total domestic uses (1+2+3+4)	X	X	X	X	x	X
6 Of which: financed by the rest of the world	x	x	x	x	(x)	x
7 National expenditure (5-6)	X	X	X	X	x	X

X…important item. x…often small. (x)…often very small/may be ignored. -…not relevant or zero by definition. nr…not recorded here to avoid double counting.

The components of national expenditure do not have the same importance. Uses of EP services (row 1) are by far the most important item of national expenditure, followed by capital formation (row 2). Uses of connected and adapted products (row 3) tend to be small (with few exceptions, e.g. when septic tanks are widely used in a country). Specific transfers (row 4) tend to be very small, except when primary data on the other components are incomplete (e.g., when only the transfers are known but no data are available or can be estimated on the expenditure financed by these transfers). In the following sections 5.2.2 and 5.2.3 the uses of EP services is described.

5.2.2 From output to uses: the supply-use table (Table B1)

The upper part of Table B (see table 5.1 above) describes the output of EP services. Before describing the uses of these services (in Table A), it is necessary to make the transition from total supply to uses. This is done in the Table B1, starting from the data in rows 7.2.1, 7.2.2 and 7.2.3 of Table B.

Table 5.8 The supply-use table for environmental protection services (Table B1)

		non-market EP services	market EP services	ancillary EP services
USES	Final consumption	X	X	-
	plus intermediate consumption	-	X	X
	of which by specialised producers	-	X	-
	of which by other producers	-	X	X
	plus capital formation (land improvement)	x	x	(x)
	plus exports	-	(x)	-
	equals total uses (at purchasers' price)	**X**	**X**	**X**
SUPPLY	Output (basic prices or cost of production)	X	X	X
	plus imports	-	(x)	-
	plus non-deductible VAT	-	X	-
	plus taxes on imports other than VAT	-	(x)	-
	plus taxes on products other than VAT	-	(x)	-
	less subsidies on products	-	(x)	-
	equals total supply (at purchasers' prices)	**X**	**X**	**X**

X…important item. x…often small. (x)…often very small/may be ignored. -…not relevant or zero by definition.

There are two groups of transactions that explain the transition from output as described by Table B to uses:

- The first group is related to imports and exports of EP services. As the national expenditure describe the uses of economic resources by the domestic economy, imports of EP services are to be added to the domestic supply, whereas exports have to be subtracted in order to arrive at domestic uses. Imports and exports of EP services are often very small so that after verification of this assumption this type of adjustment may be ignored.
- The second group of transactions is related to the system of prices. As in the national accounts, the EPEA records the uses of EP services at purchasers' prices, whereas the supply of these services is initially valued at basic prices or cost of production. Therefore, a revaluation of the supply to make it consistent with the prices in which uses are measured is made by adding non-deductible VAT and other taxes on products and deducting subsidies on products. Except for non-deductible VAT (paid mostly by households) these revaluation items are typically unimportant and may be ignored.

From domestic supply to domestic uses: imports and exports

Imports and exports of EP services are usually very limited and may be ignored in practice. Some specific cases need to be checked, however, to avoid mistakes:

- cross border waste or wastewater treatment for municipalities that treat their waste in another country, treatment of radioactive waste or other special wastes abroad,
- recycling of waste in another country.

Cross border waste treatment is controlled and must be declared using consignment notes. Therefore, data from administrative sources (e.g., the ministry of the environment) will be available to assess whether imports and exports of wastes for treatment is important. Foreign trade statistics may provide data on waste and scrap imported and exported for recycling.

From basic prices to purchasers' prices

In national accounts the relation between basic prices and purchasers' prices is the following:

Basic price = price paid by the purchaser less any taxes on products plus any subsidies on products received by the producer. This is the amount retained by the producer and thus the basis of the producer’s decisions.

The taxes on products (see ESA § 4.16) are taxes payable per unit of services produced or transacted. They are divided into value added type taxes (VAT), taxes and duties on imports and taxes on products except VAT and import taxes.

Value added taxes

In ESA, the system of registration is net of deductible VAT. This means that VAT is recorded as being paid by purchasers, not by sellers and only by those purchasers that are not able to deduct the VAT they pay from their VAT liabilities. The greater part of VAT is therefore recorded in the system as being paid on final uses, mainly on household consumption. Some producers may also be unable to deduct the VAT they pay on their intermediate consumption, e.g. those that are exempt from VAT on their sales (e.g., some government units).

As a consequence, intermediate consumption is generally valued without VAT, whereas final consumption is recorded including VAT. This aspect is also important insofar as primary data used for the compilation of expenditure accounts will follow these price concepts.

There are two possibilities for adding the VAT. Tax statistics might provide the VAT receipts by product or product group but this is often not the case. Alternatively, an examination of the VAT legislation allows to know the VAT rates applied to EP services. In this case, the transition from basic prices to purchasers’ prices is simply done by applying this VAT rate to the output figures for that part of output that is purchased by users that cannot deduct VAT (mostly households). Hence, the part of the output that is used for final consumption must first be estimated.

There are different ways for the distribution of output between users (see section 5.2.3 for details). Output may be distributed:

- according to physical data on the generation of waste and wastewater by households (which gives the final consumption part) and corporations (which gives the intermediate consumption parts),
- using data on the purchases as available from national accounts (supply-use or input-output tables) or from household surveys and from current expenditure surveys (when these provide separate data on purchases of EP services),
- according to data on the receipts of EP producers, when these are sufficiently detailed.

Taxes on products other than VAT

In some countries taxes are collected in relation to some EP services. Examples are taxes on waste disposed in landfills (landfill taxes) or on wastewater released to sewage networks. In the ESA, these taxes are recorded as other taxes on production (see ESA § 4.23 cf.). They are normally paid by the producers of EP services and are therefore already included in the value of output at basic prices. Hence, no revaluation of basic price to purchaser price is necessary for such taxes.

However, there may be exceptions. In France, for example, taxes are levied on the consumption of distributed water and wastewater treatment services that are separately shown on the water bills paid by the consumers. These taxes are not considered part of the basic prices in the French national accounts and should be added when the transition from basic to purchasers' prices is made.

Subsidies

In some cases the production of EP services, either market or ancillary, is subsidised. When these subsidies are classified as subsidies on products, the basic price and the purchaser prices are different: subsidies must be subtracted from basic prices in order to arrive at purchasers' prices.

According to ESA, subsidies on products are subsidies payable per unit of a good or service. Like all subsidies they are unrequited payments which the general government makes to resident units with the objective of influencing their levels of production, their prices or the remuneration of factors of production (see ESA § 4.30). Other non-market producers can receive other subsidies on production only if those payments depend on general regulations applicable to market and non-market producers as well. By convention, subsidies on production are not recorded for other non-market output: the other non-market output is valued by costs of production

In general, subsidies to reduce pollution are classified as other subsidies on production: they consist of current subsidies to cover some or all of the costs of additional processing undertaken to reduce or eliminate the discharge of pollutants into the environment (see ESA § 4.37 b). In practice, therefore, there are hardly any subsidies on products to be added in the supply-use table.

Implicit subsidies

The test applications of the EPEA showed that market producers (local KAUs) belonging to the general government sector can have a substantial negative net operating surplus. The position of the National Accounts Working Party at its 1-2 February 1999 meeting was the following:

- in satellite accounts a negative net operating surplus should be offset by other subsidies on products (D.319);
- these other subsidies on products should be separately identified in the satellite accounts;
- this treatment could also be used in the central system of national accounts; it leaves GDP unchanged.

It is thus recommended that in the EPEA such a negative net operating surplus should be offset by 'other subsidies on products'. These subsidies are called 'implicit subsidies' because they are not explicitly shown in the accounts of government.

In the supply-use table the value of market output is entered at basic prices as recorded in national accounts (i.e. not taking account of implicit subsidies). To maintain consistency with the national accounts, in the EPEA the implicit subsidies are not entered in the supply-use table but are directly entered in Table A.

Worked Example 15: Compiling the supply-use table for wastewater management

Three categories of wastewater services are distinguished: non-market services (none in the case of wastewater), market (external) services and ancillary services. For each of these categories the supply and use is shown in the table below. The supply-use table directly derives from the calculation of the uses (see Worked Example 13). Supply comes from the production table (Worked Example 14).

Market services are produced by firms (5 095.7 of which 258.4 as secondary output and 4 837.3 as output of specialised wastewater firms) and by local government bodies (3 959.4, of which 602.1 by wastewater departments of small cities, 1 971.5 by autonomous departments of large cities and 1 385.8 by PEIC). Non-deductible VAT on final consumption is added: 273.0. Uses are final consumption: 4 823.7 (including VAT) and intermediate consumption: 4 504.4 (=2 984.4+1 520.0, see Worked Example 13). A part of intermediate consumption (1 520.0) is used by specialised producers, as calculated in Worked Example 13, and shown in the production table in Worked Example 14. This intermediate consumption by specialised producers is not accounted for in national expenditure. Ancillary output is 1 672.5 (see Worked Example 14), and is used for (internal) intermediate consumption of non-specialised producers. For some EP services (in particular soil depollution), uses may take the form of capital formation (improvement of land) but this does not apply to wastewater services.

Supply - use table for wastewater services	Wastewater services			
	Non-market	Market	Ancillary	Total
USES				
Final consumption	-	4,823.7		4,823.7
Intermediate consumption		4,504.4	1,672.5	6,176.9
of which specialised producers		*1,520.0*		*1,520.0*
Total uses	**-**	**9,328.1**	**1,672.5**	**11,000.6**
SUPPLY				
Firms		5,095.7	1,672.5	6,768.2
Municipalities, other government	-	3,959.4		3,959.4
VAT		273.0		273.0
Total supply	**-**	**9,328.1**	**1,672.5**	**11,000.6**

5.2.3 Allocation of environmental services to user categories

The allocation of EP services to the different categories of users is rather straightforward in practice. The conceptual detail (which is more complex) is given below.

Non-market output

In the EPEA it was chosen to present actual final consumption. Non-market services are therefore consumed either by the government when they are collective services, or by households when they are individual consumption services.

The ESA defines the actual household final consumption as those (goods and) services acquired by households which present the following characteristics:

a) it must be possible to observe and record the acquisition of the good or services by an individual household or member thereof and also the time at which it took place;
b) the household must have agreed to the provision of the good or service and take whatever action is necessary to make it possible, for example by attending a school or clinic;
c) the good or service must be such that its acquisition by one household or person, or possibly by a small, restricted group of persons, precludes its acquisition by other households or persons.

For the goods and services provided by government units, the borderline between individual and collective goods and services is drawn on the basis of the Classification of the Functions of Government (COFOG). By convention, government expenditure for the (non-market) collection of household refuse should be treated as individual consumption when important (which is not the case in most countries).

The collective consumption expenditure is the remainder of the government final consumption expenditure. It consists in particular of:

a) management and regulation of society;
b) the provision of security and defence;
c) the maintenance of law and order, legislation and regulation;
d) the maintenance of public health;
e) the protection of the environment;
f) research and development;
g) infrastructure and economic development.

Therefore, only non-market output of waste and wastewater collection and treatment services may be considered as individual consumption services. However, for these services to be considered as individual services it should be possible to individualise the uses. For municipal waste collection and treatment services, this is not always possible. The services are provided to all units within a geographical area, independently of their status as household or (small) urban producer (retailers, craftsmen, etc.), and in general it is not possible to distribute the services between actual users. In this case, the services must be classified as collective services and allocated to general government.

Only when there is a key for the distribution of these services (e.g. the quantity of waste or wastewater collected and treated), it is possible to allocate the use of the non-market services to actual users, either households or (small) urban producers.

Non-market output is therefore distributed between households in their capacity as actual consumers of individual services and general government in its capacity as collective consumer according to the conventions above. Note that non-market services cannot be used for intermediate consumption.

In practice this will typically mean that all non-market output is used by government as collective consumer. Only the non-market output of waste and wastewater collection and treatment services (if any) would need further investigation (see also section 5.1.3).

Theoretically, some environmental protection activities may result in non-market output that is used for gross capital formation. This is the case for soil remediation (classified as gross fixed capital formation in land improvement) when this activity is carried out as own-account gross fixed capital formation by a government unit (see ‘treatment of decontamination of soil’ below).

Treatment of decontamination of soil

In the Environmental Protection Expenditure Account decontamination of soil activities are deemed to constitute a 'major improvement to land' and are treated as gross fixed capital formation. In discussion, the National Accounts Working Party at its 1-2 February 1999 meeting addressed the following aspects:

- If general government or property development corporations pay for the decontamination or landscape restoration this should be considered as GFCF.
- The treatment of 'end-of-life' investments (e.g. decommissioning of nuclear power plants or oilrigs) was discussed more controversially. The requirement for end-of-life investment is known to the operators and they build up financial reserves to cover these costs. In theory such end-of-life investment might constitute gross fixed capital formation.
- In conclusion it was noted that in a satellite accounts context treatment of end-of-life investment as gross fixed capital formation is possible but that in the national accounts these would rather be recorded as intermediate consumption, if only for practical reasons.

Market output of EP services

Market output may be used for final consumption (by households as actual consumers) and for intermediate consumption by producers. The distribution of market output between these two user groups can be made either on the basis of statistics on sales by specialised market producers when they are sufficiently detailed, on the basis of physical data or by using direct sources on uses (e.g., household panel data, specific industry expenditure surveys).

For the marketed wastewater and waste collection and treatment services, it is very important to identify the intermediate consumption of market EP services by the specialised producers themselves. In order to avoid double counting this intermediate consumption should not be counted as use in the Table A because it is already included in the output of the specialised producer that uses it (for detail see SERIEE § 2075 seq.). When not given by surveys (or directly by the national accounts supply-use table) this intermediate consumption has to be estimated using all information available, in particular information on the organisation of the two domains concerned and the sub-contracting or concession relationships within the different categories of units and activities.

A possible use of market output of soil remediation services is gross fixed capital formation in land improvement (see 'treatment of decontamination of soil' above).

Ancillary output

In the EPEA, all ancillary output is assumed to be used as intermediate consumption by the units that undertake the ancillary activities. Soil decontamination activities could in principle also be carried out as ancillary activities and would then represent gross fixed capital formation in land improvement for the unit undertaking the activity. However, this is probably a rare case for which data are not likely to be available.

Summary on the uses of EP services

The allocation of supply at purchasers' prices to uses may be summarised as shown in Table 5.9.

Table 5.9 Allocating the supply of EP services to uses

	Supply of EP services (at purchasers' prices)			
Uses of EP services	non-market	market	ancillary	comments
Actual final consumption by households	x	X	-	waste and wastewater
Final consumption of collective services	X	-	-	used by government
Intermediate consumption of specialised producers	-	X	-	not entered in Table A
Intermediate consumption of other producers	-	X	X	
Capital formation (land improvement)	x	x	(x)	soil decontamination
Exports	-	(x)	-	not entered in Table A

X…important item. x…often small. (x)…often very small/may be ignored. -…not relevant or zero by definition.

The detailed recording in Table A is shown in table 5.10 below.

Table 5.10 Recording the uses of EP services in Table A

	USERS/BENEFICIARIES					
	Producers		Consumers		Rest of	Total
Components of national expenditure	specialised	other	households	government	the world	
1 Uses of EP services (purchaser prices)						
(1.1) final consumption						
market	-	-	X	-	-	X
non-market	-	-	X	X	-	X
(1.2) intermediate consumption						
market	nr	X	-	-	-	X
ancillary	nr	X	-	-	-	X
(3 part) capital formation						
market	nr	x	-	-	-	x
non-market	nr	x	-	-	-	x

Numbers in brackets refer to the original numbering of Table A in the SERIEE manual (page 58). X…important item. x…often small. (x)…often very small/may be ignored. -…not relevant or zero by definition. nr…not recorded here to avoid double counting.

5.3 The recording of capital formation for EP activities in Table A

Capital formation for environmental protection activities consists in the capital formation (and net acquisition of land) of specialised producers and for ancillary activities.

Data directly come from the production table (see table 5.6 above) where gross fixed capital formation and other capital uses of producers for environmental protection are shown. Capital uses are limited to producer units of the economy. Households in their capacity as actual consumers of individual services or general government in its capacity as collective consumer do not make capital formation.

Table 5.11 Recording capital formation for environmental protection activities in Table A

	USERS/BENEFICIARIES					
	Producers		Consumers		Rest of the world	Total
Components of national expenditure	specialised	other	households	government		
(2) Gross capital formation for environmental protection activities	X	X	-	-	-	X

Numbers in brackets refer to the original numbering of Table A in the SERIEE manual (page 58). X…important item. -…not relevant or zero by definition.

5.4 The use of connected and adapted products

The production of connected and adapted products is not described in the EPEA. Except when extensions are made to include the environmental goods and services industry, the EPEA is only interested in describing the uses of connected and adapted products.

5.4.1 Definitions

Connected and adapted products cover products whose use serves an environmental protection purpose, although they are not classified as EP services (1994 SERIEE § 2024 seq.).

Connected products are products whose use by resident units directly and exclusively serves an environmental protection objective but which are not EP services produced by an environmental protection activity.

Adapted (or ‘cleaner’) products are defined (SERIEE § 2026) as products that meet the following criteria:

- on the one hand, they are less polluting when consumed and/or disposed than equivalent normal products. Equivalent normal products are products that provide similar utility, except for the impact on the environment,
- on the other hand, they are more costly than equivalent normal products. Only the extra cost paid in order to make an adapted product available to the user is considered as environmental protection expenditure in the EPEA (see section 5.4.3 below for details).

Connected and adapted products may be used by any resident producer for intermediate consumption or capital formation, as well as by households for their final consumption.

Only the uses of connected and adapted products by households and non-specialised producers are recorded. Uses by specialised producers are already included in their output or capital formation. Therefore, the recording of uses of connected and adapted products in Table A is as follows.

Table 5.12 Recording connected and adapted products in Table A

	USERS/BENEFICIARIES					
	Producers		Consumers		Rest of the world	Total
Components of national expenditure	specialised	other	households	government		
…						
Uses of connected and adapted products (purchasers' prices)						
final consumption	-	-	X	-	-	X
intermediate consumption	nr	X	-	-	-	X
capital formation	nr	X	-	-	-	X

X…important item. -…not relevant or zero by definition. nr…not recorded here to avoid double counting.

5.4.2 Scope of connected and adapted products

While many examples of connected and adapted products exist (such as mercury-free batteries, solvent-free paints, biodegradable packaging materials, CFC-free products, septic tanks, catalytic converters, trash bags, etc.), only very few products are of practical relevance (for detail see Eurostat 1997 and 2000a). These products are described below.

As a minimum, it is recommended to estimate of the use of the following products in a systematic way:
- septic tanks,
- maintenance services and other products for septic tanks,
- catalytic converters for vehicles,
- desulphurised fuels.

This minimum list includes only one adapted product (i.e. desulphurised fuels), all other being connected products.

Septic tanks and associated goods and services may be less relevant in Member States where a high share of the population is already connected to sewerage networks. Catalytic converters should be recorded by assessing the total number of converters sold in one year (including those built in new cars).

It is recommended that the following products be included as well:
- a more complete set of measures related to vehicles, based on the cost of compliance with environmental regulations (in addition to the catalytic converters already covered). This includes measurement services of exhaust gases of vehicles and measures to adapt trucks, buses and aeroplanes,
- trash bags, bins, rubbish containers, compost containers.

When estimating the expenditure associated with the use of bins, wheeled rubbish container, etc. account should be taken of those bins, etc. which are owned by specialised public or private units engaged in collecting waste as these are already included in their expenditure figures. The same applies to producer units that are subject to specific industry expenditure surveys.

The following connected products may be considered as well:
- measurement services of exhaust gases of heating systems,
- exhaust pipes of vehicles,
- anti-noise windows.

These latter products may be of minor significance in terms of volume and conceptual and/or practical problems might be faced when evaluating these products.

Several countries have covered connected and adapted products in their EPEA accounts. The results are shown in Table 5.13 and indicate that expenditure for connected and adapted products can be expected to be between 5% and 10% of total expenditure (but they are more important for some domains – e.g. for air protection). Estimating the few products most important for a country is therefore recommended.

Table 5.13 Connected and adapted products in EPEA pilot applications, in % of total expenditure

Country	Connected products	Adapted products	Total
Switzerland	-	-	7.9%
Sweden	2.1% (1)	n.a.	2.1%
UK	7.7% (2)	n.a.	7.7%
Netherlands	-	-	10.3%
France	10.3%	1.5%	11.8%
Austria	2.5%	3.5%	6.0%

(1) catalytic converters (2) catalytic converters and anti-noise windows

5.4.3 Assessment and evaluation

Evaluation

For connected products the total expenditure for their use has to be evaluated and accounted for in Table A, while for adapted products only the extra cost paid for using them has to be taken into account (see below).

When evaluating connected and adapted products, the method applied should preferably be the 'price times quantity' method. This method includes:

- an assessment of the quantities of the products, as far as possible based on existing statistical sources (such as statistics on energy use, on vehicle registration and ownership, production statistics, foreign trade statistics, etc.) or, when that is not possible, on market estimates provided by trade associations, producers or importers, etc.
- an assessment of the unit price (or extra cost per unit) based on price statistics or foreign trade statistics or, when that is not possible, based on expert assessment or based on available information on state aid linked to the use of connected and adapted products.

For example, the number of new catalytic converters may be estimated from vehicle registration data, new septic tanks installed may be estimated based on data from producers of septic tanks or from housing statistics, etc. Average prices for these products may be obtained from production statistics, foreign trade statistics or from wholesalers or importers. For catalytic converters, when data on production or on imports are not available, the spare part prices for the main car brands may be obtained from the importers of the cars (see also Box 9 below).

The basic principles of evaluation are laid down in the SERIEE manual (§ 2029 seq. and § 2050 seq.). In essence, the preferred concept is to arrive at the purchasers' price or an equivalent estimate, i.e. the price (or portion of the price) that has to be paid (by the user and/or the financer) in order to make a product available to the user. The user may benefit from specific transfers which have the effect of lowering the purchasers' price of the product. That is, when the unit cost are evaluated at the level of cost of production or basic prices, in a first step an allowance has to be made for distribution margins and for taxes on products (including non-deductible VAT) in order to arrive at the final value for each product. This is of particular importance in the case of products with special tax regimes (e.g. fuels, vehicles). For example, if the additional costs of desulphurisation of fuels are obtained from a refinery, an estimate has to be made for the way these extra costs translate into an increase of the price paid by the consumers.

For tax rates which are differentiated according to environmental characteristics (e.g. in the case of leaded versus unleaded gasoline) the final user may not face a higher price for the adapted product. For such cases, the SERIEE manual (§ 2029 and 2030) recommends to interpret the difference between the lower tax on the adapted product and the higher tax on the 'normal' product as an environmental subsidy on the adapted product. This tax subsidy is attributed to the users (corporations, households) in Table A and to government as the financer in Table C of the EPEA. The text and Figure 3 and Table 5.14 below make explicit the treatment of adapted products in the two cases, without and with tax differential.

The environmental expenditure for adapted products are ideally compiled by first measuring the extra production costs and then adjusting these extra costs by adding trade and transport margins as well as the

effects of taxes (e.g. VAT) so as to arrive at the effect of the higher production costs on the purchasers' price. National expenditure is equal to these extra costs measured at the level of purchasers' prices, i.e. the difference between the purchasers' prices of the normal equivalent (unadapted) product and the adapted product. Figure 3 below illustrates this procedure in the middle column, with C_p being the extra cost of production, C_t the taxes on the extra cost of production and C_u the total extra cost paid by the user ($C_u = C_p + C_t$). Extra trade and transport margins (if any) are treated in the same way.

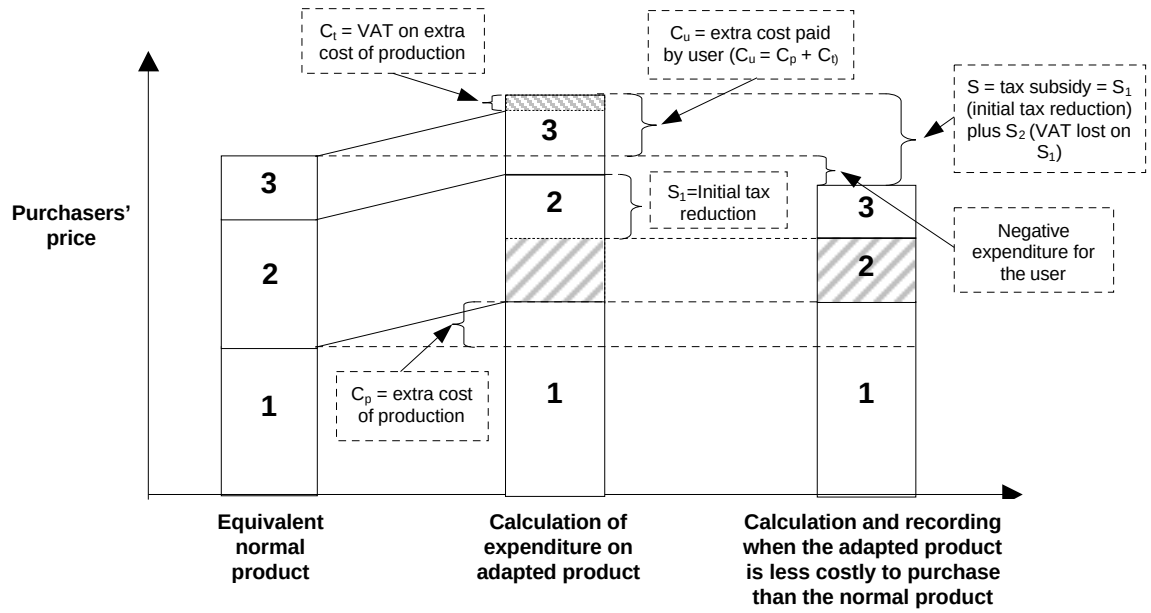
For example, in the case of adapted fuels (e.g., low sulphur or low benzene fuels or lead-free gasoline) information on the extra cost of production may be obtained from the refineries or from technical experts. If this is not possible, the compilation procedure can be reverted by calculating backwards from the purchasers' price and removing the effects of taxes etc. to arrive at the extra cost of production for the adapted product.

When all extra costs are born by the user they are recorded in rows 1.3 and 1.4 in Table A (see Table 5.15 below). When government promotes the use of adapted products by lowering their purchasers' prices through direct subsidies on products or a through a reduction in taxes on products, the total expenditure (C_u, calculated as above) is split between the user and government. Two cases may be distinguished.

In case (i), the purchasers' price of the adapted product is lowered but it is still more expensive than the normal product. The lowered extra costs for the user are recorded as before in rows 1.3 and 1.4. In addition a subsidy, which also represents a cost, is recorded in row 4.1 (under specific transfers) in Table A (see Table 5.17 below). The total expenditure (C_u) is equal to the lowered extra costs paid by the user (i.e., the difference between the purchasers' prices of the adapted product and the normal product) plus the subsidy financed by government. Case (i) is not shown in Figure 3; but a numerical example is given in Table 5.14 under the heading "Adapted product with quantity tax reduction – still more expensive than normal product".

In case (ii) the subsidy or tax reduction is so large as to make the purchase of the adapted product cheaper than the normal product, and a **negative** expenditure is recorded for the user in rows 1.3 and 1.4 in Table 5.15 instead of an extra cost. The subsidy recorded in row 4.1 in Table 5.17 is now larger than the extra cost (C_u). The total extra cost (C_u) is given by the sum of the subsidy (S) and the negative expenditure. Case (ii) is shown in the right column of Figure 3 and a numerical example is given in Table 5.14 under the heading "Adapted product with quantity tax reduction – cheaper than normal product").

Figure 3 Adapted products: analysis of the components of the purchaser's price



1 = cost of production 2 = quantity tax (fixed amount) 3 = Ad valorem tax (e.g. VAT)

The subsidy (S), when it results from a reduction of a quantity tax (i.e., a fixed amount of tax per unit of product, e.g. mineral oil tax) will include two components. The first component (S_1) is the initial quantity tax reduction which is equal to the difference between the quantity tax on the normal product (block 2 of the left

column in Figure 3) and the quantity tax on the adapted product (block 2 of the right column). The second component (S_2) is the VAT revenue lost as a consequence of the lower net price of the adapted product due in turn to the reduced quantity tax. S_2 is the difference between the VAT revenue that would have been collected if no reduction of taxes on products applied (block 3 in the middle column) and the tax revenue actually collected (block 3 in the right column). S_2 can also be calculated directly by applying the VAT rate to the quantity tax reduction. Table 5.14 below illustrates the numerical calculation in the various cases.

Table 5.14 Calculation of expenditure on adapted products

		Normal product *(Figure 3 - left column)*	Adapted product		
			Reference case (no tax reduction) *(Figure 3 - middle column)*	With quantity tax reduction	
				Case (i): still more expensive than normal product	Case (ii): cheaper than normal product *(Figure 3 - right column)*
(1)	Cost of production	100	140	140	140
(2)	Fixed (quantity) taxes on products	100	100	80	50
	Total value excluding VAT =(1)+(2)	200	240	220	190
(3)	VAT (20%)	40	48	44	38
	Purchasers' price =(1)+(2)+(3)	240	288	264	228
(4)	Extra costs for the user (price of adapted product minus price of normal product)		48	24	-12
(5)	Subsidy (S) = S_1 + S_2		0	24	60
	S_1 = initial quantity tax reduction		*0*	*20*	*50*
	S_2 = VAT on quantity tax forgone (20% of S_1)		*0*	*4*	*10*
	Expenditure = extra cost (C_u) = (4)+(5)		48	48	48

When assessing connected and adapted products some care must be taken to avoid double counting. For example:

- the volume of connected and adapted products used by specialised producers will in most cases be insignificant and no corrections need to be made (i.e. subtraction of the products used by specialised producers). However, when households have to purchase wheeled rubbish containers from municipal or other units that collect the waste, both the purchase and the income from the sales of these containers may already be included in the information available on municipal waste management,
- some of the expenditure related to connected and adapted products (e.g. waste containers or adapted fuels) may already be included in the value of ancillary EP services, depending on the definitions used in the industry questionnaire and the accompanying explanations.

Distribution of uses by sectors and industries

The use of connected and adapted products has to be distributed as far as possible among economic actors and among types of uses (gross capital formation, intermediate consumption, final consumption) based on existing information (e.g., vehicle registration data, energy statistics). For some products reliable estimates may only be possible at the very aggregated level of economic sectors (general government and corporations together, private households) and it will only be possible to distribute these quantities between final and intermediate consumption.

5.4.4 Filling in the Table A for connected and adapted products

Table 5.15 Connected and adapted products in Table A

	USERS/BENEFICIARIES					
	Producers		Consumers		Rest of	Total
Components of national expenditure	specialised	other	households	government	the world	
…						
Uses of connected and adapted products (purchasers' price)						
(1.3) final consumption						
connected products	-	-	X	-	-	X
adapted products	-	-	X	-	-	X
(1.4) intermediate consumption						
connected products	nr	x	-	-	-	x
adapted products	nr	x	-	-	-	x
(3 part) gross capital formation in						
connected products	nr	X	-	-	-	X
adapted products	nr	x	-	-	-	x

Numbers in brackets refer to the original numbering of Table A in the SERIEE manual (page 58). X…important item. x…item often small. -…not relevant or zero by definition. nr…not recorded here to avoid double counting.

Final consumption only refers to households. The value of consumption of connected products is entered at 'full' purchasers' prices, including trade and transport margins, taxes (VAT) and subsidies. The value of the consumption of adapted products is entered for the 'extra-cost' only. In this part of the table, the extra cost is assessed at purchasers' price, which means that when subsidies on products (including subsidies that take the form of a tax differential) are higher than the extra cost at basic prices, the value entered on row (1.3) may be negative, this negative value being offset by subsidies (in the specific transfers part, see section 5.5 below) so that the total expenditure is positive.

Intermediate consumption only refers to producers. Intermediate consumption of connected and adapted products by specialised producers may exist but is not recorded in the Table A in order to avoid double counting (this intermediate consumption is already included in the value of the EP services produced by the specialised producers). A particular case is the intermediate consumption for ancillary output, which may necessitate specific estimates (see SERIEE manual § 2079).

Gross capital formation only concerns producers. Only the gross capital formation by non-specialised producers is recorded in Table A as the total gross capital formation of specialised producers (recorded elsewhere) already includes any investment in connected or adapted products.

Box 9: Connected and adapted products: experience in Norway

Septic tanks and separate private sewage treatment plants

As part of the efforts to fulfil the North Sea treaty, all households and businesses along the North Sea coast have been connected to sewage plants. The septic tanks and other private treatment in this area have been removed and closed. In other parts of the country private treatment still exists. In 1997, 21 percent of the population had separate, private sewage treatment systems in a total of 331 820 plants. These statistics can be used for a rough estimate of the production in these plants. The costs are less obvious. Septic tanks are not specified as a product for manufacturing industry. Neither do the construction statistics report the cost of installing septic tanks or other private treatment plants. We have, however, received cost estimates from the Norwegian Agricultural University. Applying the average cost for the smallest plants, the capital value may be assessed at 11 000 mill. NOK at present prices for new plants. The capital consumption could roughly be assessed at 1/60 of this, using the lifetime of the National accounts, giving an estimate of yearly capital consumption of 180 mill. NOK.

For the NACE 90 local government industry, total production value according to National accounts was about 10 times the capital consumption. Applying this factor we find a very rough estimate of the value of the services of 1 800 mill NOK. If, alternatively, we use the estimated total yearly unit costs, and multiply with the number served by separate

plants, we arrive at a similar estimate of 1 700 mill. This may seem a high estimate, as the separate plants may have lower costs for sewage pipelines. On the other hand, there is, according to the cost estimates of the Agricultural University, evidence of decreasing unit costs as the size of the sewage plants increases.

Catalytic converters for cars
In Norway, all new cars have to include a catalytic converter. The unit price for a catalytic converter in the new car is not known, however. This part is not specified in the Norwegian import statistics. A rough estimate may be found, assuming the same average costs per passenger car as in Sweden (there is no domestic production of cars or catalytic converters in Norway). This roughly indicates 500 mill. NOK. It may also be possible to make an estimate from the costs of spare parts, but this has not been tried yet.

Unleaded petrol
Unleaded petrol was introduced to the Norwegian market in 1986. From 01.01.98 leaded petrol was no longer available in the market (although it is possible to buy petrol with lead substitutes added). Conventionally, the government environment protection expenditure associated with unleaded petrol (subsidy) is measured as the tax rate differential for unleaded petrol.

In 1995, the tax rate for leaded petrol was differentiated by the lead content. All the petrol sold on the Norwegian market belonged to the lowest tax category. The value for the adapted product has been found on the basis of the high tax rate, however, as this is supposed to be the relevant tax rate in the absence of environment protection. Evidently, the high tax rate is assumed to be the continuation of the tax level prior to the tax differentiation. The interpretation of the tax differential as a 'subsidy' is difficult to maintain, however, when leaded petrol is no longer marketed.

Source: Julie Hass – Statistics Norway

5.5 Specific transfers

5.5.1 Purpose of including specific transfers in environmental expenditure

Government-related data sources may include information that is not used directly in the supply-use framework, for example information on current transfers, investment grants, preferential loans given for funding environmental investment, or government receipts from earmarked pollution taxes. Such transfers will often be related to expenditure recorded already and it would lead to double counting if the transfer payments were included as well.

However, this is not always the case. First, transfers include those transfer payments without a counterpart in the uses part of the supply-use table - for example subsidies or international co-operation. Second, in practice it may be that the primary data sources are incomplete (for example, government data on transfers to specific entities may be available, while there is no data on these receiving entities – such as government transfers to associations of municipalities or to NPISHs). In such cases these transfers should not be netted out but rather used to estimate a production account for the entities not covered in primary data. Data on investment grants and on preferential loans may be particularly useful, including for estimating investment expenditure of the receivers of the loans and grants.

The purpose of the integration of specific transfers in the national expenditure aggregate is to describe those uses of economic resources for environmental protection which are not covered by the other components of environmental expenditure, i.e. which do not take the form of uses of goods and services (income transfers, transfers to other countries) or are not included in the prices of EP services and connected and adapted products (e.g., subsidies leading to lower prices paid by the purchasers). Experience suggests that the specific transfers that lower the prices of EP goods and services are often very small and may be ignored. This may not apply to the issue of negative operating surplus of government market producers which are offset by an implicit subsidy on products. The prices such producers charge are too low to cover all costs of production, and thus the uses are undervalued. Such implicit subsidies can be quite large and should be recorded in Table A under a separate sub-heading of row 4.1 (under specific transfers).

The second function of the specific transfers row in the Table A is to take up ‘open-ended’ transfers. These are transfers that would normally not be recorded in Table A because they only contribute to financing items

already included (e.g., investment grants). However, some of these transfers may be without a counterpart in the basic data available for the EPEA.

For example, transfers may be identified in the accounts of central government that go to a government agency, NGOs or to transport companies but the expenditure of these beneficiaries are not known because they are not surveyed or their annual reports are not available. In such a case, these transfer payments can be used as a basis to estimate the expenditure of these agencies, NGOs or transport companies and determine the supply and use of EP services and the investment they make. If such estimations appear unreliable, the 'open-ended' transfers can instead be entered in the specific transfers row in Table A.

Such 'open-ended' transfers may be of particular importance in the biodiversity and landscape protection domain where farmers may receive state aid in various forms targeted to protect the environment. Often, these transfers are the only basis to estimate the value of landscape protection services produced by farmers. Instead of estimating the value of these EP services it may be considered to enter the transfers in the specific transfers row of Table A.

Transfers to the rest of the world

Government as well as NGOs may finance environmental protection projects outside the national economy, in particular through public aid. In this case national resources are used for environmental protection, which do not correspond to any uses of products by resident units. Due to the growing concern for international aspects of environmental issues, this information is interesting to record.

Transfers to resident units

The expenditure made by resident units in the form of final or intermediate consumption or capital formation is recorded at purchasers' prices. These prices integrate the effects of subsidies and taxes.

Subsidies on EP services or connected and adapted products reduce the price paid by purchasers, in relation to the basic prices. Therefore, the expenditure recorded for the use of these products is undervalued in relation to the economic resources necessary for their supply. In that case the subsidies are entered as a specific item in the expenditure. Not entering these subsidies would give a wrong picture of the total resources used for environmental protection.

In other cases, transfers (e.g. investment grant) do not affect the price paid, but are only a way of financing the expenditure: e.g. capital grants given to industries for their environmental protection gross fixed capital formation do not reduce the price of the assets they acquire, their gross fixed capital formation is fully entered in the national expenditure at acquisition prices.

Some taxes which affect the acquisition price of EP services (e.g. taxes on waste disposal at landfills) are earmarked for environmental protection, and are used e.g. to pay subsidies on EP services or investment grants for EP capital formation. As the tax receipts are already included in the value of the output (e.g. of the waste services) adding the subsidies financed by these taxes to national expenditure would be wrong.

Experience with pilot applications

The EPEA pilot applications show that specific transfers represent rather insignificant flows, as illustrated by Table 5.16.

Table 5.16 Importance of specific transfers in pilot exercises

Countries	national expenditure (million national currency)	of which: specific transfers	%
Denmark	18 120	47	0.3%
Germany	98 855	443	0.4%
France *	102 586	1 896	1.8%
Austria	79 463	452	0.6%

* only waste and wastewater

Based on such data the SERIEE task force concluded at its 20-22 March 2000 meeting that specific transfers (i.e. mainly subsidies on production of EP services – lowering prices as recorded in the EPEA) were of very minor importance in EU Member States but very difficult and labour-intensive to get data on. So they can be ignored except maybe transfers to the rest of the world which can be quite important for some countries.

Before deciding to ignore these specific transfers it is recommended to estimate their magnitude. From the point of view of the polluter-pays principle the identification of specific transfers is relevant and the data may be useful for purposes other than EPEA compilation. Several types of subsidies are to be systematically searched for:

a) subsidies on the expenditure for ancillary EP services. These may consist in other subsidies on production paid by government units to compensate the costs of measures taken by producers in order to reduce the pollution or the environmental degradation caused by their activity. The range of these subsidies is rather large. Whereas they are certainly limited in some domains, e.g. waste and wastewater management, they can be more important in the protection of landscape and biodiversity where government (e.g. the ministry of agriculture) compensates the farmers for the extra-cost of less environmentally harmful agricultural practices.
b) subsidies on the expenditure in market EP services. Whereas there are few explicit subsidies on products for market EP services, there exist implicit subsidies. As has been seen above (section 5.2.2) it happens that market producers of the general government sector (i.e. units that have no autonomy of decision but keep a complete set of accounts and cover more than 50% of their costs by sales) have a negative net operating surplus. In this case, the recommended treatment is to recognise the existence of an implicit subsidy from the general government institutional unit the market producer belongs to (e.g. a municipality) to the market producer.
c) subsidies on connected and adapted products. As far as unleaded gasoline or desulphurised fuels are concerned in several countries a system of differential taxation exists in order to favour the use of these adapted products.

5.5.2 Data sources used and treatment

The analysis of accounts of government

Analysis of accounts of government allows to identify, within government outlays, current and capital transfers to units belonging to other institutional sectors. This analysis may be particularly useful for government bodies specialised in environmental protection (e.g. environmental agencies). In the ESA, subsidies are always paid to producers. By convention, subsidies on products can only relate to market output.

Information on transfers related to environmental protection should be presented and treated as follows:

A table of intra-governmental transfers should be set up – many transfer payments are between different levels of government, e.g. from the central state to an environmental fund or to local authorities. Such transfers should be separately identified and presented in a table of intra-governmental transfers (basically a supply-and-use-of-transfers table). In order to compile Table A, transfers where both the donor and the beneficiary are described in the basic data should be netted out, e.g. when basic data include investment grants from the central state to local authorities as well as the investment undertaken at local level (but these transfers are taken into account later when compiling Table C). However, there may also exist 'open-ended' transfers without a counterpart in the basic data available, e.g. transfers to a government agency whose annual report is not available. In such a case, the transfers can constitute a basis to estimate the expenditure of that agency (see above).

A table of transfers among sectors. Normally, transfers will only go from the government sector to the other sectors (households, corporations, and non-profit institutions) but the reverse can be true e.g. for large donations or for pollution taxes. The same principles as above apply: if the expenditure which are financed by the transfers are included in the primary data, the transfers should be netted out in order to compile Table A. Some kinds of transfer will have no counterpart in expenditure by definition (for example international co-operation).

Information on transfers is used to describe the financing flows related to environmental protection and hence the application of the polluter-pays-principle.

Specific transfers may also originate from the rest of the world, and in particular from European Union institutions.[7] These transfers finance part of the domestic environmental protection expenditure and should be deducted for arriving at the national environmental protection expenditure.

5.5.3 Specific transfers in Table A

In Table A, the identification of transfers without counterpart in other items and the consolidation with the supply and use table (B1 table) is made. Transfers are allocated to beneficiaries.

Table 5.17 Specific transfers in Table A

	USERS/BENEFICIARIES					
	Producers		Consumers		Rest of	Total
Components of national expenditure	specialised	other	households	government	the world	
…						
4 Specific transfers (not counterpart of previous items)						
(4.1) subsidies on production						
characteristic services	nr	x	x	-	(x)	x
connected products	nr	x	x	-	(x)	x
adapted products	nr	x	x	-	(x)	x
(4.2) other specific transfers						
current	x	x	x	x	x	x
capital	x	x	-	-	x	x
6 financing of national expenditure by the rest of the world						
current	-	x	x	x	x	x
capital	x	x	-	-	x	x

Numbers in brackets refer to the original numbering of Table A (see SERIEE manual page 58). x…often small. (x)…often very small/may be ignored. -…not relevant or zero by definition. nr…not recorded here to avoid double counting.

When the specific transfers without a counterpart have been identified they are entered in Table A. Subsidies on EP services and on connected and adapted products are distinguished from other transfers. Other transfers are for example transfers to non-characteristic producers or to households that do not constitute a counterpart of uses: e.g. compensation of losses of income or capital related to environmental protection measures.

Specific transfers are entered in the columns that correspond to the beneficiaries. As concerns subsidies on EP services or connected and adapted products, they are distributed between the users of these products in proportion of the uses and entered in the corresponding columns.

[7] An inventory of European Union institutions environmental protection expenditure has been done (see European Commission 2000b), which allows to know the transfers received by Member States for the various environmental protection domains.

5.6 National expenditure aggregate

The national expenditure for environmental protection is presented in sections 3.1.4 and 5.2.1. Table A presents the components of national expenditure by categories of users (of EP goods and services and of EP investment) or beneficiaries (of transfers).

Table 5.18 The national expenditure aggregate

	USERS/BENEFICIARIES					
	Producers		Consumers		Rest of	Total
Components of national expenditure	specialised	other	households	government	the world	
1 Uses of EP services	nr	X	X	X	-	X
2 Capital formation for environmental protection	X	X	-	-	-	X
3 Uses of connected and adapted products	nr	X	X	-	-	X
4 Specific transfers	(x)	x	x	x	x	x
5 Total domestic uses	X	X	X	X	X	X
6 less financed by the rest of the world	x	x	x	x	(x)	x
7 National expenditure	X	X	X	X	X	X

X…important item. x…often small. -…not relevant or zero by definition. nr…not recorded here to avoid double counting.

Total domestic uses (i.e. the uses of economic resources for EP) constitutes an intermediate aggregate from which the national expenditure aggregate is obtained by deducting the financing by the rest of the world. In most pilot applications it proved difficult to identify the financing by the rest of the world based on national sources. Total financing by European Union institutions was about 4.5 billion ECU for the year 1997 (see European Commission 2000b), i.e. some 3% of total environmental protection expenditure for the 15 EU Member States. This financing was particularly high in some environmental domains (e.g. biodiversity and landscape protection accounted for about 1.6 billion ECU) and for some countries (e.g. the 4 Cohesion Fund countries Greece, Ireland, Portugal and Spain received about 1/3 of the total).

National expenditure may be related to national accounts aggregates for presentational and analytical purposes (see section 7.4).

Worked Example 16: Compiling the Table A for wastewater management

Table A summarises the economic resources used by the national economy for environmental protection (in the rows), by categories of users/beneficiaries (in columns).

The upper part of the table presents the uses of wastewater management services, either final consumption by households or general government (none in the case of wastewater), or intermediate consumption by other producers (from the use part of the supply-uses table, see Worked Example 15). Intermediate consumption by specialised producers is not recorded, as it is already included in the other uses.

Then capital formation, uses of connected and adapted products and specific transfers are added.

Capital formation corresponds to the gross fixed capital formation (and net acquisition of land) for wastewater management by specialised and ancillary producers. Data come from the industrial production surveys (specialised firms 1 288.0, classified in the column ‘specialised producers’, see Worked Example 11), the analysis of accounts of government (125.0 - local government bodies classified in the column ‘specialised producers’, see Worked Example 5) and the central database of specialised municipal bodies (501.2 and 777.9 - local government bodies classified in the column ‘specialised producers’, see Worked Example 6). In the ‘other producers’ column gross fixed capital formation for ancillary activities (397.3) is recorded. It comes from the expenditure survey (see Worked Example 9). All these data are also recapitulated in the capital stock database (see Worked Example 11).

Connected and adapted products correspond to the uses of connected and adapted products, by resident units. In the wastewater domain, connected products consist in septic tanks (325.1 from the other production statistics, see Worked Example 4).

Specific transfers refer to transfers not already accounted for in the three first categories. In the case of wastewater they correspond to 'implicit subsidies' as calculated in Worked Example 13. These implicit subsidies correspond to cost not accounted for in the value of the wastewater management services sold by municipal bodies (the part of the consumption of fixed capital which is not included in the price). The total of these implicit subsidies is 442.3 (see Worked Example 14). It is distributed to users of the wastewater services sold by municipal bodies in proportion to their uses of these services (VAT excluded).

Total domestic expenditure is the sum of previous items.

When some uses are financed by the rest of the world (mainly European Union, in the case of European countries), this financing is deducted in order to arrive at the national expenditure, i.e. uses of resident units financed by resident units.

The national expenditure aggregate may be separated between current expenditure and capital expenditure, according to the nature of the uses accounted for.

Table A for wastewater	Specialised producers	Other producers	Households	Government	Rest of the world	Total
Uses of EP services		**4,656.9**	**4,823.7**			**9,480.6**
Final consumption			4,823.7			4,823.7
Intermediate consumption		4,656.9				4,656.9
market		2,984.4				2,984.4
ancillary		1,672.5				1,672.5
Capital formation						
GFCF and land acquisition	**2,693.3**	**397.3**				**3,090.6**
Connected and adapted prod.			**325.1**			**325.1**
Specific transfers		**175.1***	**267.0***			**442.1**
Total domestic uses	**2,693.3**	**5,229.3**	**5,415.8**	**0.0**	**0.0**	**13,338.4**
Financed by the rest of the world						
National expenditure	**2,693.3**	**5,229.3**	**5,415.8**	**0.0**	**0.0**	**13,338.4**
of which current		4,832.0	5,090.7			9,922.7

* These figures are obtained by assuming that the part of the implicit subsidies (442.1) attributable to 'other producers' is proportional to their uses of EP services sold by municipal bodies (i.e. excluding their uses of ancillary EP services). The part attributable to 'other producers' is calculated as **2 984.4** (i.e. the other producers' uses of EP services sold by municipal bodies) **/ 7 535.1** (i.e. total value of EP services sold by municipal bodies to 'other producers' and 'households' = 2 984.4 + 4 550.7; from households final consumption of EP services of 4 823.7 the VAT of 273 is excluded. See Worked Examples 13 and 15) **x 442.1**. The part of the implicit subsidies attributable to 'households' is then 267.0 (442.1 – 175.1). That part may also be calculated directly as **4 550.7** (i.e. uses of EP services sold by municipal bodies, excluding VAT. See Worked Examples 13 and 15) **/ 7 535.1** (i.e. total value of EP services sold by municipal bodies to 'other producers' and 'households', excluding VAT = 2 984.4 + 4 550.7) **x 442.1**.

5.7 Financing table (Table C)

5.7.1 Presentation of the financing table

The units that consume EP services or connected and adapted products or invest for environmental protection are not necessarily the financing units, i.e. those actually bearing the expenditure from own resources because units may benefit from specific transfers. The EPEA framework allows to determine the financing units, for the different components of the national expenditure. Table C is devoted to the presentation of financing by simply cross-tabulating the users or beneficiaries and the financing sectors.

The EPEA does not distinguish financial corporations, thus the financing analysis does not show loans or sums borrowed. As a result any use which enters in national expenditure and which is not financed by specific transfers is by convention assumed to be financed by the user. In the case of financing national expenditure through soft loans, the cash equivalent of these soft loans (which must be calculated) has to be treated as a transfer. For the EU, the European Commission's Directorate-General for Competition provides the rules in force for calculating the element of state aid in a soft loan as well as to reference interest rates to be used. The guidance note for the calculation of the cash grant equivalent of a soft loan can be found at http://europa.eu.int/comm/competition/state_aid/legislation/cash_en.html and the reference interest and discount rates at http://europa.eu.int/comm/competition/state_aid/others/reference_rates.html.

Table 5.19 The financing table – Table C

FINANCING SECTORS	USERS/BENEFICIARIES						
	Producers		Consumers		Rest of the world	Total	of which current expenditure
	specialised	other	households	government			
General government							
Central government	X	X	x	X	x	X	X
Local government	X	x	x	X	x	X	X
NPISHs	x	-	x	-	x	x	x
Corporations							
Specialised producers	t,X	t	t	t	t	x	X
Other producers	t	t,X	t	t	t	x	X
Households	t	t,x	t,X	t	t	x	X
National expenditure	X	X	X	X	x	X	X
Rest of the world	x	x	x	x	x	x	x
Domestic uses	X	X	X	X	x	X	X

X…important item. x…often small. -…not relevant or zero by definition. t… financing (usually indirect) through specific earmarked taxes or voluntary contributions of households and producers.

The column headings of the table are the same as the headings of Table A so that the totals in each column (National and domestic expenditure) are the same as in Table A. The rows of the table distribute the financing units according to the institutional sectors of the national accounts.

Entries in the column for specialised producers: the expenditure recorded for specialised producers correspond to their capital formation. Entries therefore describe how capital formation by specialised producers is financed. In general specialised producers finance their capital formation themselves. However the government may finance, through investment grants, a part of the capital formation of specialised corporations. Moreover, when investment grants are funded through revenues from earmarked taxes it is assumed that those that pay the taxes (in general households and other producers) are the financing units.

Entries in the column for other producers: the expenditure recorded for these non-specialised and non-characteristic producers correspond to their intermediate consumption of EP services (including ancillary services) and connected and adapted products plus their capital formation for ancillary environmental protection activities and specific transfers they benefit from. Entries in the column describe how this expenditure is financed. In general non-specialised and non-characteristic producers finance themselves their intermediate consumption and capital formation. However, specific transfers can exist that lower the price they pay for EP services or connected and adapted products. In this case the government finances a part of their expenditure. In the same way, investment grants can exist for their capital formation. When subsidies and investment grants are funded through revenues from earmarked taxes it is assumed that the units that pay the taxes (generally households and other producers) are the financing units.

Entries in the column households: the expenditure recorded for households correspond to their actual final consumption of EP services and adapted and connected products as well as any transfers they benefited from. Entries in the column describe how this expenditure is financed. In general households finance their final consumption themselves. However there are two exceptions:

a) the part of the household consumption that takes the form of government expenditure on individual consumption good and services (see section 5.2.3 for detail). Government finances this part.
b) the subsidies that lower the price of the environmental protection services or connected and adapted products (including implicit subsidies and tax subsidies on e.g. adapted products). Government finances these subsidies. However, when subsidies originate in earmarked taxes it is assumed that the units that pay the taxes (in general households and other producers) are the financing units.

Entries in the column government: the expenditure of the government as a collective consumer correspond to its expenditure on collective consumption services. In general this expenditure is financed by the government from the general budget. It may happen that receipts from earmarked taxes fund some of government's provision of collective consumption services. In this case the collective services are financed by the sectors that pay the earmarked taxes. Revenues from sales of non-market services (partial payments) are not accounted in the column of government as the part of non-market output covered by partial payments does not come under collective services in the first place (see also section 5.2.3).

Entries in the column rest of the world: the expenditure of the rest of the world correspond to the transfers paid for international co-operation in the field of environmental protection. These transfers can be financed either by the government or by households, through NGOs.

The table is a summary, which means that it is constructed on the basis of the analysis of the financing of each component of the national expenditure. However, for the main components the analysis of the financing is rather simple, following the rules set forth in the SERIEE manual § 2212 seq.

Aspects relating to specific transfers and financing by general government are more complicated and should be treated according to the following general rules:

- units which pay earmarked taxes, charges, etc. are considered the financing units of environmental protection expenditure financed from the corresponding revenues,
- general government is only considered the financer of outlays made from general budgetary resources, except therefore outlays made from tax revenues earmarked for the environment,
- government units at a given level are only considered the financing units of outlays made from their own general resources, with the exception therefore of transfers received from other units (e.g. other levels of government or European Union institutions).

Worked Example 17: Compiling the financing table for wastewater management

The financing table describes the financing of national expenditure by institutional sectors. The columns are the same as for the Table A (see Worked Example 16). Therefore the totals by column are the same as in Table A.

The table is filled in analysing the financing of each component of the expenditure.

Expenditure of specialised producers consist in gross fixed capital formation and land acquisition (see Table A). It is by convention financed by the specialised producers themselves, except for the investments grants the local government units receive (201.9, see the transfers table in Worked Example 7 and the production table in Worked Example 14). This investment grant is paid by the EPA from the earmarked receipts of pollution taxes paid by producers. The assumption is that the tax is paid by other producers (i.e. non-specialised producers).

Expenditure of other producers consist in their intermediate consumption of market and ancillary wastewater services, their gross fixed capital formation for ancillary activities and the specific transfers they benefit from (see Table A in Worked Example 16). The other producers finance themselves the first two items. The local governments pay for the specific transfers (implicit subsidy).

Expenditure of households consist in their final consumption of wastewater services, their acquisition of septic tanks and the specific transfers they benefit from. Households finance themselves the first two items. The local governments pay for the specific transfers (implicit subsidy).

The last column of the financing table gives the financing of the current expenditure by the different institutional sectors. This column provides the link to the next table (the net and total cost of environmental protection, see Worked Example 18).

Table C for wastewater management	Specialised producers	Other producers	Households	Government	Rest of the world	Total	of which current
General Government	1 202.2*	175.1	267.0			1 644.3	442.1
central government							
local government	1,202.2	175.1	267.0			1 644.3	442.1
NPISH						0.0	0.0
Corporations	1 491.1	5 054.2**				6 545.3	4 656.9
specialised producers	1 289.2					1 289.2	0.0
other producers	201.9	5 054.2				5 256.1	4 656.9
Households			5 148.8***			5 148.8	4 823.7
National expenditure	2 693.3	5 229.3	5 415.8			13 338.4	9 922.7
Rest of the world						0.0	0.0
Expenditure of resident units	2 693.3	5 229.4	5 415.8			13 338.4	9 922.7

* This figure is based on data from Worked Example 14, by summing up the GFCF of specialised producers belonging to general government and then deducting the capital grants received by some of them (1 202.2 = 125 + 1 279.1 – 201.9).

** This figure is based on data from Worked Example 16, by summing up all the environmental protection expenditures actually borne by 'other producers', i.e. intermediate consumption of EP services (both market and ancillary) and GFCF for ancillary environmental protection activities (5 054.2 = 4 656.9 + 397.3).

*** This figure is based on data from Worked Example 16, by summing up all the environmental protection expenditures actually borne by households, i.e. final consumption of EP services (including VAT) and GFCF related to the use of connected products (septic tanks) (5 148.8 = 4 823.7 + 325.1).

5.7.2 Data sources and links to previous tables

Elaboration of the financing table requires that transfers not already included in national expenditure have to be identified and analysed (e.g. investment grants, current transfers between central and local government units, payments of taxes whose revenues are earmarked for environmental protection, etc.).

As explained, for the main components of national expenditure the analysis of financing is rather simple.

- final and intermediate consumption of EP services and connected and adapted products: in general the financing unit is the unit which uses the services and products,
- gross capital formation: in general the financing units are the units that make the capital formation, except for that part which is financed by investment grants or other capital transfers,
- subsidies: when subsidies are paid from earmarked resources, the units that pay the taxes are deemed to be the financing units.

The main data sources are first the Table A which describes the national expenditure by component and user/beneficiary. Table B describes the financing of the gross capital formation: own financing by the producer for that part which is not financed by investment grants or other capital transfers.

Specific data sources that may be useful for the description of the financing of transfers include:

- earmarked taxes, which finance subsidies or other current transfers or investment grants: the tax payments must be disaggregated by institutional sectors (households and corporations) using e.g. physical data on the tax base of the earmarked taxes (air pollution, energy use, etc.) or data provided by the institution that collects the tax,
- other transfers (not financed by earmarked taxes): the transfers table (see section 4.4.1) describes the transfers between the different levels of government and between government and other sectors. It allows determining which unit is the financing unit,
- the calculation of the 'transfer component' (cash grant equivalent) of soft loans (see section 5.7.1): data may be available from environmental funds or financial institutions charged with providing and administering the soft loans.

5.8 Environmental taxes

5.8.1 Definition and classification

Earmarked taxes

In the EPEA, earmarked taxes are taxes that contribute to financing of environmental protection (these taxes are called 'specific taxes' in the 1994 SERIEE). The revenue from these taxes is earmarked for environmental protection and used for subsidising the production of environmental services, financing non-market activities or paying other current transfers or investment grants, capital formation of non-market specialised producers or other capital transfers for environmental protection. Earmarked taxes are taken into account in the analysis of financing of environmental protection (see section 5.7.1 above).

Environmental taxes and sales of EP services

When classifying government receipts, the distinction between taxes and sales of services is sometimes difficult. Whatever the name of the payment (rate, charge, fee, etc.), when there is a service provided in return the payment would typically be classified as purchase of services.

Environmental taxes in general

Environmental taxes are an important economic instrument for environmental protection. The focus is on revenue data for environmental taxes, thereby providing information on the structure and importance of environmental taxes within the taxation system. Such information is useful in a policy context of 'green' fiscal reform. A basic idea of 'green' fiscal reform is to change the structure of taxation systems so as to reduce the tax burden on labour and to increase the tax burden on the use of the environment.

OECD, Eurostat, the IEA and the European Commission's Directorates General for Environment and for Taxation have developed a statistical framework as concerns environmental taxes (see OECD 1997). In 2001, Eurostat published 'Environmental Taxes – a statistical guide (see European Commission 2001a).

The development of this statistical framework started from the following definition of environmental taxes: 'a tax whose tax base is a physical unit (or a proxy of it) that has a proven specific negative impact on the environment'. It was felt that the tax base provides the only objective basis for identifying environmental taxes for the purpose of international comparisons. This definition puts emphasis on the potential effect of a given tax in terms of its impact on the costs of certain activities or the prices of certain products.

This definition is somewhat different from the definition in the 1994 SERIEE manual (see SERIEE § 2048) where the purpose of a tax as expressed by the legislator was also retained as a criterion. The new definition (OECD 1997 and European Commission 2001a) should be used.

The definition gives an idea of the key concept that should be measured and provides a guideline for the assessment of newly introduced taxes. However, the definition still leaves room for debates on borderline cases (e.g. VAT on energy products, taxes on the purchase of land, on tourism, resource extraction, etc.). The key issue for ensuring international comparability is therefore the list of environmental tax bases (see below) as agreed by the institutions involved in defining the framework for environmental taxes.

5.8.2 Main data sources

The identification of environmental taxes will often be based on tax revenue statistics. A list of environmental taxes must be set up which allows to separate the environmental taxes from all other taxes and to assign them to the classification adopted. Allocation of tax payments to detailed industries can be made, including by using the physical tax bases (e.g. vehicle ownership or energy use by products) to distribute the aggregate revenue figures when no direct sources are available (for more detail see Hornum 2000 and Sjölin and Wadeskog 2000). Revenues from some small or local taxes may not be available from tax revenue statistics. Budget analysis may provide data on these taxes.

5.8.3 Presentation of aggregate results on environmental taxes

The framework agreed by OECD, Eurostat, the IEA and the European Commission's Directorates General for Environment and for Taxation includes an agreed list of environmental tax bases (for detail see European Commission 2001a), including:

- Measured or estimated emissions to air
- Measured or estimated emissions to water
- Energy products
  - Energy products used for transport purposes
  - Energy products used for stationary purposes
- Transport
  - Per kilometre driven
  - Import or sales of vehicles
  - Annual taxes
  - Other
- Wastewater discharges (not measured)
- Agricultural inputs (fertiliser, pesticides)
- Waste
  - General waste collection and treatment (waste collection, landfill)
  - Individual products (packaging materials, batteries, tyres, lubricant oils, etc.)
- Ozone depletion (CFCs, halons)
- Noise.

For an individual country there will often be quite few environmental taxes and the following aggregated groupings of environmental taxes may be used:

- Energy taxes (including CO_2-taxes)
- Transport taxes
- Pollution taxes (on emissions, waste, packaging, pesticides, CFC, noise, etc.)
- Resource taxes (water abstraction, sand and gravel, etc.).

It should be noted that resource taxes (as part of environmental taxes) do not include taxes on oil and gas extraction. These taxes generate important revenues in a very limited number of countries. Inclusion of taxes on oil and gas extraction would distort the analysis of the role that environmental taxes play within the overall structure of taxation. Furthermore, such taxes are set to capture (only) the extra profit or resource rent. This extra profit is determined by the difference between the cost of extraction and the world market prices for crude oil and natural gas. Energy prices are usually not influenced by these 'profit' taxes. Hence such taxes would not fit the definition of environmental taxes. Carbon dioxide taxes are included with energy taxes for several reasons, including that often carbon dioxide taxes are in fact tax rate differentials of energy taxes such as the mineral oil tax (for detail see European Commission 2001a, pages 12-13).

Box 10: Environmental taxes in Sweden

In 1999, Statistics Sweden started work to include information on environmental taxes in the Swedish environmental accounts. The main objective was to identify the taxes paid by individual economic sectors and industries. The work also included analysis of subsidies and tax exemptions that the Swedish Environmental Protection Agency (EPA) identified as potentially environmentally harmful. Analysis have been made linking data on taxes and subsidies with emission data in the environmental accounts.

Total tax revenue from environmental taxes

The first task is to identify the environmental taxes and the total tax revenue. The basis for the work was the OECD/Eurostat definition of environmental taxes, which includes all taxes levied on tax bases with environmental relevance. These tax bases can be categorised into four different groups: taxes on energy, taxes on pollution, taxes on natural resources and taxes on transport. Information on total tax revenue each year is available from the National Financial Authority. These figures are checked with information in the national accounts. The figures in the national accounts are accrual-based and thus related to activities within the actual year, which may be different from the tax revenue collected within that year. The table below shows the different environmental taxes in Sweden and the total tax revenue between 1993 and 1998.

Environmental taxes by industry

The next task is to break down the revenue on the actual tax payer. For taxes on fuel and electricity (tax on carbon dioxide, energy tax, tax on production of electricity and tax on sulphur dioxide), the fuel and electricity consumed in each industry are multiplied with the respective tax rate. Here it is important to take into account all available exemptions and differences in tax rates. One example is the tax on sulphur dioxide, where there is a re-payment scheme for enterprises which have made measures to reduce their emissions. For taxes related to transport the number of vehicles are multiplied with the relevant tax rate. These calculations from the expenditure side are then compared and made consistent with the information from the revenue side.

Environmental taxes in Sweden 1993-1998, Million SEK

Environmental taxes (Milion SEK)	1993	1994	1995	1996	1997	1998
Energy taxes	**39 017**	**42 043**	**44 161**	**49 733**	**49 352**	**52 652**
Energytax (Total)	26 230	28 448	29 908	31 975	34 586	37 286
Other production taxes on electicity	2 243	2 375	2 442	4 093	2 276	2 422
Tax on carbon dioxide	10 544	11 220	11 811	13 665	12 490	12 944
Pollution taxes (air, land and water)	**582**	**566**	**682**	**753**	**551**	**508**
Tax on sulphurdioxide	188	192	165	213	127	113
Tax on pollution from domestic flights	196	188	186	117	-	-
Tax on fertiliser	185	164	299	388	372	340
Tax on pesticides	13	22	32	35	52	55
Transport taxes	**8 119**	**5 852**	**5 798**	**6 721**	**6 451**	**6 336**
Tax on vehicles	4 095	4 064	4 049	5 471	6 242	6 103
Sales tax on vehicles	1 287	1 778	1 749	1 250	209	233
Kilometre tax	2 737	10	-	-	-	-
Resource taxes				**70**	**131**	**142**
Natural gravel tax	-	-	-	70	131	142
Total environmental taxes	47 718	48 461	50 640	57 277	56 485	59 638
Environmental taxes in % of GDP in Sweden	*3,19%*	*3,04%*	*2,96%*	*3,26%*	*3,12%*	*3,16%*
Environmental taxes in % of GDP in the EU	*2,76%*	*2,85%*	*2,84%*	*2,85%*	*2,85%*	-

Source: National accounts department, Statistics Sweden, Eurostat

Analysis and future work

The inclusion of the environmental taxes in the environmental accounts makes it possible to link this information with e.g. environmental expenditure and data on emissions. There is a link between the various types of economic information on the environment. Enterprises e.g. have a choice between implementing new environmental measures and payments of environmental taxes (or buying/selling emission permits): i.e. minimising their total environment-related expenditure. Experience from the latest Swedish survey on environmental expenditure also shows that many enterprises regard payments of these taxes as part of their environment expenditure. A comparison between total environment-related expenditure and environmental pressure data in the environmental accounts would give an indication whether the polluter pays or not. Future time series will facilitate further analysis of the linkages between taxes, expenditures and emissions.

In a recent study (see Sjölin and Wadeskog 2000), payment of environmental taxes and emissions to air have been compared. This is one example how different data in the system of environmental accounts can be used together. For carbon dioxide, Households and Construction (NACE 45) pay more tax than their share of the total emissions. The transport sector (NACE 61-64) causes 19 per cent of the total emissions but pay only 11 per cent of the tax, because of a tax relief. The manufacturing industry (NACE 15-37) has a tax relief as well and causes 28 per cent of carbon emission but pays only 7 per cent of total tax revenue.

Source: Mårten Sjölin and Ulf Johansson, Statistics Sweden

5.9 Net cost account (Table C1)

5.9.1 Objective of the table and definition of net costs

Financing of the national expenditure may be extended in order to determine the net costs that burden the different categories of resident units due to environmental protection.

Starting from current national expenditure (i.e. ignoring capital expenditure) some complementary items are first introduced. For producers, the imputed or actual interests on fixed capital less (in the case of specialised market producers) any net operating surplus is added to the financing of current national expenditure.

The burden of environmental protection only relates to current national expenditure because, from the units' point of view, it would have no meaning to consider gross capital formation (i.e. the acquisition of assets) as a burden. Only consumption of fixed capital, as included (directly or indirectly) in current national expenditure, is considered as a burden. Another approach could be to calculate the burden on the basis of net national expenditure (i.e. after deduction of consumption of fixed capital).

The net operating surplus is not an outlay but a resource from the unit's point of view. Conversely, computed interests on fixed assets (or the return to fixed capital – see e.g. European Commission 2000c, pages 23-24) may be considered as cost.

Reclassification of some transactions is then made. Receipts from taxes on production and taxes on environmental protection products (in particular non-deductible VAT) are deducted from financing of the general government.

For the corporation sector, the objective of this complementary analysis is to obtain the supplementary costs linked to the environment, ignoring that these costs are not on the whole finally supported by producers (they are part of the price the producers cover from the purchasers of their products). For households, the objective is to know how much they actually pay related to environmental protection. In the case of government, the objective is to compute the net result of financing and receipts related to environmental protection expenditure.

Table 5.20 Net cost of environmental protection

ELEMENTS OF NET COSTS	SECTORS				
	Corporations		Households including NPISHs	Government	Total
	Specialised	Other			
1 Financing of current national expenditure	x	x	x	x	x
2 Non-deductible VAT on current expenditure	-	-	-	x	x
3 Taxes on production	-	-	-	x	x
4 Net operating surplus	x	-	-	x	x
5 Any other profits	-	x	x	-	x
6 Interest on fixed capital	x	x	x	x	x
7 Net cost of environmental protection (1-2-3-4-5+6)	x	x	x	x	x

This table could be extended by adding the payments of all environmental taxes (e.g. carbon or energy taxes - see section 5.8). The result would then be the total ‘environment-related financing burden’ or cost, by sector and for the society as a whole. Environmental tax payments by industries can be useful to assess the economic impacts of environmental policy. However, the interpretation of environmental tax payments as a net cost burden may be questionable, as often environmental taxes are introduced as part of a tax shift policy and the revenue is used, e.g., to reduce labour taxes.

Note that environmental taxes that are already taken into account in row 1 (Financing of current national expenditure) of Table 5.20 should not be added. These are environmental taxes already captured in Tables B1 and A as taxes on products or in Table B as taxes on production (e.g. vehicle taxes on garbage trucks) and those earmarked taxes captured in Table C that were used to finance current national expenditure.

There is a link between different types of economic information related to the environment. For example, firms may have a choice between implementing new environmental measures and paying environmental taxes: i.e. firms may focus on minimising their environment-related expenditure rather than the more narrowly defined EPE. An analysis of the trade-offs between different types of expenditure could be expanded to include not only EPE and environmental taxes but also compensatory payments to damaged parties, penalties and fines or buying or selling emission permits. Further analysis could also be made of the effects of investment grants and other capital transfers if available data allow this. In Table 5.20 the costs of capital (imputed interest or return to capital) are allocated to the sectors that own the fixed capital but allocation could also be made to those that funded this fixed capital, e.g. via investment grants.

Table 5.21 The environment-related financing burden

	SECTORS				
	Corporations		Households	Government	Total
	Specialised producers	Other producers	including NPISHs		
Net cost of environmental protection	**x**	**x**	**x**	**x**	**x**
Environmental taxes	x	x	x	-x	0
Total environment-related burden	**x**	**x**	**x**	**x**	**x**

5.9.2 Data sources

Data sources for the net cost are the previous tables. The row ‘financing of current expenditure’ corresponds to the last column of Table C. The net operating surplus of specialised producers and the taxes on production come from Table B. The imputed interests on capital stock may be calculated from the net stock of fixed assets (supplementary data of Table B) assuming a normal rate of interest. The non–deductible VAT on current expenditure is derived from Table B1.

The only new data for calculating the net cost refer to the row ‘any other profit’. The objective of this row is to capture side benefits of EP producers from environmental protection activities such as energy or raw material savings resulting from internal environmental protection measures. However, data on such savings will rarely be available. In principle, benefits taking the form of marketable by-products of EP activities (e.g. heat from waste incineration or materials recovered) are treated as non-environmental output and already deducted from the total output of producers in Table B so these by-products should not be taken into account again in this row. For the total environment-related burden also the environmental taxes (see section 5.8 for data sources) are to be added.

Worked Example 18: Compiling the net cost of wastewater management

The ***net cost of environmental protection*** is compiled by adding and subtracting various items to/from the financing of current national expenditure as presented in the financing table (see Worked Example 17).

First item to be added is the interest on fixed capital. This cost is only indirectly included in the national expenditure through the net operating surplus of specialised producers. For ancillary producers and for government no cost is recorded, as there was a negative net operating surplus of government market producers, compensated by an implicit subsidy (see Worked Example 13). The interest on fixed capital is calculated on the basis of the net capital stock data (see Worked Example 11), applying a standard market rate (here taken as 6%).

When data are available on the indirect revenues or savings related to environmental protection activities they should be entered in the row 'any other profit'. Of course only revenues or savings not already accounted for should be entered. As sales of recovered products and recovered energy have already been deducted for the compilation of environmental protection output (see Worked Example 14) the only items to be considered are e.g. savings of energy or raw materials, or productivity gains related to integrated technologies. In the example this kind of revenue is zero.

Net operating surplus of specialised producers (corporations sector) is included in current expenditure (through the value of output and therefore the final and intermediate consumption of wastewater management services). However, it serves to finance the interest costs already included. Therefore it should be deducted from the financing of current expenditure. The data come from the production table in Worked Example 14.

The non-deductible VAT (from the supply use table, see Worked Example 15) should be subtracted. This element enters current national expenditure (household final consumption) but is received by government. Therefore it compensates partially the outlays of general government for the financing of current national expenditure. The same is true for taxes on production paid by specialised producers (from the production table, see Worked Example 14).

Environmental taxes not already accounted for in current national expenditure add to the environmental burden of corporations and households. The wastewater-related taxes are partly earmarked but are used to fund new investment so are not captured in current national expenditure (see Worked Example 8).

	Sectors				Total
	Corporations		Households and NPISHs	Government	
	Specialised producers	Other producers			
Financing of current national expenditure		4 656.9	4 823.7	442.1	9 922.7
Interest on fixed capital	571.5*	519.9**		4 805.6***	5 897.0
Any other profit					0.0
Net operating surplus	-608.0				-608.0
Non-deductible VAT on current expenditure				-273.0	-273.0
Taxes on production				-71.1	-71.1
Net cost of environmental protection	-37.0	5 176.8	4 823.7	4 903.6	14 867.1
Environmental taxes		1 269.0		-1 269.0	0.0
Total environment-related burden	-37.0	6 445.8	4 823.7	3 634.6	14 867.1

* This figure is calculated as 6% of 9 525.4, i.e. the value of the net fixed capital stock of firms specialised in the production of wastewater management services (see Worked Example 11).

** This figure is 6% of 8 665.1, i.e. the value of the net fixed capital stock of non-specialised producers for their production of ancillary wastewater management services (see Worked Example 11).

*** This figure is 6% of 80 093.3, i.e. the value of the net capital stock of public producers specialised in the production of wastewater management services (see Worked Example 11): cities<2000 inhabitants (11 592.0), cities>2000 inhabitants (38 250.7) and PEIC (30 250.6).

6. The EPEA statistical process

6.1 Overview

This chapter is devoted to the design and management of the EPEA statistical process. The statistical process includes the extraction of data from primary data sources, estimation of missing data, preparation of EPEA worksheets, verification of the worksheets and analysis of the results. The publication of EPEA results is also described in this chapter as is the issue of revision of published estimates.

As far as the data extraction process is concerned, the interface between data sources and the EPEA databases is particularly important and should be designed in consultation with data providers. Even when published data are used, the providers of the data should be informed about the use of the data in compilation to ensure that both the basic data provider and the EPEA compiler have the same understanding of the meaning of the data. When basic data are not published, their characteristics should be documented (source, date of extraction, coverage, etc.).

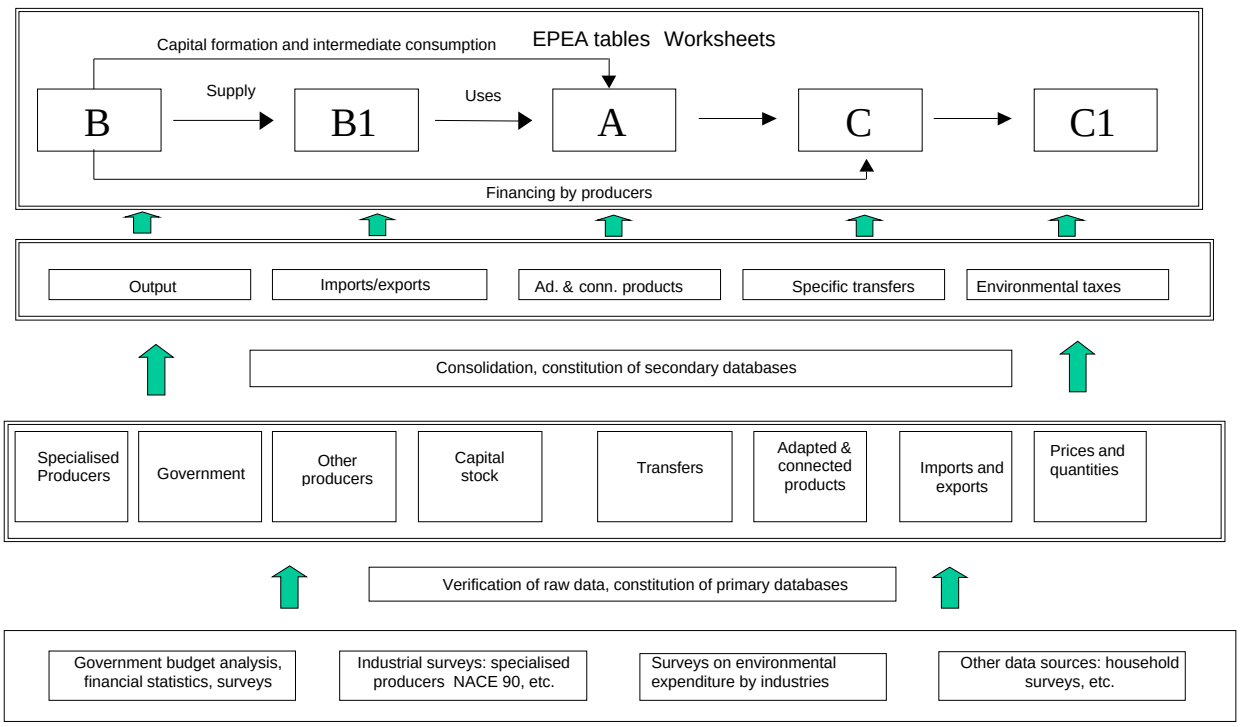
Data should be entered as received, there should be a one to one relationship between the data source and the (primary) database of the EPEA. These primary data should be analysed to ensure consistency with past data and other information available. When this is not the case the data provider should be contacted, which may result in the provision of revised data. Such revisions should be documented.

6.2 Organising data flows

The EPEA statistical process may be most effectively considered as a series of modules. Through the modular approach, each component can be established, updated and analysed in isolation before all components are combined. The modular approach can be used at various levels – that is each higher level module may consist of sub-modules.

Data flows include the collection of basic data and their organisation in (primary) databases, the treatment of primary data, the construction and maintenance of specific databases which directly feed the EPEA tables and the completion of the EPEA tables. The transition from the EPEA tables to the publication of results is not covered here. The general organisation of data flows is described in the scheme below.

Figure 4 Organisation of data flows



6.3 Constitution and maintenance of databases

It is useful to organise data in databases to facilitates analysis and updates. In this section, a comprehensive set of databases is described as an illustration. In practice, the availability of primary data will determine the databases that are most helpful for compiling EPEAs.

It may be useful to distinguish two types of databases: primary databases for raw (primary) data and secondary databases for data that have been treated or transformed and that are ready to enter the worksheets and final tables of the EPEA. Between the primary and secondary databases transformation procedures or estimation processes have to be implemented.

The number of primary databases to be established will depend on the data sources available. Typically, databases will be needed for government units, for other specialised producers, for capital stock data and for the results of industry expenditure surveys. The primary databases may be simple Excel sheets or full data bases, depending on the subject and the amount of data available. These data bases feed the secondary databases which record capital stocks, production, transfers etc.

A primary database for government

This database should record for the various years:

- transactions related to output of government units for the various domains (sales, compensation of employees, intermediate consumption, taxes on production, gross fixed capital formation),
- transfers given and received by type (capital, current) and by category of donors or beneficiaries,
- taxes paid and received,
- other data that might be useful for estimation processes, such as the amount of interest paid or the depreciation recorded (to estimate past investment).

After verification this government transactions database feeds the production database, the transfers database and the taxes database. In the production database, for non-market output, the consumption of fixed capital (from the capital stock database) is added to current outlays (compensation of employees and intermediate consumption) of general government non-market producers. For market producers, the output database subtracts the consumption of fixed capital from gross operating surplus in order to calculate the net operating surplus and (if negative) the corresponding implicit subsidy. The capital formation for environmental protection of government units is also recorded in the production database.

The transfers database records all subsidies on production and products as well as other transfers, including transfers between government units and capital transfers (investment grants).

A primary database for market specialised producers

This database records the results of annual industrial surveys of market specialised producers: number of units, sales or turnover by product, intermediate consumption, compensation of employees, taxes and subsidies on production, gross operating surplus. Number of employees and the use of sub-contracting should also be recorded in the database. Government market producers and other market producers should be separated.

After verification, (eventual) grossing up and/or identification of double counting, the primary data feed the production database. This database can be organised in such a way that the columns of Table B referring to specialised market producers may be directly filled-in (except as concerns consumption of fixed capital and capital transactions).

A primary database for capital stock

This database records the gross fixed capital formation of the different categories of characteristic producers (non-market government producers, specialised market producers, ancillary producers) for the various environmental domains. Ideally, categories of capital goods should be distinguished (buildings, transport equipment and other equipment). It is normally fed with annual surveys (production surveys, specific environmental investment surveys) or with the analysis of government transactions. As far as possible this database should also record the investment grants and other capital transfers for

environmental protection, and the price indices for EP gross fixed capital formation or for similar capital goods.

After verification and (eventual) grossing up the primary database feeds the capital stock database that uses the national accounts procedures (perpetual inventory method). This allows to derive the consumption of fixed capital by category of producers as well as, when necessary, the current expenditure for ancillary activities.

A primary database for environmental expenditure by non-specialised producers

As for market specialised producers this database would record the results of surveys on the current expenditure of non-specialised producers, distinguishing the expenditure that correspond to internal (ancillary) activities and the purchases of EP services. As concerns current expenditure, the primary database records only current outlays, the value of the output in ancillary protection services being calculated from the capital stock model through the addition of consumption of fixed capital, and stored in the production database.

A primary database on prices and physical quantities

When data exist on the quantities and prices of market EP services (mainly for waste and wastewater management), they may be organised in a database. As far as possible, this database should distinguish the volume of services provided in physical units (cubic metres of wastewater, tonnes of waste) by categories of users and according to the type of services (collection, treatment, etc.). This database facilitates the data verification process, allows to allocate the output between users and could also be used to estimate output using the price-times-quantity method.

A primary database for connected and adapted products

A database should describe the uses (by categories of users) of connected and adapted products. Practically the database may only record a proxy, the evolution of which is applied to a base year estimate for the use of these products. Ideally this database would integrate the subsidies and taxes on these products. In the case of adapted products, additional information should allow to calculate the extra cost.

A primary database for taxes

This database could record the environmental taxes as well as specific information on the non-deductible VAT on EP services and on other taxes on production and products. The database should include not only the absolute value of these taxes but also the rates of the taxes. It feeds the tables B1 (transition from output at basic prices to uses at purchasers' prices) and C1 (environmental taxes).

A primary database for imports and exports

When necessary a database on foreign traded in environmental services and in adapted and connected products could be constructed.

6.4 Estimation processes

Estimations are necessary for completing the EPEA tables. Some of these estimation procedures have been presented in previous chapters. They mainly refer to:

- grossing-up of primary data (e.g. survey results),
- identification and elimination of double counting (e.g. sub-contracting),
- calculation of output by the cost (and the use of the capital stock model),
- use of inference (estimating uses from supply),
- use of a proxy or substitute for non-available information (e.g. deriving the change in a variable from the change in another variable),
- merging of different and partial information.

In general, several estimation procedures are applied: sample expansion, estimation via a data model, and extrapolations or interpolations. Informed analysis and judgement are important in the estimation process. It is important to clearly separate the primary data, the estimation itself and the resulting estimate. When e.g. a grossing-up is made, three data sets have to be recorded: the primary data, the grossing factors and the expanded result.

6.5 Design of linked worksheets

The final worksheets are the EPEA tables. These tables are organised by CEPA classes. In theory, there would be 50 worksheets: 5 for each of the 9 CEPA classes plus 5 summary tables for the totals. In practice, either not all CEPA classes are covered, or some classes are grouped together (e.g. in the 1994 SERIEE Manual the domains 'protection against radiation', 'research and development for environmental protection' and 'other environmental protection activities' are grouped together in one sub-account, see §§ 9001 seq.).

The design of linked worksheets should consider the links of some of the final worksheets or cells in the final worksheets with the primary databases as well as the links among the final worksheets.

6.5.1 Linking EPEA worksheets with databases

The Table B worksheet can be completed on the basis of the production database.

The Table B1 worksheet receives data from Table B, from the taxes database (non-deductible VAT, other taxes on products), the transfers database (subsidies on products) and the imports/exports database.

The Table A worksheet receives data from Table B1 (uses) and Table B (capital formation of characteristic producers), from the connected and adapted products database and from the transfers database (specific transfers including transfers from and to the rest of the world).

The Table C worksheet receives data from Table A and from the transfers database. Table C1 receives data from Tables B and C and from the taxes database (non-deductible VAT, taxes on production, environmental taxes).

6.5.2 Linking EPEA worksheets together

There are numerous cells that link one EPEA table to another. The main correspondences are described here and should be incorporated within the worksheets. See Annex 4 for a more detailed description of the worksheets and the correspondences among cells.

Starting with Table B, the environmental protection output, distributed by nature of output (market, non-market and ancillary) directly goes to the supply part of Table B1 (output at basic prices). Intermediate consumption of market characteristic services by characteristic producers is also recorded in Table B1. Gross capital formation of specialised and ancillary producers directly goes into Table A (gross capital formation for characteristic activities). Financing by producers is calculated in Table B and goes into Table C. Net operating surplus goes into Table C1. Interest on fixed capital is calculated on the basis of the fixed capital stock in Table B and goes into Table C1.

In Table B1 imports are added to the output (from Table B) and the supply of EP services is re-evaluated to purchasers' prices. The supply is then distributed to uses. Uses (intermediate consumption of non-specialised producers, final consumption and capital formation) directly go to the upper part of Table A (consumption of characteristic services and gross capital formation in characteristic services). Subsidies on EP services also enter the Table A, but have to be allocated to the different categories of users.

For most of the components of the national expenditure, filling in Table C from Table A is rather straightforward, applying the rules defined as concerns financing. However, as Table C is rather aggregated,

determining the financing may imply a detailed treatment of some components of the national expenditure, in particular subsidies and transfers.

Financing of current national expenditure directly goes from Table C to Table C1. Non-deductible VAT on current expenditure, taxes on production and net operating surplus are taken from Table B and B1.

6.6 Analysis and verification of results

The purpose of the analysis and verification process is threefold. First, it serves to detect and correct errors in data. Second, by analysing data, the compiler obtains information essential for understanding and explaining the results. Third, it allows to identify weaknesses in data sources, methods and procedures and modify them.

Analysis and verification of results comprise some very basic steps: verification that the source data have been correctly entered and that they are accurate (components add to total, internal consistency, consistency from period to period, no change in definition from one year to the other), internal logical and arithmetical consistency of the results..

The main data verification occurs when data are analysed. When the analysis shows important changes from one period to the next, or an important deviation from some other aggregates so that ratios between aggregates change dramatically, a verification is useful. A priori current expenditure follow a rather smooth path, whereas capital expenditure may be more erratic. Linking with the changes in the national environmental policies and instruments is important, as there is a link between expenditure by domain and the national policy. In some years the focus may be put on a specific area, including the creation of a new financing mechanism.

Comparison of capital expenditure with statistics on the supply of environmental capital goods may also be useful.

Comparing monetary results with physical data is a powerful way of verification: for some domain the increase of expenditure may be related to a volume change (e.g. amount of waste or wastewater treated by type of treatment, development over time of specific – more costly – treatment, etc.).

In the environmental protection domain reporting is still relatively limited and new developments of the information system on the environment may occur regularly: new financial reports from specialised bodies, physical data, etc. It may thus happen that new data become available which improve the coverage or provide insights that are useful for the EPEA.

In this analysis and verification process the use of ratios is important: expenditure per capita, ratio of environmental protection investment to the total investment by industry, expenditure per unit of waste collected, etc.

6.7 Assessing the accuracy of estimates

One aspect of accuracy is to what extent the results are in line with the EPEA framework in terms of coverage of activities, valuation, classification and accounting conventions.

A main issue is the often relatively weak data basis on environmental protection activities and expenditure. Many components of the national expenditure are to some extent estimated rather than effectively measured, in the sense that statistical surveys do not provide all the necessary data for each year and each domain. It is therefore important to make explicit the different levels of accuracy of the various components of the national expenditure, according to the data used, the assumptions made and the basis for estimation.

Some estimates will be rather ‘good’, whereas others may be ‘weak’. Users should be informed of these differences, and ideally each component of the national expenditure by domain should be complemented with an assessment of the probable accuracy of results. Furthermore it should be made explicit to which

extent the main aggregates depend on estimations and whether estimation inaccuracies can threaten the reliability of changes in the main aggregates from one period to the next.

6.8 Revisions

Need for revisions

As the national accounts, environmental protection expenditure accounts will be subject to revisions. Depending on the periodicity and timeliness of the compilation, initial estimates may be preliminary and less accurate than subsequent estimates, for the same reference period. Initial revisions are often substantial; later revisions are generally less significant.

Revisions may be required for a number of reasons. Data sources may be preliminary. First estimates may incorporate estimates for non-response. In national accounts provisional and definitive estimates are a standard practice, due in particular to delays in survey results.

Types of revisions

It is useful to distinguish routine revisions and occasional revisions. Routine revisions are due to the delay in obtaining primary data. First estimates may be based on preliminary data (e.g. price index of national accounts aggregates, budget provisional data versus definitive financial statistics, etc.). This first estimate will be revised once the final source data become available. In this case the revision process can be clearly defined and timed and can be announced in the publication programme.

Occasional revisions are due to changes in the source data (e.g. new surveys are implemented) or due to estimation methods that are revised. This type of revision also covers changes in the statistical system, e.g. changes in surveys for certain activities, either in periodicity, level of detail or coverage. This may also include changes in the conceptual framework, such as the treatment of an activity or its classification. E.g., the adoption of the new European and national classifications of activities and products may result in a need for revisions of the EPEA.

A policy for revisions

The routine revisions of provisional data to arrive at final results are normal, but occasional revisions are irritating and create extra work for users. Methods should be developed to minimise the frequency of occasional revisions. If a revision becomes necessary due to significant changes in the data sources, the classifications or the methods used, the revision should be planned for the most convenient year. A new base year account has to be calculated and revision of time series should be made. Main differences between the old and the new series have to be explained and quantified. Particular difficulties arise when the economy and/or the statistical system is undergoing significant changes. Box 11 below addresses issues related to economies in transition.

Box 11: Environmental expenditure statistics in economies in transition

Collecting and analysing data on expenditure for the environment in countries in Central and Eastern Europe (often described as ‘economies in transition’) deserves some special attention. This has largely to do with some general characteristic features of these countries: traditional structure of the economy, institutional and regulatory framework and the transition towards a market economy. Besides, environmental policy and awareness are often in their early stages. This difference in starting position compared to more developed countries is reflected in the field of statistics. Some typical problems in compiling statistics on environmental expenditure partly originate from general statistical problems; others have more to do with the subject. The economies in transition can by no means simply be grouped together. There are many relevant differences between these countries (for example whether non-monetary transactions are common or not). Some aspects are discussed in more detail below.

Technological improvements

There is a big potential for technological improvement in some of the economies in transition as the capital stock is often very old-fashioned. When these capital goods are put out of order because an enterprise goes bankrupt or when

they are replaced by standard 'state of the art' equipment because of foreign investment, environmental benefits can be very substantial. This is relevant because in some of these actions environmental considerations hardly play a role. Statistics on environmental expenditure based on some variant of the primary purpose criterion would then capture only part of the real transition process. This would make an analysis of the link between environmental expenditure and environmental pollution troublesome. A solution could be to collect complementary data on yearly changes in the capital stock and by paying separate attention to some of the most relevant changes in production processes that are going on. Information on R&D expenditure may also be useful for this.

Classification

In some economies in transition, typical problems are related to the environment-unfriendly mobilisation or exploitation of natural resources. Therefore, protection and sustainable use of these natural resources (gas, oil, water, forests, etc.) is an important environmental policy issue. However, the internationally agreed classifications of environmental protection activities only incorporate this type of measures to a certain extent. This could justify an addendum to existing classifications such as the CEPA such as using an adapted classification of the nature and biodiversity domain, or to set up complementary accounts to take account of the country-specific situation.

Sample size

One aspect of the transition process towards a market economy is the splitting up of large monopolistic state enterprises into smaller commercially operating pieces. This may be complemented with fast and large-scale privatisation. With regard to statistics this transition period could cause some statistical problems, related to:

- the accurate registration of these changes in the business register,
- financial transfers between the new enterprises and
- the ownership of the capital stock.

These features are relevant for environmental expenditure statistics and accounts. It means for example that the sample size and a grossing up strategy must be designed carefully and adapted to the changing situation. One option could be to carry out an inventory survey (on items like environmental capital stock etc.).

Current prices and price distortions

Expenditure data are normally surveyed and published in current prices. Time series on environmental expenditure in current prices do not directly give accurate information on the change in the level of society's effort in favour of the environment. More advanced treatment methods could be more expensive, but at the same time generate higher positive environmental effects. For a careful interpretation, the effects of quality changes in environmental protection measures (more expensive but much more environmental beneficial measures) should be singled out from general price changes. This is a general challenge for interpretation of environmental expenditure data, but it could be even more relevant for economies in transition with high inflation rates coupled with very rapid technological improvements. It would therefore be important to find specific deflators combined with information on physical/technical data related to environmental measures, in order to improve the interpretation of the development of environmental expenditure,

In some economies in transition so-called non-monetary transactions play an important role. This means transfer or barter of (capital) goods and services without using real money. Even if the administrative prices of these kinds of transactions are known, they may give a distorted picture of the real costs. It is not known whether this problem is more severe for environmental expenditure than for the other transaction in the economy. In any case, assigning a common (cash) value to these types of transactions is difficult which hampers the collection of reliable information that can to be used in comparisons with other countries.

Source: E. Dietz – Statistics Netherlands

7. Publication of EPEA results

7.1 Introduction

The EPEA is an instrument for the follow-up of environmental policy. The main objective is to assess the economic resources a nation devotes to environmental protection. As for national accounts in general, the final aggregate (the national expenditure for environmental protection) is mainly useful for international comparisons. More useful for policy analysis are the various components of the national expenditure, the national expenditure by environmental domain, and the changes over time.

The EPEA framework also allows to follow the shifts in policy focus, either at national or Community level, the effective application of the polluter pay principle, and is a basis for cost-efficiency analysis.

7.2 Consultation with users

Publications should meet the requirements of users. This is best ensured by regular discussions with users, e.g. within the framework of a committee or advisory body that reviews the options and priorities for publication and discusses new data sources and trends in policy. Governmental departments in charge of environmental policy will be key users, but the requirements of other parts of the government, industry, educational institutions and researchers, the press, associations and the general public should also be taken into account. Different users may have different requirements which may change over time. Consultation also helps maintaining good relations with those users that are at the same time providers of primary data (government departments, corporations).

7.3 Periodicity and timeliness

The periodicity depends on the use of the EPEA and the primary data and human resources available for compilation.

As concerns data sources there is a need at least for data sources that make the production and capital formation data available for the main environmental domains with the same frequency as the considered publication. These main data sources will be the analysis of government finance statistics, the industrial surveys of specialised producers in the waste and wastewater domains and the surveys on environmental (capital) expenditure by industries. When these data sources are available on a yearly basis, the compilation of yearly EPEAs can be considered.

When annual data sources only allow to follow the main components of the expenditure it may be considered to compile the full set of EPEA tables for all CEPA classes and components less regularly, e.g. only on a five year basis.

Timeliness of publication mainly depends on the timeliness of primary data sources and the nature of the published data. In general, results of industrial surveys are only available with some delay, a more than a year delay being common between the reference period and the availability of data. Final EPEA results could therefore be released one and a half years after the close of the reference period. As for national accounts the publication of provisional estimates may be considered. This may be done in a simplified form, using short-term indicators or proxies for the main components (e.g. for wastewater a price-times-quantity method may be used to estimate the evolution of output, market surveys for some capital goods may allow to approximate environmental protection capital formation, forward budget data may be used to estimate government transactions, etc.).

Typically therefore the periodicity and timeliness of EPEA publication could be the following.

Table 7.1 Complete set of accounts

year	**n**	n+1	n+2	n+3	n+4	**n+5**	n+6	n+7
			Full set of accounts for base year n					Full set of accounts for base year n+5

Table 7.2 Simplified accounts

year	n	n+1	n+2	n+3	n+4	n+5
		estimate for year n	estimate for n+1	…	…	…
			final result for year n	…	…	…

7.4 Presentation of key aggregates and indicators

Key aggregates

Key aggregates are national current and capital expenditure, by categories of users/beneficiaries and financing units, and by environmental domains. A typical presentation could be

Table 7.3 Current expenditure for environmental protection

	year 1	year 2	year 3 [p]
Households			
Government			
Producers			
market purchases of EP services			
internal measures			
Rest of the world			
Total			

in million national currency. [p] provisional

Table 7.4 Capital expenditure for environmental protection

	year 1	year 2	year 3 [p]
Government			
Market producers			
specialised producers			
other producers			
Rest of the world			
Total			

in million national currency. [p] provisional

Table 7.5 Financing of current expenditure for environmental protection

	year 1	year 2	year 3 [p]
Households			
Government			
Producers			
market purchases of EP services			
internal measures			
Rest of the world			
Total			

in million national currency. [p] provisional

Table 7.6 Financing of capital expenditure for environmental protection

	year 1	year 2	year 3 [p]
Government			
Market producers			
specialised producers			
other producers			
Rest of the world			
Total			

in million national currency unit. [p] provisional

Comparing expenditure and financing, the effective application of the polluter pay principle can be assessed.

Ratios

The EPEA aggregates are closely comparable with national accounts main aggregates so that ratios between EPEA aggregates and national accounts aggregates may be calculated that are true shares. Ratios could include e.g.:

- national expenditure/GDP
- national expenditure/inhabitant
- capital expenditure /GFCF
- households expenditure/households final consumption
- government expenditure/collective consumption.

Employment

Employment in environmental protection activities is another important indicator. The production table includes data on employment by characteristic producers. Starting from this information employment data may be published, which should distinguish the detailed categories of producers.

Table 7.7 Employment in environmental protection activities

	year 1	year 2	year 3 [p]
Non-market producers			
Market producers			
specialised producers			
government			
corporations			
ancillary activities			
Total			

in million national currency unit. [p] provisional

Current and capital expenditure by domain

This presentation is made according to the same tables as for the total aggregates. A recapitulative table of current and capital expenditure by domain with the percent distribution may also be published.

Table 7.8 Current and capital expenditure

	Current		Capital		Total	
Environmental domains	absolute values	%	absolute values	%	absolute values	%
Air						
Water						
Waste						
Soil and groundwater						
Noise						
Landscape and biodiversity						
Radiation						
R&D						
General administration, etc.						
Total		100%		100%		100%

7.5 Presentation of detailed and supplementary tables

Detailed and supplementary tables can also be derived from the EPEA accounts.

Current and capital expenditure for detailed categories of units

These tables are mainly interesting for the description of the current and capital expenditure and their financing between the different levels and categories of units of the general government (central and local government, and the corresponding specialised bodies).

Table 7.9 Financing for detailed categories of units

Expenditure / Financing	central government		local government			Total
	total	of which …	total	of which ..	of which ..	
Central government						
of which specialised bodies						
Local Government						
of which regions						
of which counties						
of which municipalities						
of which specialised bodies						
Total						

Current and capital expenditure by industries

When they are available it is interesting to present the expenditure of non-specialised market producers by industry. For the various industries, current expenditure (intermediate consumption of market and ancillary output) may be related to the output as an indication of the proportion in which current environmental protection expenditure raises the input costs. In the same way, capital expenditure may be compared with gross fixed capital formation.

Other detailed results

Many other detailed results from the EPEA statistical process can be presented. For example, from Table B, a simplified production account; from Table B1 the supply-use table for different categories of EP services; from Table C1 environmental taxes and other components that contribute to the formation of the net burden account. A table on transfers for environmental protection in the different domains, etc. All these tables have to be defined with users.

7.6 Links to physical data

An important issue is to present physical data in parallel with monetary data. These physical data either relate to EP activities (number and capacity of installations, etc.) or data on environmental pressures (flows of pollutants treated, etc.).

Data on environmental protection installations and the use of specific products

Such data may refer either to the current year capital formation or to the stock of installations. They may cover the number or the capacity of waste and wastewater treatment plants, the area purchased for biodiversity or landscape protection purposes, the length of anti-noise walls or sewage networks constructed, the number of measurement networks, the percentage of power plants equipped with a specific environmental protection device (filters, etc.). As concerns the use of specific products, physical data could cover the use of connected and adapted products (% of cars equipped with catalytic exhaust pipes, septic tanks, consumption of unleaded gasoline or desulphured fuels, etc.).

Table 7.10 Table on physical data

	New equipment during the current year			Stock at the end of the year		
	number	capacity	population served	number	capacity	population served
wastewater treatment plants						
mechanical treatment						
biological treatment						
chemical treatment						
waste incineration plants						
with energy recovery						
with exhaust gas treatment						
landfill						
with biogas recuperation …						
composting plants						

Data on flows of pollutants and other environmental pressures

It may be particularly interesting for users to link environmental expenditure time series with changes in the pressures on the environment that are due to economic activities.

Data on effective pollutant flows can concern the ‘produced’ pollutants, the ‘collected and treated’ pollutants, the ‘eliminated’ pollutants and the pollutants ‘discharged’ to nature (e.g. water bodies).

Some of these flows can be directly related with environmental protection activities, e.g. flows of waste and wastewater that are collected and treated by waste and wastewater management activities. Other flows of pollutants cannot be directly related with environmental protection activities, mainly because they cannot be directly observed, for example the ‘avoided’ emissions of air pollutants. In the case of atmospheric emissions, a way to link physical and monetary data is to present time series of emissions in parallel with the stock of environmental protection fixed capital, by industries.

However, emissions vary not only according to the environmental protection measures but also with the level and the structure of economic activity. Therefore the influence of changes in economic activities should be eliminated through the calculation of aggregated emission coefficients by industry (e.g., emissions per unit of output or value added). Emissions also vary with environmental protection measures which do not translate in expenditure (changes in products for intermediate consumption, energy saving etc.). Comparison is however limited as the stock of fixed capital for environmental protection can hardly be divided according to the various pollutants.

Such issues could be addressed when emission data are published with expenditure data. Data on atmospheric emissions can be taken from the NAMEA air emission accounts (see e.g. European Commission 2001d).

7.7 Time series

Examples of time series for the main aggregates by domain and for other indicators are given above. Environmental protection expenditure accounts are basically an instrument for the follow-up of environmental policies and their impact on economic activity. Therefore, EPEAs are most useful when they are established on a regular basis. Although it may be interesting to make estimates of the environmental protection expenditure on an irregular basis the use of such results will be limited as they do not allow to characterise and analyse the changes. Irregular estimates suffer from the instability of data sources and methodology, including instabilities due to changes in people in charge of the compilation. For environmental protection, experience has shown that estimates made with, e.g. five years periodicity give rather different estimates. These differences may result from changes in environmental policy, from new data sources becoming available and from changes in the definitions and methods used. The impact of the first two types of changes can only be assessed when the methodology is kept stable over time and when the impact of new data sources is analysed (e.g. as part of a revision policy).

7.8 Constant price estimates

Constant price estimates are series expressed in the prices of a base year to explain changes in quantities in monetary terms. They are widely used in economic analysis and in many cases economic analysis is best served by analysis of changes in constant prices.

For environmental protection expenditure, compiling constant price estimates is important, in particular because the linking of physical and monetary data requires constant price estimates. Constant price estimates can be derived by two methods. In one method, current period quantities for each component of national expenditure are multiplied by the base period prices, and results are aggregated across components. In the second method, current price estimates are divided by an appropriate price index having the same base year as the constant price estimates being derived. The first method is conceptually sound and recommendable, whereas the second method may be less precise but is often more practical.

The detailed calculation of constant price estimates for environmental protection expenditure is difficult. The level of environmental protection varies over time not only due to an increase in quantity but also due to a ‘quality’ effect. In most environmental domains, environmental protection expenditure increase not so much because the e.g. the quantity of pollutants collected and treated increases but because the collection and treatment methods are being improved.

As an example, in most European countries all waste produced by households is already collected and treated, but not in the same way. In some countries, selective collection and sorting, which are more costly, may be more important, treatment of exhaust gases of incineration plants may be more or less developed, etc. The same considerations hold for wastewater where there are differences in the level of treatment (e.g., mechanical, biological, chemical). This means that the changes in physical quantities should be described in detail. If this is not the case the price component will incorporate also quality changes, i.e. changes in the level of treatment.

7.9 Dissemination media

A strategy has to be defined for the way EPEA results are disseminated. One element may be a specific report published every year that contains the detailed results. Ideally, the report should be presented in press conference and/or announced via a press release.

In accordance with the publication policy of the institution some key results may be made available in summary form on the Website of the institution, in the annual statistical yearbook, etc. When the department of national accounts is in charge of the compilation of the EPEA, key results can also be included in annual national accounts publications. This is already done in some countries for various environmental accounts results, including for environmental taxes and NAMEAs.

8. Improving the accounts

8.1 Integration into the statistical system

The first steps in compiling EPEAs generally consist in putting together all available sources of data, whatever the status of these sources. This may imply a lot of estimations and use of ratios in order to compensate for the lack of information. This may also imply a lot of direct data collection and treatment of data.

When things develop it is essential to improve this 'do-it-yourself' approach and to integrate the compilation of the EPEA into the normal course of statistical work. For example, the units in charge of government finance statistics, R and D statistics, registers, production statistics for NACE 90, etc. may be able to integrate some of the data coding and data aggregation procedures into their normal work, or adapt derivation formats or even re-formulate questions in their survey forms. This will make EPEA results better at reduced overall costs.

The unit in charge of the compilation should follow, and try to influence, any change in the national statistical program relevant for the EPEA: re-design of surveys, changes in classification, implementation of new classifications or surveys, price index calculations, etc.

The unit may also get involved in the various committees concerning the collection of environmental data, even when they are not part of the official statistical system. The range of these data may be very large: reporting on financial statistics of specialised organisms, physical data collection, etc.

This integration is often beneficial not only for the EPEA compilation but also for other areas of statistics. An example is the national accounts themselves, see for an illustration the box below.

Box 12: Integration of Environmental Expenditure in the Dutch national accounts and NAMEA

In 1999 the Dutch national accounts (NA) were revised according to the ESA 95 regulation. With respect to environmental expenditures the revision was taken as an opportunity to re-analyse and improve the quality of the traditional statistical sources and to integrate new statistical sources. New statistical sources on Recycling (NACE 37) and Sewage and refuse disposal, sanitation and similar activities (NACE 90) were used. Re-analysing the governmental output of EP services, it turned out that interest payments were incorrectly included in the valuation of non-market output in NA. For the purpose of the Dutch NAMEA (National Accounting Matrix including Environmental Accounts) the ancillary output of 'internal' EP services was re-investigated. Also the treatment of environmental taxes, which are singled out in the NAMEA, was revised according to ESA 95 rules.

Important categories of environmental expenditure are integrated in the supply and use tables of the NA. To improve the transparency, NACE 90 was split up into two codes. Under code 90000 the environmental services produced by private entities are recorded, whereas code 90001 records the environmental services of the government. In addition we made the same distinction in the goods and services classification.

A clear improvement of NA was the application of the annual survey on Recycling (NACE 37) and on Sewage and refuse disposal, sanitation and similar activities (NACE 90). From the statistical year 1993 onwards, this surveys provides a good coverage of private sewage and refuse disposal activities. The surveys on private entities showed that before the NA revision the production value had been substantially underestimated. A full explanation of this higher estimate in comparison to the corresponding NA figures before revision is not easy. One obvious reason is that the emerging market of EP services has been growing rather fast. At the same time the observation of this market has improved from year to year. To a large extent the increasing number of enterprises under NACE codes 90 and 37 is the result of a reclassification of enterprises in the CBS business register. For instance, when in the preparation of the survey, the population of NACE 90 enterprises was determined, many enterprises earlier classified as transport enterprises appeared to focus their main production on EP services.

The Dutch government is an important producer of sewage and refuse disposal services. Before the NA revision the Government Accounts were used as a source. One of the elements in the Government Accounts is the registration of the costs of EP services. Although the publication does not specify different cost items in detail, the estimates turned out to include also interest payments. After revision these interest payments were excluded, as they are not part of the

value of non-market output in NA. Environmental surveys of government environmental expenditure were an important data source as well. Whereas the Government Accounts broadly describe different government activities including EP, i.e. the columns in the supply and use tables, the environmental surveys on waste collection and water management provide a more functional description including a specification of EP activities carried out by the government. This type of information is directed towards the rows, i.e. the goods and services represented in the supply and use table.

Taxes, which intend to internalise negative environmental effects of activities or the use of certain products, are considered environmental taxes in the NAMEA. The ESA95 revision changed the registration of waste disposal charges. Before revision, waste disposal charges were considered an 'other tax on production' (industries) or a 'tax on income' (households). After revision, these charges are regarded as sales of waste collection and treatment services. The registration of other environmental charges such as water sewage and purification charges remains unchanged after the ESA95 revision: they are recorded as taxes on income (households) or on production (enterprises).

From 1989 onwards, the NAMEA time series also contain information on the ancillary production of environmental services. Since in the NA this type of ancillary production is not regarded as output, the recording of internal environmental services results in an expansion of the production boundary. For each individual industry in the NAMEA, the ancillary output of internal environmental services equals its intermediate consumption of internal environmental services. As a result, this recording does not alter value added. Households may also direct a part of their consumption to environmental protection. This is explicitly represented in a functional subdivision of household consumption, the so-called consumption purposes.

After the ESA95 revision the valuation of ancillary output of EP services has been modified and made consistent with non-market output in the NA. This valuation is defined as the sum of: intermediate consumption, compensation of employees and consumption of fixed capital. As mentioned before, interest payments are no longer included. The update of ancillary production comprises a further breakdown into environmental domains to which this production is directed (water, air, soil, waste, noise, landscape and other). The main purpose of this breakdown is to provide a closer connection of environmental expenditure to the physical accounts in the NAMEA.

Defining the governmental output of internal environmental services (i.e. public administration, NACE 75) appeared to be less straightforward. Public administration is almost totally consumed (and of course produced) by the government. However, this expenditure is not meant to diminish the environmental burden of the government's own production processes. It represents public expenditure on environmental management and is directed towards the environmental consequences of society as a whole. Subsequently, internal environmental services in NAMEA represent ancillary output not included in the regular NA. Environmental expenditure by public administration is part of total output and consumption in the NA and should therefore not be added as production of internal environmental services in NAMEA. Our investigations showed that only 36 million of government expenditure on cleaning of military grounds could be identified as purely internal environmental services of the production activity public administration. The remaining government expenditure will no longer be recorded as internal environmental services but as a functional subdivision of government consumption related to environmental protection and control.

Source: Mark de Haan, Sake de Boer and Leo Hiemstra

8.2 Making data flows regular

It is important to organise data flows between the providers of data and the unit in charge of the compilation of the EPEA. This organisation depends upon the way the statistical system is set up and where the EPEA compilation unit is located. Many important data sets will come from specific official statistical units: department in charge of government finance statistics, industrial surveys unit, national accounts, etc.

The transmission of data and the data treatment can be facilitated when agreements are made with the data providers on the type of data, the date of delivery or time lag in relation to the reference period and the format for the delivery (variables, types of electronic format, etc.). Specific treatment of raw data may be easiest for the holders of the primary data and may be part of such an agreement (e.g. grossing-up of raw data, correction for non-response, more detail for certain categories of surveyed units, special aggregation formats, etc.).

A flowchart of the data for the EPEA compilation can be very helpful. This flowchart will have to be updated as statistical sources evolve. The flowchart may specify the data provider, the use of the data (e.g. for provisional estimates or for definitive accounts), the times of delivery, the dependence in relation to other data, etc.

This is particularly important when the compilation depends upon surveys made by the compilation unit itself, e.g. when the compilation unit is also the unit in charge of environmental statistics. In this case the organisation of these surveys and the treatment of data can be integrated within the flowchart. Surveys may be organised e.g. during the first half of the year, whereas compilation itself is made during the second half.

It is useful to have substitute solutions for the case that some of the data are not available in time. For example, estimates based on previous years may help to overcome such situations. Some 'buffer' period should be anticipated in the compilation process but as in general the time needed for compilation is rather short, the lack of one data set should not hamper the publication of results.

8.3 Adjusting primary statistics

Primary statistics may not cover the whole universe or provide the level of detail the compiler is interested to describe. The concepts used in primary statistics are not always identical to the concepts of the EPEA. Therefore, the compilation process includes various steps of treating raw data, adapting concepts and integrating and consolidating data from different sources. All these steps should be clearly documented so as to ensure stability of the methods over time. It may also be possible to make primary data more useful for EPEA purposes in co-operation with the data providers by adapting definitions, classifications or coverage. This will however only be possible in a longer-term perspective, e.g. when surveys are re-designed.

Grossing-up and coverage

Industrial surveys often only cover a sample of firms or establishments. Although the departments in charge of industrial statistics generally publish results for the whole industry, it may occur that the survey is limited to units over a certain size, or of a specific legal status, e.g. corporations, leaving quasi-corporations and/or small enterprises outside the survey. There may also be problems of under-recording due to non-responses etc. National accountants have established procedures to adjust primary statistics. As far as possible and taking into account the characteristics of the domain and the surveys, these procedures could be adopted by compilers of the EPEA for the adjustment of industrial survey results.

When the surveys, e.g. surveys on environmental protection expenditure, only cover a limited number of industries, or some industries less regularly or with less accuracy, it may be worth expanding the results to other industries, applying ratios based on available information or partial surveys. However, the quality of such estimates may be rather low so that in the longer term the coverage of the surveys, the sample sizes, etc. should be optimised.

Adapting concepts

Industrial surveys or finance statistics do not apply the concepts of national accounts. This is in particular the case for the data resulting from the analysis of government transactions, for which it is necessary to calculate output from data on compensation of employees and intermediate consumption. Budgetary terminology and presentation is not always identical to national accounts ones. For example, employers' social contributions are not always included in the wages and salaries as recorded in budgetary documents. In some cases current transfers are to be reclassified as capital transfers, or subsidies may have to be reclassified as other transfers between government units.

Other adaptations may be related with the system of prices (e.g. related to how VAT is recorded in public budgets) or it may be necessary to split the raw data by CEPA classes or even between environmental protection transactions and non-environmental protection transactions.

Consolidation of data and ensuring consistency

The last step in adapting primary statistics is to consolidate the results and to ensure consistency. Consolidation is important, in particular to avoid double counting as concerns intermediate consumption of EP services by specialised producers. Transfers between government units also have to be analysed in order to avoid double counting, e.g. when transfers to specialised institutions are recorded in the central government budget and the specialised government institutions' output is calculated from their expenditure. Transfers need to be analysed and consolidated in the accounts of the payer and receiver units. Often there will be some inconsistencies, e.g. due to the timing of the payments or differences in recording practices. A possible rule to avoid inconsistencies is to use payer information.

Ensuring consistency also concerns the equilibrium between supply and uses of EP services. Table B1 is specifically devoted to this work and the procedure for balancing supply and use should be carefully recorded. Other verifications of consistency may consist in comparing investment grants to the gross fixed capital formation of specialised producers.

All the process of adjustment (grossing-up, adapting concepts and consolidating) should be clearly documented and the ratios used stored in specific databases in order to maintain stability of final estimates in relation to primary data.

8.4 Adapting classifications and derivation formats

The unit in charge of EPEA compilation should be involved in classification work, not only as concerns central economic classification of activities and products, but also for classifications which have to do with environmental protection: classifications of waste and wastewater collection and treatment activities, classifications of waste for physical data surveys, classification of installations, etc. Examples are the national adaptation of international classification (COFOG, CPC, NACE, etc.), but also the development of specific national classifications for waste, protected areas, etc. An aim of this work should be the consistency of classifications, e.g. between physical and monetary (expenditure) data.

An integral part of the classification work is the format for aggregating data for publication or dissemination. For example, when national accounts supply-use tables include only one supply-use equilibrium for all products corresponding to division 90 of NACE the possibilities to separate the supply-use equilibrium at least for waste and wastewater services should be examined with the national accounts department.

The EPEA compilation unit may disseminate its classifications and formats to other organisms and in particular to providers of primary data so as to encourage use of identical classifications and data formats.

8.5 Ensuring stability of derivation: a national compilation guide

As environmental protection statistics are a developing domain, it is particularly important to insure stability over time of the methods and of the results and their interpretation.

The best way to ensure stability of final results in relation to primary data is to fix the methodology of the compilation statistical process in an internal document for the use of compilers or a national compilation guide. Such a document describes all the steps for the compilation:

- the data sources and the flowchart for data,
- the treatment of the basic data,
- the raw (primary) databases and the databases for the EPEA tables,
- the worksheets for the compilation of the EPEA tables,
- the data verifications to be made,
- the revision process,
- the tables for publication.

Insofar as the compilation process differs among environmental domains, the document should be organised by environmental domains. The dissemination of this guide to data providers and advanced users can be useful as well.

Annex 1 Classification of Environmental Protection Activities and expenditure (CEPA 2000)

Introductory notes

CEPA 2000 is a generic, multi-purpose, functional classification for environmental protection. It is used for classifying activities but also products, actual outlays (expenditure) and other transactions. The classification unit is often determined by the units of the primary data sources that are being classified and by the presentation formats used for results. For example, the analysis of government budgets and accounts requires the coding of items of government environmental protection expenditure into CEPA. Some of these expenditure items will be transfers such as subsidies or investment grants whereas others will be inputs into an environmental protection activity (e.g., wages and salaries). The compilation of environmental expenditure accounts requires determining environmental protection activities and their output of environmental protection services by categories of CEPA.

CEPA is designed to classify transactions and activities whose primary purpose is environmental protection. The management of natural resources (e.g., water supply) and the prevention of natural hazards (landslides, floods, etc.) are not included in CEPA. Resource management and prevention of natural hazards are covered in broader frameworks (e.g., SERIEE, SEEA 2000 or the OECD/Eurostat environment industry manual). Separate classifications for e.g. resource management should be set up which, together with the CEPA, would be part of a family of environment-related classifications.

Environmental protection activities are production activities in the sense of national accounts (see e.g. SNA § 6.15 or ESA § 2.103), i.e. combining resources such as equipment, labour, manufacturing techniques, information networks or products to create an output of goods or services. An activity may be a principal, secondary or ancillary activity.

Environmental protection products are

- the environmental protection services produced by environmental protection activities,
- adapted (cleaner) and connected products.

The expenditure recorded are the purchasers' prices of environmental protection services and connected products and the extra costs over and above a viable but less clean alternative for cleaner products.

Expenditure for environmental protection are outlays and other transactions related to

a) inputs for environmental protection activities (energy, raw materials and other intermediate inputs, wages and salaries, taxes linked to production, consumption of fixed capital)
b) capital formation and the purchase of land (investment) for environmental protection activities,
c) outlays of users for the purchase of environmental protection products
d) transfers for environmental protection (subsidies, investment grants, international aid, donations, taxes earmarked for environmental protection, etc.)

For the presentation of aggregate results and indicators of expenditure, care is needed when adding up expenditure of different types. Available frameworks such as the SERIEE or the OECD/Eurostat PAC framework offer ways to avoid double counting of items of expenditure. In particular, they offer guidance on how to avoid mixing transfer payments with the expenditure that are financed by the transfers, and purchases of environmental products with the expenditure for their production.

Classification structure

The level 1 structure of CEPA (the 1-digits) are the *CEPA classes*. CEPA classes 1 to 7 are also called *(environmental) domains*. The main function of most 2-digits and 3-digits in CEPA is to guide classification into the classes. Selected 2-digits and 3-digits may also be used for data collection and coding as well as for publication purposes. In statistical practice, countries will have to adapt the CEPA structure to some extent, reflecting national policy priorities, data availability and other circumstances. Examples include separate 1-digit headings for traffic, international aid, energy savings programmes, general administration of the environment or soil erosion. For international comparison purposes the level 1 structure of CEPA should be fully respected.

General classification principles

Classification should be made according to the main purpose taking into account the technical nature as well as the policy purpose of an action or activity. Multi-purpose actions, activities and expenditure that

address several CEPA classes should be divided by these classes. Classification under the heading 'indivisible expenditure and activities' should only be made as a last resort.

Classification of individual items cannot be based solely on the technical nature of the items. For example, the purchase of double-glazed windows in warm countries will typically relate to issues of noise protection, whereas in colder countries they will be a standard energy saving device. Measures to reduce fertiliser use may primarily fall under CEPA 4 (protection of groundwater), CEPA 2 (prevention of runoff to protect surface waters) or CEPA 6 (prevention of nutrient enrichment to protect biotopes) depending on the main purpose of measures and policies. Measures against forest fires will be unimportant or purely serve economic purposes (and thus fall outside of CEPA) in some countries whereas in others the main aspect of forest fires will be an environmental one related to landscape and habitat preservation rather than protection of a natural resource.

Classification of transversal activities and expenditure

Transversal activities are R&D, administration and management as well as education, training and information. All R&D should be allocated to CEPA 8. Administration and management as well as education, training and information should, to the extent possible, be allocated to the 'Other' positions in CEPA 1-7. Ideally, transversal activities would be identified separately, as well as by CEPA class but primary data sources related to CEPA 1-7 often do not allow this. R&D, education and training or administration and management are often either not separable from other actions relating to another class (administration or training as part of waste management, for example) or cannot be split by class (R&D data collected by industry expenditure surveys, for example). If such identification problems are considered substantial, data on R&D, administration and management and on education, training and information should not be published at the 2-digit level.

The classification of R&D in CEPA 8 follows the NABS 1993 (the Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets). CEPA 8 should be used when primary data following the NABS are available from R&D statistics. When this is not the case, other data sources employed (e.g., budget analysis) may not allow a systematic separation of R&D from other actions and activities. R&D may then be included under several CEPA classes.

The above considerations will apply differently across countries, depending on the availability and level of detail of primary data sources. Often, differences in the main data sources will result in different practices for coding transversal activities and expenditure, and international comparability for these may be limited.

The Classification of Environmental Protection Activities and expenditure (CEPA 2000)

1 PROTECTION OF AMBIENT AIR AND CLIMATE
- 1.1 PREVENTION OF POLLUTION THROUGH IN-PROCESS MODIFICATIONS
  - 1.1.1 for the protection of ambient air
  - 1.1.2 for the protection of climate and ozone layer
- 1.2 TREATMENT OF EXHAUST GASES AND VENTILATION AIR
  - 1.2.1 for the protection of ambient air
  - 1.2.2 for the protection of climate and ozone layer
- 1.3 MEASUREMENT, CONTROL, LABORATORIES AND THE LIKE
- 1.4 OTHER ACTIVITIES

2 WASTEWATER MANAGEMENT
- 2.1 PREVENTION OF POLLUTION THROUGH IN-PROCESS MODIFICATIONS
- 2.2 SEWERAGE NETWORKS
- 2.3 WASTEWATER TREATMENT
- 2.4 TREATMENT OF COOLING WATER
- 2.5 MEASUREMENT, CONTROL, LABORATORIES AND THE LIKE
- 2.6 OTHER ACTIVITIES

3 WASTE MANAGEMENT
- 3.1 PREVENTION OF POLLUTION THROUGH IN-PROCESS MODIFICATIONS
- 3.2 COLLECTION AND TRANSPORT
- 3.3 TREATMENT AND DISPOSAL OF HAZARDOUS WASTE
  - 3.3.1 Thermal treatment
  - 3.3.2 Landfill
  - 3.3.3 Other treatment and disposal
- 3.4 TREATMENT AND DISPOSAL OF NON-HAZARDOUS WASTE
  - 3.4.1 Incineration
  - 3.4.2 Landfill
  - 3.4.3 Other treatment and disposal
- 3.5 MEASUREMENT, CONTROL, LABORATORIES AND THE LIKE
- 3.6 OTHER ACTIVITIES

4 PROTECTION AND REMEDIATION OF SOIL, GROUNDWATER AND SURFACE WATER
- 4.1 PREVENTION OF POLLUTANT INFILTRATION
- 4.2 CLEANING UP OF SOIL AND WATER BODIES
- 4.3 PROTECTION OF SOIL FROM EROSION AND OTHER PHYSICAL DEGRADATION
- 4.4 PREVENTION AND REMEDIATION OF SOIL SALINITY
- 4.5 MEASUREMENT, CONTROL, LABORATORIES AND THE LIKE
- 4.6 OTHER ACTIVITIES

5 NOISE AND VIBRATION ABATEMENT (excluding workplace protection)
- 5.1 PREVENTIVE IN-PROCESS MODIFICATIONS AT THE SOURCE
  - 5.1.1 Road and rail traffic
  - 5.1.2 Air traffic
  - 5.1.3 Industrial and other noise
- 5.2 CONSTRUCTION OF ANTI NOISE/VIBRATION FACILITIES
  - 5.2.1 Road and rail traffic
  - 5.2.2 Air traffic
  - 5.2.3 Industrial and other noise
- 5.3 MEASUREMENT, CONTROL, LABORATORIES AND THE LIKE
- 5.4 OTHER ACTIVITIES

6 PROTECTION OF BIODIVERSITY AND LANDSCAPES
- 6.1 PROTECTION AND REHABILITATION OF SPECIES AND HABITATS
- 6.2 PROTECTION OF NATURAL AND SEMI-NATURAL LANDSCAPES
- 6.3 MEASUREMENT, CONTROL, LABORATORIES AND THE LIKE
- 6.4 OTHER ACTIVITIES

7 PROTECTION AGAINST RADIATION (excluding external safety)
- 7.1 PROTECTION OF AMBIENT MEDIA
- 7.2 TRANSPORT AND TREATMENT OF HIGH LEVEL RADIOACTIVE WASTE
- 7.3 MEASUREMENT, CONTROL, LABORATORIES AND THE LIKE
- 7.4 OTHER ACTIVITIES

8 RESEARCH AND DEVELOPMENT
- 8.1 PROTECTION OF AMBIENT AIR AND CLIMATE
  - 8.1.1 Protection of ambient air
  - 8.1.2 Protection of atmosphere and climate
- 8.2 PROTECTION OF WATER
- 8.3 WASTE
- 8.4 PROTECTION OF SOIL AND GROUNDWATER
- 8.5 ABATEMENT OF NOISE AND VIBRATION
- 8.6 PROTECTION OF SPECIES AND HABITATS
- 8.7 PROTECTION AGAINST RADIATION
- 8.8 OTHER RESEARCH ON THE ENVIRONMENT

9 OTHER ENVIRONMENTAL PROTECTION ACTIVITIES
- 9.1 GENERAL ENVIRONMENTAL ADMINISTRATION AND MANAGEMENT
  - 9.1.1 General administration, regulation and the like
  - 9.1.2 Environmental management
- 9.2 EDUCATION, TRAINING AND INFORMATION
- 9.3 ACTIVITIES LEADING TO INDIVISIBLE EXPENDITURE
- 9.4 ACTIVITIES NOT ELSEWHERE CLASSIFIED

Explanatory notes and definitions

1 PROTECTION OF AMBIENT AIR AND CLIMATE

Protection of ambient air and climate comprises measures and activities aimed at the reduction of emissions into the ambient air or ambient concentrations of air pollutants as well as to measures and activities aimed at the control of emissions of greenhouse gases and gases that adversely affect the stratospheric ozone layer.

Excluded are measures undertaken for cost saving reasons (e.g. energy saving).

1.1 PREVENTION OF POLLUTION THROUGH IN-PROCESS MODIFICATIONS

Activities and measures aimed at the elimination or reduction of the generation of air pollutants through in-process modifications related to:

- cleaner and more efficient production processes and other technologies (cleaner technologies),
- the consumption or use of 'cleaner' (adapted) products.

Cleaner technologies

Prevention activities consist of replacing an existing production process by a new process designed to reduce the generation of air pollutants during production, storage or transportation, e.g. fuel combustion improvement, recovery of solvents, prevention of spills and leaks through improving air-tightness of equipment, reservoirs and vehicles, etc.

Use of cleaner products

Prevention activities consist of modifying facilities so as to provide for the substitution of raw materials, energy, catalysts and other inputs by non- (or less) polluting products, or of treating raw materials prior to their use in order to make them less polluting, e.g. desulphuration of fuel. Expenditure under this position also include the extra-cost of the use of cleaner products (low sulphur fuels, unleaded gasoline, clean vehicles, etc.).

1.2 TREATMENT OF EXHAUST GASES AND VENTILATION AIR

Activities involving the installation, maintenance and operation of end-of-pipe equipment for the removal and reduction of emissions of particulate matter or other air-polluting substances either from the combustion of fuels or from processes: filters, dedusting equipment, catalytic converters, post-combustion and other techniques. Also included are activities aimed at increasing the dispersion of gases so as to reduce concentrations of air pollutants.

Exhaust gases are emissions into the air, usually through exhaust pipes, stacks or chimneys, due to the combustion of fossil fuels. Ventilation air are exhausts of air conditioning systems of industrial establishments.

1.3 MEASUREMENT, CONTROL, LABORATORIES AND THE LIKE

Activities aimed at monitoring the concentrations of pollutants in exhaust gases, the quality of air, etc. Included are measurement services of exhaust gases from vehicles and heating systems and the monitoring related to ozone layer, greenhouse gases and climate change. Weather stations are excluded.

1.4 OTHER ACTIVITIES

All other activities and measures aimed at the protection of ambient air and climate. Includes regulation, administration, management, training, information and education activities specific to CEPA 1, when they can be separated from other activities related to the same class and from similar activities related to other environmental protection classes.

2 WASTEWATER MANAGEMENT

Wastewater management comprises activities and measures aimed at the prevention of pollution of surface water through the reduction of the release of wastewater into inland surface water and seawater. It includes the collection and treatment of wastewater including monitoring and regulation activities. Septic tanks are also included.

Excluded are actions and activities aimed at the protection of groundwater from pollutant infiltration and the cleaning up of water bodies after pollution (see CEPA 4).

Wastewater is defined as water that is of no further immediate value for the purpose for which it was used or in the pursuit of which it was produced because of quality, quantity, or time of its occurrence.

2.1 PREVENTION OF POLLUTION THROUGH IN-PROCESS MODIFICATIONS

Activities and measures aimed at reducing the generation of surface water pollutants and wastewater through in-process modifications related to:

- cleaner and more efficient production processes and other technologies (cleaner technologies),
- the consumption or use of 'cleaner' (adapted) products.

Cleaner technologies

Prevention activities consist of replacing an existing production process by a new process designed to bring about a reduction of water pollutants or wastewater generated during production. It includes separation of networks, treatment and re-use of water used in the production process, etc.

Use of cleaner products

Prevention activities consist of modifying an existing production process so as to provide for the substitution of raw materials, catalysts and other inputs by non- (or less) water polluting products.

2.2 SEWERAGE NETWORKS

Activities aimed at the operation of sewerage networks, i.e. the collection and transport of wastewater from one or several users, as well as rainwater, by means of sewerage networks, collectors, tanks and other means of transport (sewage vehicles, etc.), including maintenance and repair.

Sewerage networks are the systems of collectors, pipelines, conduits and pumps to evacuate any wastewater (rainwater, domestic and other wastewater) from the points of generation to either a sewage

treatment plant or to a point where wastewater is discharged into surface water.

2.3 WASTEWATER TREATMENT

Wastewater treatment designates any process to render wastewater fit to meet applicable environmental standards or other quality norms. Three broad types of treatment (mechanical, biological, and advanced treatment) are specified below. Alternative definitions of types of treatment may be used, e.g. based on removal rates for BOD.

Mechanical treatment of wastewater designates processes of a physical and mechanical nature which result in decanted effluent and separate sludge. Mechanical processes are also used in combination and/or in conjunction with biological and advanced unit operations. Mechanical treatment is understood to include at least such processes as sedimentation, flotation, etc. The activity is aimed at separating materials in suspension by the use of screens (large solids) or through sedimentation eventually assisted by chemicals or flotation (elimination of sand, oil, part of the sludge, etc.).

Equipment includes screens for large solids, biological plants, equipment for filtration, flocculation, sedimentation; separation of oils and hydrocarbons; separation using inertia or gravity, including hydraulic and centrifugal cyclones, diaphragm floats, etc.

Biological treatment of wastewater designates processes which employ aerobic or anaerobic micro-organisms and result in decanted effluent and separate sludge containing microbial mass together with pollutants. Biological treatment processes are also used in combination and/or in conjunction with mechanical and advanced unit operations. This activity is designed to eliminate pollution from oxidisable materials through the use of bacteria: activated sludge technique or anaerobic treatment for specific concentrated wastewater. Biodegradable materials are treated with the addition of bacteria-enriched sludge in open or closed tanks.

Treatment of wastewater by advanced technologies designates processes capable of reducing specific constituents in wastewater not normally achieved by other treatment options. Covers all unit operations which are not considered to be mechanical or biological. Includes, for example, chemical coagulation, flocculation and precipitation; break-point chlorinating; stripping; mixed media filtration; micro-screening; selective ion exchange; activated carbon absorption; reverse osmosis; ultra-filtration; elector flotation. Advanced treatment processes may be used in combination and/or in conjunction with mechanical and biological unit operations. This activity is aimed at eliminating oxidisable non-biodegradable matter at a higher level, as well as metals, nitrate, phosphorous, etc. by using powerful biological or physical and chemical action. Special equipment is required for each depollution.

Septic tanks are settling tanks through which wastewater is flowing and the suspended matter is decanted as sludge. Organic matters (in the water and in the sludge) are partly decomposed by anaerobic bacteria and other micro-organisms. Maintenance services of septic tanks (emptying etc.) and other products for septic tanks (biological activators, etc.) are included.

2.4 TREATMENT OF COOLING WATER

Treatment of cooling water designates "processes which are used to treat cooling water to meet applicable environmental standards before releasing it into the environment. Cooling water is used to remove heat." Means, methods, facilities used may be: air cooling (extra cost compared with water cooling), cooling towers (to the extent they are required to reduce pollution, as distinct from technical needs), cooling circuits for processing water from work sites and for condensing released vapour, equipment for enhancing the dispersion of cooling water on release, closed cooling circuits (extra cost), circuits for use of cooling water for heating purposes (extra cost).

2.5 MEASUREMENT, CONTROL, LABORATORIES AND THE LIKE

Activities aimed at monitoring and controlling the concentration of pollutants in wastewater and the quality of inland surface water and marine water at the place wastewater is discharged (analysis and measurement of pollutants, etc.).

2.6 OTHER ACTIVITIES

All other activities and measures aimed at wastewater management. Includes regulation, administration, management, training, information and education activities specific to CEPA 2, when they can be separated from other activities related to the same class and similar activities related to other environmental protection classes.

3 WASTE MANAGEMENT

Waste management refers to activities and measures aimed at the prevention of the generation of waste and the reduction of its harmful effect on the environment. Includes the collection and treatment of waste, including monitoring and regulation activities. It also includes recycling and composting, the collection and treatment of low level radioactive waste, street cleaning and the collection of public litter.

Waste are materials that are not prime products (that is, products made for the market) for which the generator has no further use for own purposes of production, transformation, or consumption, and which he wants to dispose of. Wastes may be generated during the extraction of raw materials, during the processing of raw materials to intermediate and final products, during the consumption of final products, and during any other human activity. Residuals recycled or reused at the place of generation are excluded. Also excluded are waste materials that are directly discharged into ambient water or air.

Hazardous waste is waste that due to its toxic, infectious, radioactive, flammable or other character defined by the legislator poses a substantial actual or potential hazard to human health or living organisms. For the purposes of this definition, "hazardous waste" comprises for each country all those materials and products which are considered to be hazardous in accordance with that country's practices. Low level radioactive waste is

included, whereas other radioactive waste is excluded (see CEPA 7).
Low level radioactive waste is waste that, because of its low radionucleide content, does not require shielding during normal handling and transportation.
Treatment and disposal of waste
Treatment of waste refers to any process designed to change the physical, chemical, or biological character or composition of any waste to neutralise it, render it non-hazardous, safer for transport, amenable for recovery or storage, or to reduce it in volume. A particular waste may undergo more than one treatment process.

Composting and recycling activities for the purpose of environmental protection are included. Often composting is a waste treatment method and the resulting compost provided free of charge or at a very low price. The manufacture of compost classified in division 24 of ISIC/NACE (Manufacture of fertilisers and nitrogen compounds) is excluded.

Division 37 of ISIC/NACE defines recycling as "the processing of waste, scraps whether or not used, into a form feasible to be transformed in new raw materials. Typical is that, in terms of commodities, both input and output consist of waste and scrap, the input being sorted or unsorted but always unfit for further direct use in an industrial process whereas the output is made fit for further processing and is to be considered then as an intermediate good. A process is required, either mechanical or chemical". The main purpose of activities classified in division 37 of ISIC/NACE is the manufacture of secondary raw materials but there may be important secondary waste management activities.

Compost and secondary raw materials (as well as products made of secondary raw materials) are not considered environmental protection products. Their use is excluded.

Disposal of waste is the final deposition of waste on or underground in controlled or uncontrolled fashion, in accordance with the sanitary, environmental or security requirements.

3.1 PREVENTION OF POLLUTION THROUGH IN-PROCESS MODIFICATIONS
Activities and measures aimed at eliminating or reducing the generation of solid waste through in-process modifications related to:

- cleaner and more efficient production processes and other technologies (cleaner technologies),
- the consumption or use of ‘cleaner’ (adapted) products.

Cleaner technologies
Prevention activities consist of replacing an existing production process by a new process designed to reduce the toxicity or volume of waste produced during the production process, including by separation and re-processing.

Use of cleaner products
Protection activities consist of modifying or adapting the production process or facilities so as to provide for the substitution of raw materials, catalysts and other intermediate inputs by new, "adapted" inputs the use of which produces less waste or less hazardous waste.

3.2 COLLECTION AND TRANSPORT
Collection and transport of waste is defined as the collection of waste, either by municipal services or similar institutions or by public or private corporations, and their transport to the place of treatment or disposal. It includes the separate collection and transport of waste fractions so as to facilitate recycling and the collection and transport of hazardous waste. Street cleaning is included for the part referring to public litter and collection of garbage from the streets. Excluded are winter services.

3.3 TREATMENT AND DISPOSAL OF HAZARDOUS WASTE
Treatment of hazardous waste comprises the processes of physical/chemical treatment, thermal treatment, biological treatment, conditioning of wastes, and any other relevant treatment method. Disposal of hazardous waste comprises landfill, containment, underground disposal, dumping at sea, and any other relevant disposal method.

Thermal treatment of hazardous waste refers to any process for the high-temperature oxidation of gaseous, liquid, or solid hazardous wastes, converting them into gases and incombustible solid residues. The flue gases are released into the atmosphere (with or without recovery of heat and with or without cleaning) and any slag or ash produced is deposited in the landfill. The main technologies used in the incineration of hazardous waste are the rotary kiln, liquid injection, incinerator grates, multiple chamber incinerators, and fluidised bed incinerators. Residues from hazardous waste incineration may themselves be regarded as hazardous waste. The resulting thermal energy may or may not be used for the production of steam, hot water, or electric energy.

Landfill is an activity concerning final disposal of hazardous waste in or on land in a controlled way, which meets specific geological and technical criteria.

Other treatment and disposal of hazardous waste may consist of chemical and physical treatment, containment and underground disposal.

Chemical treatment methods are used both to effect the complete breakdown of hazardous waste into non-toxic gases and, more usually, to modify the chemical properties of the waste, e.g. to reduce water solubility or to neutralise acidity or alkalinity.

Physical treatment of hazardous waste: includes various methods of phase separation and solidification whereby the hazardous waste is fixed in an inert, impervious matrix. Phase separation encompasses the widely used techniques of lagooning, sludge drying in beds, and prolonged storage in tanks, air flotation and various filtration and centrifugation techniques, adsorption/desorption, vacuum, extractive and azeotropic distillation. Solidification or fixation processes, which convert the waste into an insoluble, rock-hard material, are generally used as pre-treatment prior to landfill disposal. These techniques employ blending the waste with various reactants or organic polymerisation reactions or the mixing of the waste with organic binders.

Containment is the retention of hazardous material in such a way that it is effectively prevented from dispersing into the environment, or is released only at an acceptable level. Containment may occur in specially built containment spaces.
Underground disposal includes temporary storage or final disposal of hazardous wastes underground that meet specific geological and technical criteria.

3.4 TREATMENT AND DISPOSAL OF NON-HAZARDOUS WASTE
Treatment of non-hazardous waste comprises the processes of physical/chemical treatment, incineration of waste, biological treatment, and any other treatment method (composting, recycling, etc.).

Incineration is the thermal treatment of waste during which chemically fixed energy of combusted matters is transformed into thermal energy. Combustible compounds are transformed into combustion gases leaving the system as flue gases. Incombustible inorganic matters remain in the form of slag and fly ash.
Disposal of non-hazardous waste comprises landfill, dumping at sea, and any other disposal method.

3.5 MEASUREMENT, CONTROL, LABORATORIES AND THE LIKE
Activities and measures aimed at controlling and measuring the generation and storage of waste, their toxicity, etc.

3.6 OTHER ACTIVITIES
All other activities and measures aimed at waste management. It includes administration, management, training, information and education activities specific to the class, when they can be separated from other activities related to the same class and from similar activities related to other environmental protection classes.

4 PROTECTION AND REMEDIATION OF SOIL, GROUNDWATER AND SURFACE WATER

Protection and remediation of soil, groundwater and surface water refers to measures and activities aimed at the prevention of pollutant infiltration, cleaning up of soils and water bodies and the protection of soil from erosion and other physical degradation as well as from salinisation. Monitoring, control of soil and groundwater pollution is included.

Excluded are wastewater management activities (see CEPA 2), as well as activities aimed at the protection of biodiversity and landscape (see CEPA 6).

4.1 PREVENTION OF POLLUTANT INFILTRATION
Activities and measures aimed at the reduction or elimination of polluting substances that may be applied to soil, percolate into groundwater or run-off to surface water. Included are activities related to sealing of soils of industrial plants, installation of catchment for pollutant run-offs and leaks, strengthening of storage facilities and transportation of pollutant products.

4.2 CLEANING UP OF SOIL AND WATER BODIES
Processes to reduce the quantity of polluting materials in soil and water bodies either in situ or in appropriate installations. It includes soil decontamination at former industrial sites, landfills and other black spots, dredging of pollutants from water bodies (rivers, lakes, estuaries, etc.), the decontamination and cleaning up of surface water following accidental pollution e.g. through collection of pollutants or through application of chemicals, as well as the cleaning up of oil spills on land, inland surface waters and seas – including coastal areas. Excludes the liming of lakes and artificial oxygenation of water bodies (see CEPA 6). Excludes civil protection services.

Activities may consist of: measures for separating, containing and recovering deposits, extraction of buried casks and containers, decanting and re-storage, installation of off-gas and liquid effluent drainage networks, soil washing by means of degasification, pumping of pollutants, removal and treatment of polluted soil, biotechnological methods capable of intervening without affecting the site (use of enzymes, bacteria, etc.), physical chemistry techniques such as pervaporation and extraction using supercritical fluids, injection of neutral gases or bases to stifle internal fermentation, etc.

4.3 PROTECTION OF SOIL FROM EROSION AND OTHER PHYSICAL DEGRADATION
Activities and measures aimed at the protection of soil from erosion and other physical degradation (compacting, encrusting, etc.). They may consist of programs intended to restore the protective vegetal cover of soils, construction of anti-erosion walls, etc. Measures may also consist in subsidising agricultural and grazing practices less harmful for soils and water bodies.

Excluded are activities carried out for economic reasons (e.g. agricultural production or protection of settlements against natural hazards such as landslides).

4.4 PREVENTION AND REMEDIATION OF SOIL SALINITY
Activities and measures aimed at the prevention and remediation of soil salinity. Concrete actions will depend on climatic, geological and other country-specific factors. Included are actions to increase groundwater tables, e.g. through increased freshwater infiltration to avoid infiltration of seawater into groundwater bodies, lowering of groundwater tables (when groundwater contains high levels of salts) through long-term re-vegetation programmes, changes in irrigation practices, etc.

Excluded are measures that respond to economic purposes (agricultural production, reclamation of land from the sea, etc.).

4.5 MEASUREMENT, CONTROL, LABORATORIES AND THE LIKE
All activities and measures aimed at controlling and measuring the quality and pollution of soils, groundwater and surface water, measuring the extent of soil erosion and salinisation etc. Includes the operation of monitoring systems, inventories of "black spots", maps and databases of groundwater and surface water quality, of soil pollution, erosion and salinity, etc.

4.6 OTHER ACTIVITIES
All other activities and measures aimed at the protection and remediation of soil, groundwater and surface water. It includes administration, management, training, information and education activities specific to the class,

when they can be separated from other activities related to the same class and from similar activities related to other environmental protection classes.

5 NOISE AND VIBRATION ABATEMENT (excluding workplace protection)

Noise and vibration abatement refers to measures and activities aimed at the control, reduction and abatement of industrial and transport noise and vibration. Activities for the abatement of neighbourhood noise (soundproofing of dancing halls, etc.) as well as activities for the abatement of noise in places frequented by the public (swimming pools, etc.), in schools, etc., are included.

Excluded is the abatement of noise and vibration for purposes of protection at the workplace.

5.1 Preventive in-process modifications at the source

Activities and measures aimed at the reduction of noise and vibration from industrial equipment, vehicle motors, aircraft and ships engines, exhaust systems and brakes, or noise level due to tyre/road or wheel/rail surface contact. Includes the adaptation of equipment, vehicles (buses, trucks, or train and power units in the case of rail transport, aircraft and ships) in order to make them less noisy: soundproofing of hoods, brakes, exhaust systems, etc. Includes also plant modifications, specially conceived foundations to absorb vibrations, extra cost for regrouping of buildings and/or of facilities in the interest of noise abatement, special facilities in building construction or reconstruction, equipment and machines conceived or constructed for low noise or vibrations, low noise level flares and burners, etc.

Other preventive activities consist of noise abatement through the modification of surfaces. As noise emissions from motors, engines, exhaust systems and brakes are lowered, those from other sources becomes more important and in particular noise that originates from the contact between tyres and road surfaces. Activities consist of substituting concrete by silent asphalt, multi-layered surfaces, etc.

5.2 Construction of anti noise/vibration facilities

Activities and measures aimed at the installation and management of anti-noise facilities. These may be screens, embankments or hedges. They may consist of covering sections of urban motor ways or railroads. As concerns industrial and vicinity noise they also consist of add-on facilities, covering and soundproofing of machines and piping, fuel regulation systems and sound absorption, noise screens, barriers, soundproofing of buildings, noise protective windows, etc., in order to limit noise perception.

5.3 Measurement, control, laboratories and the like

Activities and measures aimed at controlling the level of noise and vibration: installation and operation of stationary measurement and monitoring sites or mobile equipment in urban areas, observation networks, etc.

5.4 Other activities

All other activities and measures aimed at noise and vibration abatement. It includes administration, management, training, information and education activities specific to the class, when they can be separated from other activities related to the same class and from similar activities related to other classes. It also includes, when separable, traffic management with noise abatement purposes (for example, lowering of speed limits, improvement of traffic flows), introduction of time and geographical restrictions for noisy vehicles, traffic detours at a distance from residential areas, creation of pedestrian areas, creation of construction-free buffer zones, restructuring of modal split (improvement of public transportation, use of bicycles). This covers a potentially large set of administrative measures which raise serious identification problems given their incorporation in integrated programmes of traffic control and urban planning and the difficulty of separating that part of measures and expenditure that, in these programmes, concern noise and vibration abatement from expenditure related to air pollution control, improvement of the living environment or traffic security.

In addition to regulation, other measures may consist of: financial incentives for the production and use of low-noise vehicles, labelling or information programmes for consumers so as to encourage the use of low-noise vehicles and the adoption of quiet driving behaviour.

6 PROTECTION OF BIODIVERSITY AND LANDSCAPES

Protection of biodiversity and landscape refers to measures and activities aimed at the protection and rehabilitation of fauna and flora species, ecosystems and habitats as well as the protection and rehabilitation of natural and semi-natural landscapes. The separation between ‘biodiversity’ and ‘landscape’ protection may not always be practical. For example, maintaining or establishing certain landscape types, biotopes, eco-zones and related issues (hedgerows, lines of trees to re-establish ‘natural corridors’) have a clear link to biodiversity preservation.

Excluded is the protection and rehabilitation of historic monuments or predominantly built-up landscapes, the control of weed for agricultural purposes as well as the protection of forests against forests fire when this predominantly responds to economic reasons. The establishment and maintenance of green spaces along roads and recreational structures (e.g. gulf courses, other sports facilities) are also excluded.

Actions and expenditure related to urban parks and gardens would not normally be included but may be related in some cases to biodiversity – in such cases the activities and expenditure should be included.

6.1 Protection and rehabilitation of species and habitats

Activities and measures aimed at the conservation, reintroduction or recovery of fauna and flora species, as well as the restoring, rehabilitation and reshaping of damaged habitats for the purpose of strengthening their natural functions. Includes conserving the genetic heritage, re-colonising destroyed ecosystems, placing bans on exploitation, trade, etc. of specific animal and plant species, for protection purposes. Also includes

censuses, inventories, databases, creation of gene reserves or banks, improvement of linear infrastructures (e.g., underground passages or bridges for animals at highways or railways, etc.), feeding of the young, management of special natural reserves (botany conservation areas, etc.). Activities may also include the control of fauna and flora to maintain natural balances, including re-introduction of predator species and control of exotic fauna and flora that pose a threat to native fauna, flora and habitats.

Main activities are the management and development of protected areas, whatever the denomination they receive, i.e. areas protected from any economic exploitation or in which the latter is subject to restrictive regulations whose explicit goal is the conservation and protection of habitats. Also included are activities for the restoration of water bodies as aquatic habitats: artificial oxygenation and lime-neutralisation actions. When they have a clear protection of biodiversity purpose, measures and activities related to urban parks and gardens are to be included. Purchase of land for protection of species and habitats purpose is included.

6.2 PROTECTION OF NATURAL AND SEMI-NATURAL LANDSCAPES

Activities and measures aimed at the protection of natural and semi-natural landscapes to maintain and increase their aesthetic value and their role in biodiversity preservation. Included is the preservation of legally protected natural objects, expenditures incurred for the rehabilitation of abandoned mining and quarrying sites, renaturalisation of river banks, burying of electric lines, maintenance of landscapes that are the result of traditional agricultural practices threatened by prevailing economic conditions, etc. For biodiversity and landscape protection related to agriculture, the identification of specific state aid programmes to farmers may be the only data source available. Protection of forests against forest fires for landscape protection purpose is included.
Excluded are measures taken in order to protect historic monuments, measures to increase aesthetic values for economic purposes (e.g., re-landscaping to increase the value of real estates) as well as protection of predominantly built-up landscapes.

6.3 MEASUREMENT, CONTROL, LABORATORIES AND THE LIKE

Measurement, monitoring, analysis activities which are not classified under the preceding items. In principle, inventories of fauna and flora are not covered since they are classified under protection of species.

6.4 OTHER ACTIVITIES

All other activities and measures aimed at the protection of biodiversity and landscape. It includes administration, training, information and education activities specific to the domain, when they can be separated from other activities related to the same domain and similar activities related to other classes.

7 PROTECTION AGAINST RADIATION (excluding external safety)

Protection against radiation refers to activities and measures aimed at the reduction or elimination of the negative consequences of radiation emitted from any source. Included is the handling, transportation and treatment of high level radioactive waste, i.e. waste that, because of its high radionuclide content, requires shielding during normal handling and transportation.

Excluded are activities and measures related to the prevention of technological hazards (e.g. external safety of nuclear power plants), as well as protection measures taken at workplaces. Also excluded are activities related to collection and treatment of low-level radioactive waste (see CEPA 3).

Definition of radioactive waste.
Any material that contains or is contaminated with radionuclides at concentrations or radioactivity levels greater than the "exempt quantities" established by the competent authorities, and for which no use is foreseen. Radioactive wastes are produced at nuclear power plants and at associated nuclear fuel cycle facilities as well as through other uses of radioactive material, for example, the use of radionuclides in hospitals and research establishments. Other important wastes are those from mining and milling of uranium and from the reprocessing of spent fuel.

7.1 PROTECTION OF AMBIENT MEDIA

Protection of ambient media groups together activities and measures undertaken in order to protect ambient media from radiation. It may consist of protecting measures such as screening, creation of buffer zones, etc.

7.2 TRANSPORT AND TREATMENT OF HIGH LEVEL RADIOACTIVE WASTE

Any process designed for the transport, conditioning, containment or underground disposal of high level radioactive waste.

Collection and transport of high level radioactive waste consists of the collection of high level radioactive waste, generally by specialised firms and their transport to the place of treatment, conditioning storage and disposal.

Conditioning of high level radioactive waste consists of activities that transform high level radioactive waste into a proper and fit condition for transport and/or storage and/or disposal. Conditioning may occur as part of ISIC/NACE 23 (processing of nuclear fuels) activities.

Containment of high level radioactive waste designates the retention of radioactive waste in such a way that it is effectively prevented from dispersing into the environment, or is released only at an acceptable level. Containment may occur in specially built containment spaces.

Underground disposal of high level radioactive waste is the temporary storage or final disposal of high level radioactive waste in underground sites that meet specific geological and technical criteria.

7.3 MEASUREMENT, CONTROL, LABORATORIES AND THE LIKE

Activities aimed at measuring, controlling and monitoring ambient radioactivity and radioactivity due to high level radioactive waste by means of specific equipment, instruments and installations.

7.4 OTHER ACTIVITIES

All other activities and measures aimed at the protection of ambient media against radiation and transport and treatment of high level radioactive waste. It includes administration, training, information and education activities specific to the domain, when they can be separated from other activities related to the same class and similar activities related to other environmental protection classes.

8 RESEARCH AND DEVELOPMENT

Research and development (R&D) comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge and the use of this knowledge to devise new applications (see Frascati manual, OECD 1994) in the field of environmental protection.

The class regroups all R&D activities and expenditure oriented towards environmental protection: identification and analysis of sources of pollution, mechanisms of dispersion of pollutants in the environment as well as their effects on human beings, the species and the biosphere. This heading covers R&D for the prevention and elimination of all forms of pollution, as well as R&D oriented towards equipment and instruments of pollution measurement and analysis. When separable all R&D activities even when referring to a specific class have to be classified under this position.

Environmental R&D is further classified in accordance with the 1993 NABS (Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets, Eurostat 1994).

Excluded are R&D activities related to the management of natural resources.

9 OTHER ENVIRONMENTAL PROTECTION ACTIVITIES

Other environmental protection activities refers to all environmental protection activities which take the form of general environmental administration and management activities or training or teaching activities specifically oriented towards environmental protection or which consist of public information, when they are not classified elsewhere in CEPA. It also includes activities leading to indivisible expenditure, as well as activities not elsewhere classified.

9.1 GENERAL ENVIRONMENTAL ADMINISTRATION AND MANAGEMENT

General administration of the environment designates any identifiable activity that is directed at the general support of decisions taken in the context of environmental protection activities, whether by governmental or by non-governmental units.

General administration of the environment, regulation and the like

Any identifiable activity within general government and NPISH units that is directed towards the regulation, administration of the environment and the support of decisions taken in the context of environmental protection activities. When possible such activities should be allocated to other classes. If this is impossible, they should be included under this position of the classification.

Environmental management

Any identifiable activity of corporations that is directed at the general support of decisions taken in the context of environmental protection activities. It includes the preparation of declarations or requests for permission, internal environmental management, environmental certification processes (ISO 14000, EMAS), as well as the recourse to environmental consultancy services. Activities of units specialised in environmental consultancy, supervision and analysis are included. When possible such activities should be allocated to other CEPA classes.

9.2 EDUCATION, TRAINING AND INFORMATION

Activities that aim at providing general environmental education or training and disseminating environmental information. Included are high school programs, university degrees or special courses specifically aimed at training for environmental protection. Activities such as the production of environmental reports, environmental communication, etc. are also included.

9.3 ACTIVITIES LEADING TO INDIVISIBLE EXPENDITURE

Environmental protection activities that lead to indivisible expenditure, i.e. which cannot be allocated to any other CEPA class. International financial aid may be a case in point as it may be difficult for the donor countries to attribute international aid to individual classes. If international aid is important in volume and/or of specific political interest, a separate 2-digit heading under CEPA 9 could be adequate for national purposes.

9.4 ACTIVITIES NOT ELSEWHERE CLASSIFIED

This position groups together all these environmental protection activities that cannot be classified under other positions of the classification.

Comparison of CEPA 1994 and CEPA 2000

1994 CEPA	CEPA 2000
1 PROTECTION OF AMBIENT AIR AND CLIMATE 1.1 Prevention of pollution through in-process modifications 1.1.1 for the protection of ambient air 1.1.2 for the protection of climate and ozone layer 1.2 Treatment of exhaust gases and ventilation air 1.2.1 for the protection of ambient air 1.2.2 for the protection of climate and ozone layer 1.3 Measurement, control, laboratories and the like 1.4 Other activities	**no changes**
2 WASTEWATER MANAGEMENT 2.1 Prevention of pollution through in-process modifications 2.2 Sewerage networks 2.3 Wastewater treatment 2.4 Treatment of cooling water 2.5 Measurement, control, laboratories and the like 2.6 Other activities	**no changes**
3 WASTE MANAGEMENT 3.1 Prevention of pollution through in-process modifications 3.2 Collection and transport 3.3 Treatment and disposal of hazardous waste 3.3.1 Thermal treatment 3.3.2 Landfill 3.3.3 Other treatment and disposal 3.4 Treatment and disposal of non-hazardous waste 3.4.1 Incineration 3.4.2 Landfill 3.4.3 Other treatment and disposal 3.5 Measurement, control, laboratories and the like 3.6 Other activities	**no changes** (Note: includes treatment of low-level radioactive waste, composting, street cleaning and sweeping, recycling)
4 PROTECTION OF SOIL AND GROUNDWATER 4.1 Prevention of pollutant infiltration 4.2 Decontamination of soils 4.3 Measurement, control, laboratories and the like 4.4 Other activities	**4 PROTECTION AND REMEDIATION OF SOIL, GROUNDWATER AND SURFACE WATER** 4.1 Prevention of pollutant infiltration ***4.2 Cleaning up of soil and water bodies*** ***4.3 Protection of soil from erosion and other physical degradation*** ***4.4 Prevention and remediation of soil salinity*** 4.5 Measurement, control, laboratories and the like 4.6 Other activities
5 NOISE AND VIBRATION ABATEMENT (excluding workplace protection) 5.1 Noise and vibration from road and rail traffic 5.1.1 preventive in-process modifications at source 5.1.2 Construction of anti noise/vibration facilities 5.2 Air traffic noise 5.2.1 preventive in-process modifications at source 5.2.2 Construction of anti noise/vibration facilities 5.3 Industrial process noise and vibration 5.4 Measurement, control, laboratories and the like 5.5 Other activities	**5 NOISE AND VIBRATION ABATEMENT (excluding workplace protection)** ***5.1 Preventive in-process modifications at source*** ***5.1.1 Road and rail traffic*** ***5.1.2 Air traffic*** ***5.1.3 Industrial and other noise*** ***5.2 Construction of anti noise/vibration facilities*** ***5.2.1 Road and rail traffic*** ***5.2.2 Air traffic*** ***5.2.3 Industrial and other noise*** 5.3 Measurement, control, laboratories and the like 5.4 Other activities

6 PROTECTION OF BIODIVERSITY AND LANDSCAPES

6.1 Protection and rehabilitation of species and habitats

6.2 Protection of natural and semi-natural landscapes

6.3 Measurement, control, laboratories and the like

6.4 Other activities

7 PROTECTION AGAINST RADIATION (excluding nuclear power stations and military installations)

7.1 Protection of ambient media

7.2 Measurement, control, laboratories and the like

7.3 Other activities

8 RESEARCH AND DEVELOPMENT

8.1 Protection of ambient air and climate

8.1.1 protection of ambient air

8.1.2 protection of atmosphere and climate

8.2 Protection of water

8.3 Waste

8.4 Protection of soil and groundwater

8.5 Abatement of noise and vibration

8.6 Protection of species and habitats

8.7 Protection against radiation

8.8 Other research on the environment

9 OTHER ENVIRONMENTAL PROTECTION ACTIVITIES

9.1 General administration of the environment

9.2 Education, training and information

9.3 Activities leading to indivisible expenditure

9.4 Activities not elsewhere classified

6 PROTECTION OF BIODIVERSITY AND LANDSCAPE

6.1 Protection of species

6.2 Protection of landscape and habitats
of which
6.2.1 protection of forests

6.3 Rehabilitation of species populations and habitats

6.4 Restoration and cleaning of water bodies

6.5 Measurement, control, laboratories and the like

6.4 Other activities

7 PROTECTION AGAINST RADIATION (excluding external safety)

7.1 Protection of ambient media

7.2 Transport and treatment of high level radioactive waste

7.3 Measurement, control, laboratories and the like

7.4 Other activities

no changes

9 OTHER ENVIRONMENTAL PROTECTION ACTIVITIES

9.1 General environmental administration and management

9.1.1 General administration, regulation and the like

9.1.2 Environmental management

9.2 Education, training and information

9.3 Activities leading to indivisible expenditure

9.4 Activities not elsewhere classified

eurostat

Annex 2 Example of an industry expenditure questionnaire: Germany

German Federal Statistical Office	**Survey on capital expenditure by industries on environmental protection, 1999 (§15 (1)(1)(1) UStatG)**	**15 I**

Reporting unit	Deadline for return of form:
	Please give the name of the person to contact if there are any queries (voluntary): Name: Telephone:

This form is to be completed only if you purchased, produced or leased tangible fixed assets for environmental protection purposes in 1999.

Please state which currency has been used on this form. Only one currency should be used.	**DM**	**or**	**EUR**	300	DM = 1 EUR = 2

15 I

Identification no	
	SSt 1 - 9

Capital expenditure[1] and value of new tangible fixed assets[2] newly leased in 1999[4], the sole or main purpose of which is environmental protection, [3]
by field and type

	Capital expenditure [1]	Value of newly leased new tangible fixed assets[2]
	for environmental protection	
	in whole units of the currency noted above	

A. Waste management[5]

I. Production-related tangible fixed assets[6] (increase in such assets for the prevention, recovery and/or disposal of waste generated by production activity)

1. Developed sites, buildings or structures[7]

(a) Landfill sites	101		102	
(b) Other developed sites, buildings or structures (e.g. intermediate storage, collection points)	103		104	
2. Sites without (own) buildings or structures[8]	105			
3. Plant and machinery, other fixtures and fittings, tools and equipment				
(a) Incineration plants	107		108	
(b) Plants treating waste prior to recovery[9] (e.g. separation and sorting installations, purification plants, used oil, solvent and plastics recovery plants)	109		110	
(c) Plants treating waste prior to disposal[10] (e.g. crushing plants, presses)	111		112	
(d) Other fixed assets for waste management (e.g. collection and transport facilities, pilot research and development plants for waste management) installations, separate fixed assets for measurement, control, analysis etc.)	113		114	
II. Product-related tangible fixed assets[11] (capital expenditure on the manufacture of products generating less waste when used or consumed)	115			

Please briefly describe the type of capital expenditure and the regulation or declaration of intent.

_____

III. Total capital expenditure and value of newly leased new tangible fixed assets for waste management (sum of I and II)	117		118	

Return address

	Capital expenditure [1]	Value of newly leased new tangible fixed assets[2]
	for environmental protection	
	in whole units of the currency noted on page 1	

Water protection[12]

I.	Production-related tangible fixed assets[6] (increase in such assets for reducing the quantity or level of pollution of wastewater and for protecting surface water and groundwater from production-generated contaminants)				
1.	Developed sites, buildings or structures[7] (e.g. sewerage system, sludge drying beds, sludge lagoons, storm water basins)	130		131	
2.	Sites without (own) buildings or structures[8]	132			
3.	Plant and machinery, other fixtures and fittings, tools and equipment				
a)	Plants for treating water already used for own operations.....	134		135	
b)	Water recirculation systems (incl. recirculation systems for cooling water)	136		137	
c)	Wastewater treatment plants: mechanical, biological, chemical/physical, combined (e.g. sieves, screens, grit chambers, grease and oil traps, biological filter, activated sludge plants, ion exchange plants, chemical precipitation plants)	138		139	
d)	Cooling plants for cooling water and wastewater, cooling towers (e.g. evaporators, heat exchangers, but excluding recirculation systems).....	140		141	
e)	Sewage-sludge treatment plants[13] (e.g. digestion tanks, chemical and thermal conditioning plants, centrifuges, sludge presses, sludge filters)	142		143	
f)	Safety devices for handling water endangering substances[14] (e.g. sealing systems for storage tanks, pipelines, holding ponds)	144		145	
g)	Other tangible fixed assets for water- protection (e.g. pilot research and development plants for water conservation installations, separate fixed assets for measurement, control and analysis, etc.)	146		147	
II.	Product-related tangible fixed assets[11] (capital expenditure on the manufacture of products causing less water pollution when used or consumed).....	148			
	Please briefly describe the type of capital expenditure and the regulation or declaration of intent. _____				
III	Total capital expenditure and value of newly leased new tangible fixed assets for water protection (sum of I and II).....	150		151	

	Capital expenditure [1]		Value of newly leased new tangible fixed assets[2]	
	for environmental protection			
	in whole units of the currency noted above			

C Noise abatement[15]

I Production-related tangible fixed assets[6] (increase in such assets for the reduction or suppression of noise and vibration generated by production activity)

1. Developed sites, buildings or structures[7] (e.g. noise barriers or screens, noise-abatement measures in buildings, such as insulated windows designed to limit emissions into the environment)..... | 160 | | 161 | |
2. Sites without (own) buildings or structures[8] ..... | 162 | |
3. Plant and machinery, other fixtures and fittings, tools and equipment (e.g. noise control devices on machinery, such as laggings, casings, acoustic screens etc., vibration insulation, special foundations, separate fixed assets for measurement, control and analysis etc, pilot research, development and testing plants for noise-abatement and vibration protection installations). ..... | 164 | | 165 | |

II Product-related tangible fixed assets[11] (capital expenditure on the manufacture of products generating less noise when used or consumed) | 166 | |

Please briefly describe the type of capital expenditure and the regulation or declaration of intent.

_____

III Total capital expenditure and value of newly leased new tangible fixed assets for noise control (sum of I and II)..... | 168 | | 169 | |

D Prevention of air pollution[16]

I Production-related tangible fixed assets[6] (increase in such assets for the removal, reduction or prevention of air pollutants in exhaust fumes generated by production activity)

1. Developed sites, buildings or structures [7] ..... | 180 | | 181 | |
2. Sites without (own) buildings or structures[8] ..... | 182 | |
3. Plant and machinery, other fixtures and fittings, tools and equipment

a) Combustion plants for low-emission fuels or for otherwise reducing emissions into the atmosphere (e.g. burner conversion, fluidised-bed combustion)..... | 184 | | 185 | |

b) Dust extractors (e.g. electro-precipitators, wet scrubbers, filtration collectors, inertial separators) ..... | 186 | | 187 | |

c) Desulphurisation plants ..... | 188 | | 189 | |

d) Nitrogen removal plants ..... | 190 | | 191 | |

e) Hydrocarbon reduction plants ..... | 192 | | 193 | |

f) Odour reduction installations ..... | 194 | | 195 | |

g) Other tangible fixed assets for preventing air pollution (e.g. cooling and condensation plants, pilot research and development plants for installations for the prevention of air pollution, separate fixed assets for measurement, control and analysis etc.) | 196 | | 197 | |

II Product-related tangible fixed assets[11] (capital expenditure on the manufacture of products causing less air pollution when used or consumed) ..... | 198 | |

Please briefly describe the type of capital expenditure and the regulation or declaration of intent.

_____

III Total capital expenditure and value of newly leased new tangible fixed assets for the prevention of air pollution (sum of I and II) ..... | 200 | | 201 | |

	Capital expenditure [1]	Value of newly leased new tangible fixed assets[2]
	for environmental protection	
	in whole units of the currency noted above	

E Nature and landscape conservation [17]

I Production-related tangible fixed assets[6] (increase in such assets for the protection and conservation of soil, vegetation and fauna affected by production activity)

1. Developed sites, buildings or structures[7] (e.g. fixation).....	220		221	
2. Sites without (own) buildings or structures[8]	222			
3. Plant and machinery, other fixtures and fittings, tools and equipment	224		225	

II Product-related tangible fixed assets[11] (capital expenditure on the manufacture of products causing less damage to soil, vegetation and fauna when used or consumed) 226

Please briefly describe the type of capital expenditure and the regulation or declaration of intent.

_____

III Total capital expenditure and value of newly leased new tangible fixed assets for nature and landscape conservation (sum of I and II)	228		229	

F Soil decontamination[18]

1. Production-related tangible fixed assets[6] (increase in such assets for the treatment of soil contaminated by production activity, i.e. plant and machinery, other fittings and fixtures, tools and equipment

a) Installations for waterproofing of contaminated soil)....	240		241	
b) Decontamination plants (e.g. for the thermal or biological or physical/chemical treatment of contaminated soil)	242		243	
c) Other soil-decontamination installations (e.g. pilot research and development plants for soil decontamination installations, separate fixed assets for measurement, control and analysis, etc.).....	244		245	
2. Total capital expenditure and value of newly leased new tangible fixed assets for soil decontamination (sum of 1 (a) to (c)).....	246		247	

G Capital expenditure and value of newly leased new tangible fixed assets for environmental protection, total

(sum of A to F)	250		251	

260 Please give brief details of any unusual events which have affected your data, and of any transfers of fixed assets under construction to another fixed assets account. This will help us to avoid coming back to you with queries.

1999 survey on capital expenditure by industries on environmental protection
(§ 15 (1)(1)(1) UStatG)

15 I

Explanatory notes

Purpose, type and scope of survey

The annual survey on capital expenditure on environmental protection covers a maximum of 15 000 enterprises and establishments, excluding the construction industry. The results provide information on the amount and structure of capital expenditure for environmental protection purposes and on changes in such expenditure.

Legal bases

Environment Statistics Act (UStatG) of 21 September 1994 (BGBl [Official Journal of the Federal Republic of Germany] I, p. 2530), last amended by Article 12 of the Law of 19 December 1997 (BGBl. I, p. 3158) in conjunction with the Statistics for Federal Purposes Act (BStatG) of 22 January 1987 (BGBl I, pp. 462, 565), last amended by Article 2 of the Law of 16 June 1998 (BGBl I, p. 1300). Data are collected as set out in § 15 (1) (1) (1) of UStatG.

The obligation to provide information arises from § 18 of UStatG in conjunction with § 15 BStatG, which require owners or managers of enterprises to provide information.

In accordance with § 15(6) BStatG, objections and challenges to the requirement to provide information have no suspensory effect.

Confidentiality

The individual data collected are strictly confidential, in accordance with § 16 BStatG. Individual data may be disclosed only in exceptional circumstances provided for under the legislation.

Under § 20 UStatG in conjunction with § 16 (4) BStatG, data collected may be made available to the competent supreme federal and *Land* authorities in the form of tables of statistical results, even if certain table cells contain information on a single case.

Under § 16 (6) BStatG, individual data may also be made available to universities or similar institutions responsible for independent scientific research, for the purposes of scientific projects, provided that the data concerned have been rendered anonymous to the extent that unreasonable amounts of time, money and labour would be required to identify the respondents or individuals concerned.

The confidentiality obligation applies also to those receiving individual data.

Individual data with names and addresses will under no circumstances be divulged.

Auxiliary characteristics, serial/code numbers, separation and destruction, address data file

The names, titles and addresses of parties responsible for providing information and the names and telephone numbers of persons responsible for answering queries are auxiliary characteristics used solely for the technical processing of the survey. As soon as the data have been checked, these details are separated from the survey forms; they are kept separately and destroyed after completion of the next survey, if not before.

The identification number is used to distinguish between the enterprises involved in the survey and to enable the survey to be prepared in an efficient manner. It consists of a freely-allocated serial number specific to the *Land* concerned.

The name and address of the enterprise and its identification number are used to administer the business register for statistical purposes (statistics register). The legal bases for this are § 13 BStatG and Council Regulation (EEC) No 2186/93 of 22 July 1993 on Community co-ordination in drawing up business registers for statistical purposes (OJ L 196, p. 1).

Reporting unit

The survey covers production enterprises, excluding the construction industry.

An enterprise is defined as the smallest unit keeping commercial accounts and balance sheets for trading and/or tax purposes.

Legally independent subsidiaries, consortia, holding companies etc. must report separately if they come under manufacturing or mining and quarrying.

Data must be provided on the entire enterprise, including all production and non-production areas but excluding branches abroad.

Definitions of survey characteristics

1. **Capital expenditure** means gross acquisitions less disposals (less turnover tax deductible as input tax) of purchased and self-produced tangible fixed assets to be capitalised in the accounting year, including leased goods to be capitalised by the lessee.

   Please exclude capital expenditure in branches abroad, assets acquired through the purchase of whole enterprises or establishments, financing charges incurred through capital expenditure, acquisitions of holdings, securities etc. (financial assets) and acquisitions of concessions, patents, licences and other intangible assets and acquisitions of premises formerly rented by the enterprise. Please also exclude advance payments in respect of fixed assets, including those under construction, even if capitalised. In this case, please do not record the full capital expenditure until completion, at the time of transfer to another tangible fixed assets account.

   Please deduct public subsidies for capital expenditure from the amount recorded.

2. The **value of newly leased new tangible fixed assets** means the value (less turnover tax deductible as input tax) of such assets (including replacements during current leasing contracts) which are not capitalised by the lessee (see [1]), as leased in the accounting year, e.g. from leasing companies, direct from the manufacturer or from enterprises in the same group (e.g. holding companies) under medium-term or long-term contracts.

   Please exclude tangible fixed assets leased for less than a year, and used capital goods.

   If the exact value is nor known, careful estimates may be made.

3. **Tangible fixed assets for the purpose of environmental protection** means all tangible fixed assets whose purpose is to protect against harmful effects on the environment. These may be for protection against harmful environmental effects arising from production activity (production-related measures), or capital investment in the manufacture of products causing less damage to the environment when used or consumed (product-related measures) (cf. [6] and [11]).

   Please include all end-of-pipe environmental-protection installations, including those which have effects additional to their desired environmental effects, such as the production of marketable by-products. Please record in every case the value of the entire plant; any part of the acquired tangible fixed assets not directly attributable to environmental protection should not be deducted from the value indicated.

   Please exclude acquisitions of environmental-protection devices which are inseparable parts of installations set up for other purposes, i.e. integral components of production plant which cannot be recorded separately.

   If your enterprise comprises establishments or kind-of-activity units whose main or sole activity is to provide disposal services for third parties, such as waste disposal, capital expenditure on such activities should not be counted as environmental protection measures of your enterprise.

Explanatory notes, continued

4. If the **accounting year** is not the same as the **calendar year**, please refer to the accounting year which ends during the reporting year.

5. **Waste management** means the prevention, recovery and disposal of waste as defined in the Waste Disposal Act (KrW-/AbfG) of 27 September 1994 (BGBl. I, p. 2705), last amended by the Law of 25 August 1998 (BGBl. I, p. 2455, 2457). Waste means all movable items in the groups listed in Annex I of KrW-/AbfG of which the owner disposes, wishes to dispose or must dispose. It includes waste for both recovery and disposal.

   Measures for preventing waste include low-waste product development, in particular.

   Recovery comprises the recovery of both materials and energy. Waste disposal comprises the provision, transfer, collection, transport, storage and tipping of waste for disposal.

6. **Production-related tangible fixed assets** for environmental protection means plant installed centrally or at emission points with the purpose of reducing or suppressing emissions.

7. **Developed sites** mean all sites with (own) buildings or structures for environmental protection. **Buildings or structures** means buildings and other separate premises on own land or elsewhere.

8. **Sites without (own) buildings or structures** may be land to be used for the construction of plant for appropriate environmental protection (including site development costs etc.) or open, undeveloped spaces.

9. **Plants treating waste prior to recovery** are installations enabling waste to be re-used (for the same purpose) or recovered (for other purposes).

10. **Plants treating waste prior to disposal** are those treating waste for subsequent tipping or for incineration with no energy recovery.

11. **Product-related tangible fixed assets** for environmental protection may arise from product-related legislation or other environmental policy measures and must be based on statutory or official regulations (e.g. the Packaging Regulation, the Lead in Petrol Act, the Banning of CFCs and Halogens Regulation) or on own declarations of intent to the federal government (e.g. commitment to reducing CO_2 emissions).

    Please include the value of converting existing production plant for the purpose of changing a product so that it causes less pollution when used or consumed. New production plant for manufacturing replacements for banned products should be included only if the capital investment is made by enterprises affected by a ban on a given material, i.e. which manufactured the product before the ban and were obliged by a product regulation to make a capital investment which would not have been necessary for operational reasons. Installations designed to comply with the take-back obligation should also be included.

    Please exclude capital expenditure on the manufacture of environmental-protection goods.

12. **Water protection** means measures for reducing the quantity or level of pollution of wastewater (reduction or elimination of solid and dissolved matter and heat reduction) and for the protection of surface water and groundwater. Please therefore include water circulating systems.

13. **Sewage-sludge treatment plants** do not include incineration and composting plants or sewage-sludge tips, which should be included under waste management.

14. **Safety devices for handling water pollutants** means, in particular, plant and installations as laid down in § 19g of the Water Resources Act (WHG) in the version published on 12 November 1996 (BGBl. I p. 1695), last amended by the Law of 25 August 1998 (BGBl. I p. 2455) and the accompanying *Länder* regulations. Please do not include integral safety devices which are part of new production plant and cannot be covered separately.

15. **Noise abatement** means measures for reducing or abating the generation and propagation of noise. It includes vibration-protection measures. Please include only expenditure on items which are not for the purpose of safety and health at work.

16. **Prevention of air pollution** means measures for removing, reducing or preventing air pollutants (smoke, soot, dust, gases, aerosols, vapours or odorous substances) in exhaust fumes or gases. Please include only expenditure on items which are not for the purpose of safety and health at work.

17. **Nature and landscape conservation** means all measures for preserving, reconstituting or restoring the natural appearance of soil and vegetation and for protecting fauna, in particular recultivation measures and measures to prevent the formation of swamps and desertification.

18. In accordance with § 2 (7) of the Soil Protection Act (BBodSchG) of 17 March 1998 (BGBl. I, p 502), **soil decontamination** means measures for 1) removing or reducing pollutants (decontamination measures); 2) preventing or reducing the spread of pollutants in the long term without removing the pollutants (safeguarding measures); 3) removing or reducing harmful changes in the physical, chemical or biological composition of the soil.

German Federal Statistical Office/VIII B 52

15 A

Survey on current expenditure on environmental protection in the production industries 1999

Statistisches Bundesamt • VIII B • PF 170377 • 53029 Bonn

Management

Deadline for return of form 30 June 2000

Please correct if the address is incorrect

Identification no: please quote in all correspondence ▷

- **Legal bases, confidentiality, auxiliary characteristics, serial/code numbers, separation and destruction and address data file:** please see the explanatory notes which are part of the survey form.
- **Guidance on completing the form:** these returns relate to the **complete enterprise** as a legally independent unit, including all production areas but excluding any branches abroad. Legally independent subsidiaries **should not be included.**
  The reporting year is the calendar year. If the accounting year does not coincide with the calendar year, the figures should refer to the accounting year which ended during 1999. **A maximum of 12 months are to be included in the accounting year.**
  If there are no data, please put a dash (–) in the appropriate box.

  The attached explanatory notes must be observed.
- **Reporting deadline:** please send one copy of the survey forms to the Statistisches Bundesamt by the above deadline. If the final end-of-year figures are not available by that date, provisional values or carefully estimated figures will suffice. The second copy of the forms is for your files.

Is the accounting year the same as the calendar year?

Yes ☐

No ☐, it runs ..... to .....

Please give the name of the person to be contacted in case of queries (voluntary):

Name: _____ Telephone number _____

If any unusual results have influenced the data, please comment briefly, to avoid our having to contact you later:

Purpose, type and scope of survey

The annual survey on current expenditure on environmental protection covers a maximum of 15 000 production enterprises, excluding the construction industry. The results provide information on the amount and structure of current expenditure for environmental protection purposes and on changes in such expenditure.

Legal bases

Environment Statistics Act (UStatG) of 21 September 1994 (BGBl [Official Journal of the Federal Republic of Germany] I, p. 2530), last amended by Article 12 of the Law of 19 December 1997 (BGBl. I, p. 3158) in conjunction with the Statistics for Federal Purposes Act (BStatG) of 22 January 1987 (BGBl I, pp. 462, 565), last amended by Article 2 of the Law of 16 June 1998 (BGBl I, p. 1300). Data are collected as set out in § 15 (1) (1) no2 of UStatG.

The obligation to provide information arises from § 18 of UStatG in conjunction with § 15 BStatG, which require owners or managers of enterprises to provide information.

In accordance with § 15(6) BStatG, objections and challenges to the requirement to provide information have no suspensory effect.

Confidentiality

The individual data collected are strictly confidential, in accordance with § 16 BStatG. Individual data may be disclosed only in exceptional circumstances provided for under the legislation.

Under § 20 UStatG in conjunction with § 16 (4) BStatG, data collected may be made available to the competent supreme federal and *Land* authorities in the form of tables of statistical results, even if certain table cells contain information on a single case.

Individual data with names and addresses will in no circumstances be divulged.

Under § 16 (6) BStatG, individual data may be made available to universities or similar institutions responsible for independent scientific research, for the purposes of scientific projects, provided that the data concerned have been rendered anonymous to the extent that unreasonable amounts of time, money and labour would be required to identify the respondents or individuals concerned.

The confidentiality obligation applies also to those receiving individual data.

Auxiliary characteristics, serial/code numbers, separation and destruction, address data file

The names, titles and addresses of parties responsible for providing information and the names and telephone numbers of persons responsible for answering queries are auxiliary characteristics used solely for the technical processing of the survey. As soon as the data have been checked, these details are separated from the survey forms, kept separately and destroyed after completion of the next survey, if not before.

The identification number is used to distinguish between the enterprises involved in the survey and to enable the survey to be prepared in an efficient manner. It consists of a freely-allocated serial number specific to the *Land* concerned.

The name and address of the enterprise and its identification number are used to administer the business register for statistical purposes (statistics register). The legal bases for this are § 13 BStatG and Council Regulation (EEC) No 2186/93 of 22 July 1993 on Community coordination in drawing up business registers for statistical purposes (OJ L 196, p. 1).

Reporting unit

The survey covers production enterprises, excluding the construction industry.

An enterprise is defined as the smallest unit keeping commercial accounts and balance sheets for trading and/or tax purposes.

Legally independent subsidiaries, consortia, holding enterprises etc. must report separately if they come under production industries.

Data must be provided on the entire enterprise, including all production and non-production areas but excluding branches abroad.

Current expenditure on measures intended solely for environmental protection[1)] including emission charges in 1999 [2)], by environmental domain

Please state which currency has been used in this return
Only one currency should be used. → DM or EUR

I Data on waste management [3)], water protection[4)], noise abatement[5)], prevention of air pollution [6)]

Ù *Expenditure on own plant should be reported under **1**. If you have no such plant, please begin at **2**.*

		Waste management	Water protection	Noise abatement	Prevention of air pollution
1. Current expenditure on the running of plant for environmental protection [7)]		in complete units of the currency stated above			
		1	2	3	4
Ù *for all plant*					
1.1 Depreciation [8)]	01				
1.2 Imputed interest [9)]	02				
Ù *If you have set up **cost centres** for plant, please fill in 1.3 - 1.6. If not, please continue with 1.7.*					
1.3 Payroll costs [10)] (Gross wages and salaries, social security contributions)	03				
1.4 Expenditure on raw materials and supplies [11)] excluding energy	04				
1.5 Expenditure on energy [12)]	05				
1.6 Expenditure on external services and other expenditure, in particular on measures carried out by the enterprise itself [13)] (plant-related expenditure only)	06				
Ù *for plant **with no** own **cost centre***					
1.7 Expenditure on staff, raw materials and supplies, including energy, and on external services and other expenditure [13)]	07				
2. Charges and contributions [14)] in particular charges for municipal waste disposal services and sewerage charges	08				
3. Other current expenditure [15)] not on the running of plant Expenditure on external services, including for the disposal of waste by private enterprises and other expenditure, in particular on measures implemented by the enterprise itself, if not already included with plant (no. 1 above)[16)]	09				
Total current expenditure (Sum of 1.1 - 1.7, 2 and 3 above)	10				

Ù *Please enter expenditure on nature and landscape conservation and soil decontamination, along with emission charges, on the reverse.*

II Data on nature and landscape conservation [17]		Nature and landscape conservation in complete units of the currency noted above
		5
1. **Charges and contributions** [18]	08	
2. **Other current expenditure**		
Expenditure on external services and other expenditure, in particular on measures implemented by the enterprise itself [19]	09	
Total current expenditure on nature and landscape conservation (Sum of headings 1 and 2 above)	10	

III Data on soil decontamination [20]		Soil decontamination in complete units of the currency noted on page 3
		6
1. **Expenditure on the running of soil decontamination installations** [21]		
1.1 Depreciation [8]	01	
1.2 Imputed interest [9]	02	
1.3 Payroll costs [10] (Gross wages and salaries, social security contributions)	03	
1.4 Expenditure on raw materials and supplies [11] excluding energy	04	
1.5 Expenditure on energy [12]	05	
1.6 Expenditure on external services and other expenditure, in particular on measures carried out by the enterprise itself [22]	06	
2. **Charges and contributions** [23]	08	
3. **Other current expenditure** [15]		
Expenditure on external services and other expenditure, in particular on measures implemented by the enterprise itself, if not already included with plant (no 1 above) [24]	09	
Total current expenditure on soil decontamination (Sum of 1 to 3 above)	10	

IV Emission charges [25]		in complete units of the currency noted above
		2
1. **Effluent charges** [26] resulting from the Taxes on the Discharge of Effluent into Receiving Waters Act (Abwasserabgabengesetz-AbwAG)	11	
		1
2. **Licence fees (charges under *Land* law)** [27] (Only in the *Land* of North Rhine-Westphalia)	12	

Survey on current expenditure on environmental protection in the production industries
Explanatory notes on the survey form

Section I

1. The **measures** concerned ar**e** intended to protect the environment from the damaging effects of the enterprise's production activity by preventing, reducing or eliminating emissions to the environment. The following should not be included: expenditure arising solely from the disposal of waste and the collection and purification of wastewater for third parties. This applies particularly to utilities (electricity, gas, district heating and water), which should not include expenditure on the public collection and removal of wastewater carried out by the enterprise (e.g. for sewage treatment plants) or public solid waste disposal.

   Current expenditure refers solely to production-related measures for environmental protection, i.e. expenditure on running plants designed to protect the environment and expenditure on measures which are not plant-related. Such expenditure does not include the extra costs involved in 'clean' production processes, i.e. in complete processes which are less polluting than other processes, nor does it include current expenditure on making products more environment-friendly to use or consume (product-related measures).

   However, the measures to be entered include both those required by law or taken in view of official regulations and any voluntary measures introduced for the sake of production-related environmental protection, i.e. connected with the running of environmental-protection plant and installations or general production-related protection of the environment by the enterprise.

2. If the accounting year is not the same as the calendar year, please refer to the accounting year which ends in the reporting year.

3. **Waste management** means the prevention, recovery and disposal of waste as defined in the Waste Disposal Act (KrW-/AbfG) of 27 September 1994 (BGBl. I, p. 2705), last amended by the Law of 25 August 1998 (BGBl. I, pp. 2455, 2457). Waste means all movable items in the groups listed in Annex I of KrW-/AbfG of which the owner disposes, wishes to dispose or must dispose. It includes waste for both recovery and disposal.

   Measures for preventing waste include low-waste product development, in particular.

   Recovery means the recovery of both materials and energy. Waste disposal comprises the provision, transfer, collection, transport, storage and tipping of waste for disposal.

4. **Water protection** means measures for reducing the quantity or level of pollution of wastewater (reduction or elimination of solid and dissolved matter and heat reduction) and for protecting surface water and groundwater.

5. **Noise abatement** means measures for reducing or suppressing the generation or propagation of noise. Vibration-protection measures should be included. Please include only expenditure on items which are not for the purpose of safety and health at work.

6. **Prevention of air pollution** means measures for removing, reducing or preventing air pollutants (smoke, soot, dust, gases, aerosols, vapours or odorous substances) in exhaust fumes or gases. Please include only expenditure on items which are not for the purpose of safety and health at work.

7. **Environmental-protection plants** are either central installations supplementing production installations (centralised plants) or decentralised add-ons to production installations at individual emission points (decentralised plants) with the sole purpose of limiting emissions from production. Examples would be:

   Waste management: landfill sites, incineration plants, plants treating waste prior to recovery or disposal, such as separation, sorting, cleansing and crushing plants, compressors or neutralisation and drying plants and waste oil, solvent and plastics processing plants (for the recovery of own waste only), intermediate storage sites, collection points, collection and transport facilities, pilot research and development plants for waste-management installations, measurement and control systems.

   Water protection: water recirculation systems (incl. recirculation systems for cooling water), plants for treating water already used for own operations, processes for wastewater reduction/waste recovery, such as evaporators, membrane technology, ion exchangers or sewerage system; mechanical, biological, chemical/physical or combined waste-water treatment plants such as sieves, screens, grit chambers, grease and oil traps, biological filter, activated sludge plants, ion exchange plants, chemical precipitation plants; cooling plants for cooling water and wastewater (e.g. evaporators, heat exchangers), cooling towers; sludge drying beds, sludge lagoons, sewage sludge treatment plants such as digestion tanks, chemical and thermal conditioning plants, centrifuges, sludge presses, sludge filters; safety devices for handling water endangering substances, such as storm-water basins, sealing systems for storage tanks, pipelines, holding ponds; pilot research and development plants for water-protection installations, measurement and control systems.

   Noise abatement: noise barriers or screens, noise-abatement measures in buildings, such as insulated windows designed to prevent the emission of noise into the environment; noise control devices on machinery, such as laggings, casings, acoustic screens etc., vibration insulation, special foundations, pilot research, development and testing plants for noise-abatement and vibration protection installations and measurement and control systems.

   Prevention of air pollution: plants designed to prevent atmospheric pollution are burners and furnaces converted to run on low-emission fuels, piping systems for collecting and extracting waste gases, waste-gas cleaning plants and plants for removing suspended particles, steam or dust from air, such as electro-precipitators, wet scrubbers, filtration collectors or inertial separators, desulphurisation, nitrogen removal, hydrocarbon and odour reduction plants; thermal off-gas treatment plants, cooling and condensation plants, pilot research and development plants for installations for the prevention of atmospheric pollution, measurement and control systems.

8. **Depreciation** means the fall in value due to wear-and-tear of environmental protection installations (imputed depreciation). Alternatively, balance-sheet depreciation may entered recorded.

9. **Imputed interest:** please indicate the amount of interest on the capital invested in environmental-protection installations (not the interest actually paid).

10. Gross wages and salaries plus statutory and other social charges for persons employed at the plants concerned.

    Gross wages and **gross salaries** consist of the sum of gross remunerations (in cash and in kind) before any deduction is made.

    Social security contributions include employers' contributions to health, pension and unemployment insurance, employers' liability insurance etc.

    Other social charges are the remaining labour costs shown in the profit and loss account.

11. **Raw materials and supplies** include all materials and components purchased elsewhere and consumed in connection with downstream plants.

Explanatory notes, continued

12. **Energy consumption** means the total consumption of fuels, propellants, electricity, gas, district heating etc. for environmental protection installations. It may also be calculated from specific thermal energy consumption per m^2 or estimated as proportional costs.
13. This means expenditure on planning, consultancy, measurements, maintenance and repairs carried out internally or by third parties, plus rents and leases. Taxes (such as property taxes on land used for environmental protection) should also be entered here. Outside services should be recorded net, excluding turnover taxes.

    Please do not include effluent and solid waste charges, which should be shown in Section IV of the survey form, and charges and contributions paid to public authorities, which should come under Section I (2) of the form. Please also exclude reserves, e.g. for recultivating landfill sites. Actual expenditure should be entered here.
14. **Charges and contributions paid to the public authorities:** e.g. charges for municipal solid waste and sewage disposal services, charges for permits to run environmental-protection plants where such charges are not capitalised and contributions such as those to municipal associations, including any connected with the running of environmental-protection plants.
15. This means expenditure on general environmental protection measures not related to plant.
16. For example, expenditure on disposal, in particular waste collection, on planning, measurements and analyses, on research and development (not on products to be marketed) carried out internally or by third parties. Licence fees for the German 'Dual System' ('Green Dot') and other systems for the disposal of packaging should not be included.

    Expenditure on environmental-protection officers, consultancy services in connection with the setting up and running of an environment management system, expert opinions, insurance (but not on compulsory environmental liability insurance), contributions to cooperatives, decommissioning costs resulting from environmental-protection legislation should also be included. Services connected with the plants listed in Section I (1) of the survey form should not be entered here.

Section II

17. **Nature and landscape conservation** covers all measures for preserving, reconstituting or restoring the natural appearance of soil and vegetation and for protecting fauna, particularly recultivation measures and measures to prevent swamp formation and desertification.
18. E.g. permit charges, contributions to municipal associations.
19. Expenditure on, for example, planning, recultivation, near-to-nature restoration, consultancy services, measurements, analyses, research and development (not on products to be marketed), carried out internally or by third parties. Expenditure on expert opinions, insurance and contributions to cooperatives should also be included. Please do not include reserves, e.g. for recultivation and restoration to nature. Actual expenditure should be entered here.

Section III

20. In accordance with § 2 (7) of the Soil Protection Act (BBodSchG) of 17 March 1998 (BGBl. I, p 502), **soil decontamination** means measures for 1) removing or reducing pollutants (decontamination measures); 2) preventing or reducing the spread of pollutants in the long term without removing them (safeguarding measures); 3) removing or reducing harmful changes in the physical, chemical or biological composition of the soil.

    Pursuant to § 2 (6) of the Federal Soil Protection and Contaminated Land Order (BBodSchV) of 12 July 1999 (BGBl. I, p. 1554), pollutants include **substances and preparations** which, owing to the fact that they are harmful to health, their longevity or their bio-availability in the soil, or owing to other properties and their concentration, are liable to damage soil functions or represent a danger of some other kind.
21. Current expenditure on the running of soil decontamination plants means the running costs of excavation and transport facilities, installations for waterproofing contaminated soil and plant for the thermal, biological or physical/chemical treatment of contaminated soils.
22. Expenditure on, for example, planning, consultancy services, measurements, maintenance and repairs carried out internally or by third parties, plus rents, leases and taxes such as property tax on land used for environmental protection.
23. Expenditure on, for example, fees for permits for soil decontamination installations, provided the fees are not capitalised, contributions to municipal associations, including any charges and contributions connected with the running of soil decontamination plants.
24. Expenditure on, for example, planning, measurements, analyses, research and development (not on products to be marketed), carried out internally or by third parties. Expenditure on environmental-protection officers, consultancy services in connection with the setting up and running of an environment management system, expert opinions, insurance, contributions to cooperatives and decommissioning costs resulting from environmental-protection legislation should also be included. Services connected with the plants listed in Section III (1) of the survey form should not be entered here.

Section IV

25. **Emission charges** to be entered are those which have to be paid on the enterprise's emissions into the environment, such as effluent and solid waste charges.
26. **Effluent charges** resulting from the Taxes on the Discharge of Effluent into Receiving Waters Act (AbwAG). The charges to be entered are those paid during the accounting year. Ground water charges, water intake fees and concession fees should not be included.
27. **Licence fees (charges under *Land* law)** are those resulting from the North Rhine-Westphalia Waste Act (LAbgG). The fees paid during the accounting year should be entered.

Annex 3 Links to the OECD/Eurostat 'Environment industry' manual

In the context of globalisation, technological change, and new political priorities, policy makers have expressed a strong interest in the environmental goods and services industry. This is seen as a new growth sector, generating wealth and creating jobs as well as playing a major role in the transition of economies towards sustainable development.

In its Chapter X the 1994 SERIEE manual already provided some guidelines for the 'Development of a recording system for eco-activities' (see SERIEE § 10031 to 10039). In SERIEE, 'eco-activities' designated all those activities which produce EP services, connected products and adapted products, specialised facilities, equipment and products involved in the execution of EP activities. Eco-activities therefore expanded the scope of EPEA and SERIEE accounts to include the production of all products used for environmental protection.

This 'eco-industry' or 'environment industry' cuts across standard industrial classifications and its identification requires specific surveys and analysis that is undertaken in different countries in a comparable way. For this reason OECD and Eurostat developed a manual for data collection and analysis (OECD/Eurostat 1999). The OECD/Eurostat manual includes definitions, classifications, variables of interest, data sources and methods for assessment. The OECD/Eurostat environment industry manual replaces the relevant parts of the 1994 SERIEE's Chapter X.

Definition and classification of the environment industry

OECD and Eurostat have defined and classified the environment industry as consisting of 'activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems'. This includes cleaner technologies, products and services that reduce environmental risk and minimise pollution and resource use.

At the first level activities are classified according to three main groups:

A) The ***pollution management group*** comprises goods and services that are clearly supplied for an environmental purpose, have a significant impact in reducing polluting emissions and that are easily statistically identifiable.

B) The ***cleaner technologies and products group*** comprises goods and services which reduce or eliminate negative environmental impacts, but which are often supplied for other than environmental purposes and for which statistical assessment remains disputed, difficult or expensive.

C) The ***resources management group*** comprises goods and services which may be associated with environmental protection, although their prime purpose is not environmental protection (e.g. energy saving and management, renewable energy, etc.). This group and the corresponding collection of data are still in the development stage.

Under these three main groups are descriptions of equipment and materials, services, construction and installation for various environmental protection activities (air pollution control, wastewater management etc), and production of equipment, technology, specific materials and services for cleaner or resource efficient technologies and processes, and for cleaner or resource efficient products.

Mapping environmental activities (from OECD/Eurostat 1999, page 11)

Business activities / ***Environmental goods and services classes***	**Production of equipment and specific materials**	**Provision of services**	**Construction and installation of facilities**	***.....***
Pollution management group				
Air pollution control				
Wastewater management				
Solid waste management				
Remediation/clean-up of soil and water				
Noise/vibration abatement				
Monitoring, analysis, assessment				
Cleaner technologies and products group				
Resource management group				

Note: This matrix is used to allocate business activities carried out by the environmental goods and services industry to environment classes. The environmental goods and services industry is assessed by filling the cells to indicate where satisfactory definitions and reliable data are available. This process can be repeated to adjust the classification to structural changes in the industry. The matrix is designed to allow comprehensive identification of environmental goods and services industry classes. Not all cells in the matrix can be satisfactorily filled due to limitations in the current state of knowledge and data collection possibilities. In addition, not all the cells of the matrix are considered to be of sufficient quantitative importance to justify major investment in data collection and research.

Relation between SERIEE and the environment industry coverage

The groups A (pollution management) and B (cleaner technologies) have a direct correspondence to the SERIEE environmental protection expenditure account, whereas group C (resource management) corresponds to the SERIEE resource mobilisation and management accounts. An exception are environment industry activities related to ***nature protection***. In the environment industry manual they are classified under resource management whereas in SERIEE they are classified under environmental protection activities.

Equipment and specific materials for pollution management correspond to the intermediate consumption or gross fixed capital formation of specialised and ancillary producers as well as the use of clean products. Together with the equipment, the construction and installation for pollution management corresponds to investment for environmental protection.

On the whole, the environment industry definition and coverage allow the establishment of very close links between the environment industry and the environmental protection and management accounts. The environmental protection expenditure accounts are a good candidate for the assessment of the environmental industry as they describe the supply and uses of environmental protection services, gross fixed capital formation for environmental protection as well as the use of cleaner products. This represents a major part of the environmental industry pollution management group.

The table below gives an overview of the coverage of the environmental industry (pollution management and cleaner technologies and products groups) by the environmental protection expenditure account.

Coverage of the environmental industry by the EPEA

Environmental industry	EPEA
Pollution management group	
Environmental services (produced as principal, secondary or ancillary activity)	production and uses of EP services covered by the supply-use tables
Environmental specific materials	covered through the uses of clean products which are exclusively for environmental protection (e.g., catalytic converters, products for septic tanks); however products used as intermediate consumption by characteristic producers are not explicitly shown
Environmental specific equipment, construction and installation	Covered through the gross fixed capital formation of EP producers and uses of clean products (e.g. septic tanks)
Cleaner technologies and products group	
Cleaner technologies	Covered through the gross fixed capital formation of characteristics producers (extra costs only)
Cleaner products	covered through the uses of clean products which are not exclusively for environmental protection (e.g., desulphurised fuels – extra costs only); however products used as intermediate consumption by characteristic producers are not explicitly shown
Resource management group	
	Nature protection activities

Main data sources and methods for assessing the environment industry

The main data sources are very similar to those for environmental expenditure and include standard statistics (e.g. some ISIC categories) and specific surveys. The main approaches to measuring the environment industry are:

- Supply side approach (specific surveys of environment industry producers, etc.)
- Demand side approach (environmental protection and resource management expenditure)
- Integrated supply-demand approach (not an independent method in itself but a combination of the supply and demand side data within an accounting framework).

The integrated supply-demand approach and environmental input-output tables also are approaches that aim at full consistency of supply side and demand side data and that allow to estimate the environment industry (or, alternatively, expenditure categories) with the help of input-output techniques.

The EPEA reconciles the uses and the supply of environmental protection services and describes the gross fixed capital formation of specialised and ancillary characteristic producers, which on the whole represent the main part of the pollution management group of the environmental industry. The EPEA provides direct supply-side and demand-side data (environmental protection services, expenditure) and is thus an important source of data for all methods for assessing the environmental industry, including as a part of the integrated supply-demand approach.

However, the EPEA is mainly interested in the uses of resident units, whatever the origin (domestic production or imports) whereas the environment industry covers the production by resident units, whatever the uses (domestic consumption or exports). Furthermore, the environment industry includes the description of the production of clean products as well as investment goods and construction activity. Due to this extended scope, trade is a much more important issue for the environment industry assessment (but data are not easy to find).

Data classified by standard trade statistical codes (*e.g.* HS commodity codes) provide a first-round measure of trade in environmental goods. However, coverage by standard trade codes is limited which results in an underestimated total trade volume. It is estimated that the information derived from selected trade codes identified clearly as environmental goods represents only about 20% of total international trade flows for environmental goods. This is because the majority of the environmental industry goods are multi-purpose products (*e.g.* filters, pumps, control equipment, etc.) and data for trade in environmental services are not provided, because services are not included in the HS commodity code system.

In general, as the environment industry accounts are often based on specific primary data (e.g. specific surveys of environment industry producers), integration of supply-side data with expenditure accounts can provide more detailed and reliable results.

Specific supply-side survey

By using a specific survey, it is possible to provide detailed information covering the most relevant economic variables (*e.g.* turnover, employment and exports by environmental goods and services categories, by size class of enterprise and with reference to standard industrial classifications, R&D) for most environmental goods and services industry segments.

When a specific supply survey is to be carried out, it is suggested that a detailed table be built establishing correspondences between the enterprises surveyed and the categories of the general national economic classification of activities. This can be done by creating a link between the code for each enterprise and the activity to which it belongs in the standard classification system. In such a way, some information can be derived. For example, value added can be evaluated by using existing data collected according to standard classifications. This table will also prove useful in designing the population for future surveys.

However, specific surveys of environmental goods and services enterprises are time- and resource-intensive and present some inconveniences. For example, information for turnover and labour employed in the production of environmental goods and services are more easily obtained when these are marketed. Surveys are less effective in measuring values for the same variables when activities are non-market, ancillary or multi-purpose. Furthermore, double counting is a problem specific to comprehensive surveys with respect to turnover estimates. For example, if filter cloths and complete filters are both included in the list of environmental goods, the same filter cloths may appear twice. This problem is particularly severe in the field of waste management as it is characterised by complex relationships among public and private waste collectors, specialised treatment operators, recycling firms, etc. Also, survey results often include information relating to secondary, non-environmental activities. Even if it is possible to exclude this output, it may be difficult to separate out the labour and other costs according to whether they are connected to the environmental or the non-environmental output.

Data from trade associations or specialised business associations

Trade associations are a further source of information on the environment industry as they regularly publish data on their members. This usually covers a particular class or sub-class of the industry - private or municipal waste management, urban wastewater collection and treatment, recycling firms, equipment providers, etc. Turnover and employment data, physical parameters and in some cases trade or value added are usually reported. In general, these detailed data may complete existing data on the environment industry, but they are insufficient to provide a wider picture of the whole industry. Trade association data are particularly useful for the assessment of environmental management, contracting and engineering services which are difficult to measure through standard surveys and not separately identified in the EPEA.

Cleaner technologies and products

Clear definition, identification and easy measurement of integrated or cleaner technologies and products have proved difficult despite their increasing importance, for example, for sustainable development and the interest in a more integrated regulatory approach to environmental protection. Cleaner technologies and products are determined with reference to 'standard' technologies and products. In a dynamic perspective, the cleaner technologies and products of today will become the 'standard' technologies and products of tomorrow. Following this approach requires very detailed information. Moreover, the question of the

proportion of, for example, turnover in cleaner technologies and products that should be attributed to the environmental protection industry (*e.g.* cleaner cars) remains open.

A number of methods which can be used to account for cleaner technologies and products have been identified. However it is important to consider that, although these approaches are relatively comprehensive and consistent with the aim of defining and assessing cleaner technologies and products, they are either limited or still at an experimental stage.

(a) Measurement of *R&D, innovation and engineering efforts* to improve environmental performance of technologies, processes and products. This would focus on *measuring R&D and related innovation and engineering costs*. R&D, innovation and engineering costs are not always possible to obtain, particularly in the business sector. Nevertheless, some R&D surveys do already capture these values, and respondents indicate - in budgetary or full-time equivalent employment terms - specific environmental research, innovation or engineering efforts.

(b) Measurement of *efforts* to improve environmental performance by measuring the incremental cost of cleaner technologies and products. This is the SERIEE approach, which considers 'cleaner' technologies and products that, from an expenditure point of view, are *more costly* than the equivalent less-clean alternative products. Only the extra costs are considered as environmental protection expenditure. This requires comparing the price of the clean product with that of the superseded item. However, from a supply-side perspective, technologies which are less polluting could also be less costly.

(c) *Creation of a list of cleaner technologies and products*. This approach consists of creating a comprehensive list of dedicated cleaner technologies, processes and products. For example, the Dutch Ministry of Finance has developed a list of cleaner technologies which is updated each year, to implement a tax-incentive system for cleaner production investment. This could be complemented with an *Eco-label approach* based on labelling procedures, once these are complete and effective. However, the eco-label approach is currently impracticable for many reasons (*e.g.* slow product identification, difficulties in defining unambiguous criteria and methodologies for the labelling procedure, under-representation of SME products). Similarly, *'leading market edges'* could be measured. This approach attempts to measure for each product group that part which is considered as the 'leading green edge' of the market, based on current standards. For example, in the field of construction, the market share of low-energy houses could be estimated.

(d) *Physical assessment*. This approach consists of measuring and evaluating reductions in pollutant emissions and waste generation due to cleaner technologies, and placing an economic value on these reductions (*e.g.* savings in disposal costs).

Annex 4 The complete EPEA tables of the Worked Example

Presentation

In this annex the standard EPEA tables for the Worked Example are presented in Excel format. The annex is based on the full set of data presented in the Worked Examples 3 to 10. The links between tables as well as the data used to fill in the tables are made explicit. Tables A to C1 are presented for only one year and for the aggregate over all CEPA classes. The complete set of all tables is available in the form of linked Excel sheets on the Circa Website (http://forum.europa.eu.int/Public/irc/dsis/pnb/library). Differences may occur due to rounding.

Table B

Table B (production of EP services) is the first table to be filled in.

The most important data (i.e. those that directly determine national expenditure) are on the rows 1.2.2. seq. (*environmental protection output*) and 2 seq. *(gross fixed capital formation* and other capital transactions).

Environmental protection output either comes from surveys of producers (market output of specialised producers and secondary output by non-specialised market producers), or is calculated via the cost of production (non-market and ancillary output). It may also be estimated via other methods, e.g. the price-times-quantity method.

When the value of output is calculated via the cost of production, data used are: current outlays for environmental protection by government (i.e. intermediate consumption, compensation of employees, other taxes on production from financial statistics or functional analysis) and in-house expenditure for internal environmental measures by industries (i.e. intermediate consumption, compensation of employees, other taxes on production less other subsidies on production from specific surveys). These data have to be complemented by the consumption of fixed capital calculated via the capital stock model.

For specialised government market producers, consumption of fixed capital is also calculated by the capital stock model and entered in row 1.1.3 under specialised producers; the net operating surplus for these producers is calculated as a difference between output (sales) and other current uses (rows 1.1.1 to 1.1.5). This calculation is important as a substantial negative net operating surplus for market producers of the general government has to be compensated by implicit subsidies that are entered in Table A.

Other important elements of Table B are:

- gross fixed capital formation and other capital uses. It comes from the functional analysis of government transactions, industrial surveys (other specialised producers) and specific expenditure surveys (capital formation for ancillary output). It also goes directly to Table A,
- intermediate consumption of characteristic services by specialised producers. These are to be identified in order to be deducted from domestic uses of characteristic services,
- other taxes and subsidies on production. The other subsidies on production are entered in Table A as a component of national expenditure.

	A	B	C	D	E	F	G	H	I
1	TABLE B: PRODUCTION OF ENVIRONMENTAL PROTECTION SERVICES								
2			Categories of producers						
3			Specialised producers		Non-specialised producers				
4			GG & NPISHs	Other	secondary output	ancillary output	Total		
5	1	CURRENT TRANSACTIONS			from specific analysis, see WE 12 and WE 13		from specific surveys see WE9		
6	1.1	Current uses							
7	1.1.1	Intermediate consumption	1,171.1	6,978.6		2,228.4	10,378.1		
8	1.1.1.1	of which EP services	187.9	2,793.4	nr	nr	**2,981.2**	to Table B1	
9	1.1.1.2	of which adapted and connected products				nr			
10	1.1.2	Compensation of employees	937.0	3,573.2		1,783.3	6,293.5		
11	1.1.3	Consumption of fixed capital	398.5	3,793.2		1,880.2	6,071.9	from capital stock model WE11, plus 9.6 for soil	
12	1.1.4	Other taxes on production		188.5			188.5		
13	1.1.5	Less other subsidies on production							
14	1.1.6	Net operating surplus	-92.9	732.9		by definition: 0	640.0		
15	1.2	Output (basic price or cost of production)	2,413.7	15,266.4	from industrial surveys and other approaches	5,891.9	23,572.0		
16	1.2.1	Non-environmental output		1,527.7		154.4	1,682.1		
17	1.2.1.1	related products		1,527.7		154.4	1,682.1		
18	1.2.1.2	other non-environmental output				-			
19	1.2.2	Environmental protection output	**2,413.7**	**13,738.7**	**383.6**	**5,737.5**	**22,273.5**		
20	1.2.2.1	non-market							
21	1.2.2.1.1	principal	From government budget analysis WE5 & WE6 1,257.1	-	-	-	**1,257.1**		
22	1.2.2.1.2	secondary		-		-			
23	1.2.2.2	market							
24	1.2.2.2.1	principal	1,156.6	13,738.7	-		**14,895.3**	to Table B1	
25	1.2.2.2.2	secondary			383.6		**383.6**		
26	1.2.2.3	ancillary	nr	nr	nr	5,737.5	**5,737.5**		
27	1.3	Current environmental protection resources	**1,027.1**	**13,738.7**	**383.6**		**15,149.4**		
28	1.3.1	Market output (including partial payments)	1,027.1	13,738.7	383.6	-	**15,149.4**		
29	1.3.2	Current transfers		-					
30	2	CAPITAL TRANSACTIONS						to Table A	
31	2.1	Gross fixed capital formation	375.6	3,723.9	-	1,591.6	**5,691.1**		
32	2.2	Other capital uses							
33	2.3	Investment grants received	10.5	331.3	from WE5 central government		**341.8**		
34	2.4	Other capital transfers received							
35	3	FINANCING BY PRODUCERS (1)	1,751.7	3,392.6		7,329.1	12,473.4		
36	4	Labour inputs (man year)	9,000.0	15,000.0	nr	6,000.0	**30,000.0**		
37	5	Stock of fixed assets	14,610.0	90,405.6	nr	34,164.4	**139,180.0**		
38							from capital stock model, WE11		
39	(1)	output plus balance of capital transactions minus resources							

Table B1

Table B1 is mainly filled-in from Table B (environmental protection output by categories, intermediate consumption of characteristic services by specialised producers). Other data are added for the calculation of supply at purchasers' prices. They first refer to taxes and subsidies on products, including non-deductible VAT (rows 4 to 7). These data come from the analysis of government transactions. Non-deductible VAT may also be calculated applying the VAT rate to those uses for which VAT is non-deductible. Implicit subsidies that compensate for a negative net operating surplus are not entered in Table B1 but directly in Table A. Imports (and exports for the calculation of domestic uses) are also introduced but are often small.

	A	B	C	D	E	F	G	H
1	TABLE B1: SUPPLY-USES OF CHARACTERISTIC SERVICES							
2			Non-market	Market	Ancillary	Total		
3	1	Uses of resident units (purchasers' prices)						
4	1.1	Intermediate consumption	from Table B -	**8,835.7**	**5,737.5**	**14,573.2**		
5	1.1.1	of which by specialised producers	-	2,981.2	nr	**2,981.2**		
6	1.1.2	of which by non-specialised producers	-	5,854.5	5,737.5	**11,592.0**		
7	1.2	Final consumption	1,225.1	6,784.8	-	**8,009.9**		
8	1.3	Gross capital formation (land improvement)	32.0	15.9		**47.9**		
9	2	Exports			to Table A			
10		Total uses (1+2) = total supply (3+4+5+6)	1,257.1	15,636.4	5,737.5	**22,631.0**		
11	3	Output (basic prices)	1,257.1	15,278.9	5,737.5	**22,273.5**		
12	4	Imports (customs price)	-		-			
13	5	Non-deductible VAT		357.5	-	**357.5**		
14	6	Other taxes on products (if any)			-			
15	7	Subsidies on products (if any)			from data on imports/exports			
16								
17			from waste and waste water services analysis (WE12, WE13)					
18								
19								

The main issue in Table B1 is to distribute the supply of market EP services among uses: final consumption and intermediate consumption. Uses may be directly available from a national accounts source (e.g. supply-use tables for some EP services). Final consumption may be known from household surveys and some part of intermediate consumption from surveys of industrial expenditure. The remaining intermediate consumption may be calculated by difference between supply, exports and the consumption already covered. VAT receipts may be another source - when such data are available, final uses may be calculated using the VAT rate. When direct sources are not available or incomplete, physical data can be used for the distribution of supply between domestic uses.

Balancing the supply-use table is necessary, and when independent data sources are used, some arbitration has to be made and the consistency of all data checked: non-deductible VAT with corresponding uses, distribution of uses with physical data, etc.

Table A

In Table A the domestic uses of characteristic services are entered from Table B1 and capital formation from Table B. These data are complemented with uses of connected and adapted products.

Starting with data from Tables B and B1, the total non-market output has to be distributed according to the actual users (households are the actual users of non-market output that takes the form of 'individual goods and services'). In the Table A used here, central and local government are distinguished.

Intermediate consumption of market EP services is distributed between non-specialised and non-characteristic producers. The basis for this distribution is constituted by the specific expenditure surveys of ancillary producers.

A specific calculation is made in order to distribute subsidies on the production of EP services (mainly market services). The other subsidies on production come from Table B and subsidies on products come from Table B1. When substantial and persistent, the negative net operating surplus of government market producers is compensated by implicit subsidies. These implicit subsidies are entered directly in table A. Subsidies are distributed according to beneficiaries, in general in proportion of the uses (intermediate and final consumption but also 'rest of the world' if EP services are exported).

New data to be entered in the Table concern mainly connected and adapted products (uses at purchasers' prices and subsidies on connected and adapted products). These data come from the connected and adapted products database. They also concern the 'other specific transfers' and the 'financing by the rest of the world', which come from the transfers database.

National expenditure for environmental protection is calculated for each category of user/beneficiaries as the total of each column.

Table C

Except as concerns the national expenditure by user, there is no direct correspondence between Table C and Table A. In order to complete Table C it is necessary to analyse each component of national expenditure and to determine the units which finance the different uses. For most of the components the analysis is straightforward. In the presentation below the consolidated Table C is obtained by adding two sub-tables.

The first one is for uses of EP services and gross capital formation for the production of EP services. For these components, financing is made by the units that use the EP services and that invest, except for that part of the gross capital formation that is financed by investment grants. For the part financed by investment grants, financing is made by the units (sectors) that pay the grants, except in the case of earmarked taxes. In this case the units at the origin of the earmarked funds used for the transfers are considered the financing units. In the example, some revenue from pollution taxes paid by producers is earmarked.

TABLE A: NATIONAL EXPENDITURE BY USERS/BENEFICIARIES

			Producers				Consumers				
			Specialised producers		Other producers		Government as collective consumer		Households as actual consumers	Rest of the world	Total
		Components of national expenditure for environmental protection	Govt & NPISHs	Other	non-specialised	non-characteristic	CG	LG			
1	Consumption of specific products										
1.1	Final consumption of EP services						882.9	342.2	6,784.8		8,009.9
1.1.1	market	-			-			-	6,784.8	-	6,784.8
1.1.2	non-market	-			-		882.9	342.2		-	1,225.1
1.2	Intermediate consumption of EP services				5,737.5	5,854.5					11,592.0
1.2.1	market	nr	nr			5,854.5	-	-	-	-	5,854.5
1.2.2	ancillary	nr	nr	5,737.5		-	-	-	-	-	5,737.5
1.3	Final consumption of connected and adapted products										
1.3.1	connected products	-	-	-				-	772.9	-	772.9
1.3.2	adapted products	-	-	-				-		-	0.0
1.4	Intermediatel consumption of connected and adapted products										
1.4.1	connected products	nr	nr				-	-	-	-	0.0
1.4.2	adapted products	nr	nr				-	-		-	0.0
2	Gross capital formation(1) for EP activities	375.6	3,723.9	1,591.6		-	-	-	-	-	5,691.1
3	Gross capital formation in specific products										
3.1	in connected products	nr	nr	0.0			-	-	-	-	0.0
3.2	in adapted products	nr	nr				-	-	-	-	0.0
3.3	in EP services (land improvement)	nr	nr			15.9	32.0	-	-	-	47.9
4	Specific transfers										
4.1	subsidies on production of										
4.1.1	EP services	nr	nr			205.5	-	-	287.7		493.1
4.1.2	connected products	nr	nr				-	-			0.0
4.1.3	adapted products	nr	nr				-	-			0.0
4.2	other specific transfers										
4.2.1	current	(-)	(-)	(-)		389.9	-	-			389.9
4.2.2	capital	(-)	(-)	(-)				-	-	103.5	103.5
5	Total uses of resident units (1+2+3+4)	375.6	3,723.9	7,329.1	6,465.7	914.9	342.2	7,845.4	103.5		27,100.3
5.1	current	-		5,737.5	6,449.8	882.9	342.2	7,520.3	0.0		20,932.7
5.2	capital	375.6	3,723.9	1,591.6	15.9	32.0	-	325.1	103.5		6,167.6
6	Financed by the rest of the world										
6.1	current					0.1					0.1
6.2	capital	10.5									10.5
7	National Expenditure for environmental protection (5-6)	365.1	3,723.9	7,329.1	6,465.7	914.8	342.2	7,845.4	103.5		27,089.7
7.1	current	-	-	5,737.5	6,449.8	882.8	342.2	7,520.3	0.0		20,932.6
7.2	capital	365.1	3,723.9	1,591.6	15.9	32.0	-	325.1	103.5		6,157.1

The second sub-table focuses on the uses of connected and adapted products and on specific transfers. Uses of connected and adapted products are financed by the users. For specific transfers, financing is made by the units (sectors) that pay the transfers, except in the case of earmarked taxes. In this case the units at the origin of the earmarked funds used for the transfers are considered the financing units. In the example, subsidies on EP services consist in implicit subsidies that benefit producers and households.

	A	B	C	D	E	F	G	H	I	J	K	L
1	**TABLE C: FINANCING OF NATIONAL EXPENDITURE**											
2			Users/beneficiaries									
3			Producers				Consumers					
4			Specialised producers		Other producers		Government as collective consumer		Households as actual consumers	Rest of the world	Total	of which current expenditure
5		Sectors of financing	Govt & NPISHs	Other	non-specialised	non-characteristic	CG	LG				
6	1	General Government (GG)										
7	1.1	Central Government (CG)	143.0	0.0	0.0	0.0	914.8	0.0	0.0	103.5	1,161.3	882.8
8	1.2	Local Government (LG)	222.1	1,369.1	0.0	205.5	0.0	342.2	287.7	0.0	2,426.5	835.3
9	2	NPISHs									to Table C1	
10	3	Corporations										
11	3.1	Specialized producers	0.0	2,023.5	0.0	0.0	0.0	0.0	0.0	0.0	2,023.5	0.0
12	3.2	Other producers	0.0	331.3	7,329.1	6,260.3	0.0	0.0	0.0	0.0	13,920.7	11,981.9
13	4	Households	0.0	0.0	0.0	0.0	0.0	0.0	7,557.7	0.0	7,557.7	7,232.6
14	5	National Expenditure	365.1	3,723.9	7,329.1	6,465.7	914.8	342.2	7,845.4	103.5	27,089.7	20,932.6
15	6	Rest of the world										
16	6.1	of which European Union	10.5	0.0	0.0	0.0	0.1	0.0	0.0	0.0	10.6	0.1
17	7	Uses of resident units	375.6	3,723.9	7,329.1	6,465.7	914.9	342.2	7,845.4	103.5	27,100.3	20,932.7
18												
19												
20	**Analysis of the financing of uses of characteristic services and capital formation for characteristic activities**											
21			Users/beneficiaries									
22			Producers				Consumers					
23		from analysis of government accounts WE 5 and WE6	Specialised producers		Other producers		Government as collective consumer		Households as actual consumers	Rest of the world	Total	of which current expenditure
24		Sectors of financing	Govt & NPISHs	Other	non-specialised	non-characteristic	CG	LG				
25	1	General Government (GG)										
26	1.1	Central Government (CG)	143.0				914.8				1,057.8	882.8
27	1.2	Local Government (LG)	222.1	1,369.1				342.2	0.0		1,933.4	342.2
28	2	NPISHs									0.0	
29	3	Corporations									0.0	
30	3.1	Specialized producers		2,023.5							2,023.5	
31	3.2	Other producers	ear-marked pollution taxes	331.3	7,329.1	5,870.4					13,530.8	11,592.0
32	4	Households							6,784.8		6,784.8	6,459.7
33	5	National Expenditure	365.1	3,723.9	7,329.1	5,870.4	914.8	342.2	6,784.8	0.0	25,330.2	19,276.7
34	6	Rest of the world									0.0	
35	6.1	of which European Union	10.5				0.1				10.6	0.1
36	7	Uses of resident units	375.6	3,723.9	7,329.1	5,870.4	914.9	342.2	6,784.8	0.0	25,340.8	19,276.8
37												
38		from table of transfers W7	**Analysis of the financing of specific transfers, connected and adapted products**									
39			Users/beneficiaries									
40			Producers				Consumers					
41			Specialised producers		Other producers		Government as collective consumer		Households as actual consumers	Rest of the world	Total	of which current expenditure
42		Sectors of financing	Govt & NPISHs	Other	non-specialised	non-characteristic	CG	LG				
43	1	General Government (GG)									0.0	
44	1.1	Central Government (CG)							0.0	103.5	103.5	
45	1.2	Local Government (LG)				205.5			287.7		493.1	493.1
46	2	NPISHs									0.0	
47	3	Corporations									0.0	
48	3.1	Specialized producers									0.0	
49	3.2	Other producers			0.0	389.9					389.9	389.9
50	4	Households							772.9		772.9	772.9

from Table A, following rules for imputing financing

from Table A, following rules for imputing financing

Table C1

Table C1 starts from the financing of the national current expenditure and then adds various elements coming either from Table B or B1, or from specific databases, namely the environmental tax databases.

	A	B	C	D	E	F	G	H
1		**TABLE C1: ENVIRONMENTAL RELATED FINANCING BURDEN**						
2			Institutional sectors					
3		Components of the financing burden	specialised corporations	non specialised corporations	Households including NPISHs	General government	Total (from Table C)	
4	1	Financing of current national expenditure	0.0	11,981.9	7,232.6	1,718.1	20,932.6	
5	2	Non-deductible VAT on current expenditure				-357.5	-357.5	
6	3	Taxes on production				-188.5	-188.5	from WE12 and WE13, sum of positive NOS for PEIC and large cities
7	4	Net operating surplus (positive NOS of firms from WE12 & WE13 plus 7.2 for soil)	-881.7			-251.4	1,133.1	
8	5	Any other profits						
9	6	Interest on fixed capital (from capital stock and interest rate)	987.0	2,049.9		5,314.0	8,350.8	
10	A	Net cost of environmental protection	105.2	14,031.7	7,232.6	6,234.7	27,604.3	
11	B	Environmental taxes		9,186.4	885.2	-10,071.6	0.0	
12	C	Environment-related financing burden (A+B)	105.2	23,218.1	8,117.8	-3,836.9	27,604.3	
13								
14								
15								

(from table B and B1)

(from environmental taxes database WE 8)

Annex 5 Useful categories in NACE Rev. 1.1 and in functional classifications

Annex 5.1: NACE Rev. 1.1 categories that identify environmental protection activities

The NACE is the official classification of economic activities in the European Union. The NACE Rev. 1.1 replaces the NACE Rev. 1 from statistical year 2003 onwards.

NACE Rev. 1.1 code	Category
23	Manufacture of coke, refined petroleum products and nuclear fuel
23.30x	Processing of nuclear fuel
37	Recycling
37.10	Recycling of metal waste and scrap
37.20	Recycling of non-metal waste and scrap
41	Collection, purification and distribution of water
41.00	Collection, purification and distribution of water
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles
51.57	Wholesale of waste and scrap
74	Other business activities
74.20x	Architectural and engineering activities and related technical consultancy
74.30x	Technical testing and analysis
75	Public administration and defence; compulsory social security
75.12x	Regulation of the activities of agencies that provide health care, education, cultural services and other social services, excluding social security
90	Sewage and refuse disposal, sanitation and similar activities
90.01	Collection and treatment of sewage
90.02	Collection and treatment of other waste
90.03	Sanitation, remediation and similar activities

Notes: This table is not exhaustive. Environmental protection activities may also be found in other NACE categories. Not all output of the activities listed is environmental protection output. An 'x' means 'part of'.

Annex 5.2: Selected explanatory notes to the NACE Rev. 1.1 categories

23.30 Processing of nuclear fuel

This class includes:

- reprocessing of nuclear fuels and treatment of radioactive nuclear waste

37 Recycling

This division includes:

- processing of waste and scrap and other articles, whether used or not, into secondary raw material. A transformation process is required, either mechanical or chemical. Typical is that in terms of commodities, input consist of waste and scrap, the input being sorted or unsorted but normally unfit for further direct use in an industrial process whereas the output is made fit for direct use in an industrial manufacturing process. The resulting secondary raw material is to be considered as an intermediate good, with a value but is not a final new product

This division excludes:

- *manufacture of new final products from (whether or not self-manufactured) secondary raw material, see 14 to 36*
- *wholesale of waste and scrap, including collecting, sorting, separating, stripping of used goods such as cars in order to obtain reusable parts, (re-)packing, storage and delivery, but without a real transformation process, see 50, 51, 52*
- *wholesale or retail sale of second-hand goods, see 50, 51, 52.50*
- *treatment of waste, not for further use in an industrial manufacturing process, but with the aim of disposal, see 90*

37.1 Recycling of metal waste and scrap

37.10 Recycling of metal waste and scrap

This class includes:

- processing of metal waste and scrap and of metal articles into secondary raw material. Examples for mechanical or chemical transformation processes are:
- mechanical crushing of metal waste such as used cars, washing machines, bikes, etc. with subsequent sorting and separation
- mechanical reduction of large iron pieces such as railway wagons
- shredding of metal waste, end of life vehicles, etc.
- other methods of mechanical treatment such as cutting, pressing to reduce the volume

37.2 Recycling of non-metal waste and scrap

37.20 Recycling of non-metal waste and scrap

This class includes:

- processing of non-metal waste and scrap and of non-metal articles into secondary raw material. Examples for transformation processes are:
  - reclaiming of rubber such as used tyres to produce secondary raw material
  - sorting and pelleting of plastics to produce secondary raw material for tubes, flower pots, pallets and the like
  - processing (cleaning, melting, grinding) of plastic or rubber waste to granulates
  - reclaiming of chemicals from chemical waste
  - crushing, cleaning and sorting of glass
  - crushing, cleaning and sorting of other waste such as demolition waste to obtain secondary raw material
  - mechanical crushing and grinding of waste from the construction and demolition of buildings (including wood), asphalt
  - processing of used cooking oils and fats into secondary raw materials for pet food or feed for farm animals
  - processing of other food waste and food residual substances into secondary raw material

41.00 Collection, purification and distribution of water

This class also includes:

- desalting of sea water to produce water as the principal product of interest

51.57 Wholesale of waste and scrap

This class includes:

- wholesale (purchase and sale) of metal and non-metal waste and scrap and materials for recycling, including collecting, sorting, separating, stripping of used goods such as cars in order to obtain reusable parts, (re-) packing, storage and delivery, but without a real transformation process. Additionally the purchased and sold waste has a remaining value
- dismantling of end-of-life vehicles (dismantling of cars; wholesale in car wrecks; sale of parts from car wrecks to private persons and professional users).

This class excludes:

- *processing of waste and scrap and other articles into secondary raw material. A real transformation process is required. The resulting secondary raw material is fit for direct use in an industrial manufacturing process and is not a final new product, see 37.10, 37.20*
- *shredding of cars by means of a mechanical process, see 37.10*
- *retail sale of second-hand goods, see 52.50*
- *treatment of waste, not for a further use in an industrial manufacturing process, but with the aim of disposal, see 90*
- *collection and treatment of household and industrial waste, see 90*

74.20 Architectural and engineering activities and related technical consultancy

This class includes:

- elaboration of projects using air-conditioning, refrigerating, sanitary and pollution control engineering, acoustical engineering, etc.

74.30 Technical testing and analysis

This class includes:

- measuring related to cleanness of water or air, measuring of radioactivity and the like; analysis of potential pollution such as smoke or waste water

75.12 Regulation of the activities of agencies that provide health care, education, cultural services and other social services, excluding social security

This class includes:

- public administration of programmes aimed to increase personal well-being: health, education, culture, sport, recreation, environment, housing, social services, etc.

90 Sewage and refuse disposal, sanitation and similar activities

This division includes:

- collection and treatment of household and industrial waste, not for a further use in an industrial manufacturing process, but with the aim of disposal and a resulting product of little or no value

This division also includes:

- other activities such as street cleaning and snow removal, etc.

This division excludes:

- *processing of waste and scrap and other articles into secondary raw material. A real transformation process is required. The resulting secondary raw material is fit for direct use in an industrial manufacturing process and is not a final product, see 37.10 and 37.20*
- *wholesale (purchase and sale) in waste and scrap, including collecting, sorting, packing, dealing, etc., but without a real transformation process, see 51.57*

90.0 Sewage and refuse disposal, sanitation and similar activities

90.01 Collection and treatment of sewage

This class includes:

- collecting and transporting of human waste water from one or several users, as well as rain water by means of sewerage networks, collectors, tanks and other means of transport (sewage vehicles etc.) and their treatment and disposal
- treatment of waste water by means of physical, chemical and biological processes like dilution, screening, filtering, sedimentation, etc.
- maintenance and cleaning of sewers and drains
- emptying and cleaning of cesspools and septic tanks, sinks and pits from sewage, servicing of chemical toilets
- treatment of waste water from swimming pools and from industry

This class excludes:

- *construction of sewer systems, see 45.21*
- *clearing, de-blocking of sewers, see 45.33*
- *treatment of polluted ground or surface water in combination with cleaning up of environmental pollution, see 90.03*

90.02 Collection and treatment of other waste

This class includes:

- collection of waste from households and enterprises by means of refuse bins, wheeled bins, containers, etc
- collection of hazardous waste, used batteries, used cooking oils and fats, etc.
- collection of used oil from shipment or garages
- collection of construction and demolition waste
- operation of waste collection centres
- waste disposal by incineration or by other means:
- dumping of refuse on land or in water, burial or ploughing-under of refuse
- treatment and disposal of transition radioactive waste from hospitals, etc. [8]
- waste treatment by composting plants with the aim of disposal and a resulting by-product (compost)
- treatment and disposal of toxic live or dead animals and other contaminated waste
- disposal of used goods such as refrigerators to eliminate harmful waste

This class excludes:

- *treatment of food residual substances to manufacture food products, see 15*
- *treatment of slaughter residual to produce animal feeds, see 15.7*
- *reprocessing of nuclear fuels and treatment of radioactive nuclear waste, see 23.30*
- *manufacture of compost, see 24.15*
- *processing food, beverages and tobacco waste into secondary raw material, see 37.20*
- *treatment of waste and scrap without a real mechanical or chemical transformation process and for sale to third parties, such as dismantling of cars, machinery or computers or such as sorting or pressing of paper, textile, plastics, wood waste, etc., see 50, 51, 52*
- *collection of waste as part of wholesale of waste, see 51.57*

[8] Type of radioactive waste (mainly from medical origin) which will decay within the period of temporary storage and may be suitable for management outside of the regulatory control system

90.03 Sanitation, remediation and similar activities

This class includes:

- decontamination of soils and groundwater at the place of pollution, either in situ or ex situ, using mechanical/chemical or biological methods
- decontamination and cleaning up of surface water following accidental pollution, e.g. through collection of pollutants or through application of chemicals
- cleaning up oil spills on land, in surface water, in oceans and seas – including coastal seas
- collection of refuse in litter-bins in public places
- outdoor sweeping and watering of streets, squares, paths, markets, public gardens, parks, etc.
- snow and ice clearing on highways, airport runways, including spreading of salt or sand, etc.
- clearing of mines and the like (including detonation)
- other specialised pollution control activities n.e.c.
- rental of lavatory cubicles

This class excludes:

- *cleaning of ditches and pest control for the benefit of agriculture, see 01.41*
- *purification of groundwater for water supply purposes, see 41.00*
- *stripping work of contaminated top soil as part of construction activities, see 45.11*
- *sealing of soils, see 45.11*
- *asbestos removal work, see 45.25*
- *transporting of polluted soil, already stripped off by third parties, see 60.24*
- *technical testing and analysis, see 74.30*
- *disinfecting and exterminating activities in buildings, see 74.70*
- *sewage activities, see 90.01*

Annex 5.3 Relevant categories in national accounts functional classifications

Classification of individual consumption by purpose (COICOP)

Division 04 – housing, water, electricity, gas and other fuels

04.4 Water supply and miscellaneous services related to dwelling

04.4.1 Water supply

04.4.2 Refuse collection

04.4.3 Sewerage collection

04.4.4 Other services related to the dwelling

Division 13 - individual consumption expenditure of NPISHs

13.6.3 Environmental protection

Classification of the purposes of non-profit institutions serving households (COPNI)

Division 08. Environmental protection

08.1.0 Environmental protection services

08.2.0 R and D

Classification of functions of government (COFOG)

Division 05. Environmental protection

05.1 Waste management

05.2 Waste water management

05.3 Pollution abatement

05.4 Protection of biodiversity and landscape

05.5 R and D

05.6 Other

Bibliography

Australian Bureau of Statistics (1995): Cost of environmental protection, selected industries 1991-92.

Australian Bureau of Statistics (1999): Environmental protection expenditure 1995-96 and 1996-97.

Banfi S. and R. Iten – INFRAS (1996): SERIEE-Tables for Switzerland, report prepared for Eurostat and for the Swiss Federal Office of Statistics. Eurostat meeting document SERIEE/96/2.

Bombana M., C. Costantino, F. Falcitelli, A Femia, C. Segatori , A Tudini, M. Vannozzi – ISTAT (1999): The ISTAT methodology for calculating general government expenditure on environmental protection, Eurostat meeting document ACCT-EXP/99/4.2.5.

Commission of the European Communities, International Monetary Fund, OECD, United Nations and World Bank (1993): System of National Accounts 1993.

C. Costantino, F. Falcitelli, A Femia, C. Segatori , A Tudini, M. Vannozzi – ISTAT (2000): SERIEE, EPEA and the CEPA classification – Methodological aspects and implementation issues.

De Boo, A. J. (1995): Accounting for the costs of clean technologies and products, paper prepared for the second meeting of the London Group, Washington March 15-17, 1995.

De Haan M., De Boer S. and L. Hiemstra – Statistics Netherlands (1998): Environmental expenditure revisited in the Dutch national accounts and NAMEA, report prepared for Eurostat and DG Environment.

Department of the Environment, Transport and the Regions – United Kingdom (1998): Environment expenditure by industry.

Desaulty D. and L. Doisneau – IFEN (1996): SERIEE's Environmental Protection Expenditure Account – waste and wastewater management, Eurostat meeting document SERIEE/95/9 rev1.

Desaulty D. and Ph. Temple (1999): In 1997, France spent 145 billion francs on environmental protection, les données de l'environnement – économie – numéro 46, IFEN, English translation by the European Commission.

Dietz E., R. Kuipers and R. Salomons – Statistics Netherlands (2000a): Environmental-related Employment in the Netherlands 1997, Eurostat Working Paper No. 2/2000/B/3.

Dietz E. – Statistics Netherlands (1995): Testing SERIEE: the Dutch Experience, report prepared for Eurostat, Eurostat meeting document SERIEE/95/11/rev.

Dutch Ministry of Housing, Spatial Planning and the Environment (VROM) (1999): Costs and benefits in environmental policy – Definitions and computational methods, Publicatiereeks milieustrategie 1999/1.

ECOTEC (1996): UK Environmental Protection Expenditure by Industry and Application of SERIEE in the United Kingdom, report prepared for Eurostat and for the Department of the Environment of the United Kingdom, Eurostat meeting document SERIEE/96/5.

ECOTEC, BIPE and IFO (1997): An estimate of Eco-industries in the European Union 1994, prepared for DG Environment and Eurostat, Eurostat Working Paper No. 2/1997/B/1.

Etwil P. – Statistics Denmark (1999): Environmentally-related taxes in Denmark, Eurostat meeting document ACCT-EXP/99/5.2.1.

European Commission (1994a): SERIEE 1994 Version - Office for Official Publications of the European Communities, Luxembourg.

European Commission (1994b): Environmental protection expenditure - Data Collection methods in the public sector and industry - Office for Official Publications of the European Communities, Luxembourg.

European Commission (1996): European System of Accounts ESA 1995, Office for Official Publications of the European Communities, Luxembourg.

European Commission (1998): Environmental Protection Expenditure in Member States First edition 1998-96, Office for Official Publications of the European Communities, Luxembourg.

European Commission (2000a): Environmental taxes in the EU – Statistics in Focus Theme 2, No. 20/2000, Office for Official Publications of the European Communities, Luxembourg.

European Commission (2000b): Environmental Protection Expenditure by EU Institutions – Statistics in Focus Theme 8, No. 3/2000, Office for Official Publications of the European Communities, Luxembourg.

European Commission (2000c): Accounts for Subsoil Assets – Results of Pilot Studies in European Countries, Office for Official Publications of the European Communities, Luxembourg.

European Commission (2001a): Environmental taxes – a statistical guide, Office for Official Publications of the European Communities, Luxembourg.

European Commission (2001b): Environmental protection expenditure in Europe – Data 1990-99, Office for Official Publications of the European Communities, Luxembourg.

European Commission (2001c): Environmental protection expenditure in Europe – Statistics in Focus Theme 8, No. 7/2001, Office for Official Publications of the European Communities, Luxembourg.

European Commission (2001d): NAMEAs for air emissions – Results of Pilot Studies, Office for Official Publications of the European Communities, Luxembourg.

European Commission (2002): Environmental Protection Expenditure Accounts - Results of SERIEE pilot applications, forthcoming.

Eurostat (1997): SERIEE Task Force meeting February 20-21, 1997 – Conclusions.

Eurostat (1998): SERIEE Task Force March meeting 25, 1998 – Conclusions.

Eurostat (2000a): SERIEE Task Force meeting March 20 –22, 2000 – Conclusions, Eurostat meeting document ACCT/00/4.6.1.

Eurostat (2000b): SERIEE Task Force meeting November 27 –29, 2000 – Conclusions, Eurostat meeting document ACCT-EXP/01/2a.

Eurostat (2001a): Classification of Environmental Protection Activities and Expenditure (CEPA 2000) with explanatory notes, submitted to the United Nations Expert Group on International Economic and Social Classifications – meeting of 18-20 June 2001 in New York.

Falcitelli F. and A. Tudini – ISTAT (1999): The 1999 survey on industry and services EPE in Italy.

French Ministry for Regional Development and the Environment (various years): Données économiques de l'environnement.

Fukami M. – Japanese Economic Planning Agency (2000): Second Trial estimation of the environmental protection expenditure account and trial estimation of the waste account in Japan.

Gié G. and A. Steurer (1998): A comparison of frameworks for environmental expenditure accounting, paper prepared for the fifth meeting of the London group on national accounts and the environment, Fontevraud May 25- 29, 1998.

Gié G. and A. Steurer (2000): review of methodological aspects of SERIEE, a paper for the SERIEE and SEEA chapter 4 Task Force March 20-22; 2000.

Gravgaard Pedersen O. – Statistics Denmark (1999): SERIEE Accounts for Environmental services Denmark 1994, a study for Eurostat and DG Regional Policy, Eurostat meeting document ACCT-EXP/99/4.2.2.

Hass J. and K. Ø. Sørensen – Statistics Norway (1999): A preliminary review of eco-industry and environmental protection expenditure accounts, a report prepared for Eurostat, Eurostat meeting document ACCT-EXP/00/4.2.7.

Hornum H. – Statistics Denmark (2000): Environmental taxes and subsidies in the Danish NAMEA, Eurostat Working Paper No. 2/2000/B/12.

IFEN (1998): SERIEE: Compte de la dépense de protection de l'environnement – Gestion des déchets, Gestion des eaux usées, protection de l'air et du climat, réduction de bruit et des vibrations, report prepared for Eurostat by the Institut Français de l'environment.

Johansson U. – Statistics Sweden (1998a): Disaggregation of environmental expenditure and incorporation in a NAMEA Framework, a report prepared for Eurostat and DG Regional policy.

Johansson U. – Statistics Sweden (1998b): Environmental protection expenditure by industry 1999, interim report.

Kestemont B. – Institut National de Statistique – Service environnement (1999): Le compte des dépenses de protection de l'environnement en Belgique, Eurostat meeting document ACCT-EXP/99/4.2.1.

Kuhn M. and U. Lauber – Statistisches Bundesamt (1996): Implementation of SERIEE in Germany – extended version, report prepared for Eurostat, Eurostat meeting document SERIEE/95/10 rev.1.

London Group (2001): The SEEA 2000, Chapter V Environmental protection and resource management accounts, Voorburg meeting draft.

Milota E. and A. Aichinger – Austrian Central Statistical Office (1999): SERIEE Tables for Austria 1995 and 1996 (abridged English version), a study for Eurostat and DG Environment, Eurostat meeting document ACCT-EXP/99/4.2.6.

National Statistical Service of Greece (1998): Environmental expenditure in Greek Industry 1995.

Ministry of the Environment of the Czech Republic (1998): Implementation of environmental accounting in the CR: Possibilities, Prague.

Nordentoft A. and E. Vesselbo – Statistics Denmark (1996): Application of SERIEE's EPEA in Denmark, report prepared for Eurostat, Eurostat meeting document SERIEE/96/6.

OECD (1997): Statistical Framework on Environmental Taxes in OECD Member Countries; document DAFFE/CFA/WP2(97)5.

OECD (1999a): Consumption Tax Trends 1999 edition.

OECD (1999b): Economic instruments for pollution control and natural resource management in OECD countries: a survey, document ENV/EPOC/GEEI(98)35/REV1/FINAL.

OECD (2001): Measuring Capital – OECD Manual: Measurement of Capital Stocks, Consumption of Fixed Capital and Capital Services, Paris.

OECD/Eurostat (1999): The Environmental Goods & Services Industry – Manual for data collection and analysis, Paris.

Pasurka C. and D. Nestor – United States Environmental Protection Agency (1995): The US environmental protection industry: a proposed framework for assessment.

Riege-Wcislo W. – German Statistical Office (1999): Implementation of SERIEE in Germany Reporting Year 1995, a study for Eurostat and DG Environment, Eurostat meeting document ACCT-EXP/99/4.2.4.

Romao N. – Instituto Nacional de Estatistica do Portugal (2000): Environment Industry and Employment in Portugal 1997, Eurostat Working Paper No. 2/2000/B/4.

Saarnilehto M. – Statistics Finland (1996): Testing SERIEE's Environmental Protection Expenditure Account in Finland, report prepared for Eurostat, Eurostat meeting document SERIEE/96/3.

Saarnilehto M. – Statistics Finland (1999): Environment industry statistics recent developments in Finland - a summary.

Schäfer D. – German Statistical Office (1992): The linking of monetary and physical data in SERIEE – the example of air pollution.

Sjölin M. and A. Wadeskog – Statistics Sweden (2000): Environment taxes and environmentally harmful subsidies in Sweden, Eurostat Working Paper No. 2/2000/B/11.

Statistics Austria (2001): Umweltschutzausgaben Österreichs [Environmental protection expenditure in Austria] 1999, Statistische Nachrichten 11/2001.

Statistics Canada (1994): Environmental protection expenditure accounts in the Canadian system of environmental and resource accounts, Catalogue No 16-505-GPE.

Statistics Canada (2001): Environmental Protection Expenditures in the Business Sector 1998, Environment Accounts and Statistics Division, http://www.statcan.ca/english/freepub/16F0006XIE/free.htm.

Statistics Norway (2000): Norwegian Economic and Environment Accounts (NOREA Phase 2), a report to Eurostat.

Steurer A. – Eurostat (1995): The environmental protection expenditure satellite account of Eurostat's SERIEE, paper presented at the second meeting of the London Group on national accounts and the environment, Washington March 15-17, 1995.

Steurer A. – Eurostat (1999): Conclusions from recent applications of the SERIEE's Environmental Protection Expenditure Account, Eurostat meeting document ACCT-EXP/99/4.3.1.

Steurer A. – Eurostat (1999): Capital stock accounts, Eurostat meeting document ACCT-EXP/99/4.3.4.

Stoltz P. – Statistics Sweden (1996): Testing SERIEE's Environmental Protection Expenditure Account in Sweden, report prepared for Eurostat, Eurostat meeting document SERIEE/96/4.

Tängdén L. and P. Svensson – Statistics Sweden (2000): The Environment Industry in Sweden, 1999, Eurostat Working Paper No. 2/2000/B/5.

Tudini A. – ISTAT (1999): Accounting for environmental expenditure: linking the micro and macro approach.

United Nations (2000): Classification of Expenditure according to Purpose: COFOG, COICOP, COPNI, COPP, United Nations - Department of Economic and Social Affairs - Statistics Division, New York.

Van der Mark R. – Statistics Netherlands (1998): Costs and Financing of Landscape management 1993. English translation by the European Commission. Eurostat meeting document SERIEE/98/2.