

SERIEE

European System for the collection of economic information on the environment — 1994 Version

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FOREWORD TO THE ELECTRONIC VERSION

In 1994 Eurostat published the SERIEE manual which sets out the conceptual framework for a monetary description of environment-related activities in line with the recommendations of Chapter XXI of the 1993 System of National Accounts. Except for some minor corrections this electronic version is identical to the paper version published in 1994 which is out of stock. The Numerical Example (Annex III to Chapter II) is available as an Excel file on Circa <http://forum.europa.eu.int/Public/irc/dsis/pnb/library>.

The main function of this electronic version of the 1994 SERIEE manual is as a reference document to the **SERIEE Environmental Protection Expenditure Accounts – Compilation Guide** that Eurostat published in 2002. This guide is designed to help compilers in the practical construction of environmental protection expenditure accounts. The guide also summarises the new developments since the publication of the 1994 SERIEE, including inter alia the **new Classification of Environmental Protection Activities and Expenditure (CEPA 2000)** or recommendations on connected and adapted products and in this regard replaces the 1994 SERIEE manual.

In 2001, Eurostat also published **Environmental Tax Statistics - A Statistical Guide** which can be downloaded from the official Eurostat Website <http://europa.eu.int/comm/eurostat> and the results of SERIEE pilot applications in several countries (**Results of pilot applications of the SERIEE's Environmental Protection Expenditure Account** – forthcoming).

Luxembourg, January 2002

Brian Newson
Head of Unit

FOREWORD TO THE PRINTED VERSION

In its Fifth Action Programme on the Environment, entitled "Towards sustainability", the European Union set an ambitious goal for itself - that of transforming its growth model in such a way that sustainable development becomes a reality. One major instrument - the improvement of data on the environment - has been highlighted in order to optimise from an economic point of view the implementation of the political measures established in the above-mentioned programme.

The White Paper on growth, competitiveness and employment identifies environmental protection as an important future market with a high potential growth and the development and application of cleaner technologies as a decisive competitive advantage.

In order to respond to these needs, Eurostat has included in its general programme of Statistics on the Environment the development and application of the European System for the Collection of Economic Information on the Environment (SERIEE). The SERIEE is set up as a series of environmental satellite accounts. This means that a proper link to economic statistics and national accounts is established. At the same time the SERIEE forms a bridge between environmental concerns and statistics, providing a powerful tool for analyses. The focus of the system in its current stage of development is environmental protection expenditure.

It is our hope, that SERIEE, in contributing to the harmonisation and improvement of statistical instruments, will facilitate the evaluation of the economic implications of environmental protection as well as the integration of environmental concerns in other policy fields.

This SERIEE manual replaces the preliminary version of 1992. Through its detailed rules of accounting within a consistent framework, it will help in improving international comparability and data quality. Those working in this area are urged both to follow this manual and to provide feedback to Eurostat so that the SERIEE and the manual can be improved.

The development of SERIEE in general, and of the now published SERIEE manual in particular, was only possible with the substantial support of many Member States and EFTA countries. This support is gratefully acknowledged.

Luxembourg, September 1994

David Heath
Director

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INTRODUCTION

Sustainable development is the path the European Union has chosen for its future. The European Union, in its Fifth Action Programme, called for information tools to stride forward on this path and to monitor the steps made. One of Eurostat's contributions to this concern was the development of the European System for the Collection of Economic Information on the Environment (SERIEE), made with the strong support of Directorate General XI - Environment, Nuclear Safety and Civil Protection, the Member States and international organisations.

This manual is built up as follows:

The introduction gives an executive summary of the manual.

Chapter I gives a more comprehensive description of the various approaches towards environmental economic accounting, especially of the System of integrated Environmental and Economic Accounting (SEEA) of the United Nations Statistical Office and of the SERIEE.

Chapter II - the largest chapter - describes in great detail the general accounting framework of the Environmental Protection Expenditure Account (EPEA), the valuation methods used, the EPEA's tables and the links to national accounts and to physical data.

Annex I to Chapter II contains the Single European Standard Statistical Classification of Environmental Protection Activities (CEPA) jointly developed by UN-ECE and Eurostat. Annex II describes details of the valuation of environmental protection output. Annex III gives a more practical insight to the accounting techniques of the EPEA by means of a fictitious numerical example.

Chapters III to IX describe the individual domains of environmental protection (air protection, waste and waste water management, noise abatement, protection of biodiversity and landscape, other environmental protection including radiation and research and development), their accounting particularities and the links to physical data.

Chapter X provides extensions and development of the SERIEE (e.g. input-output approaches) as well as a summarised description of the Resource Use and Management Account of SERIEE.

An index completes this publication.

Together with this manual, the report "Environmental Protection Expenditure - Data Collection Methods in the Public Sector and in Industry" is being published in the Studies Series of Eurostat (94/8D). This report provides useful and comprehensive information for the "intermediate systems of data collection" of the SERIEE. A collection of papers, entitled "Contributions of Member States and EFTA countries 1992 and 1993" is also available as an internal Eurostat document. The collection contains 26 documents prepared by 10 Member States and EFTA countries. The documents deal with various theoretical and practical aspects of SERIEE and are a valuable complement to this manual and to the above-mentioned report. A list of these documents may be found at the end of this publication.

Integration of economic and environmental information

There are currently two major lines of development in measuring the interaction between human activity and the environment:

- **indicators and indexes** (e.g. the *Pressure-State-Response* model adopted inter alia by OECD, Eurostat, World Bank), following closely the needs of environmental policy-makers, and
- **satellite accounts** (sometimes called "Green *National Accounting*"; e.g. the UNSTAT SEEA, the Dutch NAMEA and, to a certain extent, the French "Comptes du Patrimoine Naturel", the German "Umweltökonomische Gesamtrechnung" and others), following closely the SNA rules.

These approaches are complementary, and they both have incorporated the idea to measure society's efforts to protect the environment. In the terminology of the Pressure-State-Response framework of the indicator approach, SERIEE provides *response indicators*, measuring responses of society to environmental problems as expenditure for protection activities. The corresponding term of the satellite accounting approach would be "*defensive*" expenditure. In both cases, the information on protection expenditure would allow to assess the *financial contributions* of economic sectors in the various policy fields and to compare it to the "*success*", measured as reduction of pressures on the environment.

Eurostat will cover the physical data side with its "*Pressure Index project*", which will serve as a tool to judge the success of environmental policy in reducing pressures on the environment coming from human activities. The integration of SERIEE and the Pressure Index as well as the approaches of the SEEA type will allow (for each economic resp. institutional agent, but not necessarily at the micro level) to link

- the consumption of raw and auxiliary materials and energy, land use, pollutant generation and emissions of pollutants, treated or avoided pollutants, or, more generally, indicators for environmental pressure with
- value added, investment, exports, employees and environmental protection expenditure,

in order to arrive at a full-fledged profile of activities, sectors and products in terms of economics, employment and environment.

SERIEE's general structure

The SERIEE's focus is, as can be seen from its name, more on the economic side of the link between economy and environment. Nonetheless the main strength of SERIEE must be seen in its functioning as a bridge between physical and economic data. Therefore the links to physical environmental data are emphasised and established within the SERIEE and are indispensable for a variety of uses of the system.

The focal point of SERIEE are those economic activities and transactions that are aimed at:

- reducing and preventing pressures on the environment, or monitoring and restoring the environment,
- exploiting the environment.

These activities are seen from the two-fold economic and environmental angle:

- as cost and at the same time as market chances and
- as those activities which are most relevant for the environment in terms of pressure or prevention of pressure.

Consequently, the SERIEE currently comprises two satellite accounts:

- the Environmental Protection Expenditure Account (EPEA) and
- the Resource Use and Management Account.

Of these, the EPEA is currently more developed both in terms of accounting procedures and of experience collected by the Member States and Eurostat.

Nevertheless an extensive work on nomenclatures and on the implementation of new definitions and classifications is still needed.

The Environmental Protection Expenditure Account (EPEA)

The EPEA is designed as an economically oriented satellite account to the national accounts in a way that allows for links between economic and physical accounts. Several of such economically oriented satellite accounts have been developed to analyse specific *functions* within the economy (e.g. tourism, social protection, health, research and development, transport, etc.). A satellite account for environmental protection is - due to the nature of the field under consideration and the widespread variety of activities, products and specific financing mechanisms observed therein - among the most demanding in terms of data requirements and accounting rules.

Within such a functional analysis three points are of major importance:

- ensuring and maintaining the quality of the data,
- clearly showing the limitations of the particular satellite account alone,
- ensuring the usability of results by optimising the linkages.

The basic data for the EPEA are provided by "intermediate systems" of data collection. Such intermediate systems were developed for enterprises and for the government and are under development for specialised producers of environmental protection services and for households.

The EPEA itself provides a harmonisation of terms and definitions at European level as well as provisions to avoid double counting by means of an elaborate accounting framework. The *Single European Standard Statistical Classification of Environmental Protection Activities and Facilities* developed jointly by UN-ECE and Eurostat and approved by the Conference of European Statisticians in June 1994 was a decisive precondition.

The EPEA's main objectives are:

- to value the net cost of environmental protection measures borne by producers as well as the environment-related taxes paid by them so as to assess the consequences in terms of *international competitiveness*;
- to value the activities linked to environmental protection so as to determine the market for *environmental protection services, specialised facilities and adapted (clean) products in terms of output, employees and imports/exports*.
- Lastly, to evaluate the *effectiveness and efficiency of environmental protection measures* by linking monetary and physical data. The integration of physical data also makes it possible to link the cost of environmental protection measures to actual (or, perhaps, to avoided) pollution.

The EPEA describes within a framework consistent with the European System of integrated economic Accounts (ESA):

- the resources a nation spends for environmental protection (national expenditure for environmental protection),
- the ways of financing this expenditure as well as the financial burden related to environmental protection (environment-related financial burden),
- the production of environmental protection services.

The overall aggregate - national expenditure for environmental protection - is a useful indicator of the relative economic importance of environmental protection in general and of specific environmental domains in particular. It is broadly, if not totally, consistent with the main national accounts aggregate of GDP.

National expenditure makes it necessary to assess the State Aid schemes in the field of environmental protection as well as the amount of financing originated in the rest of the world for each country (especially EU financing).

The environment-related financial burden gives a direct estimation of the cost of environmental protection weighing on production as well as an assessment of the environment-related taxes ("green taxes") paid by producers. Therefore this aggregate is a good indicator for the effects of environmental protection on international competitiveness in what concerns industries or branches.

To calculate the environment-related financial burden it is necessary to collect data on environment-related taxes and on subsidies, investment grants etc. These data - and the possible international comparisons - can also be a tool for policy.

Finally the data on the value of the environmental protection output and on the number of employees by environmental domain may be useful indicators for the size of this emerging market and for positive effects of environmental protection on the economy and on employment.

Outlook

At the current stage, the EPEA is mainly concerned with economic accounting, and its link to the national accounts is very close. This is expressed by the use of the same concepts and terms and the limited use that is made of the degrees of freedom provided by a satellite account approach. Very detailed provisions are described to avoid double counting in the aggregates of the EPEA.

This was done in order to support another function of the EPEA: that of being a "standard" economic statistic, which provides data on investment, employment and the size and composition of markets and which itself strengthens the database of national accounts in this particular area.

The important role of the EPEA as a bridge to physical data will be extended and strengthened in the future. This is already pinpointed on several occasions in this manual and strengthened by the description of the

environmental domains included in the Chapters III to IX and especially - partly in the form of an outlook to future developments and applications of SERIEE - in Chapter X.

The strengthening of the bridge to physical data will be possible with the improvement of physical data in general and in particular the "micro-foundation" in the form of environmental accounting and reporting standards for enterprises and governments. The collection of physical data and their accounting is the concern of specific work.

Important stimulus towards improved physical data are expected to come from ongoing work at the international level (OECD, UN-ECE, etc.) as well as from the experience already collected by Member States in physical accounting and especially from the work of Eurostat concerning material balances and flow accounts and the development of a framework for a pressure index as well as the work done in the areas of waste, air and water.

In the end it may be seen that this work went as far as it could go for the time being, encouraged by the 1993 SNA and by the approval of the joint UN-ECE and Eurostat Single European Standard Statistical Classification of Environmental Protection Activities in 1994. Already ongoing tests of SERIEE in five Member States will demonstrate the practicality of the approach and will provide experience leading to improvements.

Major future steps are necessary to improve the systems of data collection and the integration of physical data, to develop the other satellite accounts and to make it an even more useful tool for decision makers. The lines to follow are already visible.

Acknowledgements

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These results would not have been possible without the substantial and encouraging support from many Member State representatives in the sub-group "SERIEE" of the Working Party on "Environment Statistics". This support is gratefully acknowledged. The Member State representatives are listed in the annex to this introduction. The sub-group has discussed several versions of the manual and national experts have contributed with their own papers on special subjects. A collection of these papers is available at Eurostat (for a list of these papers see annex at the end of this publication).

From the international institutions Mr. Andreas Kahnert (UN-ECE) and Mr. Paul Schreyer (OECD) were engaged in the work.

From the Commission's services SERIEE stems from work undertaken by Directorate General XI - Environment and Nuclear and Civil Protection. We thank Mr. Günther Schneider, Mr. Ronald Uhel and Mr. Gérard Aubrée for their ongoing interest and support. Directorate General II - Economic and Financial Affairs - actively contributed to the discussions through the participation of Mr. Mathias Mors and particularly Mr. Jan Scherp.

The manual has been thoroughly reviewed by Eurostat's unit responsible for the development of the methodology of national accounts in Directorate B. Particularly Mr. Brian Newson and Mr. Werner Thon have contributed continuously. Mr. Louis Daney de Marcillac and the national experts Mr. Frits Bos and Mr. Albert Braakmann have ensured compatibility with the draft final version of the revised European System of Integrated Economic Accounts (ESA 1995).

Inside Eurostat F3 the project has been headed by Mr. Peter Römer (official on detachment from Germany) from 1991 to 1993. He was followed by Mr. Anton Steurer (official on detachment from Austria) who redrafted the EPEA's central framework and finalised this publication with the indispensable support of many experts. Among these Mr. Bram de Boo (CBS Netherlands), Mr. Gérard Gie (Planistat Europe), Mr. Brian Newson (Eurostat B0) and Mr. Dieter Schäfer (STABU Germany) may be highlighted. Important contributions came from Luisa Ribeiro (official on detachment from Portugal). Jochen Jesinghaus, from Eurostat F3, accompanied the work with critical advice.

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I. ENVIRONMENTAL ECONOMIC ACCOUNTING

The environment and economic development

- 1001 Increased awareness of the pressures exercised by economic development on the environment and natural resources is manifest world-wide. Among the elements which have contributed to this awareness are the perception and consequences, on a world scale, of climate change and deforestation as well as chronic underdevelopment. The report of the World Commission on Environment and Development (the Brundtland Report) which resulted in the Rio Conference of June 1992 occupies a special position in this process.

National and international approaches: sustainable development

- 1002 Although the Brundtland Report deals with many other fundamental aspects, there is no doubt that one of its essential contributions is the notion of sustainable development. Over the past few years, the notion of sustainable development has become one of the essential features of development policy on a national and international level.

Sustainable development designates a concept aimed at ensuring long-term continuity of economic and social development, which respects the environment and safeguards natural resources required for human activity. In other words, the goal is to meet the needs of the present generation without compromising the ability of future generations to meet their own needs."

- 1003 To ensure sustainable development requires, in particular:
- that the quality and judicious preservation of the natural capital stock and its resources be recognised as the basis for the continued existence of human activities and of economic and social development,
 - that, since the reservoir of raw materials is finite, the flow of substances at every stage be managed so as to facilitate or encourage optimum reuse and recycling, thereby avoiding and preventing depletion of the natural resource stock,
 - that the behavioural trends of citizens reflect awareness of the fact that natural resources are limited and that the consumption and use of these resources by one individual must not be detrimental to another, just as their exploitation by one generation must not be at the expense of succeeding generations.

A number of international agreements have expressed the determination to see economic development exercised within the context of a policy which safeguards the environment by means of concrete decisions (e.g. "Montreal Protocol" on CFCs).

Community Policy

- 1004 Among the principal aims (article 2) of the European Union treaty signed on February 7, 1992, is the promotion of sustainable development. Among the activities of the European Union, the treaty provides for the development of an environmental policy aimed at a high level of protection. It also stipulates that the need for environmental protection should be incorporated in the definition and implementation of the other Community policy-programmes.
- 1005 The Member States have drawn up policies in the environmental field. In the Netherlands and France, for instance, national priorities have taken the form of "national plans for the environment". Other countries (Germany, Spain, Italy, etc.) have expressed their priorities in this field through major statute laws.
- 1006 In its Fifth Action Programme on the environment, entitled "Towards Sustainability", the European Union has elaborated a new strategy for the environment and sustainable development. The final aim of this strategy is "to transform growth models within the European Union so as to embark on the path of sustainable development."

The principles stemming from this strategy are determined for the various economic units and sectors (public authorities, enterprises and the public at large). Elements of strategy and the medium to long-range goals, instruments and the time-frame for the measures are also indicated for the main target sectors.

- 1007 In order to bring about significant changes in present trends and practices and involve all sectors of society in this movement in a spirit of shared responsibility, the programme focuses on the need to formulate a wide range of instruments: legislative action, market-related measures, attendant horizontal measures and financial support mechanisms.

Among the instruments cited in the Programme, two are of particular importance:

Improvement of data concerning the environment

- 1008 Given the existence of serious gaps in basic data, statistics, indicators, the programme emphasises the need to procure basic data and to improve their compatibility and comparability.

Trends toward market awareness of the environment through pricing

- 1009 While recognising the difficulty of translating the value of certain environmental items into monetary terms, the programme stipulates that the mechanisms for determining values and prices and their compatible instruments must play a central role in the pursuit of sustainable development.
- 1010 The following are among the measures which must be taken in order to determine ecological cost and thus provide for the introduction of mechanisms capable of setting more appropriate prices on the environmental level:
- on the one hand, valuation of the natural and environmental resources of the Member States and development of ad hoc indicators capable of showing their rates of use and renewal,
 - on the other hand, extension and adaptation, based on scientific studies at national and European levels, of the traditional tools of economic statistics, namely by modifying key economic indicators, such as the gross domestic product (GDP), so as to reflect the value of natural and environmental resources in the production of present and future revenues.
- 1011 Another set of instruments concerns environmental audits and the adoption of environmental product standards (eco-labelling). These instruments should make it possible to go beyond the simple outlook of controlling that rules are respected and should provide the basis for industrial development compatible with the demands of sustainable development.
- 1012 In the programme, particular attention is paid to adapting fiscal instruments and support policies (structural funds) to environmental goals. Within this framework, the programme indicates that the polluter pays principle (PPP) must constitute the basis of economic and fiscal incentives: taxes and charges, state aid, etc. In the field of international economic relations, the programme reasserts the need to introduce environmental aspects in world trade negotiations.

Need for environmental data and valuation systems

- 1013 Recognition of the link-up between the environment and development as well as the determination to introduce environmental aspects in the formulation of general policies, whether at the national or international level, and, in particular, to follow up on the implementation of decisions, quickly poses the problem of setting up information, valuation and accounting systems for the economic aspects of the environment.

Economic data on the environment

- 1014 During the last few years, a large number of studies, at national and international levels, have centred on environmental integration within existing economic data systems. These endeavours have had various aims: from the simple collection of partial data (physical or monetary) to more ambitious endeavours for environmental economic accounting systems.

The data systems discussed in this section will deal solely with relations between the environment and the economy, to the exclusion therefore of systems describing the environment from the ecological angle only, as a physical system irrespective of its relationship to economic activity.

- 1015 It must be noted, generally, that no complete and coherent system for the description of the natural environment exists. Its absence gives rise to a series of problems as to the possibility of valuing the overall effects of economic development on the environment (valuation of damages) in not too uncertain terms. In these circumstances, much caution must be exercised when integrating such effects in environmental accounting systems.

Valuation approaches

Among the approaches retained for the introduction of environmental accounting systems, the following are of major importance:

Natural resource accounts

- 1016 Certain countries (e.g. France, Norway) have developed accounts in physical quantities whose purpose is to measure the descriptive parameters of the quantitative and qualitative state of the environmental heritage, as well as those transformations which affect it, either as a result of natural phenomena (self-regulation, self-purification, self-reproduction) or of human activities. These approaches can be linked up with accounting systems or material balances as well as with various applications of input-output tables in physical quantities.
- 1017 However, they run up against the impossibility of making a valuation, in monetary terms, of the total sum of the elements comprising the environmental heritage and therefore of fully integrating the physical and monetary description.

Nevertheless, this impossibility does not signify that an essentially physical description of the environment has no bearing on economic valuations; the aim of certain projects is in fact to set up information systems which may relate ecological and economic or monetary aspects.

Valuation of environmental protection expenditure

- 1018 Other approaches consist of valuations of certain monetary aggregates which make it possible to show expenditure linked to environmental protection measures. The main characteristic of these approaches is that they remain within the framework of traditional national accounts. In accordance with functionally oriented satellite account approaches, the uses of resources whose goal is environmental protection have to be identified.

Environmental protection may receive comprehensive meaning with the inclusion of natural resources management, of measures for the restoration of the environment following damage inflicted through human activities or may be restricted only to environmental protection and prevention measures.

These approaches, which may be linked to a physical description, are purposely limited and do not imply the modification of traditional aggregates of national accounts.

Integrated approaches

- 1019 Endeavours, undertaken principally within the framework of international bodies, have aimed at providing a coherent statistical accounting basis for the new concept of sustainable development. The main innovation of these endeavours has been to include the environmental heritage from the dual standpoint of the resources that it can provide and the functions it fulfils, in the assets whose maintenance is necessary for the continuation of the development process.

In so doing, these approaches may lead to an (or several) adjustment(s) of aggregates of national accounts.

In particular, gross domestic product (GDP), net domestic product (NDP) and related aggregates may be corrected so as to take into account:

- the use of natural resources, and more generally the environment, in the production and consumption process,
- damages caused to the environment due to the production and consumption activities,
- environmental protection expenditure.

Use of natural resources

1020 The use of natural resources is interpreted as a withdrawal from pre-existing assets and not as the creation of new output. It is therefore necessary to deduct from output the corresponding value of pre-existing natural assets used in the production process.

According to certain approaches, consideration must also be given to the fact that the national product records the use of various services furnished by the environment (absorption of residues and pollution, aesthetic and recreational services, etc.).

Damages to the environment

1021 Human activities provoke the deterioration of the quality of the environment and deplete the services which the latter is capable of supplying (in particular for future generations). Moreover, such degradation may become the source of indirect effects on health.

It could, therefore, appear important to arrive at a valuation of the cost of damages for that portion which is (was) not compensated for through restorative activities in the year of the appearance of the damage and to deduct it from domestic product in the year damage was instigated.

Two general problems arise:

- that of determining the damages: this is highly uncertain as concerns both the medium to long-term effects of human activity on the environment and the effects of deterioration on human activities.
- that of the valuation of damages: in most cases, they are not subjected to a monetary valuation by the market, and specific valuation procedures must be sought.

Environmental protection expenditure

1022 In one sense it can be argued that environmental protection expenditure are aimed solely at maintaining the particular quality of the environment and avoiding its degradation. They would not therefore lead to real additional output and should be deducted from domestic product.

Present situation

National systems

1023 Most Member States have set up more or less complete environmental data systems. Relative publications supply, separately generally, data on the physical state (quantitative and qualitative) of the environment as well as certain monetary elements relating to the environment, in particular the valuation of environmental protection expenditure.

The situation varies widely, however, because of national differences in priorities, structures and the means devoted to the collection and treatment of economic data on the environment as well as differences in accumulated experience, since certain Member States are only initiating this task while others have been involved in it for over ten years.

Overall, in Member States, given the studies undertaken within the Eurostat framework, particular emphasis has been placed on the collection of data on environmental protection expenditure.

International systems

- 1024 At the present time, the international comparability of data is a major problem: it requires, in particular, that the fields of phenomena examined be, insofar as possible, identical. Given, on the one hand, the different priorities and concerns of the countries and, on the other, differences in the classifications employed, this is not always the case.

UN-ECE

- 1025 The United Nations Economic Commission for Europe has undertaken a threefold task for:
- the development of methods, classifications and definitions,
 - the collection of environmental data, the establishment of international data banks on the environment, the regular publication of statistical and monographic compendiums,
 - the development of physical accounts for nutrients and land use.

OECD

- 1026 OECD has formulated a dual observation system based on particular physical data (emission of pollutants, state of the environment, treatment plants for waste water and waste, etc.) as well as on expenditure for the reduction and control of pollution. Every two years a compendium on environmental data, based on questionnaires circulated among the member countries, is published. In addition, OECD supports the development of a system of indicators, satellite accounts and environmental heritage accounts.

UNSTAT

- 1027 Alongside the revision of the System of National Accounts (SNA), the United Nations Statistical Office has undertaken, in conjunction with other international organisations, the elaboration of a "System of integrated Environmental and Economic Accounting" (SEEA).

System of integrated environmental and economic accounting (SEEA)

General presentation

- 1028 Since no complete, detailed system for the description of the natural environment exists, it seems that a full system of integrated environmental economic accounts is not attainable at the present time. This situation will not be overcome in the near future. It should not, however, hinder efforts to describe, in the fullest possible way, interrelations between the natural environment and the economy.
- 1029 The SEEA includes the following four elements:
- transactions and other economic flow and stock elements of the SNA which are of special relevance to the measurement of the environmental impact of economic activities. These transactions are retained and partially disaggregated so as to identify monetary flows and assets relating to the use and the protection of the environment,
 - physical data on the flow of natural resources (raw materials, energy), between the environment and the economy, on their transformation within the economy, as well as on the flows of pollutants and residuals,
 - A description of the natural environment in physical terms in so far as it is necessary for the purpose of analysing the impact of human use,
 - environmental stocks and flows to which alternative monetary (non-market) valuations for the use of the environment are applied.

1030 The different parts of the SEEA are described not as separate entities but as extensions of the SNA accounting framework (Version I). On the basis of this common accounting framework, successive versions are developed which correspond to the increasing integration of environmental data in the economic accounts system. A common approach of all the versions is that of environmentally broadened supply and use or input-output tables for transactions and of extended balance sheets to analyse stocks.

- Version II (SEEA - part A) disaggregates SNA transactions concerning the environment.
- Version III (SEEA - parts A+B) additionally achieves the link-up between the monetary data of Version II and environmental-related information in physical terms.
- Versions IV.1, IV.2 and IV.3 (SEEA - parts A+B+C) additionally introduce imputed environmental cost valued according to diverse methods and introduce the notion of Net Ecological Domestic Product.
- Versions V.1 and V.6 (SEEA - parts A+B+C+D) additionally present valuations executed by extending production boundaries (output of environmental services by households, environmental heritage services, externalisation of ancillary environmental protection services, input-output approach, etc.).

Only Versions II (parts A+B) to IV (parts A+B+C) will be outlined here.

Version II of the SEEA

1031 In this version, the conventional SNA framework is disaggregated, to come up with the actual cost of prevention or of compensation for the negative impact of economic activities on the environment.

To disaggregate SNA transactions, it is necessary to identify, on the basis of a classification of "defensive" activities:

- environmental protection activities (prevention and restoration) as well as activities aimed at treating or avoiding damages due to the deterioration of the environment.

Among activities aimed at the provision of environmental prevention or restoration services, the following are distinguished:

- external protection activities corresponding to a principal or secondary activity of a producer unit and which may be identified as such through the disaggregation of the CITI 90;
- ancillary activities executed by a producer unit (internal environmental protection activities).
- consumption or use by units, non-producers of environmental protection or restoration services (households and general government as consumers, enterprises which are non-producers of environmental protection services), of certain goods and services which contribute to the protection or the restoration of the environment or compensation for nuisances caused by the deterioration of the environment.
- fixed asset formation used for environmental protection or to compensate for the effects of deterioration of the environment.

This disaggregation of SNA transactions and units makes it possible to compute actual environment-related cost and to determine the units bearing those cost (producers, households, general government etc.).

1032 At the same time, the SEEA describes non-financial assets according to different categories (assets produced by man or by nature, non-produced assets) which for the most part adopt the classifications of the revised SNA. It also supplies the accounting rules for changes in volume of these assets (uses, changes of quality, discoveries, etc.).

Version III of the SEEA

1033 The physical flows of natural assets towards the economy and the return flows towards the environment (residual flows) are described using the approaches of material/energy balances and natural resource accounts.

This version of the SEEA makes it possible to trace:

- the real cost of "defensive" activities in a way which is consistent with the central framework and valuation rules of the SNA, in particular by respecting the principle according to which valuations must be made on the basis of market prices observed empirically,
- the various changes which affect certain natural assets, both from the physical and monetary standpoints, within a framework which makes it possible to link physical data on these assets with the corresponding SNA monetary flows.

Version IV of the SEEA

1034 While Version II of the SEEA is only concerned with actual environment-related cost whose valuation comes within the framework of conventional national accounts, Version IV of the SEEA introduces the notion of imputed environmental cost. The introduction of this notion makes it possible to describe, additionally, in monetary terms, the impact of economic activities on the natural environment and the repercussions of the deterioration of the environment on the economy and human welfare.

Imputed cost are valued for three types of economic uses of the environment:

- depletion of natural assets (subsoil resources, etc.),
- use of the soil, landscape,
- use of functions of the environment for the elimination of residuals.

Imputed cost, associated - depending on the case - with the units responsible for them or with those which bear them, require recourse in certain instances to valuation systems which deviate from basic SNA rules. This is especially true when estimating the value for households of nuisances engendered by the deterioration of the quality of the environment. Contingent methods of valuation (willingness to pay, etc.) can then make up for the absence of valuation by the market.

In similar fashion to the transition in the SNA from GDP to NDP, accounting of additional imputed environmental cost (likened to depreciation of environmental "capital") leads, all other things being equal, to a reduction in NDP. The NDP from which producers' imputed cost are subtracted is called the Ecological Domestic Product (EDP).

1035 According to the valuation system of environmental cost retained, the following distinctions can be made:

- EDP based on market prices, for which all the data and valuation concepts are consistent with the SNA (Version IV.1).
- EDP based on "maintenance cost", closely linked to the concept of sustainable development. This approach necessitates the definition of sustainability standards (Version IV.2).
- a more controversial approach due to the contingent valuation methods employed EDP in which valuation takes into account the estimate of cost borne by households (IV.3).

1036 The SEEA has been conceived so as to be as complete, as flexible and as coherent as possible. These three characteristics should allow it to be applied in a gradual way through the construction of specific sub-systems, whereby it may meet the particular concerns of one or another country.

Hence, three subsystems, corresponding to three types of data, may be distinguished:

- Disaggregation of SNA transactions and assets for environmental activities: natural assets accounts valued at market price and monetary data on actual "defensive" activities,
- Physical accounting, product, raw materials and residuals accounts; land use accounts, environmental quality indicators, etc.,
- Valuation of imputed cost of the environmental impact of economic activities.

The flexibility of the SEEA allows for the limited implementation of the first two aspects, in which case it will be possible to remain within the framework of SNA traditional concepts.

European system for the collection of economic data on the environment (SERIEE)

Objectives

1037 In order to satisfy the demand for data generated by the policy on environmental matters defined by the Community, in particular that expressed in the Action Programmes IV and V, Eurostat has developed SERIEE. This system is intended to supply the Member States with a common framework for the collection and presentation of economic data on the environment.

In its first stage, emphasis has been placed on environmental protection, and SERIEE has concentrated on:

- the valuation and description of resources allocated for environmental protection and the form in which they are used,
- the description of financing the cost of environmental protection,
- and the measuring of output of activities whose end purpose is environmental protection.

The system makes it possible to take account of a broader range of relationships between the economy and the environment and already incorporates, in addition to the aspects involved in environmental protection, those relevant to the management and uses of natural resources.

1038 The immediate objectives are:

- to trace the monetary flows linked to environmental protection,
- to characterise the impact of environmental protection on the European economic system,
- to compute indicators.

Monetary flows linked to environmental protection

1039 As a principle, the "polluter pays principle" signifies that "expenditure concerning prevention measures and pollution control should be imputed to the polluter. In other words, the cost of these measures should be reflected in the cost of the goods and services which cause pollution as a result of their production or consumption. Generally speaking, such measures should not be accompanied by subsidies apt to engender significant distortions in international trade and investments" (OECD).

SERIEE, in making it possible to identify those units which actually (initially) bear the cost of environmental protection measures (enterprises, households or general government) and to ascertain the amount of transfers (subsidies, taxes, etc.) on both national and European Union level, provides the basis for an analysis of the application of the polluter pays principle.

1040 Although SERIEE as such does not describe pollution, the framework retained makes it possible to relate monetary flows to the data on natural resources used and on pollution caused by the various industries or branches. Payments concerning the various protection measures, corresponding either to purchases of outside services, to internal production, or to taxes on pollution, etc., can thus be linked to the data on pollution according to origin (pollution from production or resulting from the use of products, including pollution in the form of waste accumulation).

1041 Data collected also make it possible to examine the extent to which environmental protection cost are actually "internalised", i.e. to what extent the different economic units are enabled to take the environment into consideration when making their decisions.

Impact of environmental protection on the European economy

1042 The impact of environmental protection on the European economy can be characterised from the dual standpoints:

- of the actual burden on economic activities and units resulting from environmental protection measures, seen from the viewpoint of international comparisons and competitiveness,
- of activities induced by environmental protection.

1043 The need for a global approach to the integration of environmental features in international trade policies has been acutely felt. Following the Rio summit, discussions aimed at having "international trade and environmental policies mutually support sustainable development" resulted in the fact that the liberalisation of international trade undertaken within the framework of the GATT negotiations must not only provide for better allocation of production factors but also more efficient use of natural resources.

Through the creation of databases on the actual cost of environmental protection, SERIEE provides the means to inform arbitration in this field by bringing to light the actual burden borne because of the high level of environmental protection in the European Union.

1044 In describing the activities of environmental protection as well as certain induced activities (eco-activities) within a proper conceptual framework, SERIEE is creating the conditions for the analysis of the effects of these activities both on the European economy and on that of the different Member States from the standpoint of employment, markets, etc.

Indicators

1045 These indicators can link protection expenditure and the facilities involved, trace the unitary cost for certain activities or relate cost and certain pollution indicators.

While, generally speaking, it may seem hypothetical to link expenditure (or cost) corresponding to the different environmental control measures with the state of the environment (or with the variations of emissions of pollutants), SERIEE can, as soon as the data have been sufficiently disaggregated and providing that the difficulties involved in the definition of reference standards have been resolved, enable the computing of indicators on the comparative cost of environmental protection policies.

1046 The system set forth also allows for the referral of expenditure (or cost) to the traditional aggregates of the national accounts and for the measurement of investment efforts for the various categories of units.

General structure

1047 In its current stage of development, SERIEE is composed of:

- the Environmental Protection Expenditure Account (EPEA), which constitutes an application at European level of SNA proposals for satellite analysis and accounts (cf. 1993 SNA, Chapter XXI),
- the use and management of natural resources account,
- "intermediate" systems for the collection and treatment of basic data.

In addition, SERIEE incorporates physical data on environmental protection activities and provides the link to physical data.

Presentation of the accounts

Environmental Protection Expenditure Account (EPEA)

1048 This account describes the resources allocated for environmental protection by the different categories of economic units (national expenditure for environmental protection), those activities which carry out environmental protection, as well as the financing of these resources and activities.

This description, within a framework consistent with the national accounts, facilitates the breakdown of the national expenditure and makes it possible to distribute its financing among the different categories of units: general government and households as consumers, producers, rest of the world.

The EPEA is presented in detail in Chapter II.

Natural Resources Use and Management Account

1049 This account is aimed at recording natural resource management activities:

- management of water and other resources (forests, soil, energy, etc.),
- recycling and recovery activities, for that part which is not covered by the EPEA.

Although including a large set of physical data, it is primarily an "economic" account which describes monetary flows related to the management and use of natural resources within a framework similar to that of the EPEA. This account, which may constitute the basis for certain SEEA valuations, has not yet been developed in detail. It is summarised in Chapter X.

Presentation of "intermediate" systems

1050 The SERIEE "intermediate" systems are systems for the collection of basic data for the construction of the EPEA. They are organised according to the classification of statistical units used in the collection of data.

The intermediate systems for general government ("public sector") and corporations ("industries") have been developed at the present time; their purpose is to collect data on transactions linked to environmental protection for the units belonging to these two sectors. For details see the Eurostat publication "Environmental Protection Expenditure - Data Collection Methods in the Public Sector and in Industries", Studies series, 1994/8D.

Intermediate systems for households as well as for "eco-industries" are under development. The latter will concentrate on those activities which produce environmental protection market services, certain goods used in environmental control, as well as adapted ("clean") products.

General government "intermediate" system

1051 The goal of the general government "intermediate system" is to gather all data on the transactions of units of the general government sector. The intermediate system includes three main data sources:

- exploitation of data from the public accounts: current and capital expenditure, subsidies, etc. and revenues (fees, taxes, charges, etc.) relevant to environmental protection,
- exploitation of the accounts of public or semi-public bodies specialised in environmental protection,
- surveying the expenditure of local governments in the environmental protection field mainly as concerns the collection and treatment of waste and waste water.

On the basis of the data collected, general government transactions can be valued: output of environmental protection services, market and non-market, investment outlays, payments of subsidies, investment grants, collection of taxes and charges, etc.

Corporations "intermediate" system

1052 The goal of the corporations "intermediate" system is to collect data on expenditure for environmental protection from units of the "corporations" institutional sector of ESA. The collection system takes the form essentially of questionnaires addressed to enterprises and local kind of activity units and concerns their expenditure in the field of environmental protection (current and capital expenditure).

On the basis of the data collected, valuations can be made of: the ancillary output of environmental protection services, investments for the protection of the environment, the intermediate consumption of external services for environmental protection as well as the revenues associated with environmental protection.

This collection system is at the present time restricted to manufacturing activities. It has to be linked with the European or national systems of information on enterprises, in particular with the Community structural business survey. Its extension to agriculture and to services should be examined.

SERIEE's place in a system of integrated environmental and economic accounting

1053 From all that has been said, it is clear that at the present time SERIEE does not constitute a complete economic information system on the environment.

On the one hand, it does not claim to present all the physical aspects even though it integrates data provided by physical data systems and proposes a coherent framework for the linking of these data to monetary data.

On the other hand, SERIEE has not incorporated all the developments prescribed by the SEEA as presented above:

- its objectives are more limited: even in its most developed form not all environmental cost (damages in particular) are valued. As a result, no aggregate like the "Ecological Domestic Product" (in the SEEA sense) is calculated,
- its objectives are more immediate: as restricted to the flows and assets of the SNA (or the ESA), the system can be set up at the European Union level relatively quickly.

Present situation and outlook

1054 As has been seen, the situation in the different Member States is relatively diverse both from the standpoint of the concern devoted explicitly to the integration of the environment in development policies and from the point of view of the observation systems required to formulate and accompany those policies.

1055 In the early 1990s, the European Commission, through Eurostat, initiated a programme for the accumulation of economic statistics on the environment. Tests were carried out in the different countries to determine the fact-finding capacities of SERIEE. This programme led the way to considerable advances in the setting up of general government and corporations intermediate systems, due in particular to the implementation of survey programmes and the launching of projects to exploit public accounts. In the corporations domain, the first surveys were carried out by certain countries for manufacturing industries while others took advantage of the Eurostat studies to improve their traditional surveys.

Similarly, in parallel with the publication of this SERIEE manual, a program was started with Eurostat's support to implement and test this new version of SERIEE because of the interest shown by several Member States.

II. ENVIRONMENTAL PROTECTION EXPENDITURE ACCOUNT GENERAL FRAMEWORK

2001 In Chapter I, SERIEE's objectives and general structure, as well as its place within a system of integrated environmental and economic accounting, were outlined.

In the current state of development of SERIEE, the Environmental Protection Expenditure Account (EPEA) occupies a central position. In the present chapter the following aspects of the EPEA will be successively examined:

- objectives and scope (§§ 2002-2009),
- definitions and concepts (§§ 2010-2069),
- aggregates and accounts (§§ 2070-2119),
- units and transactions (§§ 2120-2167),
- accounting system and tables (§§ 2168-2232),
- information sources (§§ 2233-2252),
- integration of physical data (§§ 2253-2259).

An application of the EPEA, illustrated as a fictitious example, can be found in Annex III to this chapter.

Objectives of the EPEA

2002 The purpose of the EPEA is, within a framework consistent with the European System of Integrated Economic Accounts (ESA), to come up with answers to the following questions:

- how much does a nation spend on environmental protection and what form does this expenditure take? (determination of the national expenditure for environmental protection),
- how and by which units is this expenditure financed? (analysis of the financing of national expenditure),
- which economic activities are induced by environmental protection? (analysis of the output of environmental protection services).

2003 This description, seen from the standpoint of the elaboration of an environmental satellite account

- integrates physical data,
- interrelates environmental protection with the economy in general.

2004 Given the characteristics of the field of environmental protection - in particular the considerable role played by general government - the EPEA distinguishes transactions of general government from those of other units. The EPEA also makes it possible to pinpoint the environmental protection expenditure of the different industries, thereby enabling the linkage of this expenditure with data on production, intermediate consumption, gross fixed capital formation, the use of raw materials and energy as well as pollution. Finally, the EPEA makes it possible to ascertain the specific financing mechanisms in the field of environmental protection.

2005 The EPEA must be seen as an environmental protection satellite account. Its description of activities must be as consistent as possible with the concepts and methods currently used by the national accountants of a specific country and, ideally, with the ESA or SNA. Any differences with the national accountants' practice and with the ESA or SNA must be pinpointed.

Scope of environmental protection

- 2006 *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.
- 2007 The definition retained implies that to be included under environmental protection, actions and activities or parts thereof must satisfy the end 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.
- 2008 Activities like water supply or the saving of energy or raw materials which come under the management of natural resources are not included under environmental protection (cf. § 10040 sq.). However, such activities are included to the extent that they mainly aim at environmental protection. An important example are recycling activities which are included to the extent that they constitute a substitute for waste management (cf. § 5056 sq.).
- 2009 Given the general nature of these criteria, to define the scope of environmental protection requires identifying:
- the activities characteristic for the field of environmental protection. These are activities whose purpose is environmental protection. They are called *characteristic activities*. Their output consists of characteristic services,
 - products, although not characteristic services, whose use contributes to environmental protection. These are *connected products* and *adapted products*,
The overall grouping of characteristic services, adapted and connected products is designated by the term *specific products*.
 - transfers (subsidies, investment grants, specific taxes, etc.) in favour of environmental protection. They are called *specific transfers*.

Definitions and concepts

Characteristic activities

- 2010 Characteristic activities are activities whose purpose is environmental protection. To establish a list of characteristic activities, we can rely neither on the classification of activities of national accounts (even though certain activities defined in the Statistical Classification of Economic Activities in the European Communities (hereafter referred to as NACE Rev. 1) do constitute environmental protection activities), nor on existing functional classifications like the classification of functions of government (COFOG) or the classification of individual consumption by purpose. Therefore it is necessary to draw up such a list by defining activities.

Classification of characteristic activities

- 2011 In the EPEA the *Single European Standard Statistical Classification of Environmental Protection Activities* (hereafter referred to as CEPA) is used. The CEPA, prepared by UN-ECE and Eurostat in March 1994 (see UN-ECE document CES/822) and approved by the Conference of European Statisticians in June 1994 can be found in Annex I to this chapter.
- 2012 Defining characteristic activities requires the simultaneous use of a series of criteria. Characteristic activities can be broken down on the basis of:
- the nature of the pollution or damage - or the risk of pollution or damage - to the environment or the "environmental media" concerned,
 - the "type" of activity traced,
 - the equipment used.

The CEPA combines the first two outlooks.

- 2013 The first outlook entails distinguishing and classifying characteristic activities on the basis of their *domain*, i.e. the environmental media or type of pollution-nuisance-degradation:
- air pollution (and related climatic risks),
 - surface water pollution,
 - waste,
 - soil and ground water pollution,
 - noise and vibration,
 - degradation of biodiversity and landscapes,
 - radiation.
- 2014 The second outlook entails distinguishing and classifying characteristic activities according to their "type":
- pollution prevention activities,
 - pollution reduction activities:
 - reduction of emissions and discharges,
 - reduction of pollution levels of environmental media.
 - measurement and control activities,
 - research and development activities,
 - teaching and training activities,
 - administrative activities.

These activities may be the result of a combination of basic generic activities (e.g. collection, sorting, transport, treatment by type, etc.).

- 2015 To the extent that environmental protection activities are linked to the use of equipment (filters, dedusters, etc.) or setting up of installations (settling basins, anti-noise walls, etc.), the definition of characteristic activities refers to the stock or capacity of facilities, equipment or devices used. The definition of the scope of environmental protection thus requires the establishment of a list of corresponding facilities. See in Annex I the Classification of Environmental Protection Facilities, prepared by Eurostat and UN-ECE, as an example.

Principal, secondary and ancillary activities

- 2016 Depending on the units⁽¹⁾ which are chosen, there are two ways to describe characteristic activities. The first one, adopted in this chapter, considers local kind-of-activity units (local KAU), industries and supply and use tables. The second one, presented in Chapter X, considers units of homogeneous production (UHP), branches and input-output tables.
- 2017 In this chapter units are local KAU or KAU. This means that producers classified on the basis of (local) KAU may have secondary production but that their principal activity accounts for most of the gross value added. 1993 SNA (§ 5.22) indicates: "although the definition of establishment (local KAU) allows for the possibility that there may be one or more secondary activities carried out, they should be on a small scale compared with the principal activity". 1995 ESA (§ 2.107) stresses that "if an institutional unit producing goods and services contains a principal activity and also one or several secondary activities, it should be subdivided into the same number of KAUs, and the secondary activities should be classified under different headings from the principal activity."
- 2018 The criterion is that the unit's information system must be capable of indicating or calculating at least the value of production, intermediate consumption, compensation of employees, the operating surplus and employment and gross fixed capital formation. Therefore, when such information is available the secondary activity is treated as principal.

¹ See also Council Regulation No 696/93 on the statistical units for the observation and analysis of the production system in the Community.

- 2019 The output of principal or secondary activities is either sold on the market (market output) or provided free or at prices that are not economically significant (non-market output). The description of these activities is covered by the ESA framework.
- 2020 Characteristic activities are also executed as ancillary (cf. § 1031). A producer unit executing a polluting activity may, on its own and for own use, carry out environmental protection activities (reduction of emissions, treatment of pollutants) made necessary in order to limit the negative effects of its activity on the environment. In this case the services produced are qualified as ancillary. Ancillary activities are not isolated in national accounts, although the 1993 SNA provides the identification of their cost on a functional basis (cf. 1993 SNA § 18.13).
- 2021 Producer units of the national economy which execute characteristic activities are called *characteristic producers*. All other producer units of the national economy are called *non-characteristic producers*.
- 2022 The following characteristic producers are distinguished:
- specialised producers which execute a characteristic activity as their principal activity. These producers can be identified by referring to the NACE Rev. 1. They figure primarily in class 90.00: "sewage and refuse disposal, sanitation and similar activities" (cf. § 2243 sq.). Specialised producers belonging to general government and non-profit institutions serving households (NPISHs) institutional sectors are distinguished from specialised producers belonging to other sectors,
 - non-specialised characteristic producers which execute a characteristic activity as secondary or ancillary to a principal non-characteristic activity. These producers are regrouped according to their non-characteristic activity.

Related products

- 2023 By definition, characteristic activities only produce characteristic services. There are no characteristic goods. However, the execution of a characteristic activity may generate an output of products different from those corresponding to the characteristic activity (e.g. energy produced in the course of incineration of waste, recovery of materials during waste treatment). These products are referred to as related products. The output of related products is not considered as environmental protection output (cf. § 2100 sq. Treatment of related products).

Connected products and adapted products

- 2024 These are products which are neither characteristic services nor do constitute characteristic activities but whose use serves an environmental protection purpose. Connected and adapted products may be durable or non-durable products. They may be used for final or intermediate consumption or for gross capital formation. The EPEA describes the uses of connected and adapted products by resident units, as well as certain specific transfers related to them. It does not describe their production, contrary to characteristic services (cf. § 10031 sq. for a recording system for eco-activities).

Connected products

- 2025 These are products whose use by resident units directly serves an environmental protection objective but which are not characteristic services. A list of connected products has to be drawn up for each domain.

Preliminary list of connected products by domain:

Air: catalytic converters, carburation adjustment services.

Water: septic tanks, biological products for septic tanks.

Waste: trash bags, bins, rubbish containers.

Noise: exhaust pipes⁽¹⁾, exhaust pipe adjustment services, noise reduction windows.

¹ For that part which does not respond to technical reasons.

Adapted products

2026 Adapted products are defined as products that meet the following criteria:

- on the one hand, they are less pollutant, at the time of their consumption and/or scrapping, than equivalent normal products. Equivalent normal products are those products which furnish similar utility, irrespective of the impact on the environment,
- on the other hand, they are more costly than equivalent normal products. Only these extra cost are considered as environmental protection expenditure in the EPEA.

Examples for adapted products may be: desulphurised fuels, lead-free gasoline, CFC-free products.

2027 It is important to note that adapted products are defined in relation to pollution in the use and scrap phases of the life cycle of the product. Products which are less pollutant in the manufacturing phase are not considered to be adapted products, as modifications in the production process aimed at reducing pollution in the course of manufacture are considered as characteristic activities, generally of an ancillary nature. Modifications of the production process in order to use adapted products are also considered as characteristic activities.

2028 Given the complexity of the criteria and the need to harmonise valuations, a list of adapted products has to be established at the European Union level. This list must, insofar as possible, be accompanied by the amount of extra cost in comparison to equivalent normal products. Adapted products are subject to ongoing research.

2029 To assess extra cost, adapted and equivalent normal products should be compared at the level of their cost of production excluding any taxes on products and excluding any subsidies on products or on production, i.e. prior to subsidies to producers or fiscal incentive measures for consumers. Differences in taxes on products or in subsidies on products or on production between adapted and equivalent normal products must be analysed separately. These differences (e.g. tax reductions for lead-free gasoline) may constitute general government outlays made with an environmental protection objective.

2030 In order to determine extra cost and analyse its financing, the various components of purchaser's price must be described for the adapted product and the equivalent normal product. It will be noted that adapted products, contrary to characteristic services, bear distribution margins. Hypotheses may have to be made about the level of these margins.

2031 Double counting might appear when adapted products are used as intermediate consumption and are incorporated in other (thereby also adapted) products. An example may be the use of CFC-free foams for refrigerators. In this case either the extra cost of CFC-free foams (for that part incorporated in the refrigerators) or of the refrigerators can be included in environmental expenditure. When such double counting is expected to be important it is necessary to make an assessment of the technical relations and to decide at which stage of the manufacturing process extra cost should be measured. The users of adapted products are considered as being the financers of the corresponding environmental protection expenditure (apart from any transfers received). Therefore the choice of the appropriate stage of the manufacturing process may be based on a number of criteria. What is the easiest way to measure extra cost? Who can be assumed to be the bearer of the corresponding expenditure? A theoretically more satisfactory (but more demanding) treatment would be to distribute extra cost between intermediate and final users, which would necessitate the calculation of the "net" extra cost at each stage of the manufacturing process.

Distinction between adapted and connected products

2032 To distinguish between adapted and connected products the following criterion can be used:

- for an adapted product there must be an equivalent normal product (at least theoretically), that means that the adapted product has a "primary" use which is not environmental protection. The corresponding environmental protection expenditure is thus defined as the extra cost in comparison with an equivalent normal product which offers a similar utility,
- a connected product has no use except environmental protection. The corresponding environmental expenditure is thus equal to the total cost of the product.

2033 There are borderline cases however. For example: should the purchase of a car equipped with a catalytic converter be classified as adapted product or should the catalytic converter be classified as connected product? Applying the above criterion, a car equipped with a catalytic converter is an adapted product. Only in the case of the purchase of a catalytic converter to upgrade an existing car would the catalytic converter be classified as connected product.

Distinction between adapted capital products and "clean" technologies

2034 The definition of adapted products is similar to the definition of integrated equipment (or "clean" technologies) and the problems are similar (cf. § 2152). It may be noted that integrated equipment is defined in the same way as adapted products. There is no clear-cut theoretical difference between adapted capital products and integrated equipment. There are practical differences however. Integrated equipment is typically specific for single producers or industries in its technical specifications and extra cost can be assessed most easily by the producers employing the equipment. Adapted capital products and adapted as well as connected products in general are typically used in many or all industries and in the households sector. Extra cost as well as the use of adapted products can be most easily assessed from the outside.

Characteristic activities and the use of connected and adapted products

2035 It is necessary to clearly distinguish the execution of characteristic activities from the use of connected and adapted products. The fact that a producer unit uses connected or adapted products in its intermediate consumption or gross capital formation does not imply that this unit has to be considered as executing a characteristic activity, even as ancillary. If such were the case, the majority of the producer units of the national economy would be classified as characteristic producers since most of them use connected or adapted products to one degree or another (cars equipped with catalytic converters, rubbish containers, unleaded gasoline, etc.).

2036 A characteristic activity can be said to take place when resources such as equipment, labour, manufacturing techniques or products are *combined*, leading to the production of environmental protection services. The mere use of adapted or connected products does not meet this criterion.

2037 However, some characteristic activities may constitute borderline cases (e.g. abatement of noise through construction of anti-noise facilities). In some aspects the CEPA appears to be more a functional classification of all measures aiming at environmental protection, than a classification of "productive" activities. Such borderline cases are treated in Chapters III to IX, when describing characteristic activities by domain.

2038 Characteristic producers may, under the heading of intermediate consumption or for gross capital formation, use connected or adapted products. When these products are used as intermediate consumption for a characteristic activity, they become part of the value of the output of characteristic services. The treatment of this specific intermediate consumption - which raises the risk of double counting - is described in § 2075 sq.

Specific transfers

2039 *Specific transfers* are unrequited payments received by resident or non-resident units which contribute to the financing of characteristic activities and uses of specific products or constitute a compensation for income or capital losses related with environmental protection. Current and capital transfers are distinguished.

2040 Within current transfers subsidies on production and other current transfers are distinguished. Subsidies are paid to market (and own-account) producers only. Within subsidies on production, subsidies on products and other subsidies on production are distinguished. Subsidies on products are payable per unit of a product. Other subsidies on production are not directly linked to the quantity or value of the products. Subsidies intended to cover all or part of the cost of reducing pollution are deemed to be other subsidies on production (cf. ESA § 4.37). Other current transfers are current transfers within general government, current international co-operation, current transfers to NPISHs, etc.

2041 Capital transfers are transfers linked to the acquisition (or disposal) of fixed assets. They are subdivided into investment grants and other capital transfers. Investment grants are intended to finance the cost of acquisition of fixed assets of resident or non-resident units. Other capital transfers are transfers to cover capital losses or accumulated deficits, large legacies or donations, etc.

2042 Grants for interest relief are treated as current transfers, when they are designed to cover part of the interest charges. When they are designed to cover (part of) the amortisation of debt they are treated as capital transfers. In the EPEA, subsidised loans (soft loans) given for the acquisition of fixed assets are treated as capital transfers. Soft loans are valued by their cash grant equivalent according to the procedure laid down in the Letter to Member States to guide them in the use of the "*de minimis*"

facility⁽¹⁾. To arrive at the cash grant equivalent, the savings of interest in any year of the duration of the loan are discounted by using the official reference interest rate applicable for the assessment of state aid. However, this treatment is not that of ESA⁽²⁾ or SNA.

2043 Examples for specific transfers are:

- subsidies on products paid by general government or European Union institutions to market characteristic producers or market producers of adapted or connected products in order to lower the prices of characteristic services or adapted or connected products,
- subsidies to compensate (part of) the cost of ancillary environmental protection activities (other subsidies on production),
- subsidies paid to market producers in order to compensate current losses due to environmental protection measures and to make it possible for factors of production to receive an adequate remuneration. (e.g. transfers to the agricultural sector in order to compensate losses resulting from banning intensive cropping, transfers to specialised producers to cover current deficits),
- current transfers within general government intended to cover (part of) the cost of production of non-market producers,
- current transfers made to households in their capacity as consumers to compensate (part of) the burden of acquisition of specific products (e.g. fiscal incentives to purchasers of catalytic converters),
- current transfers to NPISHs including voluntary contributions, membership subscriptions, etc. which NPISHs receive from households and other units,
- capital transfers from general government to other units or between general government units in order to compensate or cover severe capital losses or accumulated deficits linked with environmental protection,
- current or capital transfers to the rest of the world in order to finance environmental protection programs (international public or private co-operation, etc.),
- capital transfers to households for the improvement of dwellings (e.g. installation of noise protective windows),
- capital transfers from general government to other units or between general government units in order to finance gross capital formation (investment grants),
- taxes constitute specific transfers when their revenues are earmarked for environmental protection. Such taxes are called specific taxes.

2044 According to their nature and the valuation system adopted, specific transfers are treated either only as a contribution to the financing of national expenditure for environmental protection (see § 2072 for the definition of national expenditure), or, when they are not counterpart of any other item of national expenditure, also as a component of national expenditure.

2045 National expenditure are defined from the side of uses (intermediate and final consumption of specific products, gross capital formation for characteristic activities, etc.) and uses are valued at purchasers' prices or by their cost of production. Therefore, whenever specific transfers lead to lower purchasers' prices or cost of production the specific transfers constitute a component of national expenditure. The same rule applies when there are no corresponding resident uses at all (e.g. specific transfers to the rest of the world). For more details see § 2084 sq.

2046 Specific taxes will usually only contribute indirectly to the financing of national expenditure via fiscal bodies, agencies, etc. which may redistribute the revenues of the taxes via specific transfers to other units or may directly use them for financing own characteristic activities. Therefore they usually do not appear in national expenditure and are only considered in the analysis of financing. Specific taxes may be a counterpart of other items of national expenditure when they take the form of taxes on production linked to characteristic activities or the form of taxes on products on characteristic services (e.g. a specific tax on the disposal of waste). As specific taxes are used to finance national expenditure they would be counted twice and should be deducted.

¹ Letter to Member States (93) D/6878. See also Community guidelines on State Aid for environmental protection (OJ 94/C72/03) and Community guidelines on State Aid for small and medium-sized enterprises (SMEs) (OJ 92/C213).

² But see e.g. the French SECN (Système élargi de comptabilité nationale), § 5.52, INSEE, Paris 1976.

2047 A list of specific transfers must be drawn up for each environmental domain. Given the existence of numerous national particularities, this list, including the units involved, has to be drawn up separately for each Member State. A full-fledged table of specific transfers is an indispensable tool for completing the EPEA's tables.

Environment-related taxes

2048 Environment-related taxes neither constitute elements of national expenditure nor contribute to the financing of national expenditure. These are e.g. taxes on emissions that are not earmarked for environmental protection. What has to be considered here is the basis of the tax and the issues the legislation has retained in its preambles. If they follow environmental objectives, the tax is one which is environment-related. These taxes are not classified as specific transfers but they do constitute part of the environment-related financial burden (cf. § 2112 sq.). An assessment of the effectiveness of environment-related taxes may be necessary in order to exclude those taxes having no specific environmental protection purposes.

2049 A list of environment-related taxes must be drawn up for each environmental domain. Given the existence of numerous national particularities, this list, including the units involved, has to be drawn up separately for each Member State. Such a list of environment-related taxes is also important to assess and interpret changes in emissions, when linking environmental expenditure to physical data.

Valuation

2050 The following paragraphs give an overview of the methods of valuation used in the EPEA. As the EPEA is a satellite account to the national accounts, the methods of valuation and the definitions used are in general in accordance with ESA and SNA. More details may be found in §§ 3.05-3.106 of ESA and in §§ 3.70-3.86 and 6.37-6.217 of SNA.

Market and non-market output

2051 ESA and SNA distinguish between market output, output for own final use and other non-market output. In the EPEA also ancillary output is considered.

2052 *Market output* is basically output sold at economically significant prices. In the ESA (§ 3.19) a price is an economically significant price when it covers at least 50% of the cost of production (cf. § 2064) of a product. The corresponding producer units are market producers.

2053 To assess whether a price is economically significant or not, the valuation concept used is not basic price (cf. § 2060). It is the price excluding VAT and other taxes on products but without consideration of any subsidies (cf. ESA § 3.33 and Annex II to this chapter). It is not necessary to change the classification of a producer as market or non-market immediately when the 50% borderline is crossed. Only if the change has been effected for several years or is expected to continue in existence for the near future is a reclassification necessary (cf. ESA § 3.33).

2054 *Other non-market output* (hereafter referred to simply as non-market output) is output provided free or at prices that are not economically significant. The corresponding producer units are non-market producers. In the case of non-market producers revenues from non-market output may appear when output is sold at prices that are not economically significant. Such revenues are called *partial payments* (cf. § 2066) in the EPEA.

2055 *Output for own final use* does not play an important role in the EPEA. The two main cases are:

- Output used for own gross fixed capital formation (e.g. own account construction). This kind of output is usually rather small compared to the total output of the respective units. The corresponding producer units are either market or non-market producers according to the nature of their principal output.
- Services of owner-occupied dwellings. This refers to the NACE Rev. 1 class 70.20 (Letting of own property) and is basically the output of housing services used by the owners of the dwellings themselves ("imputed rentals"). The corresponding producer units are mainly households.

2056 *Ancillary output* is the output of characteristic services of an ancillary activity. This kind of output is not recorded in ESA and SNA. The corresponding producer units are classified according to the nature of their principal output.

Valuation methods

2057 According to the nature of the output, different methods of valuation are applied. Market output is valued at basic prices or at producers' prices (only in SNA) and non-market output is valued by cost of production. Output for own final use is valued by cost of production, when no reliable basic prices can be derived from the market. In the EPEA ancillary output is also valued by cost of production. For some more details on the valuation methods presented hereunder see Annex II to this chapter.

Recording of VAT

2058 Within the EPEA, as in ESA and SNA, net recording of VAT is applied. Net recording of VAT means that:

- Output of goods and services is recorded net, that is excluding any invoiced VAT. Invoiced VAT is the VAT payable on the sales of a producer and is usually shown separately on the seller's invoice,
- Purchases of goods and services are recorded including non-deductible VAT. VAT is non-deductible when the purchaser is not able to deduct this VAT from his own VAT liability.

Usually, only VAT on final uses (mainly final consumption of households and some intermediate consumption of general government) is non-deductible. However, VAT on certain products (e.g. cars) may not be deductible in general, or certain producers may be exempted from VAT registration. In such circumstances also businesses may face some non-deductible VAT.

Valuation methods for market output and inputs

2059 *Producer's price (only SNA)*: The producer's price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any VAT, or similar deductible tax, invoiced to the purchaser. It excludes any transport charges invoiced separately to the purchaser.

2060 *Basic price*: The basic price is the amount receivable by the producer from the purchaser minus any tax payable for a unit of a good or service produced as output plus any subsidy receivable on that unit as a consequence of its production or sale. It excludes any transport charges invoiced separately to the purchaser.

2061 Basic price and producer's price are used to value market output. Neither producer's price nor basic price include any VAT, or similar deductible tax, invoiced on the output sold. The only difference between the two is that basic price excludes also any other tax payable per unit of output (taxes on products) and includes any subsidy receivable per unit of output (subsidies on products). Basic price measures the amount retained by the producer. Therefore, basic price is the price most relevant for economic decisions of the producer.

2062 *Purchaser's price*: The purchaser's price is the amount paid by the purchaser in order to take delivery of a unit of a good or service, excluding any deductible VAT or similar deductible tax. It includes any transport margins paid separately by the purchaser. Uses (intermediate and final consumption, gross capital formation) are valued at purchasers' prices.

2063 When the purchaser buys directly from the producer the differences between producer's price and purchaser's price are the value of any non-deductible VAT payable by the purchaser and the value of any transport charges paid separately by the purchaser. To make the transition from basic price to purchaser's price all taxes on products (not only non-deductible VAT) as well as any transport charges paid separately by the purchaser must be added and subsidies on products must be deducted. When the purchaser buys from wholesalers or retailers, trade margins form an additional difference in both cases.

Valuation methods for non-market output and inputs

- 2064 *Cost of production:* When output of goods and services is produced for own use and no reliable market prices of similar products are available or when the output is provided free or sold at prices that are not economically significant, this output is valued by the cost of production. To value ancillary output, in EPEA also the concept of cost of production is used (for details see Annex II to this chapter). Cost of production is defined as the sum of:
- Intermediate consumption
 - Compensation of employees
 - Consumption of fixed capital
 - other taxes (less subsidies) on production
- 2065 In the case of non-market producers no subsidies exist by definition. Transactions with the same characteristics are called other current transfers and are not deducted from cost of production. Therefore they only contribute to the financing. For non-market producers by definition no net operating surplus exists. This means in particular, that no interest payments are recorded. In the case of ancillary output subsidies on production may exist (cf. Annex II to this chapter and § 2040).
- 2066 *Partial payments:* These are revenues from sales of output at prices that are not economically significant ("revenues from other non-market output", cf. ESA § 3.33, 3.45 and 3.56). In the EPEA, partial payments are defined as the revenues from the sales of non-market output less any taxes on products (notably VAT - for non-market producers subsidies do not exist). Total output of non-market producers is valued by cost of production (as in ESA).
- 2067 In the EPEA, that part of the output which is covered by partial payments is deemed to be market output. The value of non-market output is the difference between total cost of production and the partial payments received. This treatment aims at securing continuity in time series. However, as this treatment is not in line with ESA, it may only be of interest for countries where a considerable share of producer units of general government is classified as non-market producers and where partial payments play an important role. In any case, for comparisons with national accounts, non-market output must be recalculated on the basis of the provisions actually used in national accounts.

The borderline between taxes and purchases

- 2068 For the purposes of the EPEA the distinction between transactions with a counterpart (e.g. purchases or supplies) and transactions without counterpart (e.g. subsidies, investment grants or taxes) may be important in some cases. Examples are fees paid for waste or waste water services of general government units. Less important examples may be administrative fees paid for licences, permits, etc.
- 2069 The distinction between a purchase and a tax is based on an assessment of the counterpart of the transaction. If the counterpart is to some extent proportional to the payments, the transaction is a purchase. Fees for waste or waste water services usually have the character of a purchase (cf. ESA §§ 4.23 and 4.80). However, when the revenues from such a fee (whatever the name given to them: fees, taxes, charges, contributions, rates, tolls, etc.) are much higher than cost of production of the services one may consider treating part of these revenues as taxes.

Aggregates and accounts

National expenditure for environmental protection

- 2070 The central concept on which the EPEA is founded is that of expenditure. One of the prime objectives of the account is to value the national expenditure for environmental protection, i.e. the resources the resident units of an economy are devoting to environmental protection.
- 2071 National expenditure describes the final and intermediate consumption of specific products, the gross capital formation for characteristic activities and in specific products and specific transfers that are not counterpart of the value of previous items, including transfers to the rest of the world. Financing by the rest of the world is deducted.
- 2072 National expenditure for environmental protection is defined as the sum of:
- a) final consumption of specific products by resident units,
 - b) intermediate consumption of specific products by resident units other than for characteristic activities,
 - c) gross capital formation (and acquisitions less disposals of non-produced non-financial assets) for characteristic activities,
 - d) gross capital formation in specific products⁽¹⁾ by resident units other than for characteristic activities,
 - e) specific transfers of resident units which are not a counterpart of previous items,
 - f) less financing by the rest of the world.
- 2073 That part of national expenditure which consists of market products is valued at purchasers' prices, including non-deductible VAT. Other products which are part of national expenditure (non-market, ancillary) are valued by cost of production.
- 2074 National expenditure are "gross", that is including both gross capital formation and consumption of fixed capital.

Remarks concerning intermediate consumption and gross capital formation

- 2075 Production of characteristic services may necessitate the use of specific products as intermediate consumption, (e.g. waste water treatment plants using market waste services for the treatment of sludge) or as gross capital formation for characteristic activities (e.g. specialised producers using adapted cars).
- 2076 Therefore, in order to avoid double counting between output (and subsequent uses) and intermediate consumption of characteristic producers and double counting of gross capital formation the following precautions must be taken.
- Specialised producers
- 2077 As intermediate consumption of specific products by specialised producers is included in the value of their output, it must be identified and explicitly excluded from item b). As gross capital formation in specific products of specialised producers is included in their gross capital formation for characteristic activities, it must be identified and explicitly excluded from item d).
- Non-specialised characteristic producers - secondary output
- 2078 In the case of non-specialised characteristic producers which execute characteristic activities as secondary, it is impossible to estimate (without specific inquiry) what part of the unit's intermediate consumption in specific products has been used for the characteristic secondary activity. As secondary activities are generally of minor importance (if not, they should be treated as specialised producer - cf. § 2017 sq.), one can assume that the whole intermediate consumption of specific products is related to the principal non-characteristic activity. The same rule applies to gross capital formation. When the producer unit at the same time undertakes an ancillary activity, the same precautions as described below are taken.

¹ Gross capital formation in characteristic services consists of improvement of land resulting from decontamination of soil activities.

Non-specialised characteristic producers - ancillary output

- 2079 When the non-specialised characteristic producer executes a characteristic activity as ancillary to a principal non-characteristic activity, valuation of this ancillary output results from a specific inquiry. One might choose either to incorporate the corresponding part of intermediate consumption of specific products in the value of the ancillary output or not. The first solution would require a much more detailed questionnaire (e.g. the identification of that part of the waste or waste water services purchased which is used for characteristic activities). Therefore, for simplicity reasons it can be assumed that all intermediate consumption of *characteristic services* is related to the principal non-characteristic activity. This assumption avoids double counting and requires the identification of intermediate consumption of characteristic services only for producers as a whole. However, whereas the total uses of the producer units and, consequently, the corresponding parts of national expenditure are correctly assessed, the ancillary output is under-recorded in the sense that intermediate deliveries of characteristic services among characteristic producers are netted out.
- 2080 The case of intermediate consumption of connected and adapted products for characteristic activities is more tricky. In reality the consumption of these products may not always be assessed by a questionnaire but on the basis of data on total domestic consumption. When connected products are explicitly asked for by means of a specific inquiry, the same assumption as for characteristic services can be applied. This assumption does not hold for adapted products. Adapted products are valued by their extra cost compared to an equivalent normal product when they are used as final consumption or as intermediate consumption for non-characteristic activities. But when they are part of the intermediate consumption for characteristic activities, they are valued at purchasers' prices like any other intermediate consumption. Therefore adapted products used as intermediate consumption for characteristic activities must be identified or estimated. They must be deducted from the total use of adapted products only for their extra cost when total use of adapted products is assessed on the basis of data on total domestic consumption.
- 2081 For gross capital formation in specific products the same developments hold. For secondary producers no gross capital formation can be recorded. For producers which perform an ancillary activity it is necessary to identify or estimate the connected and adapted products that are included in their gross capital formation for characteristic activities.
- 2082 For more detailed analyses, the simplifications in the treatment of intermediate consumption of specific products (in particular of characteristic services) may appear insufficient. For details see Chapter X, § 10028 sq.
- 2083 Double counting exists nonetheless, owing to the fact that characteristic producers use, as intermediate consumption or in the form of gross capital formation, products which "incorporate" environmental protection expenditure. For example: the electricity used by a waste water treatment plant incorporates environmental protection expenditure of producers of electricity. These expenditure have already been entered in national expenditure, e.g. as intermediate consumption of specific products of the producers of electricity. This kind of double counting cannot be eliminated very easily. It appears, however, that its magnitude is low.

Remarks concerning specific transfers

- 2084 Some specific transfers constitute a counterpart of uses. That is, they are used to finance (part of) the value of items already included in national expenditure. Specific transfers constituting a counterpart of uses must not be included in item e) of national expenditure. This is valid for investment grants to resident units, as gross capital formation is valued at purchasers' prices, or for current transfers to non-market producer units of general government, as non-market output is valued by cost of production.
- 2085 The case of subsidies is more complex. Some subsidies (e.g. subsidies to market specialised producers) are designed to reduce the prices of specific products. As final (and intermediate) consumption is valued at purchasers' prices it does not include these subsidies, which therefore have to be considered in item e). Other subsidies are designed to compensate losses of income due to environmental protection measures (e.g. subsidies for fertiliser-free agriculture) or to finance environmental protection in the rest of the world. These transfers also have no counterpart in uses and must be included in item e). Subsidies to producers performing ancillary activities are deemed to be subsidies on production (cf. § 2040). As ancillary output is valued by cost of production (cf. § 2064) these subsidies are deducted and, therefore, must be entered under item e) of national expenditure. However, if the data on subsidies in a country are not sufficiently detailed it may be necessary to value ancillary output without deduction of subsidies. Consequently, these subsidies are not entered under item e). For specific taxes see § 2046.

2086 The forms and modalities of specific transfers as well as the data sources for output and uses may differ among countries. Therefore it must be assessed in every particular case whether a specific transfer has a counterpart in uses or not.

Linking national expenditure for environmental protection to aggregates of national accounts

2087 The various elements of national expenditure for environmental protection can be compared with the corresponding aggregates of national accounts. Final consumption of specific products (item a)) can be compared with total final consumption of households and general government. In the same way gross capital formation (item c)) less acquisitions, less disposals of non-produced non-financial assets and item d)) may be compared to the gross capital formation of the economy as a whole.

2088 The ratio between national expenditure and central aggregates of national accounts like gross domestic product (GDP) or gross national income (GNI; formerly: gross national product, GNP) may serve as an estimate of the relative national effort in favour of environmental protection.

2089 National expenditure may be subdivided into current national expenditure (current uses of resident units less financing of current uses by the rest of the world) and capital national expenditure (capital uses of resident units less financing of capital uses by the rest of the world). It may also be calculated net, deducting the consumption of fixed capital of the characteristic producers.

2090 However, national expenditure as an aggregate cannot be strictly compared with GDP or GNI in a purely technical sense. Intermediate consumption of specific products is included in national expenditure as it is not easy to assess the cost of environmental protection included in all the products used for final consumption. The implicit hypothesis is that the cost of environmental protection included in imports is equal to that included in exports. Specific transfers (not counterpart of previous items) may include transfers which have the character of distribution of income. Therefore, elements of the distribution of income may be present.

2091 For national expenditure as an aggregate, depending on the country, some deviations in one or the other direction from a strict comparability to central aggregates of national accounts may exist. At the current state it is difficult to imagine the relative importance (if any) of these deviations. Further examination will be necessary on the basis of the data and experience accumulated during the application of the EPEA.

2092 National expenditure undergoes two complementary analyses:

- analysis of the production of characteristic services (§ 2093-2105),
- analysis of the financing of national expenditure (§ 2106-2111).

Analysis of the production of characteristic services

2093 The analysis of characteristic activities is based on local KAU (or KAU) and therefore on the distinction between specialised and non-specialised characteristic producers (cf. § 2017 sq.). Specialised producers are producers whose principal activity is an environmental protection activity defined in NACE Rev. 1 (cf. 2243 sq.). They are grouped together according to the institutional sector they belong to: specialised producers belonging to general government or NPISHs' sectors are distinguished from producers belonging to other institutional sectors. Non-specialised characteristic producers execute a characteristic activity as secondary or ancillary to their non-environmental principal activity. They are grouped according to the industry which corresponds to their principal activity.

Transactions of producers

2094 Current transactions and capital transactions of characteristic producers are distinguished. Within current transactions, output, uses and resources are distinguished (see also Annex II to this chapter).

Environmental output

2095 When the characteristic activity is executed as principal or secondary, output may be market or non-market. Market output is valued at basic prices. Non-market output is valued by cost of production, i.e. by the sum of intermediate consumption, compensation of employees, consumption of fixed capital and other taxes on production (cf. § 2064). Ancillary output is also valued by cost of production. These cost

are only known through specific inquiries. When the producer who undertakes the ancillary activity is a market producer, subsidies may exist and must be deducted. These subsidies, as they do not have any counterpart, have to be entered separately into national expenditure.

- 2096 For specialised producers non-environmental secondary output may exist and has to be identified and deducted in order to arrive at environmental output. In order to simplify the EPEA's framework, ancillary environmental output of specialised producers (e.g. a waste treatment plant which treats its emissions of air pollutants or protection of soil by an operator of a landfill) is not distinguished.
- 2097 For non-specialised producers executing a characteristic activity as secondary, (e.g. transport of waste by a transport firm of the 60.2 group of the NACE Rev. 1), environmental output corresponding to the secondary activity has to be recorded. Uses for this secondary activity cannot be distinguished from total uses of the unit (otherwise, the unit is classified as specialised producer).

Uses and resources of producers

- 2098 Current uses of producers are defined as the sum of their intermediate consumption, compensation of employees, consumption of capital, other taxes less subsidies on production and net operating surplus. In the case of non-market producers neither subsidies nor net operating surplus exist. Current uses always equal output, the net operating surplus being the balancing item.
- 2099 When the output is market output, resources of producers are by definition equal to output and current uses. In the case of market producers of general government, when they do not recover all of their cost of production from sales and the difference is not fully covered by explicitly observable subsidies, the remainder is treated as a subsidy from the respective government unit to itself.

When the output is non-market, resources of the producer (partial payments, current transfers) may not cover the cost of production or current uses. The remainder is born by the producer.

For ancillary activities, as there are no sales, cost of production (less subsidies) are born by the producer.

Treatment of related products

- 2100 The production of characteristic services may generate output of related goods and services different from those corresponding to the respective characteristic activity (e.g. energy produced by waste incineration plants, etc.). Output of related products is not considered as environmental protection output (cf. § 2023).
- 2101 Related goods and services may be own-used or sold. In the case of specialised producers, related products, if sold, are treated as (secondary) non-environmental output; if they are own-used they are, by convention, used as inputs for the characteristic activity and do not have to be recorded separately. In the case of non-specialised characteristic producers, treatment of related goods and services is more complex. Related goods and services may be sold on the market, own-used as intermediate input for the principal non-characteristic activity (example: sawmill which burns its sawdust or wood wastes and uses the produced energy for power generation) or they may be own-used for a secondary or ancillary characteristic activity.
- For non-specialised characteristic producers executing a characteristic activity as secondary, only environmental output is recorded. Sales of related products are secondary non-environmental output. Own use of related products cannot and need not be recorded.
 - For non-specialised characteristic producers executing a characteristic activity as ancillary, output of related products must be identified when this output is sold or is own-used as intermediate input for the principal non-characteristic activity. Output of related products which is own-used for the ancillary activity itself need not be distinguished.
- 2102 In principle the uses corresponding to the output of related products should also be identified and deducted from the uses for the ancillary activity. Given the difficulties which may arise in identifying these uses, it may be decided to deduct the resources from related products from ancillary output. These resources are either the revenues from sales of related products (less taxes plus subsidies (if any) on related products) or the savings due to the own use of related products. Own use of related products should be valued at market prices of comparable products. If the value of output of related products is higher than internal cost of production the corresponding ancillary activity is profitable and environmental protection output is nil.

2103 Ancillary activities may generate additional gains for the units which execute them. These gains may consist of productivity gains, avoided cost of raw materials, energy, etc. From the producer's point of view savings of materials or energy and other gains in productivity resulting from the ancillary environmental protection activity may be greater than the actual cost of the resources allocated to environmental protection. In such event, environmental protection is "profitable" and does not burden the producer. However, as savings of materials or energy and other productivity gains are difficult to estimate, it may be impossible to account for them.

National expenditure in characteristic services and output of characteristic producers

2104 That part of national expenditure which consists of consumption of characteristic services is not equal to the environmental output of characteristic producers.

Differences arise:

- because of the valuation: marketed environmental output is valued at basic prices, excluding any invoiced VAT and other taxes on products and including subsidies on products (if any), whereas uses are valued at purchasers' prices, including non-deductible VAT and other taxes on products and excluding subsidies on products. As environmental output is always services and, therefore, no distribution margins exist, the difference is equal to non-deductible VAT plus other taxes less subsidies on products (see § 2059 sq.),
- because of imports and exports, between the value of the output of characteristic services at purchasers' prices and the value of uses of characteristic services by resident units,
- because of the difference between the value of uses of characteristic services by resident units and the national expenditure in characteristic services: national expenditure in characteristic services does not include intermediate consumption of characteristic services for characteristic activities (see § 2075 sq. for details).

Capital transactions

2105 Capital uses of characteristic producers correspond to their gross capital formation and their acquisitions less disposals of non-produced non-financial assets for characteristic activities. These capital uses of producers are equal to item c) of the national expenditure. For specialised producers the whole gross capital formation is deemed to be linked with environmental protection. For non-specialised producers, when a characteristic activity is executed as secondary, no gross capital formation is recorded, when a characteristic activity is executed as ancillary, gross capital formation is recorded as it results from specific inquiries.

For their capital uses characteristic producers may benefit from capital transfers.

Analysis of the financing of national expenditure

2106 The units which consume specific products or invest for environmental protection are not necessarily the financing units, i.e. those actually bearing the expenditure from own resources: units may benefit from specific transfers. The EPEA's framework for the analysis of direct (or indirect) financing of national expenditure allows the determination, for the different components of the national expenditure, of the units which are the financiers.

2107 As a rule, environmental protection is characterised by complex financing circuits, due to the existence of subsidies, investment grants and other transfers specifically intended for the financing of environmental protection activities, measures or actions. These subsidies, grants and other transfers are financed either from the general budgetary resources of general government or from specific taxes. Specific agencies or funds may be employed for the distribution of these resources.

2108 As concerns taxes and other specific charges for environmental protection (taxes on products, spill fees, administrative charges, etc.), the EPEA's financing analysis only records those payments which contribute to the financing of national expenditure and which therefore do not constitute general budgetary resources. Nevertheless, in order to determine the overall environment-related financial burden of industries and households (in their capacity as consumers), environment-related taxes which do not contribute to financing are recorded in a specific table (cf. §§ 2112 sq. and 2229 sq.).

2109 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 transfer part of these soft loans (which must be calculated) has to be treated as a transfer (cf. § 2042).

Analysis of financing circuits

2110 The analysis of the different financing circuits must respect the following general rules:

- 1 Units which pay specific taxes, charges, etc. are considered the financers of environmental protection expenditure financed from the corresponding resources.
- 2 General government is only considered the financer of those outlays made from its general budgetary resources, except therefore those outlays made from resources earmarked for the environment.
- 3 Government units at a given level are only considered the financers 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).

The specific rules applied to determine the financers of a particular component of the national expenditure are set forth in § 2212 sq.

2111 Analysis of financing allows to determine the institutional sectors which finance either directly or indirectly the national expenditure; financing of current national expenditure and financing of capital national expenditure are distinguished.

Environment-related financial burden

2112 The EPEA allows for the *environment-related financial burden* to be computed for the different categories of units, namely corporations (by industries), households and general government (cf. § 2243 sq.). Two components of the environment-related burden are distinguished:

2113 *Financial (or cost) burden of environmental protection*: This is the burden of units, industries and institutional sectors to the financing of current national expenditure for environmental protection plus calculated interest payments on fixed capital less any net operating surplus (in the case of specialised producers).

2114 *Environment-related tax burden*: These are the environment-related taxes, charges etc. paid (or received) by units and sectors. Environment-related taxes do not contribute to the financing of national expenditure, but they must be seen as a burden related to environmental protection.

2115 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).

2116 The net operating surplus does not constitute outlays, but resources from the unit's point of view. Conversely, computed interests on fixed assets must be considered as cost.

2117 As concerns corporations the objective is to determine to what extent financing of *current* national expenditure and payments of environment-related taxes weigh on the cost of production, by relating these burdens to the output. For households the objective is to determine how much they affect either to environmental protection by financing current national expenditure or how much they affect payments of environment-related taxes. Finally, in the case of general government, we are interested in computing the net result of environmental protection financing and environment-related receipts.

2118 The concept of the environment-related burden needs further reflection and testing, especially concerning the part of the environment-related tax burden. Although it is clear that environment-related taxes (especially those on pollution) do have effects on allocation and on international competitiveness, these effects cannot be considered as being additional cost (or resources) in their totality. It is a policy goal of many countries to increase the share of environment-related taxes in the overall tax revenues. Therefore, it must be assumed that these taxes - as they are not earmarked for environmental

protection and therefore constitute part of the general budgetary resources - replace other (non-environment-related) taxes. This is in particular true for taxes with a broad tax base (e.g. taxes on CO₂ emissions) which may generate considerable revenues. Therefore an assessment of the net effects of such shifts in the overall tax burden would be necessary.

2119 Moreover, environment-related taxes may result from a mere re-labelling of existing taxes which were not explicitly environment-related. Inclusion of such taxes may give rise to considerable changes in the environment-related burden. However, this may also be true for specific taxes. Great precautions must therefore be taken in the interpretation of the results. Fiscal environment-related burden evolution must in particular be related with the overall fiscal burden.

Units and groups of units

Units

2120 Units are identified according to their function(s) with respect to environmental protection. The following are distinguished:

- user and/or beneficiary units. These are units which:
 - use specific products (characteristic services, adapted and connected products) under the heading of final or intermediate consumption,
 - make investments in order to produce environmental protection services,
 - make investments in specific products,
 - benefit from specific transfers for environmental protection.
- characteristic producer units. These are units which produce environmental protection services. The following are distinguished:
 - specialised producers. These are units which execute a characteristic activity as their principal activity,
 - non-specialised characteristic producers. These are units which execute a characteristic activity as secondary or ancillary to their principal non-characteristic activity,
- financing units. These are units which finance environmental protection (directly or indirectly).

2121 A unit may execute several functions simultaneously:

- by convention, characteristic producers are always the users of their gross capital formation for characteristic activities,
- a specialised producer which produces non-market characteristic services, is at the same time user of its output, for that part which is classified as collective consumption; it may also be the financer (even if only partially) of the corresponding national expenditure,
- a non-specialised characteristic producer which executes a characteristic activity as ancillary is the user of its own (ancillary) output and the financer (even if only partially) of the corresponding national expenditure,
- a unit which uses specific products is at the same time the financing unit (even if only partially) of the corresponding national expenditure.

Grouping of units

- 2122 Units are grouped together according to their function(s). Given their importance in the production and financing of environmental protection, those units belonging to the general government and NPISHs sectors are singled out.
- 2123 In the analysis of the national expenditure emphasis is placed on the nature of uses. The following units are distinguished:
- producer units of the national economy as users of specific products for their intermediate consumption or gross capital formation, when they are not characteristic producers, or as they invest for environmental protection when they are characteristic producers,
 - general government units as collective consumers of characteristic services,
 - households as actual final consumers of specific products,
 - the rest of the world as beneficiary of specific transfers.
- 2124 For the analysis of the production, emphasis is placed on the nature of the characteristic producers (specialised or non-specialised). Specialised producers belonging to the general government or NPISHs sectors are distinguished from producers belonging to other sectors. For non-specialised characteristic producers this distinction does not seem necessary; it is nonetheless possible. The following are thus distinguished:
- specialised producers belonging to general government and NPISHs sectors,
 - specialised producers belonging to other institutional sectors,
 - non-specialised characteristic producers, which are grouped according to their principal activity. They execute characteristic activities as secondary or ancillary to their principal non-characteristic activity.
- 2125 For the financing analysis, units are grouped according to the institutional sector they belong to. The following are distinguished:
- general government,
 - NPISHs,
 - corporations,
 - households,
 - the rest of the world.

Transactions

The main features of the treatment of transactions of units, based on their classification in the different institutional sectors of the ESA, are outlined below.

Transactions of general government (and NPISHs) units

2126 Units belonging to the institutional sector of general government (cf. ESA § 2.68 sq.) may be characteristic producers, users/beneficiaries or financers of the national expenditure for environmental protection. The general government institutional sector includes also non-profit institutions principally engaged in the production of non-market output which are controlled by general government and whose principal resources (other than revenues from sales) are derived from general government. The following developments apply to NPISHs also.

Transactions as characteristic producers

2127 General government units as producers deserve specific treatment due to the fact that these units may provide output free or at prices that are not economically significant. A distinction is made between specialised producers and other units.

Specialised producers

2128 These units produce as principal output various environmental protection services: general management of the environment, specialised teaching or research, collection of municipal waste, sewerage and treatment of waste water, etc. These services may be market output or output provided free or at prices that are not economically significant (non-market output).

2129 In SNA and ESA, the use of output provided free or at prices that are not economically significant is always final consumption. This consumption is classified either as collective consumption of general government when the services are provided to the community as a whole, or as households' actual final consumption in the case of expenditure occurred by general government or NPISHs on individual consumption services.

2130 Therefore when environmental protection services (e.g. general management of the environment) are provided to the community as a whole, free or at prices that are not economically significant, by producer units of the general government sector, they should be classified as collective consumption and valued by their cost of production: intermediate consumption, compensation of employees, consumption of fixed capital and other taxes on production. The part of cost of production covered by partial payments is deemed to be market output (cf. 2066).

2131 When payments made by actual users do not reach 50% of the cost of production of the producer unit, this unit is considered as non-market producer. Output is deemed to be market for that part which corresponds to the partial payments and non-market for that part which is not compensated for by partial payments. Total output (market plus non-market) is therefore valued by the cost of production. National expenditure (intermediate and final consumption of market services and collective consumption of non-market services) is equal to output (plus non-deductible VAT).

2132 When payments made by actual users are higher than 50% of the cost of production of the producer unit, this unit is considered as market producer. Output is deemed to be market. That part of the resources of the producing unit which does not originate in the sale of output is considered as subsidy. National expenditure is equal to the market output valued at purchaser's price plus subsidy.

2133 National expenditure appears to be similar in the two cases with the exception of (if any) a positive net operating surplus of the market producer. This treatment is exemplified below for the case of subcontracted environmental protection services.

Treatment of environmental protection services, subcontracted, leased or granted by general government units

- 2134 Different modalities (concessions, leasing, etc.) may be employed by general government units (e.g. municipalities) to subcontract the production of environmental protection services (e.g. waste water or waste management). In the event that these services are purchased by a general government unit, this unit is classified as specialised producer. Nevertheless, in order to avoid double counting, its purchase of subcontracted services will not be accounted for as uses in national expenditure (see § 2075 sq.).
- 2135 This unit may recover part of its cost of production (purchase of subcontracted services plus management cost) through revenues from actual users or beneficiaries, whatever the name given to these payments.
- If the recovered part is less than 50% of the cost of production, the unit will be classified as non-market producer: that part of its cost of production which is compensated by partial payments of the actual users is classified as market output. Corresponding uses are intermediate or final consumption of the purchasers. That part which is not compensated for by partial payments is classified as non-market output of the general government unit. Corresponding uses are collective consumption.
- If the recovered part is more than 50% of the cost of production, the general government unit will be considered as a specialised producer of market services. Output is valued at basic prices, that is to say by the payments of the users less invoiced VAT and other taxes on products plus subsidies on products. That part of the cost of production which is not covered by revenues or observable subsidies is considered to be an invisible subsidy from general government as financier to the general government unit as market producer.
- 2136 In addition to current cost (or uses) incurred for the output of characteristic services, general government, in its capacity as specialised producer, has capital outlays.
- 2137 To determine capital outlays allocated for environmental protection may require the application of functional breakdown keys in certain cases (measurement and control sites for air pollution incorporated within integrated weather monitoring networks, aeromarine monitoring equipment devoted partially to the environment, etc.).
- 2138 In the case of subcontracting, the allocation of capital outlays to general government depends on the modality according to which the latter subcontracts the output of environmental protection services: in the case of concessions, the investments are made by concessionary enterprises; in the case of leasing, the investments are made by general government units (cf. 2140).

Financing of general government as specialised producer

- 2139 General government units, in their role as specialised producers, are financed by:
- the proceeds of the sale of environmental protection market services, including partial payments to non-market producers, whatever the price charged may be called,
 - current transfers (including subsidies in the case of market producers) and capital transfers received from other general government units or European Union institutions under the heading of environmental protection,
 - other sources like voluntary contributions, donations or specific taxes.
- 2140 When a general government unit leases environmental protection facilities to an enterprise, the payments made by the enterprise under the heading of uses of equipment are recorded as rentals. They are part of the intermediate consumption of the enterprise (purchase of services produced by the general government unit). This intermediate consumption must not be accounted for in national expenditure. The output of the general government unit mainly consists of fixed capital consumption (plus some maintenance and management cost).

Non-specialised characteristic producers

- 2141 Certain units of the general government sector may produce characteristic services as secondary or ancillary to a principal non-characteristic activity (e.g. hospitals treating their own waste, waterway authorities maintaining or restoring biotopes, etc.). This output is recorded as secondary or ancillary output of characteristic services of the corresponding industry.

Transactions as users/beneficiaries

- 2142 General government units are users/beneficiaries of environmental protection expenditure for:
- their actual final consumption of non-market characteristic services,
 - their gross capital formation (and acquisitions less disposals of non-produced non-financial assets) as specialised producers,
 - their uses of ancillary characteristic services and their environmental protection-related investments in their capacity as non-specialised characteristic producers,
 - their uses (intermediate consumption and gross capital formation) of specific products in their capacity as non-characteristic producers.
- 2143 In the EPEA's tables only these units of general government which are collective consumers or specialised producers are distinguished. Therefore the uses of non-specialised characteristic or non-characteristic producers of general government are entered under the industries corresponding to the principal activity of these units.

Transactions as financers

- 2144 General government units finance, or contribute to the financing of:
- their collective consumption of non-market services as collective consumer,
 - their gross capital formation for characteristic activities,
 - their intermediate consumption of, or gross capital formation in, specific products in the case of general government units other than characteristic producers,
 - other characteristic or non-characteristic producers, through subsidies, investment grants, etc.,
 - other user/beneficiary units, through other specific transfers.
- 2145 In accordance with ESA conventions, subsidies are paid by general government (and European Union institutions) and are intended, by definition, solely for market producers; investment grants paid by general government and the rest of the world contribute to financing expressly designated for gross fixed capital formation of other units. Transfers between government units may include total or partial financing of current uses and gross capital formation linked to non-market output.
- 2146 A distinction is made between units belonging to central and state government (CG, cf. ESA §§ 2.71 and 2.72), and to local government (LG, cf. ESA § 2.73). When necessary, additional categories (e.g. social security funds) may be distinguished. Within local government (LG) the following distinctions may also be made:
- local government levels I, II or III of the statistical territorial units classification (NUTS),
 - local government units below level III of the NUTS.
- 2147 Expenditure for environmental protection are often made by, or transit in part through, specific public agencies (for example in the field of water supply: National Water Service, Waterschappen in the Netherlands, Junta de Saneamiento in Spain, Agences Financières de Bassin in France, etc.) or through ad hoc financial funds, etc. These agencies or funds may be central or local and, depending on their characteristics, may or may not be considered as general government units. In any event, the relationship (or lack of) of these bodies with the government sector must be determined. When necessary, it must be determined to which level of government they belong and their nature (producer, user, financer or a combination of these) must be specified.

Transactions of non-financial and financial corporations

2148 Units belonging to the ESA institutional sectors of "Financial corporations" and "Non-financial corporations" (cf. ESA § 2.21 sq. and 2.32 sq.) may be characteristic producers, users/beneficiaries or financers of national expenditure. Units may be:

- specialised producers which produce characteristic services as principal activity,
- non-specialised characteristic producers which produce characteristic services as secondary or ancillary to a non-characteristic principal activity,
- non-characteristic producers which do not produce characteristic services.

Transactions as characteristic producers

Analysis of transactions of characteristic producers must distinguish specialised producers and non-specialised producers.

Specialised producers

2149 In the case of specialised producers, valuation of current uses and resources and capital outlays and resources does not give rise to any particular problems since they are described in the unit's accounts and in the ESA. When the unit executes secondary activities related or unrelated with environmental protection the corresponding output has to be specified. Ancillary activities are not distinguished.

Non-specialised characteristic producers

2150 In the case of non-specialised characteristic producers which execute a characteristic activity as secondary, valuation is only possible, in the national accounts, for the output of characteristic services: uses and capital outlays for the secondary activity are not distinguished. Uses of specific products of the unit as a whole may be distinguished. Unless more detailed information is available, it is assumed that all uses of specific products correspond to the principal non-characteristic activity (cf. § 2078).

2151 In the case of non-specialised characteristic producers which execute a characteristic activity as ancillary, uses and capital outlays are not described in the national accounts and have to be identified through specific inquiries. This is a complex operation insofar as the definition of the uses and capital outlays for environmental protection ancillary activities is ambiguous.

2152 Two types of equipment used for ancillary activities may be distinguished :

so-called "end-of-pipe" equipment

This is equipment for the reduction of discharges of pollutants produced during the production cycle (dedusters, units for the detoxification of industrial waste, treatment of waste water prior to discharge, etc.). To the extent that their cost can be isolated within the gross fixed capital formation of the unit, their valuation poses no special problems, even if it necessitates a specific inquiry or recording system. Related current uses may in the same way be isolated.

integrated equipment (or "clean" technologies)

Such equipment is typically integrated in the production cycle and may result from the modification of existing equipment for the explicit purpose of reducing the output of pollutants or from the purchase of new equipment whose purpose is dual, both industrial and for pollution control. In the first case, expenditure can be estimated from the cost of the modification of existing equipment. In the second, the extra cost due to pollution control has to be estimated, i.e. the cost of "non-pollutant or less pollutant" equipment is compared to that of a "pollutant or more pollutant" reference equipment.

These estimates are uncertain: reference equipment may no longer exist or new equipment may, in addition to its beneficial effects on the environment, present other advantages (savings or substitution of raw materials, higher productivity, etc.) which in terms of cost cannot be isolated. This point is still the object of methodological research⁽¹⁾. The difficulty arises with the gradual integration of environmental considerations and economic development: as this integration progresses, substantiated by the gradual replacement of "end-of-pipe" equipment by integrated equipment and the gradual vanishing of reference equipment, it becomes increasingly difficult to separate expenditure for environmental protection from overall production expenditure.

¹ See A. J. de Boo "Cost of integrated environmental control" (Statistical journal of the United Nations ECE 10 1993).

Financing of producer units

Specialised producers

- 2153 Current resources of market specialised producers consist of their sales of characteristic services to other units. These resources are by definition equal to their current uses. Therefore financing of current uses by producers is nil.
- 2154 Capital expenditure of specialised producers may be partially financed by investment grants. As indicated in § 2109, in the present state of development of the EPEA, loans are not distinguished as sources of financing. The balance between capital expenditure and investment grants is, by convention, financed by the producers themselves.

Non-specialised characteristic producers

- 2155 The resources of non-specialised characteristic producers vary according to the nature of their output. In the case of secondary output, receipts from sales by definition correspond to current uses. No gross capital formation is recorded. In the case of ancillary output, resources are constituted solely by investment grants the producer may receive. The difference between the sum of current uses (i.e. cost of production) of producers plus gross capital formation for ancillary characteristic activities, on the one hand, and investment grants received, on the other hand, is, by convention, financed by the producers themselves.

Transactions as users/beneficiaries

- 2156 Transactions as users/beneficiaries consist of:
- gross capital formation (and acquisitions less disposals of non-produced non-financial assets) of specialised producers and of non-specialised characteristic producers which execute a characteristic activity as ancillary,
 - gross capital formation in specific products other than for characteristic activities,
 - intermediate consumption of specific products other than for characteristic activities, including ancillary characteristic services,
 - the specific transfers they may benefit from.

Transactions as financers

Financing: characteristic producers

- 2157 Characteristic producers may finance all or part of their investments and, in the case of non-specialised characteristic producers which execute a characteristic activity as ancillary, their output. In that case, the producer unit, the user unit and the financing unit will be treated as one and it will be said that the producer unit is also the financing unit (even if only partially).

Financing: user units

- 2158 Units which are not characteristic producers finance the national expenditure for their intermediate consumption of specific products.

The corresponding financing takes the form either of the purchase of characteristic services (e.g. polluting non-characteristic producers having their waste, waste water treated by specialised producers) and connected or adapted products, or of specific charges and fees paid for "public" characteristic services (e.g. collection and treatment of waste and waste water by local governments).

Financing: other cases

2159 A producer which is neither a characteristic producer nor user/beneficiary of the national expenditure, can nonetheless be a financer of national expenditure. That is in particular the case of producers which, although pollutant, neither consume any specific products nor execute any investments designed to reduce the pollution for which they are responsible. Such units may have to pay diverse specific taxes (charges linked to their emissions of pollutants, product taxes or charges, etc.) used to finance the national expenditure. Apart from the payment of specific taxes this is the case in particular of enterprises belonging to associations founded for the purpose of organising or financing selective collection and treatment of waste. These associations, which are of some significance in Germany (dual system) and in France (Association Eco-Emballages) are considered part of the corporation sector.

Transactions of households

2160 Households (cf. ESA § 2.75 sq.) may be users/beneficiaries, through their final consumption of specific products, as well as through specific transfers they may benefit from. They may be financers of the national expenditure through their purchases of specific products, payments of specific taxes earmarked for environmental protection or through their voluntary contributions to NPISHs, etc.

Transactions of households as producers

2161 Households, in their capacity as producers, are essentially non-specialised characteristic producers. According to the ESA, units of the households institutional sector may be producers, provided that the corresponding activities are not those of separated entities treated as quasi-corporations. The definition includes sole proprietorships and partnerships without independent legal status as producers of goods and non-financial services. Additionally, linked to their output of housing services ("letting of own property"), households may be led to execute ancillary activities for environmental protection. In the EPEA, these ancillary activities are treated under the corresponding NACE Rev. 1 classes. Hence, households do not appear as producers of environmental protection services. Furthermore, for the sake of simplicity, investment related to environmental protection and linked with own-account housing services, agriculture etc. are treated as gross capital formation in connected products (e.g. septic tanks, noise protective windows) of the respective industries.

Transactions of households as users/beneficiaries

2162 In their capacity as users/beneficiaries of national expenditure, households consume:

- characteristic services: sanitation services, treatment of household waste water, collection and treatment of household waste, etc.,
- connected and adapted products.

In the case of waste management, connected products may consist of receptacles, trash bags, wheeled rubbish containers, etc.; in the case of waste water management, of septic tanks and products required for the use of septic tanks; in the case of air pollution control, of carburation-regulation services, catalytic converters, etc.; in the case of noise control, of noise protective windows, etc.

Adapted products may consist of phosphate-free washes, mercury-free batteries, adapted cars, etc. The uses of adapted products are entered for the amount of extra cost as compared to equivalent normal products (cf. § 2026 sq.).

In addition, households may benefit from transfers for environmental protection. This concerns, in particular, that part of subsidies on specific products that corresponds to their consumption.

2163 The ESA and SNA do not recognise actual final consumption of NPISHs but only final consumption expenditure of NPISHs, which consists of the expenditure incurred by resident NPISHs on individual consumption of goods and services. This final consumption expenditure of NPISHs enters into actual final consumption of households. The same convention is adopted in the EPEA, actual final consumption (and uses) of households includes the output of characteristic services provided free or at prices that are not economically significant by NPISHs.

Transactions of households as financers of the national expenditure

2164 Households finance national expenditure through:

- the payments (including partial payments) they make under the heading of final consumption of characteristic services. These payments may take the form of purchases or of payments of charges, taxes, etc. linked to the price of a service (e.g. charges for waste water services),
- their purchases of connected and adapted products,
- payment of taxes or specific charges whose receipts are earmarked for environmental protection.

2165 In their capacity as producers, units of the ESA households institutional sector may also appear as financers of uses of non-specialised or non-characteristic producers. This is in particular the case of the financing by households of the environmental protection-related gross capital formation of the 70.20 class of the NACE Rev. 1 "letting of own property" industry. This gross capital formation consists of septic tanks, noise reduction windows, etc.

Transactions of the rest of the world

2166 In the EPEA as in ESA the rest of the world (cf. ESA § 2.89 sq.) is a grouping of non-resident units carrying out transactions with resident units. As concerns environmental protection, the rest of the world may:

- purchase specific products from resident producers,
- sell specific products to resident user units.

These transactions only appear in the EPEA in the supply and use table of characteristic services (cf. § 21xx Table B1). Exports of specific products - as uses of non-resident units - are not part of national expenditure.

2167 In the EPEA the rest of the world also appears as beneficiary of transfers and as financer:

as beneficiary of transfers, in the event of:

- contributions from resident units to inter-state pollution control bodies,
- international co-operation expenditure, development grants, etc. made by resident units on behalf of environmental protection,
- exports by resident units of "subsidised" environmental protection services or connected and adapted products, for the amount of the corresponding subsidies.

as financer (generally indirect) of domestic uses, in the case of subsidies or investment grants paid by the rest of the world (essentially European Union institutions) to resident units (general government, enterprises) under the heading of environmental protection. This financing must be deducted from domestic uses when determining the national expenditure.

Accounting system and tables

Structure and set-up of the account

- 2168 The EPEA contains a series of three main interactive tables, each of which responds to one of the goals recalled thereunder:
- Table A details and values the national expenditure for environmental protection.
 - Table B describes the output of characteristic services. It is supplemented by a supply and use table of characteristic services (Table B1).
 - Table C describes the way in which national expenditure is financed by cross-referencing users/beneficiaries and financers. It is supplemented by a table which presents the components of environment-related burden for the different sectors of the economy (Table C1).
- 2169 Ideally, the EPEA is drawn up by sub-account aggregation. These sub-accounts are detailed in the following Chapters III to IX; only the general framework is outlined here.
- 2170 Each of these sub-accounts concerns one of the environmental domains corresponding to the major headings in the CEPA: protection of ambient air and climate, waste water management, waste management, protection of soil and ground water, noise and vibration abatement, protection of biodiversity and landscape, other environmental protection activities (including protection against radiation and research and development).
- 2171 As required, and depending on data availability, other sub-accounts may be envisaged at a more detailed level of the CEPA (for example: sub-account on sanitation and treatment of waste water, sub-account on municipal waste, etc.). These sub-accounts are not dealt with here. They can be drawn up according to data availability and the needs of the Member States. The collection of certain data, in particular those concerning output and investments, related to the elementary characteristic activities of the classification is required in order to set up the various sub-accounts.
- 2172 For aggregation to be possible, units must be classified in the different sub-accounts in identical manner. This identical classification is necessary in order to allow a proper treatment with respect to the provisions against double counting, in particular for specialised producers. Specialised producers are thus classified with respect to environmental protection as a whole and not to a particular domain. In the tables the column for the specialised producers groups together all producers of the "environmental industry" as pertaining to the specified positions of the NACE Rev. 1. All other producers are grouped on the basis of the industry corresponding to their principal activity.

Valuation system - overview

- 2173 The following valuation concepts are used in the EPEA's tables (cf. § 2050 sq.).

VALUATION CONCEPTS used in the EPEA	OUTPUT (Tables B and B1)	USES (Tables A, B1 and C)
Market characteristic services	Basic prices	Purchasers' prices
	Partial payments	Purchasers' prices
Non-market characteristic services	Cost of production less partial payments	Cost of production less partial payments
Ancillary services	Cost of production	Cost of production
Connected products	Not recorded	Purchasers' prices
Adapted products	Not recorded	Extra cost

In the case of characteristic services - as there are usually no trade or transport margins paid separately by the purchaser - purchasers' prices less non-deductible VAT and other taxes on products plus subsidies on products are equal to basic prices. Intermediate consumption for characteristic activities as well as gross capital formation are valued at purchasers' prices.

National expenditure by components and by users/beneficiaries (Table A)

The various components of national expenditure as defined in § 2072 are described in the rows of Table A; they are entered in columns for the different categories of users/beneficiaries.

Components of national expenditure

Consumption of specific products

2174 This is defined as the sum of final and intermediate consumption of characteristic services, connected and adapted products by resident units.

Final and intermediate consumption of characteristic services

2175 Uses of market products are valued at purchasers' prices, including non-deductible VAT. Uses which consist of services produced as ancillary and/or provided free or at prices that are not economically significant are valued on the basis of cost of production (cf. § 2064).

2176 Final consumption of characteristic services is that of households (final consumption of market services, actual final consumption of services provided by NPISHs) and of general government (collective consumption). Final consumption is entered into the lines "final consumption of characteristic services"; market and non-market services are distinguished.

2177 Intermediate consumption of characteristic services is, by definition, that of producer units of the national economy. It may consist of market or ancillary characteristic services. In principle, it does not include the intermediate consumption of characteristic services for characteristic activities, as this intermediate consumption is assumed to be included in the volume of environmental output (cf. § 2075 sq.). Intermediate consumption is entered into the lines "intermediate consumption of characteristic services"; market and ancillary services are distinguished.

Final and intermediate consumption of adapted and connected products

2178 This corresponds to the final consumption of households and the intermediate consumption of producers of adapted and connected products at purchasers' prices, or at extra cost at the level of purchasers' prices. It does not include the intermediate consumption of adapted and connected products for characteristic activities (cf. § 2075 sq.). Final consumption is entered into the lines: "final consumption of adapted products" and "final consumption of connected products". Intermediate consumption is entered into the lines: "intermediate consumption of adapted products" and "intermediate consumption of connected products".

2179 If any, the amount of subsidies corresponding to adapted and connected products, whatever the form or denomination - subsidies to producers of adapted products, tax incentive measures for the benefit of consumers, etc. - is entered into the line "subsidies for adapted and connected products".

Capital expenditure

2180 These are outlays in capital of characteristic producers for their gross capital formation (and acquisitions less disposals of non-produced non-financial assets) for characteristic activities, and gross capital formation in specific products of non-characteristic producers (but see § 2075 sq.). They are valued at purchasers' prices, by cost of production and by extra cost.

Gross capital formation for characteristic activities

2181 To execute characteristic activities, characteristic producers invest in gross capital formation and acquisitions less disposals of non-produced non-financial assets (land, patents, etc.). In the case of specialised producers, these outlays raise no specific problems of identification and valuation, they are assumed to be equal to the total gross capital formation of the unit. In the case of non-specialised characteristic producers which execute a characteristic activity as ancillary, a specific inquiry is necessary to determine that part of the unit's gross capital formation which has to be allocated for the ancillary activity. This gross capital formation may include adapted or connected products. For secondary activities, no gross capital formation is recorded. However, when it is known and significant, the unit which executes the activity should be treated as specialised producer.

Gross capital formation in specific products

2182 Gross capital formation in specific products corresponds to the gross capital formation of non-specialised and non-characteristic producers in characteristic services or connected and adapted products. Gross capital formation in characteristic services is improvement of land produced by a "decontamination of soil" activity. These uses are valued at purchasers' prices, including non-deductible VAT. For the valuation of gross capital formation in adapted products the same convention as for the valuation of consumption is applied: only extra cost is registered.

Gross capital formation of specialised producer in specific products is not recorded for. It is already included in their gross capital formation. For non-specialised characteristic producers specific provisions are described in § 2075 sq.

Specific transfers

2183 Transfers become part of the national expenditure when their purpose is environmental protection and they are not the counterpart of the value of uses of goods and services. Current and capital transfers are distinguished.

Subsidies on production - characteristic services

2184 Given the valuation method at purchasers' prices, the value of the consumption of characteristic services does not account for these subsidies. To rectify this under-assessment requires that subsidies paid to characteristic producers be recorded. These subsidies must be entered separately in the columns of the users. In the event that part of output is exported, the corresponding subsidies will figure in the rest of the world column.

2185 Within subsidies on production, the ESA distinguishes subsidies on products and other subsidies on production, the two types of subsidies being treated differently in its valuation system. For the national expenditure and financing analysis, only the total of subsidies paid out is of any concern. This is the total which must be entered in the row for *subsidies on production - characteristic services*.

Subsidies on production - adapted and connected products

2186 In similar fashion, since adapted and connected products are valued at purchasers' prices and are apt to benefit from subsidies, these subsidies are entered in the row *subsidies on production - adapted and connected products*, in the columns of the users. For adapted and connected products special emphasis must be put on tax exemptions.

Other specific transfers

2187 Transfers may also consist of:

- other transfers paid under the heading of environmental protection to non-characteristic producers or households, on condition that these transfers do not constitute a counterpart of uses (e.g. compensation of losses of income or capital related to environmental protection measures).
- transfers to the rest of the world: financing of international or European Union programmes, co-operation, etc. under the heading of environmental protection.

Given the heterogeneous nature of this category, a detailed analysis of the national situation is necessary to identify all cases.

Financing by the rest of the World

2188 The national expenditure being defined as the expenditure of resident units financed by resident units, financing from the rest of the world must be subtracted from the preceding items, distinguishing financing by European Union institutions.

Users/beneficiaries*Producers*

- 2189 The producer units of the national economy are regrouped, whatever the institutional sector they belong to. They are divided into characteristic and non-characteristic producers. Among characteristic producers, specialised and non-specialised producers are distinguished. Specialised producers are finally divided into those belonging to the general government and NPISHs sectors and those belonging to other institutional sectors.
- 2190 Uses of specialised producers consist only in their investments as characteristic producers. Non-specialised characteristic producers performing ancillary activities are users of the characteristic services they produce and of capital outlays intended for the output of these services. For their non-characteristic principal activity, they also may use market specific products as intermediate consumption or invest in specific products. As users of specific products they may benefit from subsidies. Non-specialised characteristic producers performing secondary activities have no uses as long as there is no gross capital formation recorded.
- 2191 Non-characteristic producers may use specific products as intermediate consumption. They may invest in specific products. As users of specific products they may benefit from subsidies. They may also benefit from transfers whose purpose is to compensate losses either current or in capital which originate in environmental protection measures (compensation for stopping or reducing production, etc.).
- 2192 As users, non-specialised characteristic producers and non-characteristic producers may be grouped together.

General government as collective consumer

- 2193 This category groups together units belonging to the general government sector in their capacity as collective consumers. Central and state government (CG) are distinguished from local government (LG). The value of uses is equal to government expenditure on collective characteristic services, that is to say to the output by general government units of non-market characteristic services provided to the community as a whole. They generally consist of environment management, administration and the like. They are valued as defined in § 2064 sq.

Households

- 2194 Households are users of specific products in their capacity as consumers. These products may consist of market characteristic services, of characteristic services provided free by NPISHs and of connected and adapted products, including durable consumer goods. For that part of their uses which consists of market products, they may benefit from subsidies.
- 2195 Capital outlays of households in specific products corresponding to their gross capital formation for environmental protection are accounted for as gross capital formation of non-characteristic producers (e.g. under the heading 70.20 "Letting of own property" of the NACE Rev. 1).

Rest of the world

- 2196 The rest of the world may benefit from transfers under the heading of environmental protection. It also appears as beneficiary of that part of subsidies corresponding to exported specific products.

Table A: National expenditure by components and by users/beneficiaries

COMPONENTS OF NATIONAL EXPENDITURE FOR ENVIRONMENTAL PROTECTION	USERS/BENEFICIARIES								
	Producers				General Government as collective consumer		Households as actual consumers	Rest of the World	Total
	specialised producers		other producers (by industry)		CG	LG			
	GG & NPISHs	Other	non-specialised	non-characteristic					
1 Consumption of specific products									
1.1 Final consumption of characteristic services									
market	-	-	-	-	-	-	X	-	X
non-market	-	-	-	-	X	X	X	-	X
1.2 Intermediate consumption of characteristic services									
market	nr	nr	X	X	-	-	-	-	X
ancillary	nr	nr	X	-	-	-	-	-	X
1.3 Final consumption of connected products									
adapted products	-	-	-	-	-	-	X	-	X
1.4 Intermediate consumption of connected products									
adapted products	nr	nr	X	X	-	-	-	-	X
2 Gross capital formation ⁽¹⁾ for characteristic activities	X	X	X	-	-	-	-	-	X
3 Gross capital formation in specific products									
in connected products	nr	nr	X	X	-	-	-	-	X
in adapted products	nr	nr	X	X	-	-	-	-	X
in characteristic services	nr	nr	X	X	-	-	-	-	X
4 Specific transfers (not counterpart of items 1, 2, 3)									
4.1 subsidies on production									
characteristic services	nr	nr	X	X	-	-	X	X	X
connected products	nr	nr	X	X	-	-	X	X	X
adapted products	nr	nr	X	X	-	-	X	X	X
4.2 other specific transfers									
current	(-)	(-)	(-)	X	-	-	X	X	X
capital	(-)	(-)	(-)	X	-	-	-	X	X
5 Total uses of resident units (1+2+3+4)									
current	-	-	X	X	X	X	X	X	X
capital	X	X	X	X	-	-	-	X	X
6 Financed by the rest of the world									
current uses	-	-	X	X	X	X	X	X	X
capital uses	X	X	X	X	-	-	-	X	X
7 National Expenditure for Environmental Protection (5-6)									
current	-	-	X	X	X	X	X	X	X
capital	X	X	X	X	-	-	-	X	X

(1) and acquisitions less disposals of non-produced non-financial assets

Note on Table A:

In Table A, a cross indicates that the transaction is recorded at this intersection. The sign "nr" indicates that the transaction may exist, but is *not recorded* at this intersection given the construction of national expenditure and the conventions of the EPEA's valuation system. A dash indicates that the transaction does not exist. A dash between brackets indicates that the transaction may exist but no example was found.

Subsidies on specific products (characteristic services, adapted and connected products) are considered as going directly to the users of these products (as uses are valued at purchasers' prices). Uses of specific products of specialised producers are not separately recorded, but they may exist. Hence specialised producers may benefit from subsidies on specific products. As these subsidies are passed through to the other users, they are recorded in the column of these users. Other specific transfers refer to the description given in § 2187.

Production of characteristic services (Table B)

2197 Table B describes the transactions of characteristic producers. It furnishes, for the various categories of producers, details of uses linked to output as well as resources. In addition, it provides a valuation of capital transactions and the balance of producer financing. This table is complemented by a supply and use table for characteristic services.

Classification of characteristic producers

Units

2198 As already indicated, in this chapter units are local kind-of-activity units (local KAU) or KAU and analysis of production is based on the distinction between specialised and non-specialised characteristic producers.

2199 Characteristic producers may execute their characteristic activity as principal activity. These units are designated as specialised producers. These producers may also execute other characteristic activities as secondary or ancillary in the same or another environmental protection domain.

2200 Producers whose principal activity is unrelated to environmental protection may execute a characteristic activity as secondary or ancillary activity. These producers are designated as non-specialised characteristic producers. They are regrouped by industry, referring to their principal non-characteristic activity.

2201 Specialised producers are identified with reference to the NACE Rev. 1 classification. They are those units whose principal activity belongs to one of the classes of the NACE Rev. 1 as listed in § 2243 sq. It means that specialised producers are the same among the diverse domains. This rule permits the sub-accounts of the various domains to be aggregated.

2202 For specialised producers, as it is impossible to separate and affect inputs and factors and generally speaking transactions (with the exception of output) to the different activities, all the transactions of the unit are recorded. Output is separated among principal activity, secondary environmental protection activities (if any) and other secondary activities (unrelated with environmental protection). Ancillary characteristic activities are not distinguished.

2203 For non-specialised characteristic producers which execute a characteristic activity as secondary only the value of output is available. Recording of the transactions of these producers is thus limited to output. For non-specialised characteristic producers which execute a characteristic activity as ancillary to their principal activity, specific inquiries are necessary to identify transactions.

2204 Among specialised producers, those belonging to general government and NPISHs institutional sectors and those belonging to other institutional sectors are separated.

2205 The category *specialised producers belonging to the general government and NPISHs sectors* groups together specialised producers belonging to the ESA institutional sectors of general government and NPISHs⁽¹⁾. They might also be grouped according to criteria *relevant to the nature of output*: a distinction would then be made for units which produce non-market environmental protection services and those which produce market environmental protection services.

2206 The category *specialised producers belonging to other sectors* groups together specialised producers belonging to other sectors. These producers may also produce environmental protection services as secondary or ancillary; the ancillary output is not distinguished from their principal output. *Non-specialised characteristic producers* produce environmental protection services as secondary or ancillary to a non-characteristic activity.

Transactions

2207 The rows of the table describe current transactions (current uses and resources of producers) as well as capital transactions (capital expenditure and financing) as described in § 2094 sq.

¹ "Non-profit bodies serving enterprises whose principal function consists of producing non-financial market goods and services, including bodies financed by voluntary contributions or para-fiscal tax contributions, these contributions being assimilated as purchases of market services" are classified by the ESA in the corporations sector.

Table B: Production of characteristic services

TRANSACTIONS	CHARACTERISTIC PRODUCERS				Total
	Specialised producers		Non-specialised producers (by industry)		
	GG/NPISHs	Other	Secondary output	Ancillary output	
CURRENT TRANSACTIONS					
Current uses					
Intermediate consumption	x	x	nr	x	x
of which characteristic services	x	x	nr	nr	x
of which adapted and connected products	x	x	nr	nr	x
Compensation of employees	x	x	nr	x	x
Consumption of fixed capital	x	x	nr	x	x
Other taxes on production	x	x	nr	-	x
Less other subsidies on production	x	x	nr	x	x
Net operating surplus	x	x	nr	x	x
Output (basic price or cost of production)	x	x	x	x	x
Non-environmental output					
related products	x	x	nr	x	x
other non-environmental output	x	x	nr	-	x
Environmental protection output					
non-market					
principal	x	-	-	-	x
secondary	x	-	x	-	x
market					
principal	x	x	-	-	x
secondary	x	x	x	-	x
ancillary	nr	nr	nr	x	x
Current environmental protection resources					
Market output (including partial payments)	x	x	x	-	x
Current transfers	x	-	x	x	x
CAPITAL TRANSACTIONS					
Gross fixed capital formation	x	x	nr	x	x
Other capital uses	x	x	nr	x	x
Investment grants received	x	x	nr	x	x
Other capital transfers received	x	(-)	nr	(-)	x
FINANCING BY PRODUCERS (output plus balance of capital transactions minus resources)	x	x	x	x	x
Labour inputs	x	x	nr	x	x
Stock of fixed assets	x	x	nr	x	x

Note on Table B:

In Table B, a cross indicates that the transaction is recorded at this intersection. The sign "nr" indicates that the transaction may exist, but is *not recorded* at this intersection given the construction of the national expenditure aggregate and the conventions of the EPEA's valuation system. A dash indicates that the transaction does not exist. A dash between brackets indicates that the transaction may exist but no example was found.

Secondary output is assumed to be of minor importance in the EPEA. Therefore for secondary output it is assumed that the only available information is output. As no gross capital formation is recorded, the financing by producers is nil. If secondary output is found to be important, efforts have to be made to gather or estimate (e.g. on the basis of physical data or by analogy to specialised producers with the same kind of output) the necessary data and to transform the corresponding units into specialised producers (see § 2017 sq.). In the case of non-market secondary producers - as no data for the calculation of the cost of production are available - it may be possible to identify the current transfers received by the producer from the labels given to them by the donor.

2208 Tables A and B are complemented by a supply and use table for characteristic services.

Table B1: Supply and use table for characteristic services

	Non-market	Market	Ancillary	Total
1 Uses of resident units (purchasers' prices)				
Intermediate consumption	-	X	X	X
Specialised producers	-	X	nr	X
Other producers	-	X	X	X
Final consumption	X	X	-	X
Gross capital formation (land improvement)	X	X	-	X
2 Exports	-	X	-	X
Total uses (1+2) = total supply (3+4+5+6)	X	X	X	X
3 Output (basic prices)	X	X	X	X
4 Imports (customs price)	-	X	-	X
5 Non-deductible VAT	X	X	-	X
6 Other taxes less subsidies on products (if any)	X	X	-	X

2209 In order to account for the totality of supply and uses, imports and exports of market characteristic services, as well as intermediate consumption of specialised producers, are introduced. No entries are made for exchanges of production waste, scraps, by-products, etc. as long as they do have a price.

Uses

2210 Intermediate consumption of market characteristic services is valued at purchaser's price. In relation to Table A (row: "intermediate consumption of market characteristic services") the only difference is "intermediate consumption for characteristic activities" which comes from Table B.

Intermediate consumption of ancillary characteristic services is valued by cost of production and is therefore equal to the respective values in Tables A (row: "intermediate consumption of ancillary characteristic services") and B (row: "environmental protection ancillary output")

Final consumption of market characteristic services is valued at purchaser's price, including non-deductible VAT on products (domestic and imports) or by cost of production. It is equal to the respective value of Table A (row: "final consumption of market characteristic services")

Gross capital formation consists in land improvement. Such output may be produced for own use by all characteristic producers; in such a case it is classified as non-market. It is valued at purchaser's price or by cost of production.

Exports of market characteristic services (waste treatment services, etc.) are valued at basic prices.

Supply

2211 Output is valued at basic prices or by cost of production

Output of non-market, market and ancillary characteristic services is equal to the respective values in Table B (rows: "output of non-market characteristic services", "output of ancillary characteristic services", "output of market characteristic services", principal and secondary).

Imports of market characteristic services (waste treatment services, etc.) are valued at ex-customs price.

VAT on products is equal to non-deductible VAT on characteristic services (of domestic origin or imported) supported by final users.

Financing of national expenditure (Table C)

- 2212 The purpose of Table C is to identify the way the national expenditure is financed by units of the various sectors of the economy. The users/beneficiaries categories are those of Table A. The financing units are regrouped according to institutional sectors.
- 2213 For each component of national expenditure as figured in Table A, the financing unit, i.e. the unit actually bearing the expenditure, has to be identified. In a second stage, financing is cross-classified between user/beneficiary units and financing units.
- 2214 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, payment of taxes whose receipts are earmarked for environmental protection, etc.).

Analysis of financing by component of national expenditure

Consumption of specific products

- 2215 Consumption of specific products is valued at purchasers' prices. The units which actually bear the expenditure are the following:

Final and intermediate consumption of market characteristic services (sewage and treatment of household or industrial waste water, collection and treatment of municipal or industrial waste, etc.): the financer is the user.

Final consumption of non-market characteristic services: these services are produced by specialised producers of the general government and NPISHs sectors. The financer is general government or NPISHs producer unit for the value of non-market output, less current transfers. As national expenditure of non-market services is valued at their cost of production, these current transfers do not explicitly appear in national expenditure and have to be identified (cf. Table B).

Intermediate consumption of ancillary characteristic services is valued by cost of production in Table A. The financer is the user (i.e. the producer itself).

Subsidies on characteristic services are entered in national expenditure. As with any other transfer, if the funds used for the transfers are earmarked receipts (taxes, etc.), financing units are those which make the payments.

- 2216 When the non-specialised characteristic producer belongs to the general government and the NPISHs sector, it may benefit from transfers other than subsidies from other general government units (e.g. public hospitals benefiting from transfers of social security funds or central government for the treatment of hazardous waste), or from European Union institutions. In this case, the user is financer only for that part not covered by the transfers, and the units in which the funds originated for the transfers are financers for the corresponding amounts.
- 2217 Uses of connected and adapted products are valued at purchasers' price or by extra cost. The financer is the user. Subsidies on connected and adapted products, whatever the form or the name called (fiscal incentives, etc.) are considered in national expenditure (cf. § 2220).

Capital expenditure of characteristic producers

- 2218 Characteristic producers are, according to convention, the users of their capital outlays. They may receive capital transfers from other units. These investments grants or other capital transfers are not explicitly recorded in national expenditure. They appear in Table B only. By convention, characteristic producers are financers of the balance between their capital expenditure and any capital transfers received. Investment grants and other capital transfers are financed by the paying unit, except for transfers originating in earmarked receipts. For these transfers the units which contribute to the earmarked funds are the financers (for the respective amounts of their contributions).

Gross capital formation in specific products of resident units other than for characteristic activities

2219 The units which invest in specific products are the users. They are also the financers for that part of their uses which is not covered by investment grants or capital transfers. The units in which the funds originated for the investment grants and capital transfers are financers for the corresponding amounts.

Specific transfers

2220 In Table A, subsidies and other specific transfers are entered under their beneficiaries. When subsidies and other specific transfers are paid from earmarked funds, the financers are, for the respective amounts of their contributions, the units in which the funds for these subsidies or specific transfers originated.

Financing by institutional sector

Financing is described by ESA's institutional sectors and sub-sectors. Some sectors or sub-sectors are grouped as follows.

General government

2221 The sector is subdivided into the following sub-sectors (further disaggregation is of course possible: e.g. separation of social security funds):

- central and state government (CG),
- local government (LG).

2222 General government may be the financer (even if only partially) of the following components of national expenditure:

- collective consumption of non-market characteristic services,
- intermediate consumption of specific products by units which belong to the sector, other than specialised producers,
- gross capital formation for characteristic activities of producers (specialised producers, non-specialised producers which execute a characteristic activity as ancillary) which belong to the sector,
- gross capital formation in specific products of the units which belong to the sector, other than for characteristic activities,
- current and capital specific transfers (subsidies, investment grants, international co-operation, etc.) for that part which does not originate in earmarked funds.

In some countries social security funds may finance national expenditure (e.g. unemployment funds used for financing characteristic activities).

NPISHs

2223 Households are users of the NPISHs non-market output, but they are not necessarily the financers. Other units (producer, general government) or NPISHs themselves may finance part of their non-market output (for that part which is not financed by transfers) and their capital expenditure as characteristic specialised producers.

Corporations (non-financial and financial)

2224 Units of the corporations sector are divided into:

- specialised producers,
- other producers.

2225 Specialised producers finance their gross capital formation (and their acquisition less disposals of non-produced non-financial assets) for that part which is not financed by investment grants or other capital transfers.

2226 Other producers finance (even if only partially) the national expenditure under the following headings:

- intermediate consumption of ancillary output, and gross capital formation for ancillary activities: non-specialised characteristic producers which belong to the institutional sector,
- intermediate consumption of specific products and gross capital formation in specific products: non-specialised and non-characteristic producers which belong to the institutional sector,
- payments of taxes earmarked for environmental protection.

Households

2227 Households (as units of the ESA institutional sector) finance the national expenditure (even if only partially) under the following headings:

- individual final consumption of market specific products,
- financing of gross capital formation in specific products (septic tanks, noise protective windows, etc.): households as producers,
- intermediate consumption of market specific products and ancillary characteristic services: households as producers,
- payments of taxes earmarked for environmental protection, voluntary contributions to NPISHs, etc.

Rest of the world

2228 The rest of the world may finance national expenditure through current and capital transfers.

Table C: Financing of national expenditure for environmental protection

FINANCING UNITS	USERS/BENEFICIARIES									
	Producers				General government as collective consumer		Households as actual consumers	Rest of the World	Total	of which: current expenditure
	Specialised producers		Other producers (by industry)		CG	LG				
	GG & NPISHs	Other	non-specialised	non-characteristic						
General Government (GG)										
Central Government (CG)	x	x	x	x	x	x	x	x	x	x
Local Government (LG)	x	x	x	x	x	x	x	x	x	x
NPISHs	x	-	-	-	-	-	x	-	x	x
Corporations										
Specialised producers	t,x	t,x	t	t	t	t	t	t	x	x
Other producers	t	t	t,x	t,x	t	t	t	t	x	x
Households	t	t	t,x	t,x	t	t	t,x	t	x	x
National Expenditure	x	x	x	x	x	x	x	x	x	x
Rest of the world	t, x	t, x	t, x	t, x	t, x	t, x	t, x	x	x	x
of which European Union Institutions	x	x	x	x	x	x	x	x	x	x
Uses of resident units	x	x	x	x	x	x	x	x	x	x

Note on Table C:

In Table C a cross indicates direct financing. A "t" indicates (usually indirect) financing through specific taxes (or voluntary contributions) of households or producers. A dash indicates that financing does not exist at this intersection.

Payments of specific taxes (and voluntary contributions) by households or producers may appear as financing of many elements of national expenditure including the financing through transfers paid from specific funds and trusts.

Environment-related financial burden

- 2229 Financing of national current expenditure by the different sectors is not equal to the environment-related financial burden as defined in § 2112 sq. For corporations the principal differences stem from:
- first, the net operating surplus which does not constitute actual outlays for market specialised producers,
 - secondly, the interest computed on fixed assets that should be added,
 - finally from that part of the environment-related taxes they pay, which are not earmarked for financing national expenditure (and which are not already included in taxes on production).
- 2230 Environment burden is calculated for corporations (or industries) and households. In the first case the objective is to obtain the supplementary cost linked to environment. These cost are not on the whole finally supported by the producers (they are part of the price the producers cover from the purchasers of their products) but they can be considered as extra cost in relation to producers which do not support the same environmental charges or obligations.
- 2231 In the case of households, the objective is to know how much they actually pay related to environmental protection whether through financing national current expenditure or through the environment-related taxes they pay which are not used for the financing of national expenditure.
- 2232 General government environment burden may also be calculated by adding to the financing of national current expenditure these environment-related receipts which are not used for environmental protection financing.

Table C1: Environment-related financial burden

ELEMENTS OF ENVIRONMENT-RELATED FINANCIAL BURDEN	SECTORS				
	Corporations		House- holds including NPISHs	General Govern- ment	Total
	Environ- mental industries	Non- environ- mental industries			
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
5 Any other profits	-	x	x	-	x
6 Interest on fixed capital	x	x	x	x	x
A Financial burden of environmental protection (1+2+3-4-5+6)	x	x	x	x	x
B Environment-related tax burden	x	x	x	-x	0
Environment-related financial burden (A+B)	x	x	x	x	x

Information sources

Information sources are outlined in general here. A more detailed presentation of data sources and processing will be made in Chapters III to IX devoted to the different environmental domains.

- 2233 As pointed out in Chapter I, two main "intermediate" systems for the collection and treatment of data have been elaborated until now: one for general government, the other for non-specialised characteristic producers of the corporations institutional sector (see Eurostat 1994/8D-01 "Environmental Protection Expenditure - Data Collection Methods in the Public Sector and in Industry").

General government

- 2234 A first series of information sources are the public accounts. A first step to be taken consists of a functional analysis of expenditure of general government. At present, the omission in the COFOG of an environment heading requires the creation of transit tables between national budgetary classifications, when they exist, and the classifications of characteristic activities.
- 2235 When the expenditure intended for environmental protection have been identified, they should be treated in a framework compatible with the general analysis framework of general government (cf. Eurostat 1990: General government accounts and statistics 1970-1987). This analysis must be undertaken for each level of general government (central government and the different levels of local government). With this treatment it should be possible to show:
- current uses linked to production: actual current expenditure (intermediate consumption, compensation of employees and taxes linked to production) and imputed transactions (essentially the consumption of fixed capital),
 - capital expenditure (gross capital formation and acquisitions less disposals of land and other non-produced non-financial assets),
 - subsidies, current and capital transfers.
- 2236 The second step involves *income*. This requires, for every general government level, that specific income relating to environmental protection be identified, whether of a fiscal nature (taxes, charges, etc.) or incorporated as compensation for services rendered (sales of services, fees, charges, compulsory contributions, etc.), or in the form of transfers from other government units, including from the rest of the world (and in particular from European Union institutions).
- 2237 A comprehensive list of current and capital transfers as well as a list of specific (earmarked) taxes including the units involved and the specific purposes the transfers are dedicated to is an important precondition for fulfilling the EPEA's tables.
- 2238 This analysis, which must be followed up by the exploitation of data on expenditure as well as revenues of the specialised public and para-public agencies classified under general government (water authorities, specialised funds, etc.), makes it possible to go ahead with a first valuation of general government transactions from the same standpoint as that retained for the EPEA.
- 2239 Given the difficulties to which the shortcomings in public accounts can give rise (absence of a single budgetary classification for the different general government levels, the ambiguity of functional classifications, etc.), this first valuation may have to be followed up by a second series of data. This second series of data is the result of specific surveys (exhaustive or sample) addressed to local governments on their activities in the environmental protection field.
- 2240 Among these data, inventories of environmental protection facilities (purification plants, discharges, etc.) as well as physical data (volume of waste water or of waste collected and treated, etc.) can form the basis for estimating fixed capital consumption or certain expenditure which cannot be deduced from public accounts.
- 2241 An essential point in the treatment of general government data concerns the classification of general government bodies as specialised producers, financers, etc. According to convention, any general government body which executes a characteristic activity figuring in the classification as its principal activity is considered a specialised producer. In most cases, the functional analysis of expenditure - carried out for each body - enables the identification of the specialised producers, i.e. those agencies whose actual expenditure in favour of the environment consist of compensation of employees, purchases of goods and services, etc.

Corporations

2242 With respect to sources on corporations or industries, a distinction must be made between specialised and non-specialised characteristic producers.

Specialised producers

2243 Specialised producers are subject to regular statistical surveys for the preparation of the national accounts. These units (local KAU) are found essentially in the 90.00, 37.10 and 37.20 classes of the NACE Rev. 1: The CPA classification provides a way for desegregating this class, according to the main products.

37.10 Recycling of metal waste and scrap

37.20 Recycling of non-metal waste and scrap

90.00 Sewage and refuse disposal, sanitation and similar activities

- collection of garbage, trash, rubbish and waste,
- waste transport: removal of building debris,
- waste disposal by incineration and by other means:
 - waste reduction,
 - dumping of refuse on land and in water, burial or ploughing-under of refuse,
 - treatment and destruction of toxic waste including cleaning of polluted soil.
- sewerage removal, whether via drains, sewers or by other means, of human waste products and their treatment and disposal,
- disposal of sewage by dilution, screening and filtering, sedimentation, chemical precipitation, activated sludge treatment and other processes,
- maintenance of sewers and drains,
- emptying and cleaning of cesspools and septic tanks, servicing of chemical toilets.

This class also includes:

- collection of refuse in litter boxes in public places,
- outdoor sweeping and watering of streets, paths, parking lots,
- snow and ice cleaning on highways, airport runways including spreading of salt and sand.

This class does not include:

- pest control in connection with agriculture (cf. 01.41),
- recycling of refuse or waste (cf. 37),
- collection, purification and distribution of water (cf. 41.00),
- construction and repair of sewerage systems (cf. 45.21),
- disinfecting and exterminating activities in buildings (cf. 74.70).

2244 They may also be found among the following classes:

02.02 Forestry and logging related services activities

this class includes:

- forestry service activities: forestry inventories, timber evaluation, *fire protection*

73.10 Research and experimental development on natural science and engineering

73.20 Research and experimental development on social sciences and humanities

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 provides health care, 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.

75.25 Fire service activities

91.32 Activities of other membership organization n.e.c.

this class includes:

- environmental and ecological movements,
- associations for the protection of animals.

92.53 Botanical and zoological gardens and nature reserves activities

this class includes:

- operation of botanical and zoological gardens including children's zoo's,
- operation of nature reserves including wildlife preservation, etc.

2245 Other classes are also to be considered:

74.70 Industrial cleaning

this class includes:

- chimney cleaning and cleaning of fire-places, stoves, furnaces, incinerators, boilers, ventilation ducts and exhaust units.

45.11 Demolition and wrecking of buildings; earth moving

this class includes:

- clearing of building sites (CPA: stripping work of contaminated soils).

45.32 Insulating work activities

this class includes:

- installation in buildings or other construction works of thermal, sound or vibration insulation.

50.20 Maintenance and repair of motor vehicles

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.

2246 Finally some characteristic producers may be classified in:

41.00 Collection, purification and distribution of water

51.57 Wholesale of waste and scrap

Non-specialised characteristic producers

2247 As concerns non-specialised characteristic producers, data can only be gathered through specific questionnaires. A certain number of Member States already employ such inquiries for the collection of data. At the level of the European Union, harmonisation is in progress.

2248 Eurostat has developed a draft questionnaire (see Eurostat 1994/8D-01: "Environmental Protection Expenditure - Data Collection Methods in the Public Sector and in Industry") intended for national statistical services. The purpose of this questionnaire, which will complete the data collected via the Draft Council Regulation concerning Structural Business Statistics (SBS), is to collect all data necessary for the valuation of the transactions of non-specialised characteristic producers belonging to classes 10 to 36 and 40 of the NACE Rev. 1.

2249 For the principal environmental protection domains, this questionnaire provides a valuation of investments (end-of-pipe and integrated) undertaken for environmental protection, and operating cost including purchases of environmental protection services from third parties. It should also allow for the linking of data forthcoming from other sources with that of non-specialised characteristic producers.

2250 In addition, the SBS envisages collecting data annually, at the enterprise level, on investments intended for pollution control, and every four years on the current cost of environmental protection for enterprises of sections C, D, E, F of the NACE Rev. 1.

Other data sources

Consumption of households

2251 Data on the use of connected and adapted goods (and services) by households may be forthcoming from specific surveys, from associations of producers of connected and adapted products, etc. Generally speaking, adapted and connected products must be subjected to specific analyses of the supply and uses type providing for the breakdown of their uses by user category (households, etc.).

Exports and imports of environmental protection services

2252 Balance of payments data (exchanges of services) should furnish useful information on the export and import of environmental protection services.

Data on exchanges of hazardous waste may serve as a basis for estimations.

Integration of physical data

Integration of physical data is outlined in general here. A more detailed presentation will be made in Chapters III to IX devoted to the different environmental domains.

2253 One of the objectives of the EPEA is to integrate physical data. To provide for the interaction of physical and monetary data presupposes that the classifications used to describe the physical data (essentially those describing emissions of pollutants and treatment, but also those describing pollution levels) and characteristic activities and facilities are compatible.

Community system for the collection of physical data on the environment

2254 Currently this system takes the form of a series of joint OECD-Eurostat questionnaires concerning the following domains:

- Air (main questionnaire and addendum),
- Water (inland waters - main questionnaire and addenda - and marine environment - main questionnaire and addenda),
- Waste,
- Noise,
- Soil (main questionnaire and addenda),
- Forests,
- Flora and fauna.

2255 For the different domains, these questionnaires supply data on:

- pollution discharged, treated and eliminated (waste, waste water, air pollutants, etc.),
- facilities for environmental protection (treatment plants for waste water, waste, etc.),
- pollution levels of the environmental media (rivers, lakes, coastal zones, air, noise),
- uses of certain resources (soil, water, forests, etc.),
- resources (water) and inventories (flora and fauna).

2256 The integration of physical data and monetary data raises different problems depending on the domains and the types of activity. As concerns collection and treatment activities in the case of waste water and waste management, linkage can be made between current expenditure and quantities collected and treated or data on the percentage of the population serviced, on facilities, etc., and indicators of unitary cost (per m³, ton, etc.) can be calculated.

2257 The linkage of pollution data (pollution discharged or avoided, absolute levels or variations of pollution) and protection expenditure - in particular prevention expenditure - is more complicated. It brings into play not only present but past expenditure. In particular, pollution must be seen in relation to the "stock" of environmental protection facilities, which assumes the existence of an inventory and valuation of such facilities. Similarly, to compare variations in emissions of pollutants between two points in time requires an estimate of all protection measurements taken during the period in question.

2258 Certain studies⁽¹⁾ point up the difficulty of linking physical data on pollution avoided and monetary data on the "cost" of measurements, given the multiplicity of measurements to be described and the impact of external factors (variations in activity levels, etc.).

2259 Lastly, it would seem that the linkage of expenditure and pollution presupposes - to the extent that expenditure cannot be individualised by pollutant - that *synthetic* indicators are available at least for each environmental domain. Eurostat's environmental pressure index project could facilitate work in this area.

¹ See in particular: D. Schäfer: "The linking of monetary and physical data in SERIEE" (ENV/ECO/SERIEE/11 - 19. 4. 1993) for the case of air pollution.

ANNEX I

SINGLE EUROPEAN STANDARD STATISTICAL CLASSIFICATION OF ENVIRONMENTAL PROTECTION ACTIVITIES AND FACILITIES

Classification of Environmental Protection Activities (CEPA)

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 WASTE WATER MANAGEMENT

- 2.1 Prevention of water pollution through in-process modifications
- 2.2 Sewerage networks
- 2.3 Waste water 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 OF SOIL AND GROUND WATER

- 4.1 Prevention of pollutant infiltration
- 4.2 Decontamination of soils
- 4.3 Measurement, control, laboratories and the like
- 4.4 Other activities

- 5 NOISE AND VIBRATION ABATEMENT**
(excluding work place protection)
 - 5.1 Noise and vibration from road and rail traffic
 - 5.1.1 Preventive in-process modifications at the source
 - 5.1.2 Construction of anti noise/vibration facilities
 - 5.2 Air traffic noise
 - 5.2.1 Preventive in-process modifications at the 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

- 6 PROTECTION OF BIODIVERSITY AND LANDSCAPE**
 - 6.1 Protection of species
 - 6.2 Protection of landscapes and habitats
 - of which:
 - 6.2.1 protection of forests
 - 6.3 Rehabilitation of species populations and landscapes
 - 6.4 Restoration and cleaning of water bodies
 - 6.5 Measurement, control, laboratories and the like
 - 6.6 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 ambient water
 - 8.3 Waste
 - 8.4 Protection of soil and ground water
 - 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 specified

Classification of Environmental Protection Facilities

1 PROTECTION OF AMBIENT AIR AND CLIMATE

- 1.1 Dedusting equipment, filters
Industrial establishments equipped for the treatment of exhaust gases [percentage for NACE two digit categories; percentage of thermal electricity generation plants]
- 1.2 Air monitoring installations [number of measurement sites by type of compound monitored; number of measurements per year; number of mobile equipments]
 - 1.2.1 Stationary sites in built up areas
 - 1.2.2 Stationary sites in open areas
 - 1.2.3 Mobile sites

2 WATER MANAGEMENT AND PROTECTION

- 2.1 Sewerage networks (in kilometres)
- 2.2 Waste water treatment installations [number; capacity in terms of population equivalents or COD]
 - 2.2.1 Mechanical treatment technology
 - 2.2.2 Biological treatment technology (excluding septic tanks)
 - 2.2.3 Advanced treatment technology
 - 2.2.4 Septic tanks
- 2.3 Monitoring installations [number of measurement sites; number of mobile equipments; number of measurements per year and by type of water body monitored]

3 WASTE MANAGEMENT

- 3.1 Facilities for the treatment of hazardous waste [number; capacity in terms of weight that can be treated by year, by type of waste as applicable]
 - 3.1.1 Physical/chemical treatment technology
 - 3.1.2 Thermal treatment technology
 - 3.1.3 Biological treatment technology
 - 3.1.4 Conditioning of radioactive wastes
 - 3.1.5 Other treatment technologies
- 3.2 Facilities for the treatment of other than hazardous waste [number; capacity in terms of weight that can be treated by year, by type of waste as applicable]
 - 3.2.1 Physical/chemical treatment technology
 - 3.2.2 Incineration of municipal or similar wastes
 - 3.2.3 Incineration of industrial wastes
 - 3.2.4 Biological treatment technology
 - 3.2.5 Other treatment technologies
- 3.3 Facilities for the disposal of waste [number of sites]
 - 3.3.1 Landfill for all types of waste
 - 3.3.2 Landfill exclusively for hazardous waste
 - 3.3.3 Containment/underground disposal
 - 3.3.4 Other disposal installations

4 PROTECTION OF SOIL AND GROUND WATER

- 4.1 "End-of-pipe" facilities [number]
 - 4.1.1 Soil surface sealing including ditches and walls, drainage systems
 - 4.1.2 Catchments for run-offs, losses, leaks
 - 4.1.3 Improvement of underground storage and transport facilities in the interest of ground water and soil protection
 - 4.1.4 Removal of underground storage and transport facilities in the interest of ground water and soil protection
- 4.2 Reservoir liners, reinforcement of transport systems for hazardous products and other integrated facilities [number]

5 NOISE ABATEMENT

- 5.1 Noise barriers: roads, railroads, airports [in kilometres]
- 5.2 Equipment for follow-up and control of noise [number of sites and measurement equipments]

ANNEX II

USES AND RESOURCES OF PRODUCERS

In this annex, aspects of the classification of characteristic producers and of the valuation of their output are examined.

Market and non-market output (specialised producers)

In ESA and SNA, as well as in the EPEA, a distinction is made between market and non-market output. The classification of the output as market or non-market determines the valuation of the principal part of the output (secondary market output may exist in the case of non-market producers) and upon the classification of the producer as market or (other) non-market producer.

In the ESA, the distinction between market and non-market output is based on the criterion that the output is sold at economically significant prices. An economically significant price is defined as a price (excluding taxes on products) which covers at least 50% of the cost of production of a product (all subsidies being ignored).

A simplified example may illustrate the procedure necessary to decide whether output is market or non-market. For a producer unit the following data are available:

USES	Amount	RESOURCES	Amount
Intermediate consumption	100	Sales (including VAT of 30)	280
Compensation of employees	200	current transfers/subsidies on products	200
Consumption of fixed capital	150	current transfers/other subsidies on production	90
other taxes on production	20	capital transfers	50
interest payments	60		
Investments	180		

Cost of production (ignoring all subsidies/current transfers) are 470 (100+200+150+20) and sales (less taxes on products) are 250 (280-30). Therefore output is market output and the current transfers are subsidies. Output is valued at basic prices for Table B and is 450 (280-30+200). Capital uses (investments) as well as interest payments are ignored for the purpose of classifying and valuing the output.

In Table A of the EPEA uses of this producer are 180 (investments). In Table A uses of the output are valued at purchasers' prices. If the users are only households and no distributive margins appear, uses are 280. If part of the output is used by units which can deduct VAT, the corresponding part of VAT must be deducted. When part of this output is used as intermediate consumption for characteristic activities, this part is not entered into Table A. Subsidies on products and (other) subsidies on production are entered under specific transfers (not counterpart of previous items). As output always covers current uses for a market producer, the net operating surplus can be calculated as balance between cost of production and output: $(100+200+150+20-90)-(280-30+200)=70$ (including interest payments). The producer's financing of capital uses is 130 (180-50).

As concerns VAT, it may be noted that intermediate consumption as well as investments are entered at purchasers' prices (excluding deductible VAT). In the case of non-market producers it may happen that VAT on sales (if any) does not cover all of the VAT on intermediate consumption and investments. Depending on the specific fiscal regulations applied, the producer may be refunded from the tax authorities for the negative VAT balance or may face some non-deductible VAT.

Market output and corresponding current uses

For market producers the value of output is assessed from the side of the resources and is valued at basic prices. The generalised table of current uses and resources is shown below.

Market producer: current uses and resources

Current uses	Current resources
Intermediate consumption Compensation of employees Consumption of fixed capital other taxes on production less other subsidies on production Balance: net operating surplus (can be negative)	market output: sales less taxes on products plus subsidies on products
Total: carried over	Total: value of output at basic prices

In the EPEA, producer units of general government play an important role (in particular waste and waste water management activities of municipalities and other units of local government). For general government units classified as market producers it cannot be assumed that all their cost of production are covered by sales (whatever the price may be called: fee, rate, charge, toll, etc.). Due to elements of social and economic policy (e.g. exemptions for families, implicit subsidies to enterprises) producer units who recover more than 50% but less than 100% of the cost of production may be significant in some countries.

In practice, when available data (e.g. public budgets) show, that the difference between output (sales less taxes plus subsidies (if any) on products) and cost of production is not fully covered by subsidies from other (parts of) general government units and, therefore, a negative net operating surplus occurs, this remainder can be considered as an invisible (not explicitly recorded) subsidy of the general government unit to itself.

Non-market output and corresponding uses

For non-market producers the value of the output is assessed from the side of the current uses and valued by cost of production. The generalised table of current uses and resources is shown below.

Non-market producer: current uses and resources

Current uses	Current resources
Intermediate consumption Compensation of employees Consumption of fixed capital other taxes on production	Partial payments ("market output"), if any: sales (less taxes on products) Balance: non-market output=collective consumption (may be covered by transfers)
Total: cost of production=value of output	Total: carried over

Ancillary output (non-specialised producers)

In the case of ancillary output the valuation of output is based on the concept of cost of production. As ancillary output is used internally (internal intermediate consumption) an analytical decomposition of the producer unit is necessary. To illustrate, the producer unit may be treated as if it would consist of two separate units: the "ancillary unit" which undertakes the ancillary activity and the "principal producer". The "principal producer" is that part of the producer unit which remains after separation of the ancillary activity. In the terms of the EPEA the "principal producer" is a non-characteristic producer, i.e. its only functions are using or financing characteristic services (and, maybe connected and adapted products). This analytical decomposition as well as the valuation of the output is illustrated below for a market producer.

Market producer performing an ancillary characteristic activity

Current uses		Current resources	
producer as a whole			
Intermediate consumption	100	<i>market output:</i>	
Compensation of employees	150	sales	
Consumption of fixed capital	95	less taxes on products	
other taxes on production	20	plus subsidies on products	
less other subsidies on production	-15		
Balance: net operating surplus	50		
Total: carried over	400	Total: output at basic prices: 400	
of which: ancillary activity			
Intermediate consumption	6	<i>Output for own use</i> (used by producer as	
Compensation of employees	10	internal intermediate consumption):	
Consumption of fixed capital	8	sales	
other taxes on production	1	less taxes on products	
less other subsidies on production	-5	plus subsidies on products	
net operating surplus (by definition nil)	0		
Total: cost of production=output: 20	20	Total: carried over	
of which: principal producer			
Intermediate consumption	114	<i>market output:</i>	
Compensation of employees	140	sales	
Consumption of fixed capital	87	less taxes on products	
other taxes on production	19	plus subsidies on products	
less other subsidies on production	-10		
Balance: net operating surplus	50		
Total: carried over	400	Total: output at basic prices: 400	

For the market producer as a whole current uses are equal to output. The value of the output is assessed from the side of the resources and is valued at basic prices.

Intermediate consumption is valued at purchasers' prices, whereas output is valued at basic prices. However, in the case of internal intermediate consumption all differences between basic prices and purchasers' prices may be assumed to be nil. The treatment of taxes and subsidies should be the same as for the producer as a whole. Subsidies on ancillary environmental protection activities are generally treated as other subsidies on production (cf. ESA § 4.37). Therefore no subsidies on products appear for the ancillary output. By analogy, the same is applied to taxes: it is assumed that there are no taxes on products for the ancillary output. In the case of internal intermediate consumption of services no transport and trade margins appear. Therefore, in the case of ancillary activities, the value of ancillary output is equal to the value of the internal intermediate consumption of the principal producer.

It may be noted, that the total output of an economy would be increased when ancillary activities are externalised and ancillary output is accounting explicitly. Value added of the principal producers would drop. However, total value added of both externalised ancillary activities and of principal producers would remain unchanged.

ANNEX III: A NUMERICAL EXAMPLE

In this annex the functioning of the EPEA's framework is exemplified using an hypothetical national case. Although it is impossible to treat all cases, the example covers the main environmental activities and measures. This example is not intended to give answer to the detailed practical problems of collection and treatment of data, but to illustrate the EPEA's framework.

Description of environmental protection activities and measures

Central government

- (1) Expenditure of Ministry of Environment for general administration and management activities are:

intermediate consumption of 268 (including non-deductible VAT of 54), compensation of employees of 180, calculated consumption of fixed capital for the stock of assets used for these activities of 85.

A part of the expenditure of the ministry is covered by earmarked administrative fees paid by polluting industries of 122 for examination and permits.

- (2) Ministry also invests 165 (including non-deductible VAT of 18) in new building and equipment.

- (3) Ministry pays specific transfers:

subsidies to manufacturing industries for ancillary environmental protection activities are 345,

subsidies to agriculture (compensation of production losses) are 270 and

capital transfers to municipalities for waste water treatment are 127.

- (4) Ministry of Environment also finances for 230 decontamination of soil on privately owned land.

- (5) A central government specialised institution (water agency) pays:

subsidies of 87 and investment grants of 104 to waste water treatment plants managed by municipalities.

The funds originate in a pollution tax paid by water consumers (taxes paid by households are 187 and taxes paid by enterprises are 98).

Therefore the balance between receipts and payments of the water agency is 94.

Classification of units and transactions

Ministry of environment is classified as specialised producer (GG & NPISHs).

Output is non-market. Cost of production is $268+180+85=533$. Output and uses of the characteristic services are 533 and are classified as market for that part which corresponds to administrative fees of 122 paid by polluting industries and as non-market for the balance of 411. Financing of the non-market output is made by general government.

Investments by ministry in building and equipment of 165 are classified as gross fixed capital formation of specialised producers (GG & NPISHs).

Transfers are classified as:

subsidies of 345 to manufacturing industries for ancillary activities as subsidies on production (non-specialised characteristic producers),

subsidies of 270 to agriculture as other current transfers (non-characteristic producers),

capital transfers to municipalities of 127 as investment grants to specialised producers (GG & NPISHs).

Financing of decontamination of soil is entered in Table C as financing of non-characteristic producers by central government for 230 (see (13)).

Subsidies on production of 87 are entered under the users of waste treatment services in proportion to their uses in Table A (see (7)). In Table B they are entered as subsidies on production to specialised producers (GG & NPISHs). In Table C they are entered as own financing by households and other producers for amounts which are proportional to their tax payments (57 and 30).

Investments grants of 104 are entered in Table B. They are entered in Table C as financing by households and other producers for amounts which are proportional to their tax payments (68 and 36).

- (6) Environmental protection-related receipts of general government from a CO₂ tax are 2.500. The tax is not earmarked for environmental protection. Payments by households as consumers are 1.000, payments by producers are 1.500.

Receipts from the CO₂ tax are neither entered in Table A nor in Table C. They are only entered in the Table C1 (environment-related tax burden) in the columns of households and other producers (deemed to be non-environmental industries) and they are deducted in the column of general government.

Local government

- (7) Sewage and waste water treatment services are produced by specialised units managed by municipalities.

Waste water treatment units are classified as specialised producers (local government). Output is considered as market output of characteristic services. Output at basic prices is 2030 (Table B).

Current uses are: intermediate consumption is 1.500 (of which treatment of sludge services by a waste treatment plant of 400 - see (11)), compensation of employees is 410, taxes on production is 22 and calculated consumption of fixed capital is 185. They are covered by a sanitation tax: households as consumers pay 1.372 (including non-deductible VAT for 172) and enterprises (deemed to be intermediate consumption of non-characteristic producers) pay 830 (excluding deductible VAT). Net operating surplus is nil.

Uses which come into Table A are: final consumption of households of 1.372 and intermediate consumption of non-characteristic producers of 830. Subsidies of 87 are recorded under the users in proportion to the uses (estimated on the basis of the value of uses without consideration of VAT: households 51 and other producers 36).

These activities benefit from subsidies for 87 (via water agency - see (5)). Investments in new plants are made for 556 (excluding deductible VAT). Investment grants from central government are 231 (104 from the water agency and 127 from ministry).

Financing by the producer is nil. Financing of corresponding national expenditure is the following: households for their individual final consumption of 1.372; other producers for their intermediate consumption of 830; households and other producers for the subsidies (amounts which are proportional to their payments of the earmarked taxes).

In Tables A and B gross capital formation in new plants for 556 are entered (specialised producers - GG & NPISHs), financed by central government, for 127, by households and by other producers (via water agency) for 68 and 36 respectively and by local government itself for the balance of 325.

- (8) Municipal waste is collected by municipalities which cover the cost from their general budget. Analysis of accounts results in the valuation of the cost at 601: compensation of employees is 237, intermediate consumption is 261 (including non-deductible VAT of 35), calculated consumption of fixed capital is 80, other taxes on production is 23.
- (9) Treatment of waste is purchased by municipalities from private firms. The value of this intermediate consumption is 1.165 (including 165 non-deductible VAT).

Waste collection units are classified as specialised characteristic producers belonging to the local government sub-sector. As the output (601) is provided free to the community, it is classified as collective consumption of characteristic services in Table A. In Table B output and current uses are entered. Financing (601) is made by local government.

The intermediate consumption of 1.165 is added to the value of output under (8) and in Table A. Corresponding output and uses are entered in Table B. Financing is made by local government. Uses (1.165) are entered in Table B1 (non-market).

(10) Local government also invests in the construction of anti-noise walls on publicly owned land for 234 (including non-deductible VAT of 54) and gives investment grants to private waste treatment plants for 117.

Investment in anti-noise walls (234, including non-deductible VAT) comes into national expenditure as gross capital formation of specialised producers (local government unit). They are recorded in Tables A and B. Financing is by local government for the total amount. Anti-noise walls already constructed give rise to an output whose value is the corresponding fixed capital consumption. Estimated output of 290 is entered in Table A as collective consumption. Financing is by local government for the total amount.

Investment grant paid by local government for financing of waste treatment plants (117) are not entered in Table A and B1. They are recorded in Table B and in Table C.

Enterprises

(11) Specialised enterprises treat municipal waste as well as industrial waste and sludge from the waste water treatment plants. Output corresponding to the principal activity (waste treatment) is 2.500: 1.000 for municipal waste, 600 for industrial waste of enterprises, 400 for waste water treatment plants' sludge and 500 from sales of recycled or recovered products. Secondary output (unrelated with environmental protection) is 212. Intermediate consumption, compensation of employees are known by the enterprise annual statistical survey (respective amounts are 1.500 and 445). Calculated value of fixed capital consumption is 350. Taxes paid on production are 25.

Enterprises which treat municipal waste are classified as "other" specialised producers. Corresponding output (2.712) is market output. Secondary output (212) and output corresponding to recycled and recovered products (500) are not environmental protection output. Output used as intermediate consumption of specialised characteristic producers (municipal waste for 1.000 and sludge treatment services for 400) is not entered in Table A. Therefore the output comes into national expenditure (intermediate consumption of non-characteristic producers) only for 600. The whole output, including intermediate consumption of characteristic producers (1.400), is entered as output at basic price in Table B1. Net operating surplus is calculated as balance (392).

(12) New waste treatment plants are constructed for 1.200. Investments are made by enterprises. Financing is 405 from European Union regional fund, 232 from a special fund (whose receipts originate in a tax on packaging paid by enterprises -dual system), 446 from loan and 117 from investment grants from local government.

Investments in new waste treatment plants (1.200) are entered in national expenditure in Table A as GFCF of "other" specialised producers. They are also entered in Table B.

Their financing is:

investment grants recorded in Table B (754), of which:

from the rest of the world (European union institution) recorded in Table C (405); from local government recorded in Table C (117); from other producers (for their payments to the special fund - dual system) recorded in Table C (232),

the producers themselves, for that part which corresponds to the loan, recorded in Tables B and C (446).

Receipts and outlays of the special fund (dual system) are not explicitly recorded in Table A, as they are only financing.

(13) Decontamination of soils is made by construction firms as secondary activity. Inputs and factors used in production and investments are not known. Value of output is 230 (see (4)).

Works of decontamination of soils are secondary output of non-specialised characteristic producers. They come into national expenditure (230) as gross fixed capital formation of the unit which owns the land (deemed to be non-characteristic producer). They are recorded in Tables B and B1. They are considered as financed by general government under the heading of "other capital transfers".

(14) A specific inquiry results in the assessment of the value of current uses for ancillary activities of manufacturing industries at 3.550: intermediate consumption 2.185, compensation of employees 800, taxes on production 105 and calculated consumption of fixed capital 460. Sales and own-consumption of related products are 455. Subsidies are received from central government ministry for 345. Environmental protection-related investments are 1.525.

That part of the current uses of manufacturing industries which serves for characteristic services (3.095) is entered in national expenditure under the following headings of Table A: intermediate consumption of ancillary characteristic services by non-specialised producers (2.750), subsidies for characteristic services (345). They are also entered in Table B (with the corresponding current uses).

Financing is:

subsidies (central government) in Table B (345), producers themselves in Table B (2.750).

(15) Enterprises also pay: intermediate consumption of waste water services 830, waste treatment services 600, packaging taxes 232, water pollution taxes 98, administrative fees 122, CO₂ tax 1.500 and buy unleaded gasoline for 2.000 (including specific non-deductible tax on energy).

The respective transactions are treated under the numbers (1), (6), (7), (9), (12), and (18).

NPISHs

(16) Associations for environmental protection pay 43 for compensation of employees, 34 for intermediate consumption and 18 for non-deductible VAT. Calculated consumption of fixed capital is 50. In the year in consideration no investments are realised

NPISHs are non-market specialised producers. Their output comes into national expenditure as individual consumption of households (145).

Households

(17) Households invest in the construction of septic tanks for 700 (including 70 non-deductible VAT). They pay 1.372 for waste water services, 187 for taxes on water, 1.000 as CO₂ tax. They buy lead-free gasoline for 12.000). Consumption of fixed capital cannot be estimated.

Investments in septic tanks by households come into national expenditure as gross capital formation in connected products by the non-characteristic producers pertaining to the 70.20 (letting of own property) class of the NACE Rev. 1 (700 including non-deductible VAT). These investments are financed by households.

Adapted products

(18) Sales of unleaded gasoline are 14.000 (including specific tax on energy). Prices of normal gasoline are 2,1% higher but unleaded gasoline is subsidised for 1.000 by central government (tax-differential). "Extra cost" of unleaded gasoline is calculated, on the basis of cost of production and taxes (700). Sales of unleaded gasoline are distributed as follows: households as consumers 12.000, producers 2.000.

Transactions related to adapted products come into national expenditure under two headings:

as (negative) final consumption of households as consumers and intermediate consumption of producers for the respective amounts (-257 and -43),

as specific transfers (subsidies for adapted products) for the benefit of households as consumers (857) and of non-characteristic producers (143).

The total of these entries is equal to "extra cost" (700).

National expenditure - Table A

National expenditure is 13.893

Final and intermediate consumption of specific products (total 7.986)

- *collective consumption of characteristic services by central government ministry* - (411)(1) *and local government*: waste collection (601)(8), municipal waste treatment (1.165)(9), noise abatement (290)(10). Total collective consumption of local government is 2.056,
- *individual consumption of characteristic services by households*: waste water services (1.372)(7), services produced by NPISHs (145)(16),
- *intermediate consumption of non-characteristic producers*: market services produced by ministry, corresponding to administrative fees (122)(1;15), waste water treatment (830)(7), industrial waste (600)(11) [total 1.552] *and of non-specialised producers*: ancillary output (2.750)(14),
- *final consumption of adapted products by households*: (-257)(18),
- *intermediate consumption of adapted products by non-characteristic producers*: (-43)(18).

Gross fixed capital formation for characteristic activities (total 3.680)

- specialised producers of GG & NPISHs sectors: ministry (165)(2), local government -waste water plants- (556)(7) and anti-noise walls (234)(10). Total is 955,
- other specialised producers: waste treatment plants (1.200)(12),
- non-specialised producers: manufacturing industries (1.525)(14).

Gross fixed capital in specific products of non-characteristic producers (total 930)

- connected products: septic tanks (700)(17),
- characteristic products: decontamination of soils (230)(13).

Subsidies (total 1.432)

- for characteristic services: waste water treatment: households (51)(5;7), non-characteristic producers (36)(5;7), ancillary output (345)(3;14),
- for adapted products: households (857)(18), non-characteristic producers (143)(18).

Other specific transfers: current transfers to non-characteristic producers (agriculture) (270)(3)

less financing by the rest of the world

European Union investment grant for "other" specialised producers (waste treatment plants) (405)(12)

Financing by sector - Table C

General government (total: 5.280)

- collective consumption of central government (411)(1) and of local government (601+1165+290=2.056)(8;9;10),
- gross fixed capital formation: ministry (central) (165)(2), waste water treatment plants (local) (325)(7), anti-noise walls (234)(10),
- investment grants: waste water treatment plants (127)(3), waste treatment plants (local) (117)(10;12),
- other capital transfers for decontamination of soils (central) (230)(4),
- subsidies for ancillary activities (central) (345)(3;14), for agriculture (central) (270)(3), for adapted products (central) (1.000: of which 857 for households and 143 for non-characteristic producers)(18).

NPISHs final consumption of households for the value of the services (145)(16)

Corporations (total: 6.528)

- specialised producers: gross fixed capital formation in waste treatment plants: (446)(12)
- other producers: intermediate consumption: waste water (830)(7), industrial waste (600)(11), administrative services (122)(1), ancillary services of manufacturing industries (2.750)(14), gross fixed capital formation for ancillary activities (1.525)(14), subsidies for characteristic services through water pollution taxes (30)(5-see note below), investments grants for waste water treatment plants through water pollution taxes (36)(5), investments waste treatment plants through packaging taxes (232)(12), consumption of adapted products (-43)(18).

Households: 1.940

- final consumption of waste water services (1.372)(7),
- investments in septic tanks (700)(17),
- adapted products (-257)(18),
- subsidies through water pollution taxes (57)(5-see note below),
- investments grants through water pollution taxes (68)(5).

Note: Financing by corporations of subsidies for waste water characteristic services through water pollution tax (30) is distributed in Table B according to the uses of services; therefore 12 is entered in the column "non-characteristic producers" and 18 in the column "households". In a similar way financing by households of subsidies for waste water characteristic services through water pollution tax (57) is distributed in Table B according to the uses of services; therefore 24 is entered in the column "non-characteristic producers" and 33 in the column "households".

Environment-related financial burden - Table C1

Financing of current national expenditure is corrected for:

- taxes on production paid by characteristic producers (175)(7;8;11;14),
- non-deductible VAT (444)(1;7;8;9;16),
- net operating surplus of specialised producers (392)(11),
- calculated interests on stock of fixed assets (750)(assumed to be 50% of consumption of capital),
- CO2 tax paid by households as consumers and producers (2.500)(6),
- balance of receipts and disbursements of the water agency (94)(5).

Production of characteristic services - Table B

General government/NPISHs

- intermediate consumption is (3.246)(1;7;8;9;16),
- of which characteristic services (1.565)(7;9),
- Compensation of employees (870)(1;7;8;16),
- Consumption of capital (690)(1;7;8;10;16),
- other taxes on production (45)(7;8),
- less other subsidies in the case of market producers (87)(5),
- output is (533+2.030+1.766+290+145=4764)(1;7;8;9;10;16),
- of which market output (2030+122=2152)(1;7),
- gross capital formation (955)(2;7;10),
- investment grants received (231)(3;5).

Other specialised producers: these are the values derived from (11).

Secondary output: these are the values derived from (13).

Ancillary output: these are the values derived from (14).

Supply and use table for characteristic services - Table B1

Non-market output (2.612) equals uses and is derived from Table B.

Market output (4.382) is derived from Table B, non-deductible VAT is 337 (7;9). Gross capital formation in characteristic services is land improvement (230). Final consumption of market services (1.372) as well as intermediate consumption of other producers (1.552) are derived from Table A. Intermediate consumption of specialised producers (1.565) is derived from Table B.

Ancillary output (2.750) is derived from Table A.

The corresponding EPEA tables are presented below.

Table A: National expenditure by components and by users/beneficiaries

COMPONENTS OF NATIONAL EXPENDITURE FOR ENVIRONMENTAL PROTECTION	USERS/BENEFICIARIES								
	Producers				General Government as collective consumer		Households as actual consumers	Rest of the World	Total
	specialised producers		other producers (by industry)		CG	LG			
	GG & NPISHs	Other	non-specialised	non-characteristic					
1 Consumption of specific products									
1.1 Final consumption of characteristic services	-	-	-	-	411 (1)	2.056 (8;9;10)	1.517 (7;16)	-	3.984
market	-	-	-	-	-	-	1.372 (7)	-	1.372
non-market	-	-	-	-	411 (1)	2.056 (8;9;10)	145 (16)	-	2.612
1.2 Intermediate consumption of characteristic services	-	-	2.750 ⁽¹⁴⁾	1.552	-	-	-	-	4.302
market	-	-	-	1.552	-	-	-	-	1.552
ancillary	-	-	2.750 ⁽¹⁴⁾	1.552 (1;11)	-	-	-	-	2.750
1.3 Final consumption of connected products	-	-	-	-	-	-	-257 ⁽¹⁸⁾	-	-257
adapted products	-	-	-	-	-	-	-257 ⁽¹⁸⁾	-	-257
1.4 Intermediate consumption of connected products	-	-	-	-43 ⁽¹⁸⁾	-	-	-	-	-43
adapted products	-	-	-	-43 ⁽¹⁸⁾	-	-	-	-	-43
2 Gross capital formation ⁽¹⁾ for characteristic activities	955 (2;7;10)	1.200 (12)	1.525 (14)	-	-	-	-	-	3.680
3 Gross capital formation in specific products	-	-	-	930	-	-	-	-	930
in connected products	-	-	-	700 ⁽¹⁷⁾	-	-	-	-	700
in adapted products	-	-	-	-	-	-	-	-	-
in characteristic services	-	-	-	230 ⁽¹³⁾	-	-	-	-	230
4 Specific transfers (not counterpart of items 1, 2, 3)									
4.1 subsidies on production	-	-	345	179	-	-	908	-	1.432
characteristic services	-	-	345 ⁽³⁾	36 ⁽⁵⁾	-	-	51 ⁽⁵⁾	-	432
adapted and connected products	-	-	-	143 ⁽¹⁸⁾	-	-	857 ⁽¹⁸⁾	-	1.000
connected products	-	-	-	-	-	-	-	-	-
4.2 other specific transfers	-	-	-	270 ⁽³⁾	-	-	-	-	270
current capital	-	-	-	270 ⁽³⁾	-	-	-	-	270
capital	-	-	-	-	-	-	-	-	-
5 Total uses of resident units (1+2+3+4)	955	1.200	4.620	2.888	411	2.056	2.168	-	14.298
current capital	-	-	3.095	1.958	411	2.056	2.168	-	9.688
capital	955	1.200	1.525	930	-	-	-	-	4.610
6 Financed by the rest of the world	-	405 ⁽¹²⁾	-	-	-	-	-	-	405
current uses	-	-	-	-	-	-	-	-	-
capital uses	-	405	-	-	-	-	-	-	405
7 National Expenditure for Environmental Protection (5-6)	955	795	4.620	2.888	411	2.056	2.168	-	13.893
current capital	-	-	3.095	1.958	411	2.056	2.168	-	9.688
capital	955	795	1.525	930	-	-	-	-	4.205

(1) and their acquisition less disposals of non-produced non-financial assets

Figures in brackets refer to the numbers of the description of environmental protection activities and measures.

Table B: Production of characteristic services

TRANSACTIONS	CHARACTERISTIC PRODUCERS				Total
	Specialised producers		Non-specialised producers (by industry)		
	GG/NPISHs	Other	Secondary output	Ancillary output	
CURRENT TRANSACTIONS					
Current uses					
Intermediate consumption	3.246	1.500	nr	2.185	6.931
of which characteristic services	1.565	-	nr	-	1.565
of which adapted and connected products	-	-	nr	-	-
Compensation of employees	870	445	nr	800	2.115
Consumption of fixed capital	690	350	nr	460	1.500
Other taxes on production	45	25	nr	105	175
Less other subsidies on production	87	-	nr	345	432
Net operating surplus	0	392	nr	-	392
Output (basic price or cost of production)	4.764	2.712	230	3.205	10.911
Non-environmental output related products	-	712	nr	455	1.167
other non-environmental output	-	500	nr	455	955
Environmental protection output	-	212	nr	-	212
non-market	4.764	2.000	230	2.750	9.744
principal	2.612	-	-	-	2.612
secondary	2.612	-	-	-	2.612
market	-	-	-	-	-
principal	2.152	2.000	230	-	4.382
secondary	2.152	2.000	-	-	4.152
ancillary	-	-	230	-	230
ancillary	-	-	-	2.750	2.750
Current environmental protection resources	2.152	2.000	230	-	4.382
Market output (including partial payments)	2.152	2.000	230	-	4.382
Current transfers	-	-	-	-	-
CAPITAL TRANSACTIONS					
Gross fixed capital formation	955	1.200	nr	1.525	3.680
Other capital uses	-	-	nr	-	-
Investment grants received	231	754	nr	-	985
Other capital transfers received	-	-	nr	-	-
FINANCING BY PRODUCERS (output plus balance of capital transactions minus resources)	3.336	446	0	4.275	8.057

Table B1: Supply and use table for characteristic services

	Non-market	Market	Ancillary	Total
1 Uses of resident units (purchasers' prices) ⁽¹⁾				
Intermediate consumption	-	3.117	-	3.117
Specialised producers	-	1.565	-	1.565
Other producers	-	1.552	2.750	4.302
Final consumption	2.612	1.372	-	3.984
Gross capital formation (land improvement)	-	230	-	230
2 Exports	-	-	-	-
Total uses (1+2) = total supply (3+4+5+6)	2.612	4.719	2.750	10.081
3 Output (basic prices) ⁽¹⁾	2.612	4.382	2.750	9442
4 Imports (customs price)	-	-	-	-
5 Non-deductible VAT	-	337	-	337
6 Other taxes less subsidies on products (if any)	-	-	-	-

(1) or cost of production

Table C: Financing of national expenditure for environmental protection

FINANCING UNITS	USERS/BENEFICIARIES									
	Producers				General government as collective consumer		Households as actual consumers	Rest of the World	Total	of which: current expenditure
	Specialised producers		Other producers (by industry)		CG	LG				
	GG & NPISHs	Other	non-specialised	non-characteristic						
General Government (GG)	851	117	345	643	411	2.056	857	-	5.280	4.092
Central Government (CG)	292	-	345	643	411	-	857	-	2.548	2.026
Local Government (LG)	559	117	-	-	-	2.056	-	-	2.732	2.056
NPISHs	-	-	-	-	-	-	145	-	145	145
Corporations	36	678	4.275	1.521	-	-	18	-	6.528	4.289
Specialised producers	-	446	-	-	-	-	-	-	446	-
Other producers	36	232	4.275	1.521	-	-	18	-	6.082	4.289
Households	68	-	-	724	-	-	1.148	-	1.940	1.172
National Expenditure	955	795	4.620	2.888	411	2.056	2.168	-	13.893	9.688
Rest of the world	-	405	-	-	-	-	-	-	405	-
of which European Union Institutions	-	405	-	-	-	-	-	-	405	-
Uses of resident units	955	1.200	4.620	2.888	411	2.056	2.168	-	14.298	9.688

Table C1: Environment-related financial burden

ELEMENTS OF ENVIRONMENT-RELATED FINANCIAL BURDEN	SECTORS				
	Corporations		Households including NPISHs	General Government	Total
	Environmental industries	Non-environmental industries			
1 Financing of current national expenditure	-	4.289	1.317	4.082	9.688
2 Non-deductible VAT on current expenditure	-	-	-	-444	-444
3 Taxes on production	-	-	-	-175	-175
4 Net operating surplus	-392	-	-	-	-392
5 Any other profits	-	-	-	-	-
6 Interest on fixed capital	175	230	25	320	750
A Financial burden of environmental protection (1+2+3-4-5+6)	-217	4.519	1.342	3.783	9.427
B Environment-related tax burden	-	1.532	1.062	-2.594	0
CO2 tax	-	1.500	1.000	-2.500	0
water agency	-	32	62	-94	0
Environment-related financial burden (A+B)	-217	6.051	2.404	1.189	9.427

III. AMBIENT AIR AND CLIMATE PROTECTION ACCOUNT

Introduction

3001 In the present chapter the EPEA's sub-account for ambient air and climate protection is presented.

The following aspects are successively examined:

- general description of the domain (major pollutants, causer groups and environmental problems),
- physical data potentially available for the domain,
- specificity of ambient air and climate protection (classification and definition of activities, etc.),
- specific accounting problems for the domain (specification of units and transactions, data sources and link to physical data).

As concerns the last aspect, only references to the EPEA's framework are made, the framework itself is not presented. Therefore, readers are advised to refer to this framework and the tables in Chapter II for a general view of the accounting approach.

Purpose of the ambient air and climate protection account

3002 The purpose of the ambient air and climate protection account is to describe monetary flows related to ambient air and climate protection within the EPEA's framework, and to link them with corresponding physical data. In particular, the account provides a valuation of the national expenditure for ambient air and climate protection and describes its components and financing.

3003 As EPEA's sub-account, the ambient air and climate protection account excludes expenditure primarily aimed to energy or other natural resources saving or to develop renewable energy. These expenditure are accounted for in the "natural resource use and management account" (see Chapter X). Also excluded are expenditure aimed to compensate the impacts of ambient air pollution or climate deterioration on human health, produced fixed assets (plant, buildings, etc.) or production (agriculture, etc.).

3004 Generally, measures aimed at reducing traffic congestion, prohibiting production of certain products (CFC, etc.) or in favour of less pollutant transportation, etc., are not classified as characteristic activities. When these measures are backed by monetary transactions (e.g. subsidies for compensating additional cost) these transactions constitute environmental protection transfers (specific transfers).

3005 According to available data (cf. State of the Environment in the European Community, March 92, volume III, p. 82), ambient air and climate protection represents 22% of total environmental protection expenditure of the Member States (roughly 10 billion ECU for the year 1988). Ambient air and climate protection thus ranks as the third highest expenditure in environmental protection, after waste water and waste management.

Description of the domain

Global considerations concerning air pollution

3006 Three interdependent phenomena endow air pollution with specific characteristics:

- depletion of the ozone layer,
- greenhouse effects,
- transfrontier propagation of air pollution.

According to numerous convergent indications, chlorine-containing compounds produced by human activities are responsible for the first phenomenon (chlorofluorocarbons - CFC are responsible for greenhouse effects).

Gases with greenhouse effects (CO_2 , CH_4 , CFC, N_2O , O_3 , etc.), whose accumulation in the atmosphere disturbs the radiant equilibrium of the earth-atmosphere system, cause rising temperatures on the earth's surface.

The displacement of pollutants from one region to another through air circulation is a factor in the globalisation of pollution problems and gives rise to the acidification of the environment in the world (acid rain and deposition, photochemical smog, etc.).

Besides these specific characteristics, air pollution also endows more classical, local, effects (local concentration of pollutants in ambient air, etc.)

3007 Another characteristic of air pollution is the fact that, contrary to waste water and solid waste, pollutants cannot be collected after their emission into the ambient air. Consequently, protection activities are essentially those aimed at lessening the output of air pollutants, their emission and concentration in the air.

As a result, specialised producers which execute "public services", comparable to those found in the waste water or waste management domains (collection and treatment of waste water and waste), do not exist.

Hence, national expenditure take essentially the form of:

- expenditure occurred by polluting producers (power plants, chemistry etc.) in order to reduce their emissions,
- consumption of adapted and connected products by households and other sectors.

Air pollution

3008 Air pollution is defined as the introduction by man into the atmosphere, either directly or indirectly, of substances or energy harmful to the extent that human health is endangered, biological resources and ecosystems damaged, material goods deteriorated and the pleasurable values and other legitimate uses of the environment undermined.

Types of pollutants

A distinction is generally made between "classic" pollutants, greenhouse gases and other pollutants.

"Classic" pollutants

3009 These are the most abundant and are those whose effects on human health and the natural environment were recognised first. The combustion of fossil fuel represents the principal source of classic air pollutants of human origin.

NO_x (NO , NO_2)

The principal economic related source of nitrogen oxide in European Union countries is road traffic, followed by electric power plants and industrial combustion. Nitrogen oxides affect the respiratory system, contribute to acidification and the formation of atmospheric ozone (responsible for photochemical smog).

SO_x (SO_2 , etc.)

Power plants constitute the main source of SO_2 emissions; industrial combustion and industrial processes account for less than 10%. Sulphur dioxide affects respiratory system; it contributes to the acidification of the other environmental media (water, land).

CO

Emissions of carbon monoxide are the result of incomplete combustion of fossil fuels. The major part of emissions can be attributed to automobile traffic.

VOC (volatile organic compounds)

Approximately half of VOC emissions originating in human activities are due to automobile traffic and one-third to the massive use of solvents in industry as well as in household consumption. VOCs are divided between methane and non-methane VOCs. Almost all VOCs are known or suspected to be cancer-producing; they contribute to photochemical pollution.

Greenhouse gases

CH₄ (methane)

- 3010 CH₄ emissions vary in origin. Methane emanates from the anaerobic decomposition of organic matter, intestinal digestion, biomass combustion, etc. It contributes to the greenhouse effect and interacts with the mechanisms of ozone formation.

CO₂

Although not a pollutant in the classical sense, carbon dioxide (CO₂), which is due to fossil fuel combustion, contributes greatly to the greenhouse effect.

CFC (chlorofluorocarbons), halons, (chloro)fluorobromocarbons

Produced for varying uses (solvents, foaming agents, refrigerant fluids, etc.), they are responsible for the reduction of ozone in the stratosphere and contribute to the greenhouse effect. The Montreal Protocol, whose provisions have been strengthened and extended by the London meeting, restricts their use.

N₂O

Due in major part to agriculture and certain industrial processes, discharges in the air of nitrous oxide (N₂O) contribute to the greenhouse effect.

Other pollutants

Lead

- 3011 Lead in the air is the result of manifold human activities, by far the greatest of which is automobile traffic where leaded petrol is consumed. Lead inhibits haemoglobin synthesis, affects the liver and kidneys.

Particulate

In developed countries the principal source of particulate is fuel combustion. Particulate also form in the atmosphere from the agglomeration and chemical transformation of gaseous emissions.

Contrary to classic air pollutants, which are few in number, are known and relatively controlled, trace toxic pollutants are many, have been studied less and are not subjected to systematic controls.

The sources are numerous: incinerators, industrial processes, waste water treatment plants, etc.

Pollution sources

3012 Most classic air pollutants are the result of fossil fuels combustion. A distinction is generally made between mobile and stationary pollution sources and, among the latter, power plants. The following table, based on the OECD 1991 Compendium, underscores the role of road transportation and energy production in emissions.

	SO _x	NO _x	Part.	CO	VOC	CO ₂
Mobile sources	5.2%	61.1%	38.3%	79.2%	51.3%	20.6%
Stationary sources	94.8%	38.9%	61.7%	20.8%	48.7%	79.4%
Industry						(16.9%)
Energy						(35.8%)
Other						(26.7%)
Total	100%	100%	100%	100%	100%	100%

(Table based on emissions for France (except VOC), former Federal Republic of Germany, Netherlands, Italy and United Kingdom)

Measurement of pollution

Emissions

3013 As a general rule emissions calculations are based on emission factors linking emission of pollutants with the uses of units of raw materials (in particular the different types of fossil fuels).

Concentration

3014 Concentration is measured at given sites representative of urban zones and of "background" pollution; it is generally measured in $\mu\text{g}/\text{m}^3$ or in ppm.

Pollution data

3015 Numerous efforts have been made at the national and international levels to collect physical data on air pollution. At the European Union level the most relevant system is CORINAIR. As in other domains, the joint OECD-Eurostat questionnaire in the ambient air and climate domain also allows for a standardised collection of data at international level. In addition, Member States submit emissions data under the Convention on Long range Transboundary Act Pollution and the associated EMEP monitoring program.

CORINAIR

3016 The CORINAIR project aims at establishing an air emissions inventory for classic pollutants. To the sulphur (SO_x) and nitrogen (NO_x) oxides and VOCs of the 1985 prototype inventory have been added (Corinair 1990) CO₂ and N₂O, CO and NH₃. Amongst VOCs, methane has been considered separately from non-methane VOCs.

The project has developed a number of very detailed, specific and general classifications as well as a simplified classification (Selected Nomenclature for Air Pollution: SNAP) which in its latest version (1990) covers 300 activities divided into eleven groups, fuel types being considered apart.

The project also takes selected "large point sources" (LPS) into account. These consist of plants which, due to the size and number of emissions of pollutants, merit special concern either from an administrative standpoint or because of their impact on the environment:

- thermal electricity generation plants with a capacity of over 300 thermal MW,
- refineries,
- nitric or sulphuric acid producing units,
- steel plants with a capacity of over 3 million tons,
- paper pulp mills with a capacity of over 100,000 tons,
- vehicle paint plants (over 100,000 vehicles per year).

Other LPS considered are those with over 1000 t/y of SO₂, NO_x, VOC and over 300,000 t of CO₂, as well as the large European airports.

- 3017 Noteworthy efforts have been made within the scope of this project to define standard emission factors. The first studies deal with emissions from road transport and with VOCs and provide guide values of emission factors for SO_x, NO_x and VOCs. A study on NH₃, NO_x, CH₄ and other VOCs at stationary sources has recently been completed. Work is in progress on N₂O and CO₂ emissions and for the specification of other VOC emissions (stationary sources).

In future CORINAIR will provide annual inventories of emissions.

OECD-Eurostat questionnaire

- 3018 At the present time this questionnaire represents one of the major international standardised source of data on air pollution. Rate of replies from Member States are relatively high for the section on emissions, but lower for the section on concentration.

Data gathered include the following:

- Sulphur and nitrogen oxides, particulate, carbon monoxide, VOCs, methane, lead, CO₂, CFC and halons broken down by source,
- Concentrations of SO₂, particulate, NO₂, oxidants, lead,
- PH values of acid precipitation, contained in SO₄ and NO₃.

Ambient air and climate protection

- 3019 Given the specific nature of air pollution, ambient air and climate protection has led to numerous international agreements aimed at reducing emissions, including prohibiting the manufacture of certain products. Moreover, the extent of emissions resulting from the combustion of fossil fuels has led to a series of measures ranging from the substitution of certain fuels to the use of special combustion equipment and measures aimed at modifying emission factors. Result is the importance given, amongst protection measures, to the use of environmentally adapted products.

Characteristic activities

- 3020 Ambient air and climate protection characteristic activities consist primarily of abating emissions of pollutants during the production and/or consumption process, in particular emissions related to the combustion of fossil fuels.
- 3021 As indicated earlier, the nature of the pollution is such that activities for the collection and treatment of pollution or pollutants, of particular importance in waste water and waste management, do not exist for ambient air and climate. Therefore, characteristic activities are essentially ancillary activities as defined in Chapter II (see § 2020). They consist of: measures aimed at lowering the production of pollutants and measures aimed at reducing discharges or concentration of pollutants in the air after production.

Definition of characteristic activities

3022 The UN-ECE and Eurostat have developed a joint classification for environmental protection activities (CEPA). Class 1 of the CEPA is a grouping of ambient air and climate protection activities (cf. Annex I to Chapter II).

- 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

Prevention of pollution through in-process modifications

3023 Prevention may consist of eliminating or reducing the production of air pollutants through in process modifications related to:

- the manufacturing-production process ("clean" technologies),
- the consumption or use of products (adapted products).

Clean technologies

3024 With respect to clean technologies, prevention activities consist of the use of modified facilities in order to limit the output of pollutants during the production, storage or transportation process (fuel combustion improvement, fluidised beds, post-combustion, weatherproofing, etc.).

Adapted products

3025 With respect to adapted products, protection activities consist of modifying facilities so as to provide for the substitution of raw materials, energy, catalysts and other intermediate pollutant input by non- (or less) pollutant products, or of treating raw materials prior to their use (e.g. desulphurisation). However, use of adapted products is not in itself considered as characteristic activity.

3026 Thus, the first group (clean technologies) is aimed at reducing emission factors, i.e. the volume of emissions resulting from the use or production of a unit of a given product, without modifying the products used. The second group aims at lessening emissions through substitution of the products used.

Treatment of exhaust gases and ventilation air

3027 The second category of characteristic activities refers to end-of-pipe equipment for the removal and reduction of particulate matter or other air-polluting substances from exhaust gases or ventilation air either from the combustion of fuels or from processes: filters, dedusting equipment and other relevant techniques. Also included are those 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.

Measurement, control, laboratories and the like

3028 This category covers all activities aimed at monitoring the concentrations of pollutants in exhaust gases, the quality of air or monitoring ozone layer and greenhouses gases, etc. These activities are undertaken either by general government (as a follow-up to urban pollution, scientific programs, etc.), or by enterprises operating either own (ancillary) follow-up of their pollution, or market follow-up of pollution for third parties.

Means, facilities

3029 Air monitoring refers to the programmed process of sampling, measurement, and subsequent recording or signalling, or both, of various characteristics of air, often with the aim of assessing conformity to specified objectives or norms.

Air monitoring installations refer to technical installations used in the pursuit of monitoring. It may or may not be operating in networks, and it may or may not be covering air only (integrated monitoring stations for air, water, soil etc.). Air monitoring installations exclude weather stations. Climate monitoring installations are specific monitoring installations related to ozone layer, greenhouses gases and climate change.

Other activities

3030 These activities group together teaching, regulation, administration and management activities for air protection when they are sufficiently differentiated.

Protection facilities and equipment

3031 Ambient air and climate protection facilities are:

- equipment and facilities aimed at reducing the output of air pollutants due to changed technical conditions of the production process,
- facilities aimed at reducing discharges of pollutants in the air (facilities for the treatment of exhaust gases and ventilation air),
- equipment and facilities for measurement, control and the like.

Producers of ambient air and climate protection services

3032 According to EPEA's conventions (cf. § 2022), producers of environmental protection services (called characteristic producers) are classified in two main categories:

- specialised producers which execute a characteristic activity as their principal activity; output may be market or non-market,
- non-specialised characteristic producers which execute a characteristic activity as secondary or ancillary to their principal non-characteristic activity. These producers are regrouped by industries, according to their principal non-characteristic activity.

Producers are classified as specialised according to environmental protection activities in general and not according to a specific domain.

3033 Producers which execute an ambient air and climate protection activity as principal activity are few: they are either non-market specialised producers belonging to the general government sector (e.g. governmental agencies specialised in air pollution control or regulation) or market producers of ambient air and climate protection services (surveys, measurement, control, engineering, etc.). Ambient air and climate protection services generally take the form of services produced as ancillary and producers are essentially units of the manufacturing, transport and energy industries.

3034 According to available data (OECD-Eurostat Survey 1992), corporations execute more than 90% of total expenditure for air protection (households not included). Ambient air and climate protection expenditure of corporations represent between one-third and one-half of corporations environmental protection expenditure, all domains combined.

3035 Specialised producers of other domains may execute ancillary activities in the air domain. Example: waste incineration unit (classified as specialised producer) which executes ancillary ambient air and climate protection activities (dedusting, filtering of its gaseous emissions, etc.). EPEA's convention is that these ancillary activities of specialised producers are not separately recorded. They are deemed to be linked to waste management (cf. Chapter V), thus they do not appear in the ambient air and climate protection account. If significant - as in the case of incineration plants - these activities may be separated and the related transactions accounted for in the ambient air and climate account. In this case, when aggregating the different accounts, one must take care to avoid double counting.

Adapted and connected products

In the air domain, uses of adapted and connected products (see § 2016) constitute an important part of national expenditure.

3036 Adapted products are:

- cars equipped with catalytic converters,
- less air polluting transport facilities (low emissions trucks, electric cars),
- lead free gasoline,
- desulphurised fuels,
- substitutes of CFC, etc.

For adapted products, only extra cost, as valued in §§ 2029-2030, and specific transfers are considered. To avoid double counting, an adapted product can only be recorded once (see § 2031).

3037 Connected products consist mainly of:

- catalytic converters for cars (when they are used to upgrade existing cars),
- services of carburation adjustment.

Transactions related to ambient air and climate protection

3038 The description of the transactions related to ambient air and climate protection fits into the general framework of the EPEA. These transactions consist of transactions in products and transfers.

Transactions in products

3039 Transactions in products concern:

- the supply and use of ambient air and climate protection services resulting from characteristic activities,
- the gross capital formation for characteristic activities,
- the uses of adapted and connected products.

Output of characteristic activities and respective uses

3040 Ancillary output is the result of characteristic activities undertaken for own use by polluting industries in order to reduce emissions of air pollutants, monitor emissions, etc. This output is valued by the cost that the unit which executes the activity bears in respect to the protection measures it takes: intermediate consumption, compensation of employees, fixed capital consumption and other taxes less subsidies on production. In order to avoid double counting, intermediate consumption of market services for ambient air and climate protection must be identified and treated separately (cf. § 2075 sq.). Ancillary output is assumed to be own intermediate consumption of the industries which produce it.

3041 Market output of ambient air and climate protection services generally consists of air pollution control and measurement services. When used by a specialised producer (e.g. a specialised general government agency for ambient air pollution control subcontracting measurement services), in order to avoid double counting, these market services are not accounted for when calculating national expenditure.

3042 Non-market output of ambient air and climate protection services consists of management, administration services, etc. by general government units. Output is valued by cost (intermediate consumption, compensation of employees, fixed capital consumption and other taxes production on production) less any revenues related to the service. This output is assumed to be collective consumption of general government. If any, non-market output of NPISHs is valued in the same way, but assumed to be actual final consumption of households.

Gross capital formation for characteristic activities

3043 Gross capital formation for characteristic activities corresponds to the investments related with the ambient air and climate protection activities (buildings, equipment, etc.). It includes expenditure related to acquisitions less disposals of non-produced non-financial assets (land, etc.). Whole gross capital formation and acquisitions less disposals of non-produced non-financial assets of specialised producers is considered. For non-specialised producers, that part of gross capital formation for characteristic activities which consists of adapted and connected products must be treated specifically (see §§ 2075-2083).

Uses of adapted and connected products

3044 Adapted and connected products are used either as intermediate or final consumption, or when they are capital goods, as gross capital formation.

3045 Intermediate consumption is the consumption of producer units of the national economy. These units may use unleaded gasoline, CFC substitutes etc. According to EPEA's conventions, in order to avoid double counting, uses by specialised producers are not separately recorded (cf. § 2077).

3046 Final consumption is the consumption of households. As concerns adapted products it consists of final consumption expenditure in unleaded gasoline, purchase of adapted cars, etc. As concerns connected products it consists of purchase of catalytic converters, of services of carburation adjustment, etc.

3047 Gross capital formation in adapted products is that of producer units of the national economy. It mainly consists of purchase of adapted cars, buses, trucks adapted heading systems, etc. Gross capital formation of specialised producers in adapted products is not recorded. The gross capital formation of non-specialised characteristic producers in adapted products requires a specific treatment (see § 2079 sq.).

Transfers

3048 Generally speaking, the users of ambient air and climate protection services finance their uses themselves: the different industries finance their own-account (ancillary) protection activities and corresponding gross capital formation; general government finances its collective consumption of non-market services; households bear the cost of adapted and connected goods, etc. The major deviation from this general rule originates in the existence of transfers.

3049 Transfers in the ambient air and climate protection domain consist either of taxes, charges, fees, etc., or of subsidies, investment grants and other current or capital transfers in favour of ambient air and climate protection. Furthermore, tax receipts may be earmarked for financing ambient air and climate protection measures or activities. An analysis of transfers linked to ambient air and climate protection is therefore required.

Treatment of ambient air and climate related taxes

3050 One must analyse the allocation of the receipts:

- receipts may be allocated for the financing of ambient air and climate protection activities, including management activities, through current or capital transfers, including international transfers aimed to finance ambient air and climate protection measures in other countries (specific taxes). According to EPEA's conventions this part is treated either as part of national expenditure or as mere financing,
- when receipts are not allocated to ambient air and climate protection measures or activities, they only enter in the "environment-related tax burden" of the respective paying units (environment-related taxes).

Transfers as component of national expenditure

- 3051 When analysing the ambient air and climate protection-related transfers from the beneficiary side, a distinction should be made between transfers which have to be included in national expenditure and transfers which are only financing uses of products already accounted for in national expenditure (cf. § 2084 sq.).
- 3052 Transfers of the first category consist of subsidies to ambient air and climate protection activities or transfers intended to compensate losses resulting from ambient air and climate protection measures (e.g. prohibition of production or use of harmful products, international co-operation, etc.).
- 3053 Transfers of the second category consist of investment grants and other capital transfers intended to finance gross capital formation for ambient air and climate protection, other current transfers within general government, etc.

System of taxes in the ambient air and climate domain

Spill fees

- 3054 Spill fees are charges computed on the basis of quantity and/or nature of the discharged pollutants. A distinction is generally made between incentive charges and distributive charges, the latter serving to finance pollution control activities. As economic instruments, spill fees may play a substantial role in the ambient air and climate domain.

Example of the French additional tax levy

- 3055 The additional tax levied on emissions of air pollutants was instituted in 1985 for a five-year period and renewed in 1990. The rate was increased as well as the number of those liable (now about 870). The SO₂ tax went up from 130 to 150 FF/t; H₂S, NO_x and HCl are also taxed with 150 FF/t. Dust and volatile organic compounds are now covered by the decree.

The tax is levied upon:

- operators of combustion plants of over 20 thermal MW,
- operators of waste incineration plants with a capacity of over 3 tons/hour,
- operators of facilities emitting over 150 tons/year of volatile compounds, nitrogen oxide compounds, hydrochloric acid, non-methane hydrocarbons, solvents or other volatile organic compounds.

Estimated receipts - 180 million FF in 1991 - will be used for the installation of appropriate equipment as well as for the development of prevention, reduction and measurement techniques relating to air pollution (e.g. purchase of air pollution control equipment and financing of technical research).

Product charges

- 3056 A number of taxes on products exist in the ambient air and climate domain which makes it necessary to inventory and classify these taxes for each country. In the air pollution field, the key taxes are taxes on fuel insofar as *their explicit objective* is environmental protection.

Draft proposal for a European Union tax on CO₂ and energy

- 3057 A proposal for a European Union tax on energy (except for renewable energy) has been drafted.

This tax, to be applied in the final stage of energy use, is two-part.

- The first part on the "taxation of CO₂ emissions due to fossil fuels" would apply to the end uses, as fuels, of hydrocarbons and their derivatives, gas, coal and coke, brown coal and peat, as well as their derivatives of alcohols to be used as fuels. The tax base is the volume of CO₂ discharged during combustion, and this tax must be considered as a spill tax,
- The second part on the "taxation of energy" would affect all uses of energy, except those which are renewable, the tax base being the energy output.

The tax preamble leaves no doubt as to its environmental protection ultimate objective, at least for the part "taxation of CO₂ emissions".

Differential taxes

- 3058 Differential taxes are surcharges which are added to existing taxes on products, or exemption or reduction of existing taxes. Generally, they are aimed at the reduction of air pollution from automobiles. They may consist of adjustments in the price of automobiles so as to stimulate sales of adapted cars, as well as in the price of petrol depending on whether it is leaded or unleaded.

Ambient air and climate protection account

- 3059 The account contains a series of articulated tables. Their basis is the general framework proposed in the Chapter XXI ("satellite analysis and accounts") of the 1993 SNA.

The purpose of Table A is to value and describe the national environmental expenditure.

Table B describes the output of environmental protection services. Table B1 is a supply and use table of environmental protection services.

Table C details the way in which national expenditure is financed, by cross-referencing the users/beneficiaries and the financers. Table C1 calculates the environment-related financial burden for industries and sectors.

National expenditure

- 3060 Table A describes environmental protection expenditure from the standpoint of uses. The general structure of this table is described in Chapter II (cf. § 2174 sq.). Main aspects of the various components of national expenditure relating to the ambient air and climate domain are presented below.

Components of national expenditure*Consumption of specific products*

- 3061 Consumption of specific products is the sum of the (final and intermediate) consumption of ambient air and climate protection services and of connected and adapted goods and services by resident units.

Consumption of ambient air and climate protection services is essentially intermediate consumption of non-specialised producers of their ancillary output. In practice, it corresponds to the cost of production (intermediate consumption, compensation of employees, consumption of fixed capital and other taxes less subsidies production), related with the environmental protection activities they undertake.

It may also consist of intermediate consumption of environmental protection market services. These services are mainly market services of measurement of pollutants or emissions, control of air quality, etc.

Finally, it consists of collective consumption of non-market environmental protection services by general government and, if any, actual final consumption by households of non-market services produced by NPISHs.

- 3062 Consumption of adapted and connected products takes the form of final consumption of households and intermediate consumption of producers.

These products may consist of:

- expenditure for vehicle carburation and heating system adjustment services,
- expenditure for the purchase of catalytic converters,
- expenditure, valued by extra cost, for the purchase of adapted products (unleaded gasoline, desulphurised fuels, adapted cars, etc.)

The consumption of connected goods and services does not include expenditure by households for thermal insulation or energy saving.

Gross capital formation and acquisitions less disposals of non-produced non-financial assets for characteristic activities

- 3063 It corresponds to gross capital formation and net acquisition of land, either for market or non-market characteristic activities executed by specialised producers, or for ancillary activities (gross fixed capital formation in buildings, control and measurement equipment, etc.).

Gross capital formation in adapted and connected products

- 3064 It corresponds to the gross capital formation in adapted cars, buses, etc. by the non-specialised and non-characteristic producers for that part which is not included under gross capital formation for characteristic activities.

Transfers

- 3065 Uses of specific products are valued at purchasers' prices, including non-deductible VAT. When production of these products or the products themselves are subsidised, subsidies must be recorded on the rows "subsidies for characteristic products" and "subsidies for adapted or connected products".

Subsidies as defined in Chapter II, § 2085 are entered in the columns which correspond to the users.

Among other transfers, mention may be made of:

- transfers to the rest of the world: financing of international or European Union programmes in the ambient air and climate protection domain,
- transfers to resident units: transfers to industries in order to compensate the losses resulting from adoption of environmental protection measures.

User/beneficiary units

Producers

- 3066 Characteristic producers are users of the national expenditure for the investments they make and which are intended for the output of characteristic services.

Non-specialised and non-characteristic producers are users of characteristic services under intermediate consumption of market and ancillary characteristic services (if any). They also may use adapted and connected products, or invest in connected or adapted capital goods.

General government

- 3067 General government units may be users/beneficiaries of characteristic services as collective consumer for their collective consumption of non-market characteristic services.

Households

- 3068 Households consume adapted and connected products. They may also consume services produced by NPISHs, if any.

Rest of the world

- 3069 The rest of the world may be the beneficiary of transfers for environmental protection (international co-operation).

Production of characteristic services

- 3070 Table B (see § 2109) describes the output of ambient air and climate protection services for the main categories of producers. It also furnishes a valuation of capital transactions and the resultant producer financing.
- 3071 In line with the guidelines of the EPEA, producers' transactions are separated into current and capital transactions. According to available data (OECD-Eurostat), the breakdown for expenditure is approximately half and half for current expenditure and investment expenditure.
- 3072 If ancillary output of ambient air and climate protection services by specialised producers (mainly waste incineration plants) is recorded, it must be excluded from the output of these specialised producers in the waste management domain. The same occurs with gross capital formation.
- 3073 Related products may consist of by-products of exhaust gas treatment activities (soot, etc.) which are generally classified as waste. Purchase of waste management market services for the elimination of these related waste is not considered in the current uses for the ancillary ambient air and climate protection activity. Certain activities, however, (fuel desulphurisation, prevention of heavy metal emissions, etc.) may give rise to the output of related products with commercial value. The related resources are not to be considered as ambient air and climate protection output and should therefore be deducted when valuing ancillary output.

Producer financing

- 3074 Financing by producers is equal to the amount of their current uses and capital expenditure less their resources (any sales, subsidies or other current transfers, investment grants or other capital transfers received). If ancillary output of ambient air and climate protection services by waste management specialised producers and respective gross capital formation are recorded, a net financing by specialised producers appears, which is balanced in the waste management account.

Financing of national expenditure

- 3075 The purpose of the financing table (cf. 2212 sq.) is to show how national expenditure for ambient air and climate protection is financed. Unless ancillary output of air protection services of waste management specialised producers is recorded, there are no changes in relation to EPEA's framework.

Environment-related financial burden

- 3076 Environment-related financial burden is computed in accordance with the methodology outlined in the presentation of the EPEA. It corresponds to the sum of:
- financing of national current expenditure
 - less net operating surplus of specialised market producers (which in the ambient air and climate protection domain is rather insignificant),
 - less any supplementary gain or profit resulting from ancillary characteristic activities,
 - plus calculated interests on fixed capital devoted to ambient air and climate protection activities,
 - plus taxes, charges, etc. paid out under ambient air and climate protection, when they are not entered as financing of national expenditure.

Data sources

General government sector units

Specialised institutions

3077 As a first step it is necessary to identify those units of the general government sector which produce non-market ambient air and climate protection services: quality of air agencies, specialised bodies and institutes, central or local environmental services responsible for administration and monitoring in this field (elaboration of regulations, issuance of permits, management of taxes, grants, etc., measurement of pollution, meteorological services, etc.).

3078 An economic analysis of the expenditure of these units as ascertained in the public accounts (general and local government budgets) may provide the data required for the establishment of the account, that is to identify, or calculate:

- intermediate consumption, compensation of employees, taxes on production,
- consumption of fixed capital,
- gross capital formation (buildings, equipment, land, etc.),
- the receipts related with the services provided,
- the transfers these units may distribute or benefit from.

The valuation of fixed capital consumption by general government implies an assessment of the fixed capital stock used for ambient air and climate protection activities.

Non-specialised characteristic producers

3079 These are units of the general government sector which execute ambient air and climate protection activities as ancillary or secondary to a non-characteristic activity. Examples are: municipalities or other general government units which do have ambient air and climate protection activities (management etc.) which are not separated. Functional analyses of expenditure and specific inquiries are necessary to identify the corresponding transactions.

Financing and valuation of environmental burden

3080 As air protection taxes, charges, etc. are collected by general government units (either central or local governments or specialised agencies) analysis of these receipts is necessary to ascertain which units (corporations, households) pay these taxes and charges and which uses the funds are allocated to (for giving subsidies, investment, grants, etc. or the financing of own activities). Such data are necessary in order to establish the financing table and to calculate environmental burden by institutional sector and industry.

Corporations

3081 Transactions of corporations concern essentially those activities executed as ancillary. As concern the current and capital expenditure for ambient air and climate protection activity, they may be valued only by means of specific surveys (cf. § 2247 sq.).

Households

3082 Data about household consumption are generally too aggregated in national accounts or national statistical surveys on household expenditure. As household expenditure mainly consist of consumption of connected or adapted products, which are subject to specific inquiries. Data about supply and uses may be provided by professional associations or specialised marketing institutes.

Integration of physical and monetary data

Effectiveness of protection measures

- 3083 The characterisation (measurement) of effectiveness generally assumes that cost and benefits (advantages) can be linked. In the case of ambient air and climate protection this linking is, in most cases, impossible as benefits are not valued in conventional national accounts. It is nonetheless possible to ascertain the relative effectiveness by comparing cost and physical results of several protection measures or activities in order to determine the most "effective".
- 3084 In the case of market environmental protection services, it is possible to compute the unitary cost of services rendered (cost of sanitation and purification of a cubic meter of waste water) if the corresponding services are defined with sufficient precision (purification level or process, size of the area, etc.).
- 3085 In the case of ambient air and climate protection services which are essentially ancillary and which mainly consist of prevention activities, the measuring of effectiveness is more complex. It presupposes that a recording system of emissions of pollutants exists which makes it possible to determine, in the changes of these emissions, that part due to the different protection measures taken.
- 3086 It is thus necessary to identify all factors concerning emission changes and to link them to the measures. Changes in emissions are not to be imputed solely to protection measures but may, for example, result from variations in economic activity. On the other hand, not all ambient air and climate protection measures do translate into transactions to be included under national expenditure (e.g. prohibition of CFC). Linking measures (and expenditure) to results necessitates detailed analysis which certainly are beyond the scope of the ambient air and climate protection account. Account data may nevertheless constitute a basis for this link.
- 3087 At macro-economic level a "measurement of effectiveness" might make it possible to compare the effectiveness of different national policies. In particular it may permit the determination of the extent to which a high environmental protection level "penalises" some industries (or countries) in relation to others.

Integration of physical and monetary data

- 3088 The level of emissions of air pollutants of a given industry (or branch) can be linked to the volume of its output. For one unit of output, it depends, by means of the emission factors, on the nature and the volume of the products used (inputs), taking into account the technique employed.
- 3089 For a given industry (or branch), comparisons of emissions per unit of output between countries or periods can be explained by the differences in emission factors, inputs or technologies used.
- 3090 Expenditure likely to influence the level of emissions for a given industry (or branch) may be broken down into prevention expenditure linked to technologies, prevention expenditure linked to products, treatment expenditure, which are separate items of the classification of the ambient air and climate protection activities, and intermediate consumption of adapted products.
- 3091 Prevention expenditure associated with the development of clean technologies consist of a modification of equipment so as to limit, for identical outputs, the output of pollutants during the production process. Treatment expenditure consist of reducing discharges of pollutants in the environment, after they have been produced in the production process. These expenditure can be correlated with changes in emission factors.
- 3092 Prevention expenditure linked to consumption or use of adapted products are expenditure resulting from substitution of raw materials or energy, the use of catalysts, etc. These expenditure, as well as intermediate consumption of adapted products may be correlated with input modifications.
- 3093 One problem, difficult to overcome, persists: the breakdown of monetary data by pollutant has not been envisaged as measures generally affect emissions of more than a single pollutant. Attempts have been made (e.g. in Canada in the 1989 PAC survey and in Austria at the end of the 70s) and it may be possible, in certain cases (desulphurisation of fuel, CFC substitutes), to relate physical and economic data. Further work is in any case necessary in the long run. Synthetic indicators may constitute a way if one can relate the field they describe with expenditure. In the ambient air and climate domain three synthetic indicators are already under study, for greenhouse gases, ozone layer depletion and acidification.

IV. WASTE WATER MANAGEMENT ACCOUNT

Introduction

4001 In the present chapter the EPEA's sub-account for waste water management is presented.

The following aspects are successively examined:

- general description of the domain (major pollutants, causer groups and environmental problems),
- physical data potentially available for the domain,
- specificity of waste water management (classification and definition of activities, etc.),
- specific accounting problems for the domain (specification of units and transactions, data sources and link to physical data).

As concerns the last aspect, only references to the EPEA's framework are made, the framework itself is not presented. Therefore, readers are advised to refer to this framework and the tables in Chapter II for a general view of the accounting approach.

Purpose of the waste water management account

4002 The purpose of the waste water management account is to describe the monetary flows related to management of waste water, interrelating them with the corresponding physical data. In particular, the account should make it possible to value the *national expenditure for waste water management*, to describe its components and its financing.

4003 Waste water designates water which 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. Waste water includes cooling water. Waste water management designates all activities and measures intended to prevent the pollution of surface water, to collect and treat waste water including monitoring and regulation activities.

4004 According to available data (see State of the Environment in the European Community, March 92, volume III p. 82) waste water management and water protection represents 44% of the total environmental expenditure of the Member States of the European Union, i.e. roughly 20 billion ECU for 1988, in the first position before waste management.

Waste water management and water management

4005 In accordance with the EPEA's convention, the waste water management account does not go into aspects related to the management of water resources from the quantitative standpoint (see Chapter X). This exclusion may give rise to problems insofar as the separation between management of water and management of waste water is practically difficult in a certain number of cases, the units responsible for these activities often being the same (for example, agencies for water distribution and sewerage of waste water).

4006 Activities for the waste water management do not cover all activities related with water protection. Activities for the protection of ground water are treated with soil protection activities, restoration of water bodies activities are treated with protection of biodiversity and landscape (see Chapters VI and VIII).

Description of the domain

4007 Water, at one and the same time an economic resource, living environment, major component of living organisms and ecosystems, is an element with oft-competing manifold functions posing the most acute management problems.

These problems are due both:

- to the increasing scarcity of this resource whose uses, while constantly augmenting, are also undergoing large-scale redistribution because of changes in life styles,
- to the deterioration of the quality of this resource due to pollution resulting from output and consumption activities.

4008 It should be noted that in most cases water is not in the strict sense of the term consumed but is simply used for certain of its qualities and then discharged in the environment; theoretically it then becomes available again (in the more or less long term) for other uses; however, often its use generates a deterioration of its quality and can make it unfit for further use.

Categories of water

4009 The distinctions generally made for the natural element water are:

- surface inland water or superficial water: watercourses, lakes and ponds, artificial reservoirs, etc.,
- subsurface inland water: ground water, deep water,
- sea water, including brackish water.

In waste water management only surface inland water and sea water are dealt with.

Physical description

4010 Although harmonised methodology is lacking at the European Union level, making it difficult to characterise the situation, it is generally considered that despite the investments made over the last twenty years the state of water resources in the European Union has not improved overall. It is observed in particular that the proportion of eutrophicated and polluted coastal zones and estuaries has increased and that the acidification of inland water is on the rise.

Pollutants which were measured to a lesser degree until now risk manifesting their effects in the near future. This is the case notably for pesticides and more generally for micro-pollutants, whose effects, although manifest already, are hidden due to other pollutants, notably oxidizable matter causing anaerobiosis.

4011 Concerning the marine environment and bathing waters more specifically, the discharge of waste and waste water has led to the eutrophication of the seas and surface water in general to which must be added hydrocarbon pollution, either accidental or linked to offshore exploitation, cleaning of holds, etc.

Contamination by heavy metals is a difficult problem of diffuse pollution, especially sensitive near major estuaries and industrial coasts. Contamination by organic compounds whether halogenated organic compounds (DDT, lindane, dieldrin, PCB, etc.) or organo-metallic compounds is disquieting.

Urban discharges are mainly responsible for bacteriological pollution and industrial discharges for chemical pollution which disturbs the food chain. From the standpoint of public health, principal negative consequences are the deterioration of bathing waters and the contamination of shell-food.

Pollution

4012 A distinction is generally made for the following sources of pollution:

- household discharges. Rich in oxygen-demanding products and nutritive elements, they contribute to the danger of anoxia (absence of dissolved oxygen) which disturbs (or eliminates) aquatic life and produces disagreeable odours,

Sludges from municipal and some industrial waste water treatment plants are sometimes used as fertilisers or transformed into compost, thereby engendering problems due to their concentrations of heavy metals and micro-pollutants, as well as to their sanitary worth. Their incineration or landfill poses specific problems as well,

- industrial discharges. The extent and the nature of pollution problems vary considerably according to the industrial sector. Industrial pollutants, which may consume large quantities of oxygen when discharged in surface water, also enter the water cycle through toxic and acid precipitation,
- diffuse discharges. An ever-increasing proportion of existing pollution may be attributed to diffuse sources, in particular run-offs from urban and agricultural zones. Another major source of pollution is atmospheric (acid rain, etc.),
- agriculture is a leading source of diffuse discharges through the leaching of nitrogen and phosphate fertilisers, the spreading of animal excrement (numerous infringements of standards) which lead to water eutrophication, but also through the leaching of pesticides and other pollutants,

Furthermore, infiltration of surface water may reach vulnerable aquifers, infiltration due to run-off water being particularly difficult to monitor.

Types of pollution

4013 Pollution rates of surface water can be estimated on the basis of three series of criteria:

- those which describe the oxygenation regime, in connection with the concentration of oxygen-consuming materials,
- those which announce eutrophication (nutrients causing algae blooms) owing to concentrations of nitrates and phosphates,
- those which describe the concentration of micro-pollutants (heavy metals, pesticides, chlorinated substances, etc.).

4014 Among the different pollutants the following distinctions are generally made (these headings are not exhaustive).

- Materials in suspension (MIS) or total suspended solid (TSS). These are the easiest to dispose of through various sedimentation processes, screens, etc.,
- Oxidizable materials (OM). These are substances which consume the oxygen in water; the more numerous they are, the less oxygen is dissolved in water, thus disturbing (or eliminating) aquatic life. The quantity of oxygen used in the biochemical oxidation of oxidizable materials (organic or inorganic) is called BOD (biochemical oxygen demand). The measurement is taken for five days, i.e. BOD5. When organic matter is not biodegradable, heavy chemical action is required. The COD (chemical oxygen demand) measures the quantity of oxygen used in chemical oxidation by dichromate or permanganate of organic or inorganic matter in water,
- Nitrogenous materials (NM),
- Phosphorous materials (PM),
- Metals,
- Micro-pollutants.

Pollution measurements

4015 Pollution is generally measured by the quantity of average pollution discharged by one inhabitant in one day (population equivalent/day - cf. § 4037). Measurements vary from country to country; some countries add heavy metals and toxics.

European Union system for the collection of physical data on waste water management and water protection

4016 The OECD-Eurostat questionnaires constitute the main normalised source of data on water pollution as well as on treatment and disposal facilities.

The following data are collected:

Inland water

Estimate of renewable water resources	(Table 1)
Annual abstraction of water by source and by sector	(Table 2)
Water consumption by supply type and by sector	(Table 3)
National population connected to treatment plants	(Table 4)
Treatment capacity of treatment plants in terms of volume	(Table 5)
Production and disposal of treatment plant sludge	(Table 6)
Production and discharges of waste water in terms of volume	(Table 7.1)
Production and discharges of waste water in BOD terms	(Table 7.2)
Quality of water in selected rivers	(Table 8)
Quality of water in selected lakes	(Table 9)

Additional tables

Quality of water abstracted for public supply	(Table 2A)
Seasonal population connected to treatment plants	(Table 4A)
Treatment capacity of treatment plants in BOD terms	(Table 5A)
Production and discharges of waste water, general pollution	(Table 7A.1)
Production and discharges of waste water, heavy metals	(Table 7A.2)

Marine environment

Emissions in marine environment	
Pollution from the coast	(Table 1)
Pollution from coastal industries	(Table 2)
Pollution from rivers	(Table 3)

Quality of marine environment

Description of coastal areas	(Table 4)
Bacteriological quality of sea water	(Table 5)
Concentration of pollutants in sea water and sediments	(Table 6)
Concentration of pollutants in living matter	(Table 7)

Waste water management

4017 Waste water management involves a series of actions and measures. Only these actions and measures which give rise to monetary transactions are described in the waste water management account: thus measures like ban, prohibition of products or productive activities are not recorded, unless they do translate into monetary transactions (e.g. transfers to compensate losses resulting from a ban).

Waste water management may take the form of:

- activities of waste water management, called characteristic activities,
- uses of adapted and connected products,
- and finally specific transfers.

Characteristic activities

4018 Waste water management characteristic activity designates any activity whose purpose is the management of waste water. Characteristic activities are always executed by production units of the national economy, either as principal or secondary activity, or as ancillary (for own account). Output of characteristic activities are called characteristic services. Producers of characteristic services are called characteristic producers.

Definition of characteristic activities

4019 UN-ECE and Eurostat have developed a joint classification for environmental protection activities (CEPA). Class 2 of the CEPA distinguishes the following waste water management activities:

- 2 Waste water management
 - 2.1 Prevention of pollution through in-process modifications
 - 2.2 Sewerage networks
 - 2.3 Waste water treatment
 - 2.4 Treatment of cooling water
 - 2.5 Measurement, control, laboratories, and the like
 - 2.6 Other activities

Prevention of pollution through in-process modifications

4020 Prevention of water pollution through in-process modifications may relate to:

- modifications of manufacturing and production processes (clean technologies),
- uses of adapted products.

Clean technologies

4021 Prevention activities consist of replacing an existing manufacturing-production process by a new process designed to bring about a reduction of pollutants generated during production. By extension, activities aimed at reducing emissions of pollutants and/or waste water are included (separation of networks, treatment and recycling of water used in the production process, etc.).

Uses of adapted products

4022 Prevention activities may consist of modifying the production process or facilities to enable the use of adapted (less pollutant) products. Use of adapted products is not, in itself, considered as a characteristic activity.

Sewerage networks

- 4023 This activity consists of collecting and transporting 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.)
- 4024 Sewerage networks designates the system of collectors, pipelines, conduits and pumps to evacuate any waste water (rainwater, domestic and other waste water) from the points of generation to either a municipal sewage treatment plant or to a point where waste water is discharged into surface water. Distinctions may be made for unitary, separator, mixed, pseudo-separator networks as well as public and private networks, tanks, cesspools. Collection can lead to the discharge of waste or rain water in the natural environment (surface or sea water but also soil and ground water through leakage) or to their treatment in a treatment plant.

Waste water treatment

- 4025 Waste water treatment designates any process to render waste water fit to meet applicable environmental standards or other quality norms. Three broad types of treatment are specified: mechanical, biological, and advanced treatment.
- 4026 Activities for the treatment of industrial waste water may be separated from activities for the treatment of urban waste water. This distinction refers less to the origin of the water than to the nature of the facilities: urban waste water (household or similar waste water) designates waste water from collective sewerage networks whatever their origin: households' waste water, industrial waste water discharged in collective networks, rain water, etc. Industrial waste water designates waste water treated by industrial enterprises themselves, either prior to discharge in the collective sewerage network, or prior to discharge in the environment.

Mechanical treatment of waste water

- 4027 Mechanical waste water treatment 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.).

Principal equipments are:

- screens for large solids,
- plants, equipment for filtration, flocculation, sedimentation; separation of oils and hydrocarbons; separation using inertia or gravity, including hydraulic and centrifugal cyclones,
- diaphragm floats.

Biological treatment of waste water

- 4028 Biological treatment of waste water 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 oxidizable materials through the use of bacteria: activated sludge technique or anaerobic treatment for specific concentrated waste water. Biodegradable materials are treated with the addition of bacteria-enriched sludge in open or closed tanks.
- 4029 The operation of septic tanks is not considered as a characteristic activity. Septic tanks are classified as connected products. A septic tank is defined as a settling tank through which waste water 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.

Advanced treatment of waste water

- 4030 Treatment of waste water by advanced technology designates "processes capable of reducing specific constituents in waste water 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 oxidizable non-biodegradable matter at a higher level, as well as metals, nitrates, etc. by using powerful biological or physical and chemical action. It necessitates special equipment for each depollution.

Treatment of cooling water

4031 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."

Cooling water may be distinguished according to origin:

- cooling water from thermal electricity generation plants,
- cooling water from other activities, which use water as their cooling fluid.

Means, methods, facilities:

- 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).

Measurement, monitoring, analysis, etc.

4032 This position groups all activities aimed at controlling the quality of surface and marine water (analysis and measurement of pollutants, etc.).

Means, facilities: stationary and mobile measurement and monitoring sites in urban or rural areas, etc., including installations incorporated within climate observation networks.

Other activities

4033 Activities under this heading correspond to teaching, and administration activities in the waste water management domain, when they may be distinguished from general environmental teaching or administration or from other waste water management activities.

Remark concerning classification

4034 According to international classifications, the treatment of sludges from waste water treatment plants comes under the waste water management domain and the elimination of residues from this treatment comes under the waste management domain.

Facilities

4035 Facilities for waste water management refers to "technical installations or equipment designed for use in the context of waste water management. The installations can be of the "end-of-pipe" type or they can be part of a larger production process.

Classification of facilities

4036 A classification of Environmental Protection Facilities has been drawn up by UN-ECE and Eurostat in association with the CEPA. Class 2 of this classification groups together waste water management facilities.

The following facilities are distinguished:

- 2.1 Sewerage networks [in kilometres]
- 2.2 Waste water treatment installations [number; capacity in terms of population equivalents or COD]
 - 2.2.1 Mechanical treatment technology
 - 2.2.2 Biological treatment technology (excluding septic tanks)
 - 2.2.3 Advanced treatment technology
 - 2.2.4 Septic tanks
- 2.3 Monitoring installations [number of measurement sites; number of mobile equipments; number of measurements per year and by type of water body monitored]

Description of facilities

- 4037 In the case of treatment plants for waste water the most frequently used measuring unit for capacity is that of population equivalent. The definition of the unit has not been standardised. The population equivalent is defined as the amount of oxygen-demanding substances whose oxygen consumption during biodegradation equals the average oxygen demand of the waste water usually produced by one person per day. For practical reasons it is assumed that one unit equals 54 g BOD (at 20 degrees over 5 days) per 24 hours or at 180 g (COD + 4.57 Kjeldahl N) per 24 hours.
- 4038 Among other indicators concerning facilities, the following may be retained:
- % of population serviced by "public" waste water treatment plants, by treatment type,
 - % of population connected to a collective sewerage network,
 - % of population connected to an autonomous network, etc.

Producers of waste water management services

- 4039 According to EPEAs' conventions (see § 2022), producers of environmental protection services, called characteristic producers, are classified in two main categories:
- specialised producers which execute a characteristic activity as their principal activity; output may be market or non-market; units which belong to the general government and NPISHs institutional sector are distinguished from units which belong to other institutional sectors,
 - non-specialised producers which execute a characteristic activity as secondary or ancillary to their principal non-characteristic activity. These producers are regrouped by industries, according to their principal non-characteristic activity.
- 4040 Producers are classified as specialised according to environmental protection activities in general and not according to a specific domain. In the waste water management domain, distinctions should be made on the basis of the characteristic activities.

"Public" or collective services

- 4041 Operation of sewerage network and urban waste water treatment which correspond to "public" services are generally executed by specialised producers belonging either to the general government (local government) or corporations institutional sectors. According to indicative data obtained from the "SERIEE test" and the 1992 OECD survey on expenditure for pollution and abatement control, expenditure related with these activities represent roughly 70% of waste water management expenditure.

4042 Organisation of these activities is varied and rapidly evolving.

- numerous modalities:

In Germany localities and groups of localities occupy a central position. In some Länder "municipal enterprises" exist; in France a high proportion of these activities are undertaken by private enterprises (three large integrated groups account for roughly 60% of sewerage and treatment activities) which execute their activity under the aegis of municipalities and according to varying systems.

- rapidly evolving organisation:

Because of the financial difficulties of local governments, structural modifications in the management of collective services began in the early 1980s. The first solution consisted of creating specific public establishments enjoying financial autonomy. Examples of this type of development are numerous in European Union countries.

Concessions to private operators for a limited time, the municipality conserving ownership of the facilities and authority for the services, is also a scheme being developed. Since 1987 in Lower Saxony, for example, a dozen municipalities have given over the modernisation and management of treatment plants to private enterprises for some thirty years; this model will serve as example for other regions of Germany. In Belgium, Spain and Italy this tendency is also strong.

In the United Kingdom, following the 1983 reform, the 1989 Water Act initiated major structural changes in the water sector. According to this legislation public water agencies become private companies in England and Wales. Water agencies remain under public control in Northern Ireland and Scotland.

Other activities

4043 Prevention activities, industrial waste water treatment activities, and treatment of water cooling activities are generally executed as ancillary.

4044 Measurement, monitoring and analysis activities are mainly executed by non-market units of general government, although producers belonging to the corporations sector may also execute them, as principal, secondary or ancillary activity.

Connected and adapted products

Adapted products

4045 A list of adapted products in the waste water management domain has to be established.

Examples of adapted products may be:

- phosphate free washes,
- highly biodegradable products.

For adapted products, only extra cost, as valued in Chapter II, § 2029 sq., are considered.

Connected products

4046 They mainly consist of:

- septic tanks,
- biological activators for septic tanks,
- services for collecting septic tanks sludge.

Transactions related to waste water management

4047 The description of the transactions related to waste water management fits into the general framework of the EPEA. These transactions consist of transactions in products and transfers.

Transactions in products

4048 Transactions in products concern:

- the supply and uses of waste water management services resulting from characteristic activities,
- the gross capital formation for characteristic activities,
- the uses of adapted and connected products.

Output of characteristic activities and respective uses

Market output

4049 Market output mainly corresponds to that part of the collective sewerage and treatment services which is not provided free by general government units to the community as a whole. Partial payments by beneficiaries of the sewage and treatment services are classified as market output (see § 20xx sq.)

4050 Users of collective sewerage networks (households, enterprises, etc.) and public treatment plants pay charges to the producers of sewage-treatment services, whether local government or units of the "specialised producer" sub-sector acting or not acting as subcontractors.

4051 The frequent integration of water supply services and sewage-treatment services, in particular for billing, and the fact that in a certain number of cases several taxes or charges are levied simultaneously, are apt to pose problems for the identification of services actually paid for, as well as for their valuation and classification.

4052 In France, for example, the sewerage tax paid by users is included in the water bill of local governments or the distributor companies. They represent roughly 43% of the total bill; local government and distributor companies retain 37% for collection and treatment. The remaining 6% are collected by the Agences Financières de Bassin. The 37% is considered market sales by specialised producers (whether they belong to the general government sector or to the corporations sector) of sewage-treatment services. The 6% levied by the Agences de Bassin represent spill fees and are a tax on product. This fee is computed according to pollution released (for households this is a fixed charge, for enterprises it depends on actual pollution). The Agences Financières de Bassin use the amounts collected to give subsidies and to contribute to depollution.

4053 In the water protection account for services rendered charges are treated in the same way as the price of services paid to the producer by users (corporations and households). In the case of charges paid to general government which subcontracts the production to enterprises, rules defined in § 2134 sq. apply.

Table of charges for services rendered under water depollution

Country	Charge calculation	Target groups
France	water consumption quantity + pollution load	households, enterprises enterprises
Germany	quantity of water used water consumption	households, enterprises
United Kingdom	water consumption quantity + pollution load	households enterprises
Belgium	unitary rate unitary rate	households enterprises
Denmark	fixed rate quantity of water used	households enterprises
Italy	quantity + pollution load	households, enterprises
Netherlands	fixed rate or quantity quantity + pollution load	households enterprises

Non-market output

- 4054 This output, which consists of management, administration services by general government units and that part of the sewage and treatment services which is provided free to the community as a whole, is valued by the cost (intermediate consumption, compensation of employees, fixed capital consumption and taxes on production) less any receipts related to the services rendered. This output is assumed to be collective consumption of general government. If any, non-market output of NPISHs is valued in the same way, but assumed to be actual final consumption of households.

Ancillary output

- 4055 Ancillary output is the result of characteristic activities undertaken by polluting industries in order to reduce emissions of water pollutants, monitor emissions, etc. This output is valued by the cost that the unit which executes the activity bears in respect to the protection measures it takes: intermediate consumption, compensation of employees, fixed capital consumption and taxes on production less subsidies. In order to avoid double counting, intermediate consumption of adapted and connected products, or intermediate consumption of market services for waste water management must be treated specifically (cf. § 2075 sq.). Ancillary output is assumed to be own intermediate consumption of units which produce it.

Gross capital formation

- 4056 Gross capital formation and acquisitions less disposals of non-produced non-financial assets for characteristic activities corresponds to the gross capital formation expenditure related with waste water management activities: sewerage networks, treatment plants, etc. Whole gross capital formation of specialised producers and acquisitions less disposals of non-produced non-financial assets is considered. For non-specialised producers, that part of gross capital formation for characteristic activities which consists of adapted and connected products must be treated specifically.

Uses of adapted and connected products

- 4057 Adapted and connected products are used either as intermediate or final consumption, or, when they are capital goods, as gross capital formation. Intermediate consumption is that of producing units of national economy. These units may use phosphate-free products and other adapted products. According to EPEA's conventions, in order to avoid double counting, uses by specialised producers are not separately recorded. Final consumption is that of households. As concerns adapted products, it consists of final consumption expenditure in phosphate-free products etc. As concerns connected products it consists of purchase of biological activators for septic tanks, etc.
- 4058 Gross capital formation in connected products is that of producing units of national economy. It mainly consists of purchases of septic tanks. Gross capital formation of specialised producers in adapted products is not separately recorded. The gross capital formation of non-specialised producers in adapted products, intermediate consumption of adapted and connected products or intermediate consumption of market services for waste water management must be treated specifically (cf. § 2075 sq.).

Transfers

- 4059 Generally speaking, the users of waste water management services finance their uses themselves: the different industries finance cost for own-account (ancillary) protection activities and corresponding capital formation; general government finances its collective consumption of non-market services; households bear the cost of public sewage and treatment services and of adapted and connected products.
- 4060 Transfers in the waste water management domain either consist of specific taxes or subsidies, investment grants, other current or capital transfers in favour of waste water management. An analysis of transfers linked to waste water management is therefore required.

Treatment of taxes

4061 One must analyse the allocation of the receipts:

- receipts may be allocated for the financing of waste water management activities, including management activities, through subsidies, investment grants, current or capital transfers, including international transfers aimed at financing waste water management measures in another country. According to EPEA's conventions, this part is treated either as part of national expenditure or as mere financing,
- when receipts are not allocated to waste water management measures or activities, they only enter in the environment-related financial burden of the respective paying units.

Transfers as a component of national expenditure and financing

4062 When analysing the waste water management related transfers from the beneficiary side, a distinction should be made between transfers which have to be included in national expenditure and transfers which are only financing of uses of products already accounted for in national expenditure.

Transfers of the first category consist of subsidies to waste water management activities or transfers intended to compensate current charges resulting from waste water management measures (prohibition of certain intensive agricultural practices or use of harmful products, etc.), current or capital transfers to the rest of the world.

Transfers of the second category mainly consist of investment grants and other capital transfers intended to finance gross capital formation of producers, either specialised or not, for waste water management.

Spill fees

4063 These are payments carried out under the heading of discharges into the environment; they are computed on the basis of quantity and/or pollution load for discharged water. Based on their impact, a distinction is made between incentive charges and redistributive charges. In the latter case, the payments made serve as resources for funds which finance activities for water pollution control.

Some Member States (Germany, Italy, Netherlands, France, etc.) practice water pollution charges.

Country	Purpose	Target groups
France	F	enterprises, households, municipalities
Germany	I/F	enterprises, households
Italy	I	enterprises
Netherlands	F	enterprises, households

F: financing = redistributive; I: incentive

Waste water management account

National expenditure

4064 Table A describes environmental protection expenditure from the standpoint of uses. For the general structure of this table, one should refer to the general presentation of the EPEA (cf. § 2174 sq.). Main aspects of the various components of national expenditure relating to the waste water management domain are presented below.

Components of the national expenditure

4065 Table A describes the expenditure for waste water management from the standpoint of uses.

Specificity in the water domain is based on:

- the existence of collective services whose users are not always readily identifiable,
- the difficulty in separating monetary flows which pertain to resource management (water supplying) from those which pertain to waste water management,
- intermediate consumption by specialised producers (waste water treatment plants) of characteristic services of waste disposal.

Collective sewerage and treatment services

4066 If the users are identifiable as a whole (in principle they correspond to the total number of resident units in the geographical area covered by the services), their breakdown between the different categories of users (households, industries, general government) is difficult in the absence of a breakdown key.

4067 In the case of non-market services, the total use of these services enters under the heading collective consumption of the general government. In the case of market services, the breakdown key should be based on the payments made for services rendered, which presupposes that a breakdown of these payments between the different sectors is available. In practice, in order to arrive at this breakdown, one may have to proceed by estimates.

Separation of characteristic waste water management activities and water management activities

4068 In a certain number of countries, users pay for water consumption and waste water management services (sewerage and treatment) at the same time. It is important that the allocation of the payments be made on the basis of services rendered. The same effort should be undertaken for the integrated administrative bodies responsible for the financing of both management action (mobilisation of the resource, conveyance, etc.) and protection activities.

Intermediate consumption of waste disposal services by waste water treatment plants

4069 Disposal of sludge resulting from waste water treatment may constitute a significant intermediate consumption of waste water specialised producers. As they are included in the value of their output, they do not have to be recorded separately in the uses of waste treatment services (cf. 2075 sq.).

Uses of adapted and connected products

4070 Final consumption of connected products takes the form essentially of final consumption by households of biological products for the operation of septic tanks. Final consumption of adapted products (valued on the basis of extra cost) concerns phosphate-free washes, for example. Producer units of national economy may also use as intermediate consumption adapted products. Gross capital formation in adapted products is primarily exemplified by septic tanks.

Transfers

4071 In the waste water management domain transfers may consist of subsidies to specialised producers of sewerage and treatment and also of transfers to the rest of the world in order to finance programs of collective sewerage and treatment in other countries (international public or private aid for development).

Production of waste water management services

4072 Table B (see Chapter II, § 2197 sq.) describes the output of waste water management services. For the main categories of producers, it supplies detailed uses linked to output. It also furnishes a valuation of capital transactions and the resultant financing of the producer. Producers' and transactions classification is identical to that for the EPEA.

4073 Waste water treatment may give rise to the output of related products with commercial value: sludge used as fertiliser after treatment, recovery of energy. The related products are not to be considered as waste water management output and should therefore be deducted in order to value environmental output of characteristic producers.

Financing of national expenditure

4074 The purpose of the financing table (cf. § 2212 sq.) is to show how national expenditure for waste water management protection is financed. Unless ancillary output of waste management specialised producers is recorded, there are no changes in relation to the EPEA's framework.

Environment-related financial burden

4075 Environment-related financial burden is computed in accordance with the methodology outlined in the presentation of the EPEA. It corresponds to the sum of:

- financing of national current expenditure,
- less net operating surplus of specialised market producers (which in the waste water management domain is rather insignificant),
- less any supplementary gain or profit resulting from ancillary characteristic activities,
- plus calculated interests on fixed capital devoted to waste water management activities,
- plus taxes, charges, etc. paid out under waste water management, when they are not entered as financing of national expenditure.

Data sources

General government sector units

4076 The first step is to identify the specialised units of the general government institutional sector, i.e. those units which execute waste water management characteristic activity as principal activity. They first consist of municipal services which produce public, sewerage and treatment services on a market or non-market basis (cf. § 2050 sq.). They may also consist of specialised agencies, central or local services related to waste water (or water) management, i.e. responsible for administration and monitoring in this field (elaboration of regulations, issuance of permits, management of taxes, charges, grants, etc., measurement of pollution).

4077 An economic analysis of the expenditure of these units as ascertained in the public accounts (general and local government budgets) has to be made.

In order to provide the data required for the establishment of the account, it is necessary to identify, or calculate:

- intermediate consumption, compensation of employees, taxes on production,
- consumption of fixed capital,
- capital expenditure for waste water management activities (sewerage networks, treatment plants, measurement and control equipment, etc.),
- the receipts related with the services provided,
- the transfers they may pay out or benefit from.

The valuation of fixed capital consumption by general government implies an assessment of the fixed capital stock used for waste water management activities.

- 4078 On this basis, the market or non-market nature of these units has to be established. Market units may be recorded in national repertories of establishments, which allows for the availability of accounting data. For non-market units, functional analysis of expenditure and specific inquiries are necessary to identify the transactions related to the activities.
- 4079 As waste water management charges, or taxes related with water protection are collected by general government units (either central government, local governments or specialised agencies) analysis of these receipts is necessary to ascertain which units (corporations, households) pay these taxes and charges and to which uses the funds are allocated to (subsidies, investment grants by industries, etc.). Such data are necessary in order to establish the financing table and to calculate environment-related financial burden by institutional sector and industry.

Corporations

- 4080 Transactions of corporations concern either the production of market services, generally as specialised producers, or waste water management activities executed as ancillary. Data about the first category are generally available through the statistical system on corporations, as these units are identified. As concerns the current and capital expenditure for waste water management ancillary activities, they may be valued only by means of specific surveys. See Chapter II, § 2247 sq. for details.

Household

- 4081 Statistical surveys on household expenditure for final consumption provide data about consumption of waste water sewerage and treatment services (either aggregated or not with water consumption). These data allow for a comparison with data on turnover of specialised market producers, etc.

Data about household consumption are generally too aggregated in order to provide information about consumption by households of connected or adapted products. Nevertheless, these products are generally subject to specific inquiries and data about supply and uses may be provided by professional associations or specialised marketing institutes. For example construction firm associations may provide data about construction of septic tanks.

Integration of physical and monetary data

- 4082 Several aggregates may be used for measuring pollution at various stages:
- released pollution. This corresponds to the total pollution produced by economic units and may be expressed in "population equivalent/day" or in kg BOD per day,
 - treated pollution. This corresponds to that part of released pollution which enters treatment plants,
 - eliminated pollution. This corresponds to that part of treated pollution eliminated in the treatment process,
 - discharged pollution. This corresponds to the pollution discharged in the environment (surface or sea water).
- 4083 The linking of these different measurements (applied to the different types of pollution and treatment) makes it possible to characterise the effectiveness of waste water management and water protection measures and to determine average unitary cost.

As concerns effectiveness - with reservations as to the problems posed by co-elimination - the most significant indicators are the following:

- indicators linking the reduction of discharges of pollutants resulting from the various output and consumption activities and the cost incurred for that reduction,
- indicators linking treated and eliminated pollution and treatment cost.

V. WASTE MANAGEMENT ACCOUNT

Introduction

5001 In the present Chapter the EPEA's sub-account for waste management is presented.

The following aspects are successively examined:

- general description of the domain (major pollutants, causer groups and environmental problems),
- physical data potentially available for the domain,
- specificity of waste management (classification and definition of activities, etc.),
- specific accounting problems for the domain (specification of units and transactions, data sources and link to physical data).

As concerns the last aspect, only references to the EPEA's framework are made, the framework itself is not presented. Therefore, readers are advised to refer to this framework and the tables in Chapter II for a general view of the accounting approach.

Purpose of the waste management account

5002 The objective of the waste management account is to describe monetary flows relevant to waste management, i.e. prevention of waste production, collection and transport, treatment and disposal activities for the different categories of waste, and to link these flows with the corresponding physical data.

In particular, the account should provide for the valuation of the national expenditure for waste management, describe its components and its financing.

5003 As EPEA's sub-account, the waste management account excludes recording of expenditure relating to raw material saving. These expenditure are accounted for in the "natural resource use and management account" (see Chapter X). Nevertheless recycling activities are described insofar as they constitute waste treatment or disposal activity.

5004 According to available data (cf. State of the Environment in the European Community, March 92, volume III, p. 82), waste treatment represents 29% of the total environmental expenditure in European Union countries, i.e. roughly 13 billion ECU for the year 1988 (second rank after expenditure for water protection).

Description of the domain

Definition of waste

5005 UN-ECE and Eurostat have retained the following definition:

"Materials that are not prime products (that is, products produced 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. For member countries of the European Union, wastes are defined as any substance or object which the holder discards or intends or is required to discharge (in accordance with Council Directive 91/156/EEC, amending the Directive 75/442/EEC on waste)."

A European Catalogue of Waste, was recently published (cf. Official journal, January 7 1994). Waste classification is under preparation.

Classification of waste

5006 The European Waste Catalogue distinguishes 20 main categories of waste according to the generating activities:

- waste from mining and further treatment of minerals and quarry (EWC 01),
- waste from agricultural, hunting, fishing, primary production, food preparation and processing (EWC 02),
- waste from manufacturing, chemical, industrial and thermal processes (EWC 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14),
- packaging , filter, protective clothing (EWC 15),
- waste from demolition/construction and dredging, (EWC 17),
- waste from medical or veterinary care or research (EWC 18),
- waste from water, waste water and waste treatment plants (EWC 19),
- municipal waste (EWC 20).

The following categories, which refer either to the source of the waste or its nature, are also often distinguished:

Municipal and similar waste

5007 EWC 20: municipal wastes and similar commercial, industrial and institutional wastes including separately collected fractions. This is waste normally arising from the (urban) residential environment; hence, it generally results from consumption by households, but may be generated by any economic activity if the composition and nature is similar to that of household waste and can be treated and disposed of together with the latter: waste from commercial activities, small industrial or craft industries, banks, administrations, etc., as well as residues from markets, gardens and street cleaning, septic tank sludge, end of life vehicles, etc.

This category also includes bulky waste which cannot be collected at the same time as household refuse and similar waste and which has to be collected specially. On the other hand, it excludes all waste which requires treatment different from that of household waste.

Industrial and similar waste

5008 This is waste from production activity. The following are generally distinguished:

- ordinary waste from enterprises, which can be classified according to the material which characterises it and the economic activity which produced it,
- special waste which contains more or less heavy concentrations of harmful substances and which thus presents greater danger to the environment. In general, only hazardous waste is distinguished.

Hazardous waste

5009 They are defined by UN-ECE and Eurostat as "wastes which due to their toxic, infectious, radioactive, flammable or other character (as defined in the Annex III of Council Directive 91/689 (EU)), pose a substantial actual or potential hazard to human health or living organisms. Hazardous waste is potentially damaging to the environment and must therefore be controlled. Hazardous waste can present either short-term acute hazards or long-term environmental hazards. Waste with these properties may arise as by-products, process residues, spent reaction media, contaminated plant or equipment from either manufacturing operations or the treatment of toxic substances, or from the discarding of manufactured products."

Radioactive waste

5010 Radioactive waste is 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 radio-nuclides in hospitals and research establishments. Other important wastes are those from mining and milling of uranium and from the reprocessing of spent fuel. Radioactive wastes are commonly classified as low-level, intermediate-level, or high-level. Management of low-level radioactive waste (notably hospital waste containing radio-nuclides) is included in the waste management account; excluded, however, is management of radioactive waste from nuclear plants.

European Union system for the gathering of physical data on waste

5011 The OECD/Eurostat questionnaire constitutes the main standard source of data on waste (output, treatment, disposal and flows) as well as on treatment and disposal plants.

The data collected are as follows:

- Quantities of waste produced by sector (Table 1a)
- Quantities of waste produced by flows of selected waste (Table 1b)
- Production of hazardous waste (Table 2a)
- Treatment, disposal and flows of hazardous waste (Table 2b)
- Composition of municipal waste (Table 3)
- Treatment, disposal and flows of municipal waste (Table 4)
- Recycling activities (Table 5)
- Waste treatment and disposal plants (Table 6)

Currently, available data is still limited, as is attested to by the recent summary of replies from Member States to the OECD/Eurostat questionnaire. According to experts, quality of data on recycling is poor.

Waste management

5012 Waste management involves a series of actions and measures. Only these actions and measures which give rise to monetary transactions are described in the waste management account: thus measures like ban, prohibition of products or productive activities are not recorded, unless they do translate in monetary transactions (transfers to compensate losses resulting from the ban, etc.).

Transactions related with waste management may refer to:

- activities of waste management, called characteristic activities,
- uses of connected and adapted products,
- and finally transfers.

Characteristic activities and uses of adapted and connected products are successively examined in this section; transfers are presented in the following section "Transactions related to waste management account".

Characteristic activities

5013 Waste management characteristic activity designates any activity whose purpose is waste management as defined below. Characteristic activities are always executed by production units of the national economy, either as principal or secondary activity, or as ancillary (for own account). Output of characteristic activity is called characteristic services. Producers of characteristic services are called characteristic producers.

5014 Characteristic activities of waste management mainly consist of:

- collection, transport, treatment (including separation) and disposal of waste,
- control, monitoring and regulation of the production, collection, transport, treatment and disposal of waste,
- prevention of waste production through in-process modifications related to technical process (introduction of clean technologies) or modifications linked with the use of less polluting (adapted) products.

5015 For the first category of characteristic activities, the producers are essentially specialised producers (local government, public or private corporations), which execute these activities as principal activity, although the transport activity might be carried out by units of the transport industry as secondary activity.

For the second category, general government is the principal producer, although internal (ancillary) activities exist in principal firms.

The third category of activities is essentially executed as ancillary (on own account) by producers which exercise a polluting activity.

Definition of characteristic activities

5016 In the CEPA, class 3 groups together all waste management characteristic activities (see general classification in annex to Chapter II). Classification of waste management activities is the following:

- 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

Remarks about UN-ECE Eurostat classification

5017 Activities for the resorption of discharges and old deposits are classified under " protection of soil and ground water" (see Chapter VI). Treatment of sludge from waste water treatment plants when made in waste water treatment plants comes within the water domain; however the disposal of residues from treatment of slugs from waste water treatment plants is part of the waste domain (see Chapter IV).

Prevention of pollution through in-process modifications

5018 Prevention of waste through in-process modifications distinguishes in-process modifications linked to:

- adoption of clean technologies,
- consumption or use of adapted products.

Clean technologies

5019 The activity concerning *clean technologies* consists of substituting for an existing manufacturing-production process, a new method designed to reduce the toxicity or volume of waste in the course of the production process.

5020 The activity concerning *adapted products* consists of modifying or adapting the production process or facilities so as to allow for the replacement of intermediate inputs whose use is damaging to the environment by new, "adapted" inputs whose use produces less waste or less hazardous waste. Use of adapted products is not, in itself, considered as characteristic activity.

Collection and transport of waste

5021 Collection and transport of waste activity 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. Collection of treatment of hazardous waste and non-hazardous waste, including municipal waste may be distinguished.

5022 Collection and transport of hazardous waste activity consists of the collection of hazardous waste, generally by specialised producers, and their transport to the place of treatment or discharge.

5023 Collection and transport of non-hazardous waste activity consists of the collection of municipal waste, inert waste, and all waste which are not classified as hazardous, either by municipal services or similar institutions or by public or private corporations, and their transport to the place of treatment or discharge. Collection of municipal waste is often distinguished. Street cleaning is to be included for the part referring to public litter and collection of garbage from the streets. Excluded are winter services. Collection may be selective (i.e. carried out specifically for a type of product) or non-selective (i.e. covering at the same time all waste).

Treatment and disposal of waste

5024 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. Recycling activities for the purpose of environmental protection are included.

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.

Treatment and disposal of hazardous waste

5025 *Treatment of hazardous waste* comprises the processes of physical/chemical treatment, thermal treatment, biological treatment, conditioning of radioactive 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

5026 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 sometimes be regarded as hazardous waste. Incineration of hazardous waste can be carried out on land or at sea. Evolving thermal energy may or may not be used for the production of steam, hot water, or electric energy.

Landfill

5027 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

Other treatment and disposal may consist of:

5028 *Chemical treatment of hazardous waste:* 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.

5029 *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 pretreatment prior to landfill disposal. These techniques employ blending the waste with various reactants or organic polymerization reactions or the mixing of the waste with organic binders.

5030 Other disposal of hazardous waste may take the form of:

Containment: 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: temporary storage or final disposal of hazardous wastes underground that meet specific geological and technical criteria.

Treatment and disposal of non-hazardous waste

5031 *Treatment of non-hazardous waste* comprises the processes of physical/chemical treatment, incineration of waste, biological treatment, and any other treatment method.

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.

Biological treatment is the treatment of waste in specialised treatment facilities for the removal of organic matter with the assistance of living micro-organisms.

Recycling

5032 In the division 37 of the NACE Rev. 1, recycling is defined 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".

5033 In the EPEA all activities which respond to the NACE Rev. 1 definition are considered as recycling and classified as characteristic activities. Units which execute recycling are classified as characteristic producers. However, recycled products are not considered as characteristic products but as related products (see § 2015). Therefore, according to the treatment of related products (cf. § 2100 sq.), output which corresponds to recycled products is not considered as environmental output.

Measurement, control, laboratories and the like

5034 This position regroups all activities aimed at controlling, measuring production and storage of waste.

Other activities

5035 Activities under this heading correspond to teaching, administration and research and development activities at such time as they may be sufficiently differentiated and allocated to the waste domain.

Facilities

5036 Facilities for waste management refers to technical installations or equipment designed for use in the context of waste management. The installations can be of the "end-of-pipe" type or they can be part of a larger production process.

Classification of facilities

5037 A classification of Environmental Protection Facilities associated with the CEPA has been drawn up by UN-ECE and Eurostat. Class 3 of this classification of groups together waste management facilities. The following facilities are distinguished:

- 3.1 Facilities for the treatment of hazardous waste [number; capacity in terms of weight that can be treated per year, by type of waste as applicable]
 - 3.1.1 Physical/chemical treatment technology
 - 3.1.2 Thermal treatment technology
 - 3.1.3 Biological treatment technology
 - 3.1.4 Conditioning of radioactive wastes
 - 3.1.5 Other treatment technologies
- 3.2 Facilities for the treatment of other than hazardous wastes [number; capacity in terms of weight that can be treated per year, by type of waste as applicable]
 - 3.2.1 Physical/chemical treatment technology
 - 3.2.2 Incineration of municipal or similar wastes
 - 3.2.3 Incineration of industrial wastes
 - 3.2.4 Biological treatment technology
 - 3.2.5 Other treatment technologies
- 3.3 Facilities for the disposal of waste [number of sites]
 - 3.3.1 Landfill for all types of waste
 - 3.3.2 Landfill exclusively for hazardous waste
 - 3.3.3 Containment/underground disposal
 - 3.3.4 Other disposal installations

Definitions

5038 The following definitions apply:

Capacity of treatment: tonnage of waste that can be treated during one year and to usual standards in accordance with usual technology in a given treatment unit.

Facility for the treatment or disposal of waste: establishment or part of an establishment that is wholly or partly destined to treat or dispose of wastes, such as treatment plants of wastes of various kinds and technical equipment that is fit for treatment of hazardous or non-hazardous waste which is part of any other production process. For the purposes of this definition, contiguous areas either on land or at sea used for the dumping of wastes are included, such as landfill sites and sea areas used for dumping.

Landfill site: Site of final waste disposal in or on land in a controlled or uncontrolled way according to different sanitary, environment protection and other security requirements.

Producers of waste management services

5039 According to EPEA's conventions (see Chapter II, § 2022), producers of environmental protection services (called characteristic producers) are classified in two main categories:

- specialised producers which execute a characteristic activity as their principal activity; output may be market or non-market; units which belong to the general government and NPISHs institutional sector are distinguished from units which belong to other institutional sectors,
- non-specialised producers which execute a characteristic activity as secondary or ancillary to their principal non-characteristic activity. These producers are regrouped by industries, according to their principal non-characteristic activity.

Producers are classified as specialised according to environmental protection in general and not according to a specific domain.

In the waste management domain, distinctions should be made on the basis of the characteristic activities.

"Public services" and similar activities

5040 Activities for the collection, transport, treatment and disposal of municipal and similar waste which correspond to "public services" are generally executed by the public sector (local government or public or similar enterprises) or under their authority (private subcontracting enterprises or concessions by public services). Producers are generally specialised producers.

5041 According to data indications obtained from the "SERIEE test", "public-service" activities represent roughly 70 to 80% of waste management expenditure. They are undertaken either by local government or by public agencies (Netherlands, Germany, Italy), or by private enterprises working or not as subcontractors for local government (France, Germany, etc.).

Recycling

5042 Producers which execute recycling activities are always classified, for the purpose of the waste management account, as non-specialised producers.

Other waste collection, transport, treatment and disposal activities

5043 Activities for the *collection, transport, treatment and disposal of hazardous waste* are generally those of specialised producers, having possibly been set up with the help of general government and in any event subjected to strict rules by it.

5044 Activities for the *collection and transport of other waste, the treatment and storage of other ordinary waste* are executed by specialised or non-specialised (secondary) producers. Secondary producers may be numerous in the transport of waste activity.

Prevention activities

5045 These are generally ancillary activities undertaken by pollutants producers in order to reduce the amount or toxicity of their waste.

Measurement, control, laboratories and the like activities

5046 These are generally those of non-market branches of general government or of specialised firms.

Connected and adapted products

Adapted products

5047 As in other domains, the list of adapted products in the waste management domain has to be established at the European Union level.

Examples of adapted products are:

- all the products designed to produce less waste or less harmful waste, to be more easily recyclable when finally disposed of,
- all products designed to produce less waste or less harmful waste when used as inputs.

For adapted products, only extra cost, as valued in Chapter II, § 2029 sq., is considered.

5048 Furthermore, for sake of simplicity and to avoid double counting of extra cost, when adapted products are used as intermediate consumption for the production or the conditioning (in the case of packaging) of another product, this product is not considered as adapted product.

5049 In the waste management domain, the result is, in particular, that use of adapted packaging products is only intermediate consumption of manufacturing, conditioning or wholesale or retail industries. Products which are packaged with adapted packaging are not considered as adapted products.

Connected products

5050 They mainly consist of trash bags, bins, wheeled rubbish containers. Final consumption of adapted and connected products, either durable or non-durable, is that of households. Intermediate consumption or gross capital formation of adapted and connected products is that of producing units of national economy.

Transactions related to waste management

Transactions in products

5051 Transactions in products concern:

- the supply and uses of waste management services resulting from characteristic activities,
- the gross capital formation for characteristic activities,
- the uses of adapted and connected products.

Output of characteristic activities and respective uses

Market output of waste management services

5052 This output, which mainly consists of services for collection, transport, treatment and disposal of waste, is used either as final consumption by households or as intermediate consumption by industries. When used by a characteristic producer (for example waste disposal services used as intermediate consumption by a waste water treatment plant), in order to avoid double counting, these market services are not accounted for.

Charges for services rendered

5053 These are taxes collected by local government under the heading of collection, transport, treatment and disposal of municipal and similar waste. These charges exist in the different Member States for the collection of urban waste. These charges are assimilated in the price of a service paid to the producing unit by the beneficiaries or users. In the case of charges paid to a local government unit (e.g. municipality) which subcontracts production to specialised corporations the rules defined in § 2134 sq. apply.

Table of charges for services rendered under the heading of waste management

Country	Charge computation	Target groups
Belgium	fixed rates or volume	households
Denmark	fixed rates volume of waste	households enterprises
France	size of dwelling (or) volume of waste (or) financing from public budget	households, enterprises households, enterprises
Italy	size of dwelling	households, enterprises
Netherlands	fixed rates volume of waste	households enterprises
United Kingdom	fixed rates volume of waste	households enterprises
Germany	diverse	all sectors

Non-market output of waste management services

- 5054 This output, which consists of management, administration services, or in services of waste collection, transport, treatment and disposal provided free to the community as a whole by general government units, is valued by cost of production (intermediate consumption, compensation of employees, fixed capital consumption and taxes on production) less any receipt related to the service. This output is assumed to be collective consumption of general government. If any, non-market output of NPISHs is valued in the same way, but assumed to be final consumption of households.

Ancillary output

- 5055 Ancillary output is the result of characteristic ancillary (own account) activities undertaken by pollutant industries in order to reduce waste engendered in production, to treat and dispose of their waste. This output is valued by the cost of production that the unit which executes the activity bears in respect to the protection measures it takes: intermediate consumption, compensation of employees, fixed capital consumption and other taxes less subsidies on production.

Recycling

- 5056 As indicated, recycled products are not considered as characteristic products but as related products. Therefore, according to the treatment of related products (cf. § 2100 sq.), output which corresponds to recycled products is not considered as environmental output.
- 5057 For a characteristic producer whose principal activity is recycling (i.e. which pertains to the division 37 of the NACE Rev. 1), it means that the market environmental output of the unit is only that part of the output which corresponds to the payments made by the holders of waste in order to get rid of their waste, that is to say to waste collection, transport, treatment or disposal services executed by recycling units. This environmental output is secondary output, otherwise the producer would be classified as specialised producers under the heading of waste management (class 90.00 of the NACE Rev. 1). Nevertheless units whose principal activity is recycling units may undertake characteristic activities as ancillary.
- 5058 For a specialised producer whose principal activity is not recycling (waste treatment plant, waste water treatment plant, etc.), it means that the sales of recycled products must be deducted in order to obtain environmental output.
- 5059 When recycling is executed as ancillary, i.e.; when recycled products are used by the producing unit itself, the value of recycled products, valued at market prices, is to be deducted from the cost of production of the ancillary activity (or not included in).
- 5060 Nevertheless, when units whose principal activity is recycling receive subsidies, these subsidies are deemed to be for environmental purpose (unless otherwise explicitly indicated). Therefore, it may occur that even when no environmental output and use is registered, subsidies appear in national expenditure.

Gross capital formation for characteristic activities

5061 It corresponds to the gross capital formation expenditure related with the waste management activities: buildings, equipments, etc. It includes change in inventories and the expenditure related to acquisitions less disposals of non-produced non-financial assets (land, etc.). Whole gross capital formation of specialised producers and acquisitions less disposals of non-produced non-financial assets is considered. For non-specialised producers, that part of gross capital formation for characteristic activities which consists in adapted and connected products must be treated specifically.

As recycled products are not classified as environmental output, gross capital formation for recycling is not considered.

Uses of adapted and connected products.

5062 Adapted and connected products are used either as intermediate or final consumption, or when they are capital goods, as gross capital formation.

Intermediate consumption is that of producing units of national economy. These units may use adapted products such as bins, trash bags, wheeled rubbish containers. They may use as packaging products adapted packaging. According to EPEA's conventions, in order to avoid double counting, uses for characteristic activities are not separately recorded.

Final consumption is that of households. As concerns adapted products it consists in final consumption expenditure in products designed to produce less waste or waste less harmful or more easily recyclable waste when finally disposed of. As concerns connected products it consists of purchase of trash bags, etc.

Gross capital formation in adapted and connected products is that of producing units of national economy. It mainly consists of purchase of products designed to produce less waste when finally disposed of (recyclable cars and equipments, etc.) and some connected capital goods. Gross capital formation for characteristic activities in adapted and connected products is treated specifically (cf. § 2075 sq.).

Transfers

5063 Generally speaking, the users of waste management services finance their uses themselves: the different industries finance their intermediate consumption of market waste management services and the cost they bear for own-account (ancillary) waste management and prevention activities and corresponding gross capital formation; general government finances its collective consumption of non-market services; households bear the cost of their final consumption of market waste management services and of connected and adapted goods.

5064 Nevertheless transfers exist in the waste management domain which consist either of specific (earmarked) taxes or of subsidies, investment grants, other current or capital transfers in favour of waste management.

An analysis of transfers linked to waste management is therefore required.

Taxes related to waste

Tipping or spilling fees

5065 These are payments made under the heading of discharges in the environment; they are calculated on the basis of quantity and/or quality of the discharged waste. From the standpoint of their impact, incentive and redistributive taxes are distinguished. Redistributive taxes designates those taxes whose receipts serve as resources for financing waste management activities. Incentive taxes designates those charges whose purpose is only to penalise the discharge of waste in the environment.

Taxes on products linked to waste production

5066 In a certain number of countries taxes exist on products specifically designed to finance the subsequent collection, treatment and disposal activities for the corresponding waste (packaging, used motor oils, private vehicles, etc.).

Taxes on products

Country	Product
France	lubricating oils packaging
Italy	lubricating oils plastic bags
Germany	lubricating oils

Treatment of waste related taxes, charges, etc.

5067 One must analyse the allocation of the receipts:

- receipts may be allocated for the financing of waste management activities, through subsidies, investment grants other, current or capital transfers, including international transfers aimed to finance waste management measures or activities in another country (international co-operation). According to EPEA's conventions this part is treated either as part of national expenditure or as mere financing,
- when receipts are not allocated to waste management measures or activities, they only enter in the "environment-related financial burden" of respective paying units and corresponding institutional sectors.

5068 When analysing the waste management-related transfers from the beneficiary side, a distinction should be made between specific transfers which have to be included in national expenditure and other transfers which are only financing of uses of products already accounted for in national expenditure.

Transfers as component of national expenditure

5069 Transfers of the first category consist of subsidies to waste management activities or transfers intended to compensate current losses resulting from waste management measures (prohibition of production or use of harmful products, obligation or use of incentives to increase use of adapted products, etc.), current or capital transfers in benefit the rest of the world (international co-operation, etc.).

Transfers as financing

5070 Transfers of the second category consist primarily of investment grants and capital transfers intended to finance gross capital formation of producers, either specialised or not, for waste management. They may also consist of current transfers other than subsidies (current transfers between administrations).

They generally are paid by general government but in certain cases they may consist of "transfers" between units of the corporations sector. Such a case occurs when non-characteristic producers (e.g. packaging industries or industries which use certain packaging products) constitute associations to organise and finance waste management activities (dual system in Germany, etc.).

Waste management account**Review of objectives**

5071 The waste management account is a sub-account of the EPEA. Its goals are those of the latter as concerns waste management.

The EPEA consists of a series of articulated tables. Their basis is the general framework proposed in the Chapter XXI of the 1993 SNA devoted to "satellite analysis and accounts".

The purpose of Table A is to value and describe the national expenditure by components and users/beneficiaries.

Tables B and B1 describe the output of environmental protection services in a manner that is consistent with ESA's supply and uses tables.

Table C details the financing of national expenditure by cross-referencing the users/beneficiaries and the financers. Table C1 presents the institutional sectors' environment-related financial burden.

Components of national expenditure

5072 Table A describes environmental protection expenditure from the standpoint of uses. For the general structure of this table, one should refer to the general presentation of the EPEA in Chapter II. Main aspects of the various components of national expenditure relating to the waste management domain are presented below.

5073 Table A describes waste management expenditure from the standpoint of uses. Seen from this angle, the specificity of the account is based on:

- the existence of public, collective services of which the users are not always readily identifiable,
- the particular organisation of characteristic activities in certain countries,
- the treatment of recycling activities.

Collective services for the collection, transport, treatment and disposal of municipal and similar waste

5074 While users are identifiable as a whole (they correspond in principle to the total of resident units in the geographical area covered by the services), their breakdown by institutional sector (households, enterprises, general government) is difficult in the absence of a breakdown key.

5075 For that part of these services which is market (cf. § 2050 sq.), the users are those units which make the payments (whatever the name given: taxes, charges, fees, etc.). The distribution of the uses between final consumption (of households) and intermediate consumption (of industries) presupposes that a breakdown of these payments according to sector is available. In practice, one may have to use estimates in order to arrive at this breakdown.

5076 For that part of these services which is non-market, uses are always collective consumption of general government.

Particular organisation of characteristic activities in certain countries

5077 The organisation of waste management is complex. Various characteristic producers are involved. Municipalities subcontract private enterprises, found associations of municipalities or are owners of enterprises. The collection, sorting and final treatment of waste may be undertaken by different units. therefore, following the financing circuits and avoiding double counting is especially important.

5078 The increasing importance of waste recovery and recycling related activities and the multiplicity of the organisational forms these activities take gives rise to a series of problems. Producers' associations whose explicit purpose is the organisation or the mere financing of selective collection and transport of certain waste (packaging, etc.) for the purpose of recovery or recycling are developing. The activities executed or financed by these associations (or by specific bodies set up under the aegis of general government) are funded by earmarked taxes or charges, voluntary contributions or by current transfers of general government. Outlays of these associations are generally subsidies either to specialised producers (municipal waste management units) or non-specialised producers (including recycling units) and they must be recorded on the row: subsidies for characteristic services.

Recycling activities

5079 As has been seen only that part of recycling activities which corresponds to collection, transport, treatment and disposal of waste is accounted for as environmental output and use. Value is equal to the payments made to recycling units by the holder of the waste in order to get rid of it. When recycling activity is subsidised, subsidies are accounted for in national expenditure, even when no corresponding environmental output exists.

Uses of connected and adapted products

5080 In the field of waste, the use of connected products takes the form essentially of final consumption by households of containers, bin liners, wheeled receptacles, etc. However, intermediate consumption or gross capital formation in connected products by non-specialised producers may exist. Adapted products (valued at extra cost) are extremely varied (mercury-free batteries, vehicles adjusted to produce less waste when scrapped, etc.).

Production of characteristic services

5081 The second table (see § 2197 sq.) describes the output of waste management services. For the main categories of producers, it supplies detailed uses linked to output and supply cost. It also furnishes a valuation of capital transactions and the resultant producer financing. Producers' and transactions classification is identical to that for the EPEA.

5082 As concerns the Table B, the two main specificities of the waste management domain are:

- the importance of related products,
- the existence of significant foreign exchanges.

Related products

5083 The execution of characteristic activities of selective collection and treatment may give rise to the output of related products: "waste" sold for recycling and recovery, energy produced in the course of waste incineration, internally used recycled products, etc. Related products do not come under national expenditure and are recorded in a specific row of Table B.

5084 When environmental output is non-market, its value is calculated on the basis of cost of production (intermediate consumption, compensation of employees, other taxes on production and consumption of fixed capital). It is therefore necessary to deduct from cost of production, uses allocated to the output of related products, whether they were sold (residual sales) or consumed by the producing unit itself as intermediate input. For the sake of simplicity, as uses allocated to output of related products may be difficult to identify, one may deduct from cost of production the value of related products on the basis of market prices.

Foreign exchanges of waste management services

5085 Waste management is one of the domains of environmental protection in which foreign exchanges may be significant. To transit from the output of waste management services to uses, it is necessary to take account of exchanges of services with the rest of the world.

These foreign exchanges do not enter in national expenditure but they are accounted for in the supply and uses table of characteristic services (Table B1).

5086 Nonetheless, in the case of exports of waste treatment market services whose output has been subsidised, a transfer for the benefit of the rest of the world corresponding to that portion of the subsidy "incorporated" in the exports value should be recorded. This transfer should be entered on the row: subsidies for characteristic services (column: rest of the world) in Table A.

Data sources

General government sector units

- 5087 The first step is to identify the specialised units of the general government institutional sector, i.e. those units which execute a waste management activity as principal activity. They first consist of municipal services which produce collection, transport, treatment and disposal of waste services on a market or non-market basis (cf. § 2050 sq.). They may also consist of specialised agencies, central or local services related with waste management, i.e. responsible for administration and monitoring in this field (elaboration of regulations, issuance of permits, management of taxes, charges, grants, measurement of pollution, etc.).
- 5088 An economic analysis of the expenditure of these units as ascertained in the public accounts (general and local government budgets) has to be made. In order to provide the data required for the establishment of the account, it is necessary to identify, or calculate:
- intermediate consumption (separation of waste management services rendered),
 - compensation of employees, taxes on production,
 - consumption of fixed capital,
 - gross capital formation expenditure for waste management activities (trucks, plants, equipment for control, etc.) and acquisitions less disposals of land, etc.,
 - the receipts related with the services provided,
 - the transfers they may give or benefit from.

The valuation of fixed capital consumption by general government implies an assessment of the fixed capital stock used for waste management activities.

- 5089 On this basis, market or non-market nature of these units has to be established. Market units may be recorded in national repertories of establishments, which allows for the availability of accounting data. For non-market units, functional analyses of expenditure and specific inquiries are necessary to identify the transactions related with the activities.

Financing and valuation of environment-related financial burden

- 5090 As waste management charges, or taxes related with waste generation are collected by general government units (either central government, local governments or specialised agencies) analysis of these receipts is necessary to ascertain which units (corporations, households) pay these taxes and charges and which uses the funds are allocated to (subsidies, investment grants, by industries, etc.). Such data are necessary in order to establish the financing table and to calculate environment-related financial burden by institutional sector and industry.

Corporations

- 5091 Transactions of corporations concern either the production of waste management services, as specialised producers, or waste management activities executed as ancillary.

Data about the first category are generally available through the statistical system on corporations, as these units are identified.

For these units which pertain to the division 37 of the NACE Rev. 1 (recycling), and which are classified as non-specialised (secondary) producers for the purpose of the waste management account their secondary environmental output may be identified, through the disaggregation of their sales, as this part which corresponds to the class 90.00 or to the products 90.00.2 (refuse disposal services - collecting, incineration) of the CPA.

As concerns the current and capital expenditure for waste management ancillary activities, they may be valued only by means of specific surveys. See § 2247 sq.

Households

5092 Statistical surveys on households expenditure for final consumption provide data about consumption of waste management services when their payments take the form of purchase. In other cases, when the payments take the form of taxes or charges for services rendered, one must use the general government database on fiscal or para-fiscal receipts. These data allow for a comparison with other data from the supply side: turnover of specialised producers.

Data about households' consumption are generally too aggregated in order to provide information about consumption by households of connected or adapted products which are seldom identified as such. However, these products are generally subject to specific inquiries and data about supply and uses may be provided by professional associations or specialised marketing institutes.

Rest of the world

5093 Significant flows of exports and imports of waste or environmental protection services concerning waste management exist, which can be traced in the statistics on foreign exchanges. For the requirements of the account, and in particular in order to link national expenditure to output of characteristic producers - Table B1, it is necessary to record these exchanges.

Another source of data may be the permits delivered or the taxes collected by the relevant units of general government.

Linking physical and monetary data

The linking of physical and monetary data depends on the adoption of common classifications describing characteristic activities, facilities and waste flows. It also depends on the level of disaggregation of the data.

5094 The most significant indicators at present are those linking the quantities of waste collected and treated (according to the different categories of waste) and waste management expenditure.

The data on treatment, disposal and flows (Tables 2b, 4 of the OECD/Eurostat questionnaire), as well as those on facilities (Table 6) can be directly linked to the account data:

- current national expenditure relevant to the treatment and disposal of municipal waste (if distinguished) can be related to the quantities figuring in Table 4 (treatment, disposal and flows of municipal refuse),
- current national expenditure relevant to the treatment and disposal of hazardous waste can be related to the quantities figuring in Table 2b (treatment, disposal and flows of hazardous waste).

5095 A second category of indicators would relate prevention expenditure and changes in quantities of waste engendered. They might consist of relating changes in quantities of waste engendered by an industry and the stock of prevention facilities or assets. This stock must be known to calculate fixed capital consumption, which is part of national current expenditure. As in other domains (ambient air and climate protection, etc.) the main problem is in the level of disaggregation of the waste (pollutants) flows and expenditure data.

5096 As concerns facilities, the joint classification drawn up by UN-ECE and Eurostat, which distinguishes between facilities for the treatment of hazardous waste and those for the treatment of other waste, would permit the linkage of data on facilities for hazardous waste treatment and expenditure for the treatment of hazardous waste. Linkage of facilities data (Table 6 of the OECD questionnaire: number, discharge capacity, incineration plants, processing centres, etc.) could be made with the stock of fixed assets (capital expenditure must be seen in relation to new installations).

5097 Other physical indicators may be related with data on expenditure:

- % of the population serviced by waste collection systems and level of expenditure for municipal waste management,
- data on characteristic activity means (labour force, etc.).

VI. PROTECTION OF SOIL AND GROUND WATER ACCOUNT

Introduction

6001 In the present Chapter the EPEA's sub-account for protection of soil and ground water is presented.

The following aspects are successively examined:

- general description of the domain (major pollutants, causer groups and environmental problems),
- physical data potentially available for the domain,
- specificity of protection of soil and ground water (classification and definition of activities, etc.),
- specific accounting problems for the domain (specification of units and transactions, date sources and link to physical data).

As concerns the last aspect, only references to the EPEA's framework are made, the framework itself is not presented. Therefore, readers are advised to refer to this framework and the tables in Chapter II for a general view of the accounting approach.

Purpose of the protection of soil and ground water account

6002 The purpose of the protection of soil and ground water account is to describe monetary flows relevant to protection of soil and ground water, linking them with corresponding physical data.

In particular, the account must provide a valuation of the national expenditure for protection of soil and ground water, and describe its components and financing.

6003 Protection of soil and ground water is defined at international level (UN-ECE and Eurostat) as:

"Environmental protection activity involving the construction, maintenance, and operation of installations for the decontamination of polluted soils and the cleansing of ground water. Also included is protection against pollutant infiltration."

6004 The protection of soil and ground water account excludes any measure or activity which purpose is soil protection against erosion when it responds to economic (agricultural) needs. However in some cases, measures and activities for protection against erosion have mere environmental objectives (increasing water infiltration and recharging of ground water bodies, fighting against desertification, etc.). When they are executed in protected areas or are related with protected areas, transactions linked to these activities and measures are to be recorded in the biodiversity and landscapes protection account (see Chapter VIII). When they are executed on non-protected areas, they must be recorded in the protection of soil and ground water account.

Description of domain

Soil

6005 Up until recently, no collective centre for the treatment of industrial waste existed and for decades millions of tonnes of hazardous waste were spread over the soil and buried underground without precaution. At the end of the 1970s the problem was raised concerning the management of "black spots" (mining tips, former refinery sites, former industrial sites generally, etc.) which constitute a direct threat to the ground, phreatic waters as well as for the health of those who live around them.

6006 The European Union has accounted for several thousand contaminated sites, of which the inventory is far from complete. The following table provides an evaluation of the situation as estimated at present (Report on the State of the Environment in the European Union, March 1992).

Table on "black spots"

	B	DK	D	G	E	F	I	L	NL	P	UK
estimated number of sites		3 115	35 000		94	800	5 433		6 060	>1 800	300
actions to be taken	74	501	5 400			82			1 460	69	
controls & analyses required	11	2 610	22 600	>100		371	800	75	1 900		
number of actions required			22 000					54	1 300		
cleaned up & closed sites	248					107		12			

6007 Given the absence of common standards, great differences appear in the number of "black spots" from one country to the next and even within a given country, revealing substantial variations in estimates.

Whereas in 1980 some 4 000 polluted sites were identified in the Netherlands, of which at least 1 000 required immediate clean-up measures, in 1986, 20 000 polluted sites were officially inventoried; in 1989, following in-depth surveys and applying more stringent criteria, 135 000 sites were estimated likely to be polluted.

In Germany, there are an estimated 48 000 or more polluted sites in the "old Länder" (of which some 5 000 require treatment measures and 10 000 need further investigation) to which must be added the 15 to 20 000 sites in the "new Länder".

In Belgium, in Wallonia alone, more than 8 000 waste deposit sites, of which 148 contain chemical and/or infectious waste, were inventoried in 1982.

In France, where standards are more stringent⁽¹⁾, a first inventory in 1978 identified 450 cases, of which 80 justified immediate action. In some ten years a hundred or so of the inventoried black spots were eliminated. A new survey carried out in 1988 came up with an estimated 100 new black spots. At the present time, there are officially 450 sites polluted by former industrial activities. This figure is considerably underestimated; to it should be added 5 000 local dump sites, tens of thousands of unauthorised dumps, 700 former gas factories, former hydrocarbon depots and sales outlets.

Resorption of black spots

6008 Curative action for black spots presupposes, first, the adoption of procedures for the identification and characterisation of polluted sites and procedures for the preliminary evaluation of danger. Their overall cost would appear extremely high.

Germany has planned to spend 15 billion DM over five years for the depollution of sites in the new Länder, in particular in coal mining regions (the annual budget is 1.5 billion DM for the clean-up of open-pit coal mines) and for the chemical factories around the cities of Halle, Leipzig and Bitterfeld. In total, more than 40 000 sites will be cleaned up. This activity should create tens of thousands of jobs.

In France, the agency in charge of waste management (ADEME) has calculated that the total elimination of unauthorised dumping would require, over a ten-year period, the investment of 40 billion FF to be footed mainly by inter-communal associations.

6009 In various countries, but also at the European Union level (convention on civil responsibility for damages resulting from environmentally dangerous activities, Council of Ministers, 3/8/93), the problems raised by the clean-up of former dump sites and the requirements of the campaign against new black spots has led to the adoption of new regulations concerning civil responsibility as well as to the creation of specialised funds (Superfund in the United States) financed in part by taxes levied on the producers of certain chemical and petroleum products.

¹ The definition of black spot implies recognized danger to the environment. A dump site which does not "leak", which conceals only slightly toxic products, etc. is not considered a black spot.

Generally speaking, in order to cover the financial side of dump site clean-up, attempts have been made to sue those presumed responsible for them or to appeal to the goodwill of industry. In Denmark, the Netherlands, etc. budgets have been set aside at the national level.

Other soil pollution

6010 The characterisation of the situation with respect to soil pollution should not, however, be limited to the counting of black spots. Soil contamination takes diverse forms:

Principal soil and ground water pollutants

- heavy metals (Cd, Hg, Cu, Pb, etc.),
- dangerous chemical products,
- petroleum products,
- nitrates,
- pesticides.

Contamination by heavy metals disturbs plant physiology and can even block photosynthesis. Further, it can even lead to total soil sterility. Generally speaking, the consequences are of particular significance for ground water.

Ground water

6011 In the early 70s it was generally thought that the ground water in many regions were a source of lasting and pure fresh water. In twenty years time ideas have changed. Diffuse discharges in ground water produced by the various uses of the soil, such as agriculture, waste disposal, treatment of sewage waters, storage of products and containment of industrial waste have often been the cause of local and widespread deterioration of the quality of ground water. The slow pace of pollutant migration in the soil and ground water complicates the problem: when damages appear they are all the more significant, more costly to repair and responsibilities are more difficult to pinpoint.

6012 Ground water can be very vulnerable and risk deterioration when located in agricultural regions. Fertilisers and pesticides used commonly in modern agriculture are applied in large quantities; certain agricultural practices can affect ground water. In many countries, France, Denmark and the Netherlands notably, substantial and generalised increases of nitrates in the ground water have been confirmed. The pollution of these waters by pesticides is also disquieting, in particular because of the highly increased mobility of modern herbicides. In addition, excessive abstractions for irrigation can provoke phenomena of salinisation of fresh-water aquifers.

6013 Both hazardous and household waste disposal has on different occasions been responsible for the local deterioration of ground water reserves. Waste can drain off from areas in which surface sediment is permeable and reach the phreatic ground water. Waste drainage in embankments and dumps without the use of modern containment techniques has contributed to the seepage of organic and metal pollutants in ground water. Volatile organic compounds, such as trichloroethylene and chloroform, are especially mobile and give rise to serious problems, notably in Germany, Italy, etc.

Observation system for soil and ground water contamination

OECD-Eurostat soil questionnaire

6014 In its present version, the OECD-Eurostat only covers soil use and erosion. The three tables concern:

- Table 1: Soil use
- Table 2: Evolution of soil use
- Table 3: Soil deterioration: erosion

For the long term, it is planned to collect data on soil deterioration through desert formation, salinisation, compaction and pollution (pesticides and heavy metals, etc.).

6015 In the United Kingdom, in implementation of the European Union directive on nitrates, a monitoring and control programme is being carried out. Its results should be available shortly. In France, according to recent data, a large number of ground water, in widely differing aquifers in areas of intensive agriculture, have been contaminated to a preoccupying degree by nitrates: West France, Parisian Region, Poitou Charente, the alluvial silts of the Garonne and the Rhône.

European Union policy

6016 The Fifth Programme is founded on the following observation: the directive concerning the protection of ground water has not always met its goals and both pollution and over-exploitation endanger ground water resources. As concerns soil deterioration, the relevant directives on waste management, on the use of purification sludge in agriculture and the spreading of nitrates as well as certain aspects of the SEVESO directive on the risks of major accidents have led to or are leading to relatively positive results for soil protection. Nevertheless, hyper-intensive agricultural practices, the abusive use of fertilisers, pesticides and herbicides and drainage and sanitation activities have deteriorated the soil in many regions, notably through contamination, acidification, desert formation and erosion.

6017 The following objectives have been set forth for the ground water domain:

- maintain the quality of unpolluted phreatic ground water,
- prevent any worsening of pollution in already polluted phreatic ground water,
- bring the quality of polluted phreatic ground water back to a level of usefulness for the production of drinking water.

and the target for the year 2000 has been formulated as follows: "prevent all forms of pollution from impromptu sources and reduce pollution arising from diffuse sources by implementing the best environmental practices and the best techniques available, in particular through the strict application of existing directives on urban waste water and nitrate pollution".

No objective has been defined as concerns soil decontamination and the reduction of "black spots".

National policies

6018 According to available data, at least three Member States have given priority to soil depollution, including the resorption of black spots: Germany has set as its priority in environmental questions the depollution of the "new Länder"; France is stressing the resorption of unauthorised dumping; and the Netherlands has, in its "strengthened plan for national environmental policy", emphasised soil depollution and protection.

In all Member States, the responsibility for policy in the domain is placed at different general government levels: in the Netherlands, for example, the provinces are in charge of controlling the implementation of the interim law on soil decontamination.

Protection of soil and ground water

6019 Protection of soil and ground water involves a series of actions and measures. Only these actions and measures which give rise to monetary transactions are described in the protection of soil and ground water account: thus, measures such as ban or prohibition of products or productive activities are not recorded, unless they do translate into monetary transactions (transfers to compensate losses resulting from the ban, etc.)

6020 Protection of soil and ground water may take the form of:

- activities of protection of soil and ground water, called characteristic activities,
- transfers.

Characteristic activities are examined in this section; transfers are presented in the section "Transactions related to protection of soil and ground water".

Characteristic activities

6021 Protection of soil and ground water characteristic activities designates any activity whose purpose is the protection of soil and ground water. Characteristic activities are always executed by production units of the national economy, either as principal or secondary activity, or as ancillary (for own account). Output of characteristic activities is called characteristic services. Producers of characteristic services are called characteristic producers.

Definition of activities

6022 The UN-ECE and Eurostat have developed a joint classification for environmental protection activities (CEPA). Class 4 of the CEPA is a grouping of protection of soil and ground water activities (cf. Annex I to Chapter II).

The CEPA covers the following activities:

- 4 Protection of soil and ground water
 - 4.1 Prevention of pollutants infiltration
 - 4.2 Decontamination of soils
 - 4.3 Measurement, control, laboratories and the like
 - 4.4 Other activities

Prevention of pollutant infiltration

6023 The prevention of pollutant infiltration refers to a modification of production processes. It aims at the reduction or elimination of polluting substances that may be applied to soil or percolate into ground water. Included are notably activities related to sealing of soils of industrial plants, installation of catchments for pollutant run-offs, leaks, and strengthening of storage facilities and transportation of pollutant products.

6024 The activities concerned are the following:

- sealing of soils of industrial plants, services, etc.,
- installation of catchments for pollutant runoffs, leaks, etc.,
- strengthening of storage facilities and transportation of pollutant products.

6025 The corresponding facilities are:

"end-of-pipe" facilities

- Soil surface-sealing including ditches and walls, drainage systems,
- Catchments for runoffs, losses, leaks,
- Improvement of underground storage and transport facilities in the interest of water and soil protection,
- Removal of underground storage and transport facilities in the interest of water and soil protection.

integrated facilities

- (extra cost for) reservoir liners, reinforcement of transport systems for hazardous products, etc.

These activities are executed as ancillary by producing units whose activity creates the danger of soil pollution and thereby of ground water pollution.

Decontamination of soils

6026 The decontamination of soils is defined as: Process to reduce the quantity of polluting materials in soil, either in situ or in appropriate installations. Treatment of dredging residues are included.

6027 Activities may consist of:

- measures for separating, containing and recovering deposits,
- extraction of buried casks, decanting and re-storage,
- installation of off-gas, liquid effluent drainage networks,
- soil washing by means of degasification, pumping of pollutants,
- soil removal and expedition to industrial treatment centres,
- 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.

Regeneration of soils polluted by metals may also be achieved by the introduction of beringite which absorbs heavy metals.

These activities are generally executed by specialised firms at the request of the producers responsible for the pollution or depositions, or of general government.

Measurement, control, laboratories and the like

6028 Measurement, control, laboratories and the like: the relevant activities consist of creating monitoring systems, inventories of "black spots", maps of polluted soils according to the nature of the pollutants, etc.

The activities are executed either by potentially pollutant firms, as ancillary, or by general government within the scope of their general mission for the protection of the environment, or even by specialised producers at the request of one or the other.

Other soil and ground water protection activities

6029 Other soil and ground water protection activities may consist of administration, training, research and development activities provided they are sufficiently differentiated.

Also included are activities to fight erosion of soil, desertification and to increase water infiltration when they do not respond to economic (agricultural) purposes. They may consist of programs intended to restore the protective vegetal cover of soils, construction of anti-erosion walls; measures may also consist in subsidising agricultural and grazing practices less harmful for soils. However, when these activities are directly linked to the protection of biodiversity and landscape; they are included under this heading (see Chapter VII).

Facilities

6030 Facilities for protection of soil and ground water refers to technical installations or equipment designed for use in the context of protection of soil and ground water. The installations can be of the "end-of-pipe" type or they can be part of a larger production process.

Classification of facilities

6031 The Single European Standard Statistical Classification covers the specific facilities employed in the operation of the different characteristic activities. Class 4 of this classification of environmental protection facilities groups together protection of soil and ground water facilities.

The following facilities are distinguished:

4.1 End-of-pipe facilities [number]

4.1.1 Soil surface-sealing including ditches and walls, drainage systems

4.1.2 Catchments for run-offs, losses, leaks

4.1.3 Improvement of underground storage and transport facilities in the interest of ground water and soil protection

4.1.4 Removal of underground storage and facilities in the interest of ground water and soil protection

4.2 Reservoir liners, reinforcement of transport systems for hazardous products and other integrated facilities [number]

Producers of protection of soil and ground water services

6032 According to EPEAs' conventions (see Chapter II, § 2022), producers of environmental protection services (called characteristic producers) are classified in two main categories:

- specialised producers which execute a characteristic activity as their principal activity; output may be market or non-market; units which belong to the general government and NPISHs institutional sector are distinguished from units which belong to other institutional sectors,
- non-specialised producers which execute a characteristic activity as secondary or ancillary to their principal non-characteristic activity. These producers are regrouped by industries, according to their principal non-characteristic activity.

Producers are classified as specialised according to environmental protection activities in general and not according to a specific domain.

Organisation and financing of activities

Prevention activities

6033 These are primarily those of pollutant or potentially pollutant producing units. These units undertake themselves or order the execution by other units, soil-sealing, drainage and treatment of recovered pollutants, consolidation, reinforcement of their storage and transportation facilities.

These activities are mainly ancillary; in this case they generally take the form of additional investments.

Activities for decontamination, resorption of "black spots"

6034 Producer units responsible for pollution can themselves, voluntarily or by force owing to legal or administrative decisions, execute pollution decontamination, elimination work, in which case the activity is classified as ancillary. However, these tasks are generally, in the different stages (identification of the contamination, determination of its extent, actual decontamination, resorption measures) subcontracted to market producers. Given the nature of the output, which may be assimilated to "improvement of land", the uses take the form of fixed assets and not of intermediate consumption.

In certain cases, in particular that of "orphan black spots" (former industrial zones of which responsible have disappeared or are insolvent), general government or associations created for the purpose undertake the task.

6035 While in most cases the financing and execution of this work does not give rise to any particular problems of classification - the financing being included in the budgets of the various levels of general government - a few special cases exist:

In France, for example, an association called "Enterprises for the Environment" has been founded, whose members (some twenty of the largest industrial firms) contribute through their dues to a fund for the financing of the decontamination of orphan black spots. At the same time, a specialised governmental agency as well as a fund (fund for the modernisation of waste management) exist and can take over the financing of certain tasks.

In Germany, the Federal Labour Office (*Bundesanstalt für Arbeit*) increasingly finances decontamination by redundant workers on the former industrial sites of the "new Länder". This decontamination is carried out by private associations or the former enterprises which finance, with the help of these transfers, the salaries of their workers.

Connected and adapted products

6036 No example of adapted and connected product was found for the protection of soil and ground water domain; all potential adapted and connected products of the domain are recorded in the waste water management or waste management domains.

Transactions related to protection of soil and ground water

6037 The description of the transactions related to protection of soil and ground water fits into the general framework of the Environmental Protection Expenditure Account. These transactions consist in transactions in products and transfers.

Transactions in products

6038 Transactions in products concern:

- the supply and uses of protection of soil and ground water services resulting from characteristic activities,
- the gross capital formation for characteristic activities,
- the uses of adapted and connected products.

Output of characteristic activities and respective uses

6039 Ancillary output is the result of characteristic activities undertaken by pollutant industries in order to reduce emissions of soil pollutants, to monitor emissions or to decontaminate the soils. This output is valued by the cost that the unit which executes the activity bears in respect to the protection measures it takes: intermediate consumption, compensation of employees, fixed capital consumption and other taxes less subsidies on production. Ancillary output is assumed to be own intermediate consumption or own gross fixed capital formation of the units which have produced it.

6040 Market output of protection of soil and ground water services is output, which generally consists of soil pollution control and measurement services or decontamination of soils works and is used as intermediate consumption or gross fixed capital formation by industries. When used by a specialised producer, in order to avoid double counting, these market services are not separately accounted for.

6041 Non-market output of protection of soil and ground water services. This output, which consists in management, administration services by general government units, is valued by the cost (intermediate consumption, compensation of employees, fixed capital consumption and other taxes on production) less any receipt related to the service. This output is assumed to be collective consumption of general government. If any, non-market output of NPISHs is valued in the same way, but assumed to be final consumption of households.

Gross capital formation for characteristic activities

6042 Gross capital formation for characteristic activities corresponds to the gross capital formation expenditure related with the protection of soil and ground water activities: buildings, equipment, etc. It includes change in inventories and the expenditure related to acquisitions less disposals of non-produced non-financial assets (land, etc.). Whole gross capital formation of specialised producers and acquisitions less disposals of non-produced non-financial assets is considered. For non-specialised producers, that part of gross capital formation for characteristic activities which consists in adapted and connected products must be treated specifically.

Gross capital formation in characteristic services

6043 As indicated, result of decontamination of soils characteristic activity is classified as gross fixed capital formation of the unit which owns the land. Analogy was made with improvement of land category of SNA. However this classification does not match with the proposed treatment in SEEA; one could imagine treating it as a transaction of the "other changes in the volume assets account" (see SNA 1993: Chapter XII) and not as gross fixed capital formation.

In a similar way, the result of anti-erosion works, if some of these activities are recorded, is treated as gross fixed capital formation.

6044 Generally speaking, the users of soil and ground water protection services finance their uses themselves: the different industries finance cost for own-account (ancillary) protection activities and corresponding capital formation; general government finances its collective consumption of non-market services; households bear the cost of connected and adapted goods.

6045 Nevertheless transfers exist in the soil and ground water protection domain which consist either in taxes, fees, etc, or in subsidies, investment grants, other current or capital transfers in favour of soil and ground water protection. Furthermore, tax receipts may be earmarked for financing soil and ground water protection measures or activities. An analysis of transfers linked to soil and ground water protection is therefore required.

6046 As concerns taxes and charges, it must be noted that few taxes or charges are paid *solely for soil and ground water protection*, most taxes or charges being paid for water protection and waste management. The only payments corresponding to this heading concern the voluntary or non-voluntary contributions of specific funds founded for the elimination of "black spots" (the case for example of the Superfund in the United States or the dues paid to the "Enterprises for the Environment" association in France).

Transfers as component of national expenditure

6047 When analysing the soil and ground water protection-related transfers from the beneficiary side, a distinction should be made between specific transfers which have to be included in national expenditure and others transfers which are only financing of uses of products already accounted for in national expenditure.

Transfers of the first category consist of subsidies to soil and ground water protection activities or intended to compensate current charges resulting from soil and ground water protection measures (prohibition of production or use of harmful products, obligation or encouragement to use adapted products, etc.), current or capital transfers in benefit of the rest of the world (international co-operation, etc.), etc.

Transfers of the second category consist in investment grants and capital transfers intended to finance gross capital formation of producers, generally non-specialised, for soil and ground water protection.

Protection of soil and ground water account

Review of objectives

6048 The protection of soil and ground water Account is a sub-account of the Environmental Protection Expenditure Account (EPEA). Its goals are those of the latter as concerns protection of soil and ground water.

6049 The account contains a series of articulated tables. Their basis is the general framework proposed in the chapter devoted to "satellite analysis and accounts" of the 1993 SNA.

The purpose of table A is to value and describe the national expenditure.

Tables B and B1 describes the output of environmental protection services in a manner that is consistent with the supply and uses tables.

Table C details the way in which national expenditure is financed, by cross-referencing the user/beneficiary sector and the financers. Table C1 calculates the institutional sectors' environment-related financial burden.

Components of national expenditure

6050 Table A describes environmental protection expenditure from the standpoint of uses.

For the general structure of this table, one should refer to the general presentation of the EPEA (§ 2174 sq.). Main aspects of the various components of national expenditure relating to the protection of soil and ground water domain are presented below.

6051 As regards components of national expenditure the two main particularities of the protection of soil and ground water account are:

- there is no use of adapted and connected products,
- there is gross capital formation in characteristic services.

Units transactions

General government sector

6052 In the general government sector, specialised bodies must be identified. In most cases these are specialised bodies of the waste domain: services of central or local governments, agencies, financial funds, etc. In other cases, they are specialised bodies of the water domain for the financing of certain decontamination activities, etc. Generally speaking, specialised bodies of the soil and ground water protection domain are relatively few.

6053 These specialised bodies may execute soil and ground water control, monitoring, administration (regulations, etc.) activities. They may also finance certain activities executed by other units, either directly as project manager or financer of operations of decontamination, resorption of black spots, unauthorised discharges, or through subsidies, capital grants.

If they carry out characteristic activities themselves (control, monitoring, administration, etc.), these specialised services appear as producers, users (for their collective consumption) and financers (at least partially) of these activities.

If they have these activities carried out by specialised producers (subcontractors), they only appear as users (for their collective consumption) and financers.

6054 According to the conventions of the EPEA, the transactions (of output, use and financing) of general government bodies which are not specialised in environmental protection, i.e. which execute as their principal or secondary activity a non-characteristic activity, are recorded under the branch corresponding to their activity: decontamination operations which the army, for example, may execute or finance for itself, i.e. for pollution for which it is responsible, are to be entered under the branch corresponding to the general government division ("services of public prerogative") of the NACE Rev. 1.

Corporations sector

Specialised producers

6055 In certain countries, professional associations of these producers exist ; for example, in France, the "Professional Union of Enterprises for Site Depollution". Some positions of the NACE Rev. 1 provides for the identification of these producers.

90: "purification of waste water, collection and treatment of household refuse, disposal and treatment of other waste" includes "cleaning of polluted soils"

45.11: "cleaning of building sites": CPA corresponding heading is "stripping works of contaminated soils"

These producers may also be found in "underground work, waterproofing, boring and drilling", as well as in "testing and technical analyses" classes.

Non-specialised producers

6056 A number of firms executing activities which are pollutant or potentially pollutant for soils (and for ground water) take steps to limit the effects of their production activity on the environment. When they initiate measures themselves or when they invest for this purpose in facilities, this is considered as an ancillary activity of these firms. The producers are at the same time users (for their intermediate consumption of ancillary services and their investments), producers (of ancillary services) and financiers (perhaps only partially if they receive subsidies or capital grants) of the corresponding national expenditure.

Financing of national expenditure

6057 The purpose of the financing table is to show how national expenditure for protection of soil and ground water is financed. Unless ancillary output of waste management specialised producers is recorded, there are no changes in relation to EPEA's framework.

In Germany, social security funds finance important works in decontamination of soils. In other countries associations of corporations (classified as corporations in ESA) finance some works on "orphans black spots".

Data sources

6058 In most countries, as concerns general government, the public administration system furnishes an estimate of expenditure in the domain which should then be broken down so as to arrive at valuations of output, uses and financing of general government units

With respect to corporations, specialised producers and ancillary producers must be distinguished.

Specialised producers

6059 As pointed out, specialised producers in the domain are difficult to pinpoint insofar as the corresponding activities are not isolated as such in the NACE Rev. 1. Until such time as a specific collection system on eco-industries or eco-activities has been set up, it is probable that data on this type of producer will only be ascertained from the "use-side" by valuing the uses of general government and industries.

EPEAs' corporation intermediate system (see § 2247 sq.) provides for the collection of soil decontamination external expenditure of corporations. Similarly, the valuation of purchases by general government of specialised soil and ground water protection services should be forthcoming from the general government system.

Non-specialised characteristic producers

6060 Most Member States and EFTA countries organise surveys on the environmental protection activities of manufacturing industry. These surveys cover soil and ground water protection activities in Germany, Netherlands, Spain, Greece, Sweden, Finland and Austria. In certain cases, they only cover gross fixed capital formation expenditure.

6061 The corporation intermediate system of the EPEA also provides a general framework for the collection of the cost borne by manufacturing industry on behalf of their ancillary activities in the soil and ground water protection domain. The domain is specified as follows:

- control and supervision,
- prevention,
- treatment and depletion of substance seepage in soils and ground water,
- insulation,
- transport, treatment and elimination of contaminated soils and ground water pollution.

The data collected covers both investments ("end-of-pipe" or integrated) and the operating or capital cost for protection facilities.

VII. NOISE AND VIBRATION ABATEMENT ACCOUNT

Introduction

7001 In the present chapter the EPEA's sub-account for noise and vibration abatement is presented.

The following aspects are successively examined:

- general description of the domain (major pollutants, causer groups and environmental problems),
- physical data potentially available for the domain,
- specificity of noise and vibration abatement (classification and definition of activities, etc.),
- specific accounting problems for the domain (specification of units and transactions, data sources and link to physical data).

As concerns the last aspect, only references to the EPEA's framework are made, the framework itself is not presented. Therefore, readers are advised to refer to this framework and the tables in Chapter II for a general view of accounting approach.

Purpose of the noise and vibration abatement account

7002 The purpose of the noise and vibration abatement account is to describe monetary flows and transactions related to noise and vibration abatement, linking them with corresponding physical data. In particular, the account must provide a valuation of the national expenditure for noise and vibration abatement, and describe its components and financing.

7003 Noise and vibration abatement is defined by UN-ECE and Eurostat as: "any activity to reduce the emission of noise or vibrations at a source, in order to protect persons and built-up structures from exposure to noise and vibrations. Noise abatement for the protection of workplaces is excluded as is the demolition of residential units for reasons of excessive exposure to noise and vibration."

Nature of protection activities

7004 The European Union survey on the perception of the environment shows that while noise occasioned by construction work, heavily travelled roads and airports is not considered as "a serious threat to the environment" (*The Europeans and the Environment* survey of 1992), for the majority of the European Union's inhabitants the density of automobile traffic and noise are among "reasons to complain about one's immediate surroundings". Thus noise pollution appears more as an urban living environment concern than as a natural environment problem. In fact protection measures against noise are generally integrated with the overall, broader measures concerning transport policy and planning through city planning (transport plan, residential zoning and urban land projects, etc.) and area-wide planning. As a consequence, expenditure which have a considerable effect on noise pollution are not easily isolated or identifiable.

7005 Nevertheless, according to available data, expenditure for noise pollution abatement only represent roughly 2% of total environmental protection expenditure.

7006 Another characteristic of noise and vibration abatement is that it mainly consists of very specific activities or measures: not only are measures integrated with urban planning and traffic management, but noise and vibration abatement activities only consist, in many cases, of the erection of anti-noise walls, soundproofing of housing, creation of buffer zones, use of less noisy vehicles, etc. Characteristic services are therefore difficult to identify and evaluate.

Description of the domain

Noise pollution

Noise pollution measurement

7007 Noise is measured in decibels (dB). The dBA is the unit of measurement of noise by which the median and sharp frequencies to which the human ear is most sensitive can be determined. Its correlation with subjective impressions of noise is rather good. Various indexes have been formulated to evaluate the effects of noise and regulate emissions. The trend is to use the Leq scale in dBA (loudness equivalent in A-scale decibels). The Leq determines the loudness equivalent average level over a given period.

Effects of noise

7008 The effects of noise on man are seen mainly through its effects on health, communication and behaviour. The effects on health are manifested in hearing losses and disturbed sleep but also in physiological disorders and non-auditory pathogenic effects which are the consequences of exposure to loud surroundings over a long period of time. The World Health Organization considers that noise represents a danger to health.

Thresholds: black spots and zones, grey spots and zones

7009 Noise thresholds have been defined which indicate bearable or desirable levels. Outside noises of 65 dBA (daily Leq) are considered unacceptable; the limit of 55 dBA corresponds to "an absence of acoustic comfort". "Black" zones (or spots) correspond to those which exceed the first limit; in the second case, they are called "grey" zones (or spots).

Origins of noise pollution

7010 The major source of noise pollution is land and air transportation. The latter has, of course, increased tremendously. While trends contrast widely, it is generally considered that over the last twenty years the different measures taken (reinforcement of noise emission standards for vehicles, measures against noise propagation, etc.) would only have compensated for the increase in traffic.

Data on noise pollution

7011 The joint OECD/Eurostat questionnaire on noise represents the main source of data on the exposure of the population to noise. It is comprised of three tables:

- national population living in housing units exposed to various levels of noise, by source (road traffic, railroads, aeroplanes, industries, other),
- population living in areas exposed to various levels of noise due to daily road traffic,
- population living in areas exposed to various levels of noise near airports.

Present situation

7012 Noise pollution, while not well known, can be considered as the nuisance which affects the greatest number of persons and to which the fewest means are devoted:

- more than 16% of the population suffers from night noise at a level which is equivalent to or higher than 65 dBA, noise due essentially to road and air traffic,
- a significant proportion of the European Union population is exposed to noise levels exceeding 55 dBA.

7013 It is estimated for example that in Germany one-half of the population is affected by noise due to traffic, 20% very seriously (cf. *The State of the Environment in the European Community*, March 1992), and that the social cost of damages from transportation noise has risen to 2% of the GDP (cf. *The State of the Environment* OECD 1991).

European Union policy: Fifth programme

- 7014 Noise is cited as one of the nuisances of the urban environment and of the quality of the living environment. Within the framework of the general goal according to which no one should be exposed to noise levels apt to compromise health or the quality of life, targets have been established for the year 2000, aimed at:
- the gradual elimination of any exposure of the population to noise levels higher than 65 dBA, the 85 dBA level to be exceeded at no time during the day,
 - the non-increase of the percentage of the population presently exposed to noise levels between 55 to 65 dBA,
 - and the non-increase of the noise level for the population presently exposed to noise levels lower than 55 dBA.
- 7015 The European Union has already undertaken the definition of standards, the formulation of directives aimed at limiting pollution due to the use of certain facilities. As concerns household and neighbourhood noise, since 1984 the European Union has laid down compulsory and suggested noise levels (approval procedures, labelling, authorisations for the sale of work site motors and materials, lawn mowers, household appliances, etc.).
- 7016 Policies on noise abatement have also been defined at the level of the Member States which in some cases take the form of "laws against noise", but in most cases takes the form of regulations and standards on the acceptable levels of noise pollution of vehicles, planes, industrial and/or household facilities. In all countries, regulations concerning noise emissions of new vehicles constitute a key means of noise abatement. The Netherlands, for example, has adopted a medium and long range programme for reduction of vehicle noise emission limits. In Germany, plants which do not respect the standards defined by the *federal law on ambient noise abatement levels* can be subjected to restrictions on their activity time schedule. The use of noise barriers is widespread in all the countries and, especially, in France, Germany, Netherlands.

Noise and vibration abatement

- 7017 Noise and vibration abatement involves a series of actions and measures. Only these actions and measures which give rises to monetary transactions are described in the noise and vibration abatement account. Thus measures such as ban and restriction of activities are not recorded, unless they do translate into monetary transactions (transfers to compensate losses resulting from the ban or the restriction of activities, et.).

Noise and vibration abatement related transactions may take the form of:

- activities of noise and vibration abatement, called characteristic activities,
- uses of adapted and connected products,
- and specific transfers.

Characteristic activities

- 7018 Noise and vibration abatement characteristic activities designates any activity whose purpose is the abatement of noise and vibration. Characteristic activities are always executed by producing units of the national economy, either as principal or secondary activity, or as ancillary (for own account). Output of characteristic activities are characteristic services. Producers of characteristic services are called characteristic producers.

Definition of activities

7019 The UN-ECE and Eurostat have developed a joint classification for environmental protection activities (CEPA). Class 5 of this classification groups together noise and vibration abatement activities (cf. Annex I to Chapter II). The following activities are distinguished:

5.1 Noise and vibration from road and rail traffic

5.1.1 Preventive in-process modifications at the source

5.1.2 Construction of anti-noise/vibration facilities

5.2 Air traffic noise

5.2.1 Preventive in-process modifications at the source

5.2.2 Construction of anti-noise/vibration facilities

5.3 Industrial process noise and vibrations

5.4 Measurement, control, laboratories, and the like

5.5 Other activities

Noise and vibration from road and rail traffic abatement

7020 Abatement activities are of two types: those aimed at noise abatement at the source and those aimed at limiting the propagation of noise or the noise perceived.

Preventive in-process modifications at the source

7021 These activities consist of measures to reduce noise from motors, from exhaust systems and brakes, or noise level due to tyre/road surface contact. Regulations concerning emission standards and the existence of approval procedures have resulted in the fact that "less noisy" vehicles are the rule: there are no "more noisy" vehicles, except in an accidental or particular case. Thus activities under this heading only correspond to endeavours of transport firms to specially adapt vehicles (buses, trucks, or train and power units in the case of rail transport) in order to make them less noisy: soundproofing of hoods, brakes, exhaust systems etc.

7022 The other preventive characteristic activities consist of noise abatement through the modification of surfaces. As noise emissions from motors, exhaust systems and brakes are lowered, that from other sources is increasing and in particular noise which originates from the contact between tyres and road surfaces. Activities consist of substituting concrete by silent asphalt, multi-layered surfaces, etc.

Construction of anti-noise vibration facilities

7023 These activities consist of installing anti-noise facilities. These may be: screens, embankments or hedges. They may also consist of covering sections of urban motor ways or railroads. These activities may also consist of the soundproofing of buildings etc., in order to limit noise perception. Soundproofing whose purpose is noise abatement outside industrial plants is classified in industrial noise and vibration abatement.

7024 As noise protective windows are mainly used by households, they are classified as connected product and not as execution of a characteristic activity.

Rail traffic noise and vibration

7025 Up until now rail traffic noise has been of less concern; efforts in this field have been devoted especially to zoning (railroad corridors) and adapting tracks and equipment. In the Netherlands and in Germany, exposure limits have been defined.

Air traffic noise

7026 As in the case of road and rail traffic, air traffic noise and vibration abatement activities are of two types: those aimed at noise abatement at the source and those aimed at limiting the propagation of noise or the noise perceived.

Preventive in-process modifications at the source

7027 As concerns prevention at the source, through modification of aircraft engines, constructors have managed somewhat easily to reduce noise and, as a result of their efforts, to reduce fuel consumption. However, it would seem that they have arrived at a stage where new reductions in noise (and fuel consumption) will generate substantial additional cost.

7028 Movement to reduce noise from air traffic has been supported by the introduction of noise limits, the levying of variable charges on noise, to be included in landing rights and better traffic control (time and itinerary restrictions). Noise charges can be used to finance indemnities and protection programmes for nearby residents. Noise charges can be replaced by reducing landing taxes for quiet planes. The indemnities paid by airport operators can take the form of soundproofing, payment of bonuses or, as in the United Kingdom, of financial compensation for loss of amenities.

Construction of anti-noise/vibration facilities

7029 In the case of air traffic, construction of anti-noise/vibration facilities consists mainly of soundproofing of housing units.

Industrial process noise and vibration abatement

7030 The activities consist of the installation of facilities whose goal is noise abatement in industrial facilities, work sites, etc. Abatement of noise and vibration inside the factory or on the construction site is excluded: it is in general covered by legislation on hygiene and safety rather than by environmental regulations. Activities may concern plant modifications or the soundproofing of buildings. They take the form of:

- add-on facilities
 - covering and soundproofing of machines and piping,
 - fuel regulation systems and sound absorption,
 - noise screens, barriers,
 - noise measurement systems and instruments,
- integrated facilities
 - flexible joints and piping,
 - 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 (including insulation materials introduced in buildings),
 - equipment and machines conceived or constructed for low noise or vibrations,
 - low noise level flares and burners, etc.

Measurement, control, laboratories and the like

7031 This position groups all activities aimed at controlling the level of noise. Means, facilities consist of stationary measurement and monitoring sites in urban areas, observation networks, etc.

Others activities

7032 Activities under this heading correspond to regulation, enforcement and administration activities in the noise and vibration abatement domain, when they can be distinguished from general environmental administration and from other noise and vibration abatement activities. They cover a large set of administrative measures which raise serious identification problems given their incorporation in integrated programmes of traffic control, urban planning and the difficulty of separating that part of the 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 even traffic security.

- 7033 Examples of such measures, whose corresponding expenditure, either management cost, or incitative transfers are to be identified, are the following:
- traffic management with noise abatement purpose (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).
- 7034 In addition to measures on regulations, other measures may consist of:
- financial incentives for the production and use of low-noise vehicles,
 - labelling of programmes for consumers so as to encourage the use of low-noise vehicles and the adoption of quiet driving behaviour.

Activities for abatement of neighbourhood noise (soundproofing of dancing, etc.) as well as activities for the abatement of noise in places frequented by the public (swimming pools, etc.), in schools, etc are also to be included.

Facilities

- 7035 Facilities for noise and vibration abatement refers to technical installations or equipment designed for use in the context of noise and vibration abatement. As have been seen from the examples, installations can be of the "end of pipe" type or they can be part of a larger production process.
- 7036 A classification of Environmental Protection Facilities has been developed by UN-ECE and Eurostat in association with the CEPA (see Annex I to Chapter II). Class 5 of this classification groups together noise and vibration abatement facilities.

The following facilities are distinguished:

5.1 Noise barriers: roads, railroads, airports [in kilometres]

5.2 Equipment for follow-up and control of noise [number of sites and measurement equipment]

Producers of noise and vibration abatement services

- 7037 According to EPEAs' conventions (see Chapter II, § 2022), producers of environmental protection services are classified in two main categories:
- specialised producers which execute a characteristic activity as their principal activity; output may be market or non-market; units which belong to the general government and NPISHs institutional sector are distinguished from units which belong to other institutional sectors.
 - non-specialised producers which execute a characteristic activity as secondary or ancillary to their principal non-characteristic activity. These producers are regrouped by industries, according to their principal non-characteristic activity.

Producers are classified as specialised according to environmental protection activities in general and not according to a specific domain.

- 7038 In the noise and vibration abatement domain specialised producers are few. They mainly consist of governmental agencies or services which execute measurement, control activities or regulation and administration of the domain or which are responsible for the abatement of noise from road, railway or air traffic. Other activities are generally executed as ancillary activity by non-characteristic producers whose principal activity engenders excessive noise, including private units managing highways or airports.

Connected and adapted products

Adapted products

7039 A list of adapted products in the noise and vibration abatement domain has to be established. Examples of adapted products are:

- cars less noisy than normal equivalent cars,
- lawn mowers and other adapted household equipment and appliances.

For adapted products, only extra cost, as valued in Chapter II, § 20xx, are considered.

Connected products

7040 They mainly consist of:

- exhaust pipes, for that part which does not respond to technical reasons,
- noise protective windows.

Transactions related to noise and vibration abatement

7041 The description of the transactions related to noise and vibration abatement fits into the general framework of the EPEA. These transactions consist of transactions on products and transfers.

Transactions in products

7042 Transactions in products concern:

- the supply and uses of noise and vibration abatement services resulting from characteristic activities,
- the gross capital formation for characteristic activities,
- the uses of adapted and connected products.

Output of characteristic activities and respective uses

Ancillary output

7043 Ancillary output results from characteristic activities undertaken by noise polluting industries in order to reduce the level of noise emission, monitor emissions, etc. This output is valued by the cost that the unit which executes the activity bears in respect to the protection measures it takes: intermediate consumption, compensation of employees, fixed capital consumption and taxes less subsidies on production. Ancillary output is assumed to be own intermediate consumption of these industries.

7044 In the case of noise and vibration abatement output consists essentially of the fixed capital consumption which corresponds to the fixed assets for noise and vibration abatement of the units which take the noise abatement measures, including private firms which operate toll motorways, airports etc.

Market output

7045 Market output of noise and vibration abatement services is insignificant. This output, which generally consists of noise and vibrations level measurement services, is mainly used as intermediate consumption of general government units. When used by a specialised producer, and in order to avoid double counting, these market services are not separately accounted for.

Non-market output

- 7046 Non-market output of noise and vibration abatement services consists of management and administration services by general government units. It also consist of the fixed capital consumption corresponding to anti-noise walls on public highways, etc. It is valued by the cost (intermediate consumption, compensation of employees, fixed capital consumption and taxes on production) less any receipts related to the services. This output is assumed to be collective consumption of general government. If any, non-market output of NPISHs is valued in the same way, but assumed to be final consumption of households.

Gross capital formation and acquisitions less disposals of non-produced non-financial assets for noise and vibration abatement activities

- 7047 Gross capital formation and acquisitions less disposals of non-produced non-financial assets for noise and vibration abatement activities consists of anti-noise walls, covering of urban roads, soundproofing of equipment's, means of transports, housing, equipment's for measurement, etc. It includes acquisitions less disposals of non-produced non-financial assets (land for the constitution of anti-noise walls, buffer zones etc.), which may prove to be of large importance in the domain. Whole gross capital formation of specialised producers and acquisitions less disposals of non-produced non-financial assets is considered. For non-specialised producers, that part of gross capital formation for characteristic activities which consists of adapted and connected products is treated specifically (cf. § 2075 sq.).

In the noise and vibration abatement domain the evaluation of stocks of fixed assets is of particular importance since they constitute the basis to evaluate environmental output mainly fixed capital consumption.

Uses of adapted and connected products.

- 7048 Adapted and connected products are used either as intermediate or final consumption, or when they are capital goods, as gross capital formation.

Intermediate consumption is that of producing units of national economy. These units may use adapted transport equipment, exhaust pipes (for that part which does not respond to technical reasons), etc. According to EPEA's conventions, in order to avoid double counting, uses by specialised producers, if any, are not separately recorded.

Final consumption is that of households. As concerns adapted products it consists of final consumption expenditure in adapted (less noisy) household equipment, etc. As concerns connected products it consists of purchase and installation of exhaust pipes (for that part which does not respond to technical reasons), etc.

- 7049 Gross capital formation in adapted products is that of producing units of national economy. It mainly consists of purchase of adapted cars, buses, trucks, etc. Gross capital formation of specialised producers in adapted products is not separately recorded. The gross capital formation of non-specialised producers in adapted products is treated specifically (cf. § 2075 sq.). Gross capital formation in noise protective windows is recorded under the heading "letting for own property" of the NACE Rev. 1.

Transfers

- 7050 Generally speaking, the users of noise and vibration abatement services finance their uses themselves: the different industries finance cost for own-account (ancillary) noise and vibration abatement activities and corresponding capital formation; general government finances its collective consumption of non-market services; households bear the cost of adapted and connected products.

Transfers in the noise and vibration abatement domain consist either in taxes, or of subsidies, investment grants and other current or capital transfers in favour of noise and vibration abatement. Furthermore, tax receipts may be earmarked for financing noise and vibration abatement measures or activities. An analysis of transfers linked to noise and vibration abatement is therefore required.

7051 In certain Member States measures have been taken to encourage the use of vehicles emitting less noise than that admitted by regulations, so as to create a market for such vehicles before more stringent international regulations are adopted. Among these measures can be cited:

- granting of subsidies covering extra cost of purchase,
- adoption of preferential buying policies,
- levying of charges on noisy vehicles.

7052 According to constructor surveys, it would seem that technology for noise abatement is likely to increase the purchase price of vehicles by 2 to 10%. One solution to this problem of extra cost consists of paying compensatory subsidies by means of fiscal rebates and bonuses. In certain cities and regions of Germany, subsidies are as high as 2 000 DM for vehicles defined as low-noise.

7053 In the Netherlands, a dual financial approach was adopted for a few years: on the one hand, bonuses were granted for investments which reduced noise levels below the legal standards; on the other hand, a tax on the owners of noisy vehicles was introduced, based on the noise nuisance potential caused by the vehicle.

Certain expenditure for connected products by households may receive transfers (in France, for example, at various times "subsidies" have been granted for noise abatement of motorbikes, etc.). Bonuses and indemnities can be distributed for soundproofing and the purchase of noise protective windows.

Noise and vibration abatement account

Review of objectives

7054 The noise and vibration abatement account is a sub-account of the EPEA. Its goals are those of the latter as concerns noise and vibration abatement.

The account contains a series of articulated tables. Their basis is the general framework proposed in the Chapter XXI of the 1993 SNA.

The purpose of Table A is to value and describe the national expenditure.

Tables B and B1 describe the output of environmental protection services in a manner that is consistent with the supply and uses tables.

Table C details the way in which national expenditure is financed, by cross-referencing the user/beneficiary sector and the financers. Table C1 calculates the institutional sectors' environmental burden.

For the general structure of these tables, one should refer to the general presentation of the EPEA (see Chapter II, § 2174 sq.). Main aspects related to the noise and vibration abatement domain are presented below.

General government

7055 In the noise domain, general government may be a specialised producer (general administration, management, monitoring, control of noise abatement services, etc.) and, in the case of non-market output, it is also financer and user (under collective consumption).

7056 General government may also finance activities for noise and vibration abatement (financing of noise screens, extra cost of special surfacing, etc.) executed by other producers or when transfers are made to users of adapted or connected products.

7057 Ancillary activities executed by non-specialised characteristic producers of the general government sector are retraced in the industry corresponding to their principal activity. Such is, in particular, the case of traffic noise abatement activities when they are executed by non-specialised units of the general government (e.g. management agencies for land or air transportation).

Corporations

7058 Corporations activities are for the most part ancillary activities for industrial noise abatement such as activities for noise abatement in the field of transportation (airports, concessionary motor way enterprises, rail transport enterprises, etc.). These activities may benefit from transfers on the part of general government. In the framework of their non-characteristic activities, enterprises may consume characteristic activities as intermediate consumption (measurement, control, auditing in the noise domain).

Households

7059 The only transactions which are recorded in the account are those which correspond to the purchase of connected products (purchase of replacement exhaust-pipes, repair of existing exhausts, etc.) and adapted products valued at their extra cost. Expenditure relevant to housing (soundproofing) are not allocated to households but to the housing industry as ancillary activity (soundproofing) or gross capital formation in connected products (noise protective windows).

Data sources

General government

7060 According to available information, all the countries surveyed collect data on general government expenditure in the noise domain.

Corporations

7061 The draft revision of the European Union structural business survey envisages collecting, annually, for sections C, D, E and F of the NACE Rev. 1, data on enterprise investment in the noise abatement domain. The collection of similar data is not envisaged for enterprises of section I (transportation).

7062 The draft industry questionnaire plans to collect data on the cost of ancillary activities of industrial enterprises. These activities are defined as:

- activities for the control and prevention of noise levels,
- measures to lower noise levels at the source, between the source and the recipient at the recipient level.

Expenditure for noise abatement are included in the surveys of the following countries: Germany, Netherlands, France, Denmark, Spain, Portugal, Greece, Sweden, Finland and Austria.

7063 A particular valuation problem arises for soundproofing cost for non-industrial housing and buildings, for which no collection system is presently envisaged.

Households

7064 Specific consumption surveys on adapted and connected products constitute the main sources for household uses. Surveys of households can also furnish useful data for the valuation of ancillary characteristic activities of the housing industry.

Linking physical data to monetary data

7065 Variation in level of noise may be related with expenditure for noise and vibration abatement.

Nevertheless, one must take into account the increase in traffic in order to assess the efficiency of measures and expenditure. Analysis of noise and vibration emissions is therefore necessary, which must allow for identification of:

- result of production and consumption variation (traffic and industrial noise and vibration),
- result of variation of emissions factors (measures for less noisy vehicles),
- result of activities aimed at limiting the propagation of noise.

As expenditure are mainly linked to ancillary characteristic services which take the form of fixed capital consumption, the main indicator for expenditure is the stock of assets for noise and vibration abatement: anti-noise walls, covering of urban motor ways, resurfacing of roads etc.

VIII. PROTECTION OF BIODIVERSITY AND LANDSCAPE ACCOUNT

Introduction

8001 In the present chapter the EPEA's sub-account for protection of biodiversity and landscape is presented.

The following aspects are successively examined:

- general description of the domain,
- physical data potentially available for the domain,
- specificity of protection of biodiversity and landscape (classification and definition of activities, etc.),
- specific accounting problems for the domain (specification of units and transactions, data sources and link to physical data).

As concerns the last aspect, only references to the EPEA's framework are made, the framework itself is not presented. Therefore, readers are advised to refer to this framework and the tables in Chapter II for a general view of accounting approach.

Purpose of the biodiversity and landscape protection account

8002 The purpose of the biodiversity and landscape protection account is to describe monetary flows and transactions related with biodiversity and landscape protection, linking them with corresponding physical data, when possible. In particular, the account must provide a valuation of the national expenditure for biodiversity and landscape protection, and describe its components and financing.

8003 As EPEA's sub-account, the biodiversity and landscape account excludes expenditure relating to protection of amenities, built heritage (historic heritage) and human settlements or establishments, or to agricultural activities. In line with the general definition of environmental protection, activities of economic management of fauna and flora (for example breeding for the replenishment of stocks for fishing or hunting, etc.) are also excluded. Insofar as it is executed in protected areas, protection of soil against erosion is included.

8004 Expenditure for nature protection represent roughly 3% of overall expenditure for the environment. Due to the absence, however, of common definitions and the difficulties of tallying and valuation, such estimates are particularly unreliable.

Description of the domain

8005 At the European Union level, it has been observed that despite international directives and conventions (Bonn and Bern), pressure exercised on rare species and their habitats has intensified. Intensive agriculture constitutes one of the main causes of diminished biological diversity. Economic development and erosion cause unending deterioration to coastal environments. Forest fires have devastated numerous sectors of the Mediterranean region and now run riot every year. Fire destroys close to 1% of the total forest area year after year. Other incursions due to the development of leisure time activities and the attendant proliferation of secondary residences have led to the degradation of uplands and mountain zones.

8006 Given present trends affecting the protection of species and biological diversity, fears as to the perpetuation of the European Union's biological heritage may be entertained. A number of animal species or populations requiring considerable space are threatened with extinction; the survival of a certain number of treasured forest ecosystems is extremely precarious; the continued existence of woodland massifs in the southern regions is in no way guaranteed. The depletion of open environmental media, exacerbated by the twofold action of land use and eutrophication, is considerable and continuing. Large-scale aquatic media have become extremely rare and are under heavy threat. Their safekeeping implies territorial management on a scale extending over all catchment basins.

- 8007 As a result of inadequate soil management, certain regions of the European Union are, each year, losing vast tracts of fertile arable lands through erosion. Drainage leads to the impoverishment of wetlands. Efforts made to protect land and fight erosion in the northern countries are often doomed to failure because of overgrazing due to pay scales based on the number of livestock, especially bovine.
- 8008 More specifically, as concerns soil protection against erosion from wind, water or gravitation, it has been observed that the physical deterioration of soils - an age-old phenomenon - is perpetuated today by the new agricultural techniques. Erosion impoverishes the soil by draining organic matter, by weakening its structure and diminishing its capacity for water retention, thereby reducing its agricultural productivity. Wind erosion principally affects arid regions, coastal zones, the broad expanses of grasslands, as well as ancient hedge lands on which hedgerows and banks have been levelled. Water erosion is evidenced more particularly in the southern part of the European Union in which 34% of soils are subjected to high risks of erosion. In certain European Union regions (in south eastern Spain, for example) indications of desert formation, owing to the combined action of climate and land neglect, have been observed. The fight against desert formation becomes all the more difficult as soil erosion gains ground.
- 8009 The patchwork of rural landscapes created by human activity interacting with natural conditions pays witness to the history and culture of the peoples of Europe. This heritage has been subjected to considerable quantitative and qualitative regression over the last thirty years and the process continues. Along the Mediterranean, over half the terraces have been abandoned, many are in the process of being abandoned, causing not only degradation of the landscape but soil erosion as well.
- 8010 The various intrusions enumerated above must be added to the effects of air, soil and water pollution: close to 40% of European Union forests are more or less deceased as a result of acidification; the eutrophication of surface waters is endangering aquatic life, etc. Pollution of this sort constitutes the principal threat to species and natural areas; it is not, however, the sole cause. It is for this reason that, among goals involving agriculture, rural environmental management is envisaged in order to preserve biodiversity and natural habitats.

European Union policy: Fifth Programme

- 8011 In certain fields (protection of biodiversity, coastal areas, etc.) the major goals have been defined. Among them, the following may be mentioned:
- maintenance of biological diversity through the adoption of sustainable development policies and the management of natural habitats of European and world value and by monitoring exploitation and exchanges of wild species;
 - adoption of sustainable development policies for coastal regions and their resources which take into account the capacity for resistance of the environmental media in question.
- 8012 These goals have been targeted for the year 2000 and a certain number of instruments have been identified. Among the latter, while the financial contribution of the European Union and generally speaking of government must in no event diminish the responsibility of the different economic units, the mechanisms for financial support are of particular importance.
- 8013 The "traditional" structural funds (FEDER, FSE and FEOGA), which are increasingly integrating environmental concerns, have been supplemented by LIFE (European Union financing instrument for the environment) whose mission consists mainly in defining and promoting production models and behaviour patterns which conform to the principles of sustainable development.

Community system for the collection of physical data on biodiversity and landscape

- 8014 The OECD-Eurostat questionnaires constitute one of the main normalised source of data on biodiversity and landscape. Beside the questionnaire on soils, which covers the use of soils (and their evolution) as well as the extent of the area affected by erosion and the amount of soil lost, two questionnaires exist:

OECD/Eurostat questionnaire on flora and fauna

- 8015 This questionnaire makes it possible, for the main taxonomic groups of animal and plant species, to collect data on the total number of individuals and/or the geographical distribution of species according to their status (endangered, vulnerable, etc.), as well as certain specific data on endangered or vulnerable species (factors contributing to their decline, etc.). The goal of this data gathering is, in particular, to analyse the impact of international action in the field of conservation and biodiversity of species.
- 8016 As for physical data on flora and fauna, the linkup with protection expenditure (or with overall expenditure for nature protection and conservation management, including natural parks) can only be very loose insofar as it is based on the assumption that the measures traced in the expenditure, and those alone, are directly effective. A large number of measures, however, cannot be valued (bans on exploitation, on trade, etc.). Given the more or less serious nature of the problems identified, when (physical and monetary) data is actually available, it can at best characterise the relative national effort.

OECD/Eurostat questionnaire on forests

- 8017 Devoted to the gathering of data on total areas planted or being exploited, the questionnaire offers little hope of a linkup with protection expenditure against fires except for computing the indicators of protection expenditure by hectare for areas in danger of fire (forest species, etc.).

Other sources of physical data

- 8018 Many Member States are in possession of physical data, in particular on the acreage of reserves and natural parks, on threatened natural environmental media, etc.

Protected areas

- 8019 Statistics on protected areas are compiled by the World Conservation Monitoring Center (WCMC) for the World Conservation Union (IUCN). A list of protected areas is published regularly by IUCN. In the Europe's Environment 1993 Statistical Compendium five categories of protected areas are defined on the basis of IUCN classification; category I excludes public access, when for category V public access is not limited but some form of control is exercised, while economic and/or legal measures may be used to maintain the quality of the landscape, for example by encouraging the continuation of traditional farming practices.
- 8020 The IUCN list also provides information about the type of area which have been designated as World Heritage Sites, Biosphere Reserves or Wetlands of International Importance.

Biodiversity and landscape protection

- 8021 Biodiversity and landscape protection involves a series of actions and measures. Only those actions and measures which give rise to monetary transactions are described in the biodiversity and landscape protection account: measures such as ban on trade, prohibition of products or productive activities are not recorded, unless they do translate into monetary transactions (transfers to compensate losses resulting from the ban, etc.)

Biodiversity and landscape protection may take the form of:

- activities of biodiversity and landscape protection, called characteristic activities,
- specific transfers.

No example of adapted and connected product was found.

Characteristic activities

8022 Biodiversity and landscape protection characteristic activity designates any activity whose purpose is the protection of biodiversity and landscape. Characteristic activities are always executed by producing units of the national economy, either as principal or secondary activity, or as ancillary (for own account). Output of characteristic activity is called characteristic service. Producers of characteristic services are called characteristic producers.

Definition of activities

8023 UN-ECE and Eurostat have developed a joint classification for environmental protection activities (CEPA).

In the CEPA, class 6 regroups biodiversity and landscape protection activities (see Annex I to Chapter II). the following biodiversity and landscape protection activities are distinguished:

- 6.1 Protection of species
- 6.2 Protection of landscapes and habitats
of which:
 - 6.2.1 protection of forests
- 6.3 Rehabilitation of species populations and landscapes
- 6.4 Restoration and cleaning of water bodies
- 6.5 Measurement, control, laboratories and the like
- 6.6 Other activities

Protection of species

8024 Protection of species refers to environmental protection activities for the purpose of the conservation of threatened species of fauna and flora. They may cover activities for conserving the genetic heritage, maintaining natural balances, recolonising or reconquering destroyed ecosystems. Only those activities expressly intended for the preservation of biodiversity, to the exclusion of activities aimed at conservation and protection of habitats, are included. This item also covers all measures for the protection of animal and plant species, which place bans on exploitation, trade, etc.

8025 Activities include census, inventories, data banks, application of bans, creation of grain reserves or banks, public information or awareness, etc. These activities are sometimes barely distinguishable from scientific research activities or habitat protection action. They may, however, take the more specific form of:

- improvement of linear infrastructures (burying of power lines, pipelines, underground passages for animals (highways, railways), etc.),
- feeding of the young,
- special natural reserves (botany conservation areas, etc.) management.

Except as concerns the improvement of linear infrastructures and scientific activities, these activities are the privileged area of intervention by non-profit institutions (nature conservation societies, etc.).

Protection of landscapes and habitats

8026 Activities for habitat protection cover all measures and activities relating to the protection of outstanding ecosystems and habitats, which are essential to the well-being of fauna and flora species. Also covered is the protection of landscapes for their aesthetic value. Included is the preservation of legally protected natural objects or areas, that is to say all activities for the protection of objects, areas identified by laws or similar legal instruments from pollutant damage or physical disturbance, such as road construction, building of houses, etc.

8027 The main activities are those of 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 subjected to restrictive regulations whose explicit goal is the conservation and protection of habitats. While some of these activities may be executed by the private sector (in particular by non-profit

institutions), they are generally undertaken by local or central government. Protected areas management bodies are often separate administrative bodies (public establishments) which makes it easier to gather relatively detailed data. It will be noted that in the NACE Rev. 1, activities for the management of protected areas are grouped together in a special class (92.53: *Botanical and zoological gardens and nature reserves, which includes operation of nature reserves including wildlife preservation, etc.*)

In addition to current management transactions, the importance of purchases of land in the transactions and expenditure of the bodies concerned should be noted.

Protection of forests

8028 Protection of landscapes and habitats includes as a specific position the *protection of forests*. Protection of forests is defined as: "Any activity for the preservation of forest, scrubland, etc. as natural environmental media (as distinct from economic resources). Included notably are the development of fireballs, the mobilisation of fire fighting means or measures aimed at the prevention of fires in forest areas."

8029 Generally speaking, these measures are carried out by two types of specialised bodies: forestry bureaux responsible for the protection and management of public-owned forests, fire fighting services responsible for general fire fighting. To distinguish the protection of forests as environmental media from the management of forest as economic resources or from the protection of human establishments from fire can prove difficult. Moreover, forest protection from fire often requires mobilising exceptional means (voluntary participation of the local population, army intervention, etc.) whose cost is difficult to quantify without an in-depth survey.

Rehabilitation of species populations and landscapes

8030 These activities aim at the reintroduction of extinct fauna or flora species, or the recovery of species threatened with extinction, as well as the reshaping of damaged landscapes for the purpose of strengthening their natural functions or increasing their aesthetic value. Included are the expenditure incurred for the rehabilitation of abandoned mining and quarrying sites. In certain countries, activities for the rehabilitation of mining sites are classified under soil protection. Cf. for the United Kingdom "A review of UK environmental expenditure" HMSO 1993.

Restoration and cleaning of water bodies

8031 Activities for restoration and cleaning of water bodies refer to protection measures such as artificial oxygenation and lime-neutralisation actions, artificial acid or anoxic removals, and cleaning of pollution in all water bodies.

A distinction is made for sea and brackish water and fresh water:

- In the case of sea and brackish water, activities consist mainly of precise actions for the collection and cleaning of the water bodies following accidental pollution (hydrocarbon discharges, etc.), most pollution control taking place up ahead so as to reduce the release of effluents in coastal areas, estuaries and lagoons,
- In the case of fresh water, activities consist of artificial oxygenation and lime-neutralisation actions in lakes, artificial acid or anoxic removals and cleaning of accidental pollution. They may also consist of "biological" operations modifying fish stocks.

Measurement, control, laboratories and the like

8032 This position groups together those measurement, monitoring, analysis activities which are not classified under the preceding items. In principle, inventories of fauna and flora, for example, are not covered since they are classified under protection of species.

Other activities

8033 All management and administration activities concerning the protection of biodiversity and landscape come under this position.

Transactions related with biodiversity and landscape protection

8034 The description of the transactions related to biodiversity and landscape protection fits into the general framework of the EPEA. These transactions consist of transactions in products and transfers.

Transactions in products

8035 Transactions in products concern:

- the supply and uses of biodiversity and landscape protection services resulting from characteristic activities,
- the gross capital formation for characteristic activities.

Output of characteristic activities and respective uses

Non-market output of biodiversity and landscape protection services

8036 This output, which consists of management and administration services by general government units, is valued by the cost (intermediate consumption, compensation of employees, fixed capital consumption and taxes on production) less any receipts related to the services. Output is assumed to be collective consumption of general government. If any, non-market output of NPISHs is valued in the same way, but assumed to be actual final consumption of households.

8037 In the case of units belonging to the general government sector, these may be bodies for the management of reserves and natural parks, specialised bodies for flora and fauna, etc. In the case of private institutions, these may be associations for environmental protection, voluntary fire fighting brigades, etc. It will be noted that, in accordance with ESA conventions, non-profit institutions which are controlled by general government and whose resources are principally derived from payments made by units belonging to the general government sector are classified under this sector.

Characteristic services are valued in line with the corresponding rules of the ESA. For public units in charge of the management of reserves and protection areas, income forthcoming from public attendance (entrance fees) is to be treated as residual sales of market services and excluded of environmental protection output.

Market output

8038 *Market output* of biodiversity and landscape protection services is expected to be insignificant. However, marked specialised producers may exist (e.g. engineering firms, consultants).

Ancillary output

8039 Ancillary output is the result of characteristic activities undertaken by industries in order to protect biodiversity and landscape such as rehabilitation of mining and quarrying sites, burying of power lines, etc. Output is valued by the cost that the unit which executes the activity bears in respect to the protection measures it takes: intermediate consumption, compensation of employees, fixed capital consumption and taxes less subsidies on production. Ancillary output is assumed to be own intermediate consumption of the unit which produces it.

Gross capital formation and acquisitions less disposals of non-produced non-financial assets for biodiversity and landscape protection activities

8040 Gross capital formation and acquisitions less disposals of non-produced non-financial assets for biodiversity and landscape protection activities. It corresponds to the gross capital formation expenditure related with the biodiversity and landscape protection activities: civil works for the rehabilitation of mining sites, etc. Also accounted for is the expenditure related to acquisitions less disposals of land.

Uses of connected or adapted products

8041 In the biodiversity and landscape protection domain no examples for adapted or connected products were found.

Transfers

8042 Actions in favour of nature and landscape protection often take the shape of subsidies paid to farmers, breeders, etc. for terminating certain crops or farming practices harmful to the natural environmental media, or, on the contrary, for them to remain on the spot so that fragile media are not endangered by the cessation of human activity. These subsidies are to be analysed as transfers for environmental protection. Insofar as there is no corresponding use in the national expenditure, these transfers must figure on the "other transfers" row of Table A.

8043 These subsidies are to be distinguished from capital transfers intended for the financing of biodiversity and landscape protection measures. As corresponding gross capital formation and acquisitions less disposals of land are included in the national expenditure, these capital transfers are mere financial flows not to be added in with the other items of national expenditure.

Biodiversity and landscape protection account

Review of objectives

8044 The biodiversity and landscape protection account is a sub-account of the EPEA. Its goals are those of the latter as concerns biodiversity and landscape protection.

8045 The account contains a series of articulated tables. Their basis is the general framework proposed in the chapter devoted to "satellite analysis and accounts" of the 1993 SNA.

The purpose of Table A is to value and describe the national expenditure.

Tables B and B1 describe the output of environmental protection services in a manner that is consistent with the supply and uses tables.

Table C details the way in which national expenditure is financed, by cross-referencing the user/beneficiary sector and the financers. Table C1 calculates the institutional sectors' environment-related financial burden.

For the general structure of the tables, one should refer to the general presentation of the EPEA (see Chapter II, § 2174 sq.). The main aspects of the biodiversity and landscape protection domain are presented below.

Characteristic activities

8046 Main specific aspects are:

- the output of characteristic services is essentially that of units belonging to the general government sector,
- investments for characteristic activities include a substantial portion of net purchases of land or of land improvements.

There may be no entry under "Consumption of connected and adapted products".

Transfers

8047 Among transfers, mention has to be made of:

- transfers to the rest of the world: financing of programmes in the biodiversity and landscape protection field in other countries (tropical forests, etc.),
- transfers to resident units: transfers in order to compensate the losses resulting from adoption of environmental protection measures.

Financing by the rest of the world

8048 In certain Member States, the European Union's financing mechanisms may constitute a considerable source of finance, in particular as subsidies to agricultural systems for the purpose of backing reforms in agricultural practices with a view to nature and landscape protection.

Data sources

General government

8049 Eurostat document ENV/ECO/16/Final provides a summing up of the situation of data presently collected on general government. As a rule, the main source of data being the public accounts, the same general difficulties which characterise that source are encountered. In the specific case of nature and landscape protection, specific difficulties arise for the identification and isolation of the different activities.

8050 *Germany*: Forest fire control is broken down among various organisations. Major fires only break out certain years. Specialised units, including the army, intervene alongside regular volunteers. To calculate the fire fighting expenditure of these units is not possible.

8051 *Netherlands*: Data on nature and landscape protection are covered separately in "cost and financing of landscape management". These statistics supply data on cost by sector engaged in the management of forests and other nature conservation domains as well as on the financing of these expenditure. As for general government, these cost mainly concern the purchase, management and conservation of natural areas, the maintenance of green belts and other activities aimed at incorporating infrastructures into the landscape. Protection of species and habitats is covered insofar as it comes under landscape management. Dune conservation is accounted for from the standpoint of the management of natural areas by private companies in charge of water management.

8052 *United Kingdom*: A first estimate of expenditure by general government was undertaken on the basis of data from ministries and governmental agencies. This estimate (cf. "A review of UK environmental expenditure") corresponds essentially to outlays by the National Heritage Ministry and may include certain expenditure devoted to historic heritage protection.

8053 *France*: General government expenditure cover the prevention and conservation management of nature and environmental media (expenditure for regional parks and natural parks, for the purchase of green forest areas and forest development) as well as outlays for coast cleanup facilities, erosion control, dune stabilisation and fire control. Activities for the protection of species (flora and fauna) are not explicitly covered; they may, in part, be traced in the data on natural, regional or national parks.

8054 *Austria*: according to the report of the Austrian Central Statistical Office, discussion centres around natural heritage protection measures with particular emphasis on the Alpine regions, hedgerows, ancient tree species, etc. Farmers receive transfers to remain in the less productive areas. On the other hand, programmes for the elimination of certain intensive practices and the adoption of ecological criteria exist (no fertilisers or pesticides, no harvesting, etc.).

8055 *Portugal*: general government expenditure in the domain are relatively high given the inclusion of transfers paid to different voluntary associations and fire brigades. These outlays would seem to constitute the major element of general government expenditure.

Non-profit institutions

- 8056 These are relatively important in the domain given the existence of many environmental protection associations and the level of voluntary help (including for fire control). In the United Kingdom, for example, it is estimated that associations for nature protection cover roughly 15% of the population and spend sums equivalent to roughly half that of general government.
- 8057 The collection of reliable data on these associations supposes the existence of files, difficult to maintain, as certain of them are neither stable nor declared, all the while providing precise responses to local problems.
- 8058 The inventory of subsidies paid by central or local government, or in certain cases by European Union institutions, constitutes another important source of data for assessing monetary flows from the standpoint of financing.

Corporations

- 8059 The draft European Union regulation concerning structural business statistics does not provide for the collection of data on investments and current expenditure of corporations in the field of nature and landscape protection. Indeed, statistics on industrial enterprises only envisage the collection of data on investments (and operating expenses) relevant to waste management, to ambient air and climate protection, to waste water management and to noise abatement.
- 8060 However, insofar as enterprises are classified in class 95.5 (management of natural heritage: conservation of natural heritage, management of botanical and zoological gardens, of reserves and natural parks) they would be subject to the requirements of European Union regulations. On condition that the data is sufficiently detailed, European Union regulations could, therefore, constitute a source of data on biodiversity and landscape protection activities.
- 8061 On the other hand, the intermediate system of data collection on industry (cf. Eurostat 94/8D) encompasses the collection of data on measures taken by industrial enterprises for the protection of biodiversity and landscape. This data covers notably:
- end-of-pipe investments,
 - integrated investments,
 - capital cost (interest and investment depreciation),
 - current cost for facilities,
 - taxes: for example, tax for the restoration of the environment after use (mines and quarries, etc.),
 - subsidies.
- 8062 The document stipulates that data collection concerns all activities intended for the protection, restoration and improvement of landscapes.
- These activities may be the following:
- green belts around industrial sites,
 - reconstruction of landscape following extraction,
 - visibility of power lines (so as to prevent birds from hitting against them),
 - prevention of attacks on the landscape (detours, slanted drilling, burial of lines, etc.),
 - additional cost for pylons adapted to the landscape,
 - measures to restrict the use of ground waters, etc.
- 8063 These activities are mainly those of the following branches or industries:
- mines and quarries,
 - production and transport of electricity.
- 8064 The Netherlands, Greece and Sweden include the protection of nature and landscape in their enterprise surveys. In the case of Sweden, there is no specific heading for these outlays: they have to be placed under the "other" heading.

IX. OTHER ENVIRONMENTAL PROTECTION ACTIVITIES ACCOUNT

Introduction

9001 In the present chapter the EPEA's sub-account for *protection against radiation, research-development for environmental protection and other environmental protection* activities is presented.

The following aspects are successively examined:

- general description of the domain,
- specificity of these environmental protection activities (classification and definition of activities, etc.),
- specific accounting problems for the domain (specification of units and transactions, data sources).

As concerns the last aspect, only references to the EPEA's framework are made, the framework itself is not presented. Therefore, readers are advised to refer to this framework and the tables in Chapter II for a general view of accounting approach.

Purpose of the other environmental protection activities account

9002 The purpose of the other environmental protection activities account is to describe monetary flows and transactions related to protection against radiation, research-development for environmental protection and other environmental protection activities. In particular, the account must provide a valuation of the national expenditure in these domains, and describe its components and financing.

Description of the domain

9003 The domain consists of all those activities whose purpose is environmental protection and which are not recorded in the previous accounts (see Chapters III to VIII). These are activities classified under positions 7, 8 and 9 of the UN-ECE/Eurostat classification (see Annex I to Chapter II):

- protection against radiation,
- research and development for environmental protection,
- other environmental protection activities.

Protection against radiation

9004 Protection against radiation designates "any activity destined to reduce or eliminate negative consequences of radiation emitted from any source, except nuclear power plants and military installations. Protection measures taken at workplaces are excluded".

Research and development for environmental protection

9005 Research and development activities for environmental protection designates creative work undertaken on a systematic basis in order to increase the knowledge of man and his culture and the use of this knowledge to devise new applications in the field of environmental protection.

9006 This heading regroups all research and development (R&D) activities 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. All R&D activities even when referring to a specific domain have to be classified under this heading.

Other environmental protection activities

9007 This heading groups together all environmental protection activities which take the form of training or teaching activities specifically oriented towards environmental protection or which consist of public information or of general environmental administration activities. It also includes activities leading to indivisible expenditure, as well as activities not elsewhere classified.

9008 Education, training and information and general administration are "transversal" activities, i.e. apt to concern each of the domains - ambient air and climate protection, waste water management, waste management, etc. The following rules apply as concerns the allocation of activities to the positions of the CEPA:

- education, training and information activities are always to be allocated to the sub-position: "education and training and information" of the "other environmental protection activities" heading, even when they refer exclusively to one of the domains;
- when they refer to one of the domains, general administration activities must be allocated to this domain (two-digit position "other activities" of each domain). Only when separation is impossible they should be allocated to the sub-position "general administration of the environment" of the "other environmental protection activities" heading of the CEPA.

European Union policy

9009 The Fifth Action Programme places emphasis on the participation of all levels of society in the established goals. The Council recognises that research and development, information, teaching and training activities must be encouraged and intensified. Among the range of instruments cited by the Programme, research and development, public information and education and professional training receive special attention.

Research and development

9010 As concerns "Scientific research and technical progress", the Programme lays emphasis on the role of R&D in carrying the Programme through to a successful conclusion. R&D at the European Union level must assist in:

- supplying a scientific foundation for the assessment of the state of the environment (elaboration of environmental markers and parameters, advanced systems of surveillance and assessment, etc.),
- a better understanding of the fundamental mechanisms active in the environment and the effects of human activity,
- elaborating a solid base of market-related regulatory instruments (pre-normative R&D on health and public safety, environmental dangers, etc.),
- elaborating and implementing techniques for the prevention, reduction and suppression of the impact of human activity on the environment (advances in new materials, new non-pollutant methods, in waste improvements and in the prevention of industrial accidents).

Public information and education

9011 Surveys have demonstrated that the public is highly sensitive to environmental problems but that essential information on the domain is crucially lacking. It is essential that citizens play a role in the establishment of conditions for the granting of operating authorisations and for integrated pollution control. The introduction of a Community ecological label will constitute a step in this direction.

9012 One of the resolutions adopted by the Council and the Ministers of Education stipulates that "the goal of education in the environment field is to strengthen the awareness of citizens of the problems existing in this field as well as the awareness of possible solutions, and to lay the foundation for the fully informed and active participation of the individuals in environmental protection and the careful and rational use of natural resources".

The Programme goal is for environment-related subjects to be included in all primary and secondary school curricula by the year 2000, and that they figure as official examination electives after that date.

Professional training

9013 Administrations and enterprises of the production and services sector must profit from any new or complementary skills and training:

- in the public sector this need concerns, in particular, decision-making and management on the political and structural levels and, at the project, water resources management and waste disposal levels, the follow-up on conformity to standards, etc.
- in the private sector needs at every level (execution and leadership) concern industry (methods management, energy yield, recycling and safe disposal of waste, etc.), agriculture (nature conservation and management, ecologically acceptable agricultural techniques, etc.) and services (legal and technical counselling services, appraisals, accounting, etc.).

Classification and definition of activities

9014 UN-ECE and Eurostat have developed a joint classification of environmental protection activities (CEPA-see Annex I to Chapter II). As has been indicated in § 9003 sq., the CEPA distinguishes:

- Protection against radiation (excluding nuclear power stations and military installations),
- Research and development,
- Other environmental protection activities.

Protection against radiation

9015 As has been seen (cf. § 9004) protection against radiation designates "any activity destined to reduce or eliminate negative consequences of radiation emitted from any source, except nuclear power plants and military installations. Protection measures taken at workplaces are excluded". The following activities are distinguished:

7.1 Protection of ambient media

7.2 Measurement, control, laboratories, and the like

7.3 Other activities

9016 Protection of ambient media refers to all activities undertaken either as specialised or ancillary, in order to protect ambient media from radiation. It may consist of protecting measures such as screening, creation of buffer zones, conditioning of radioactive products for their transportation or handling. Protective measures referring to nuclear power plants and combustible, to radioactive waste and to the working places are excluded.

Measurement, control laboratories and the like designates all activities aimed at measuring ambient radioactivity by means of specific equipment, instruments and installations.

Other activities refer to general administration of the protection against radiation when they can be differentiated.

Research and development

9017 In the CEPA, R&D activities are classified in accordance with the Chapter 3 of the NABS 1993 (Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets). R&D activities are distributed among the following sub-positions, which correspond to the one-digits of the CEPA:

- 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 ambient water
- 8.3 Waste
- 8.4 Protection of soil and ground water
- 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

It should be noted that only those R&D activities relevant to environmental protection should be entered, to the exclusion of those relevant to the management of natural resources.

Other environmental protection activities

9018 The following activities are distinguished:

- 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 specified

General administration of the environment

9019 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.

9020 These are activities of co-ordination, management of actions and measures whose goal is general environmental protection (not specific to a domain) or which cannot be classified within a single domain. They may be executed by specialised units of the general government sector or, as ancillary, by non-specialised producers.

- in the first instance, as an example, by the central or local government bodies responsible for the definition and implementation of protection policies (ministries, state secretariats, decentralised divisions, etc.),
- in the second instance, by services or divisions within enterprises responsible for environmental protection.

Education and training and information

9021 Education, training and information activities designate any activity that aims at providing environmental education or training and disseminating environmental information and which are executed e.g. by specialised institutions even when they treat a specific domain and are adequately differentiated. Although recorded in this sub-account, these activities may be distinguished by domain (see R&D). The activities of general educational system are excluded.

9022 Education and training activities are generally executed by specialised units of the general government (teaching or training units) or corporations sectors. They may also consist of activities executed as ancillary within enterprises.

9023 Information activities may be executed by specialised units of general government by non-profit institutions (e.g. nature protection associations). They may also be activities executed as ancillary by non-specialised characteristic producers for the information of the public on protection measures they undertake.

Indivisible expenditure

9024 These are expenditure for environmental protection referring to several one-digit categories of the CEPA which cannot be allocated to other one-digit categories.

Activities not elsewhere classified

9025 This position groups together all these activities which are not classified under other positions of the classification.

Units and transaction and data sources

General government and private institutions

9026 Education, training and information activities oriented towards environmental protection are generally those of specialised units of general government. They are either units specialised in education or training which devote some part of their activity to the teaching of environmental protection, or units specialised in environmental protection which devote some part of their activities to teaching, training, information, etc.

Protection against radiation, research and development and general administration of the environment are also executed by specialised units of general government or NPISHs.

General government

9027 The Eurostat document ENV/ECO/16/final contains a balance of the expenditure presently covered by data on general government. As a general rule, the main data source being the analysis of public accounts, one is faced with the general difficulties which characterise that source. In the specific case of the activities grouped here, precise difficulties appear relative to problems of identification and of separation of the various activities.

Examples of the treatment adopted by some member countries are:

Netherlands: the "others" sub-position of the different domains include R&D as well as activities for the implementation and monitoring of regulations. Data on research and development (position 8 of the CEPA) is derived from "Statistics on Education and Science" (cf. ENV/ECO/16/final report).

United Kingdom: the specific collection system used to value the expenditure of general government makes it possible for activities of research and development, training in environmental matters as well as for the administration of the environment to be pinpointed (cf. ECOTEC Oct. 92).

Portugal: under other environmental protection activities, a special sub-position covers environmental education and training activities when executed outside the classic educational system.

Non-profit institutions

9028 Non-profit institutions are of relative importance in the domain given the existence of numerous environmental protection associations undertaking public information activities, etc.

Corporations

9029 Firms execute activities of the domain, either in a specialised or ancillary capacity. These are, notably, protection against radiation, research and development as well as management activities.

Sources on corporations

- 9030 The draft Council regulation concerning structural business statistics does not envisage collecting data on enterprise investments and current expenses for specific professional training, information or research and development activities on the environment.
- 9031 On the other hand, the system of environmental statistics on industry plans to collect data on "general expenditure for the environment" of industrial enterprises. Under this heading, plans are to collect the cost of activities which cannot be imputed to other domains (air, water, waste, soil and ground water, noise, nature and landscape). The heading is divided into two subheadings: general expenditure for the environment and research and development.

General expenditure for the environment

- 9032 This subheading groups expenditure of enterprises for co-ordination, for monitoring, to the extent that they cannot be imputed to other domains (cf. Eurostat ENV/ECO/Ind/14/final). It may also include purchases of licences and patents.

Research and development

- 9033 This subheading regroups all expenditure in the different domains for research and development relevant to environmental protection insofar as they are not specified in the different domains. It does not include research and development cost intended for the elaboration of adapted products. As a general rule, information and professional training activities undertaken by enterprises do not come under a specific heading except in the case of the Spanish survey.

Physical data and indicators

- 9034 Physical data covers essentially those means devoted to the different activities and, in particular, the labour force involved in research-development, teaching or training activities. In the latter case, other physical data is constituted by the number of trainees, workers trained, etc.

Concerning public information, the percentage of those who state they are adequately informed constitutes an indicator which can be interrelated with expenditure.

X. DEVELOPMENT OF SERIEE

10001 In this chapter SERIEE's possible future development will be presented as concerns:

- the integration of monetary and physical data,
- input-output tables for characteristic activities,
- the development of a recording system for eco-activities.

A preliminary view of the natural resource use and management account will also be presented.

Integration of monetary and physical data

10002 As concerns the integration of physical and monetary data, the following aspects will be dealt with:

- facilities and equipment of characteristic activities,
- emissions of pollutants and input-output tables on raw material uses.

10003 A number of studies have pointed the difficulties of interlinking, within the SERIEE framework and more precisely that of the EPEA, protection measures and the evolution of the state of the environment.

- On the one hand, environmental protection measures are not limited to characteristic activities and the use of connected and adapted products, described in the EPEA.

Environmental protection may take the form of administrative measures in favour of public transport, city and regional planning, changes in people's behaviour patterns, etc. which, at best, the EPEA is only capable of ascertaining partially through the recording of related transactions.

- On the other hand, the state of the environment is not subjected to a satisfactory statistical description given the absence of a full theoretical framework allowing for the various interactions between environmental media and economic activities to be accounted for in a scientific way.

Despite the efforts made, the description remains fragmentary and until now no synthetic indicator seems to be capable of rendering account of the state of the environment, not even for each of the main media or environmental concerns.

Physical description of EPEA's transactions

10004 The EPEA traces certain transactions in monetary terms: environmental protection activities, uses of adapted and connected products and environmental protection related transfers.

Means of characteristic activities

10005 The execution of characteristic activities assumes that various means are put into operation. These may consist of equipment and facilities, as well as land especially in the case of noise and vibration abatement or biodiversity and landscape protection; they also consist of intermediate consumption and labour. Physical data describing the means used may be related to the corresponding monetary flows.

10006 The description of the means of specialised activities in certain domains (sewerage and treatment of waste water, collection, transport and treatment of waste, etc.) presents no particular difficulties. These activities, which are identified as such in the NACE Rev. 1, are the subject of regular statistical surveys; in most countries, inventories of facilities are made. Internal or external, technical, economic or financial follow-up of these activities results in a lot of data. These data make it possible to describe simultaneously activities in monetary and physical terms as well as to characterise their technical effectiveness.

Provided certain precautions are taken, above all adequate disaggregation of the data, indicators of unitary cost or uses may be calculated and compared: cost of treatment of waste water for the diverse categories of treatment, labour inputs, etc.

10007 However, this is not the case for ancillary activities. In most instances, only cost estimates (current or capital) are available, without it being possible to tie in a physical description of the means used with

these cost, except through specific monographic surveys covering one or another measure. The air domain is often used as an illustration of this situation: its activities are essentially ancillary, and the measures taken cover a multiplicity of pollutants.

10008 Despite these difficulties, the existence of lists of specialised facilities for the execution of ancillary characteristic activities should, for the principal industries or branches of activity, and with the help of specific surveys, make it possible to ascertain facility or equipment ratios: ratio of dedusting equipment among cement factory plants, of off-gas filtering systems in thermal electricity generation plants, etc. As will be seen, such estimates are, in any event, necessary for the valuation of emissions.

In this domain, the creation of an eco-industries observation system (cf. § 10031 sq.) for that part of their activity which consists of the output of specialised facilities and equipment would represent an appreciable step forward.

Connected and adapted products

10009 The use of connected and adapted products constitutes another series of environmental protection measures accounted for in the EPEA. Whereas connected products interest mostly households and, except in the case of catalytic converters and septic tanks, have only relatively secondary effects on environmental pollution, such may not be the case for adapted products.

10010 Insofar as uses of adapted products are valued according to the extra cost in relation to equivalent normal products, valuation can only be arrived at by calculation based on physical quantities of products used, it being impossible to collect monetary data directly from surveyed units. Monetary and physical description, which allows for determining the environmental effects (reduction or changes in emissions of pollutants) are thus closely tied.

Moreover, a dual approach covering both uses and supply appears to be necessary in order to assess, in an exact way, expenditure related with adapted products, thus reinforcing the need of a recording system of eco-industries.

10011 Overall, it appears that a significant part of EPEA's transactions can be described using physical data, irrespective of whether this description takes the shape of facility inventories (accompanied by treatment capacities), or indicators of equipment ratios, surface of protected areas, labour or input quantities, etc. (see e.g. physical units for the description of facilities in the UN-ECE and Eurostat classification of environmental protection facilities in Annex I to Chapter II).

The linkup with monetary data may take place at several levels:

- gross fixed capital formation of characteristic producers and the development of stocks of facilities during a given period,
- current uses of producers and the stock of installed facilities.

10012 To the extent that current uses are broken down into intermediate consumption, compensation of employees and consumption of fixed capital, they can be related to the labour force, to physical quantities of inputs and stock of fixed assets. It will be noted that, inversely, knowledge of the labour input permits in several cases compensation of employees to be calculated or estimated. Similarly, the stock of fixed assets is necessary to calculate fixed capital consumption.

Description of emissions of pollutants and pollution levels

10013 The statistical description of emissions of pollutants and pollution levels has been undertaken through a series of questionnaires of which the main one is the joint OECD/Eurostat questionnaire. This questionnaire is summarised in the various accounts.

The main issue concerns the origin of the data. The origin of data on pollution levels, or more generally on the state of the environment, does not raise any special problems to the extent that the data is the result of measurements carried out through observation networks on the quality of water, air, the number of species, etc. This is not the case for the measurement of emissions of pollutants.

10014 Data on emissions of pollutants is forthcoming:

- from direct observation, in the case of certain large capacity units which have, voluntarily or for legal or regulatory reasons, measurement systems for controlling or monitoring; in the case of households' waste or waste water the existence of specialised characteristic activities allows for the measurement of pollution output. In the case of hazardous waste, administrative regulations generally impose the recording of physical flows,
- through the use of emission factors, for example, in the air pollution domain; Use of emission factors must take into account the environmental protection measures taken by the different branches or industries, i.e. they must rely on estimates of the extent of ancillary characteristic activities within a given branch or industry (percentage of units equipped with environmental protection equipment or facilities) or of the use of connected and adapted products.

Input-output tables, raw materials balances and emissions of pollutants

10015 Different applications of the input-output tables for uses of raw materials and emissions of pollutants have been developed or are envisaged. At the same time, raw materials balances are carried out systematically in a certain number of countries. The System of Integrated Environmental and Economic Accounting (SEEA) includes a standard description of raw materials and pollutant flows.

10016 In Germany, the Federal Statistics Office has brought out balances on energy sources and for steel using the input-output table method. Eurostat, through its Task Force on input-output tables, examined the applications of input-output tables to the description of uses of raw materials, energy and pollution output. These developments make it possible to associate with the different branches of economic activity (as well as with final consumption of households) either the uses of raw materials or energy or the emissions of pollutants, for each major domain (waste, waste water, etc.).

10017 In the Netherlands, work has been based on raw materials balances systematically since the end of the 70s. These balances constitute the basis of proposals concerning measures capable of reducing environmental pollution. Certain EFTA countries, notably Austria, Norway and Sweden, have been engaged in similar endeavours over a number of years. Certain of them, covering "sensitive" raw materials (cadmium, mercury, etc.), describe uses as well as pollutant flows.

In certain cases, raw materials balances - when stocks and transfrontier movements are integrated (cf. Statistics Netherlands' studies on phosphorous) - make it possible to link emissions of pollutants and pollution levels, thereby furnishing a first indication of the link between protection measures and the pollution levels of the environmental media.

Lastly, the introduction of eco-balances and environmental audits in the field of Community legislation should lead to substantial improvements in information on pollutant flows.

Interlinking emissions and monetary data

10018 As has been seen, data on emissions result from:

- direct measurements,
- calculations based on the analysis of the production or consumption process through the use of emission factors.

Data on emissions must allow for the calculation of "avoided emissions". Avoided emissions are of particular importance in order to assess the effectiveness of prevention (generally ancillary) activities and use of connected and adapted products.

10019 As concerns specialised characteristic activities, physical data generally result from direct measurement. For sewerage and treatment of waste water, for waste treatment, noise control through the use of noise screens, nature protection (protected areas), etc., the linkup between EPEA transactions described in monetary or physical terms and the pressures on the environment gives rise to no particular problems, except those related to data collection (classifications, statistical units, etc.). Effectiveness indicators linking pollution collected, treated, disposed of and collection, treatment and disposal expenditure can be calculated.

- 10020 As concerns prevention activities, avoided emissions have to be calculated. Determination of avoided emissions necessitates the assessment of variations of emissions between two periods. Variations must be analysed. For a production or consumption activity, variations of emissions may result from variations in the level of activity, changes in emission factors of the inputs used, including changes in the conditions of use, and finally changes in the products' uses.
- 10021 Effects of variations in the activity level have to be isolated. Changes in emission factors related to the use of a given product (or the conditions of use of a given product) may be linked with prevention activities, whatever they may consist of: in-process modifications related to introduction of new technologies, end-of-pipe equipment for reducing emissions into the media, etc. Changes in the products' uses may be related with expenditure for adapted products.
- 10022 When data on pollution and avoided pollution result from calculations based on the analysis of the production or consumption process through the use of emission factors it appears that close integration between the monetary data (and the physical data describing characteristic activities or uses of adapted products) and data on emissions is necessary: only a detailed description of the technical conditions of production from the environmental angle (namely, the valuation of clean technologies and the use of adapted products) makes it possible to determine emissions of pollutants. This integration constitutes a guarantee of validity both as concerns the monetary data of the account and the data on emissions.
- 10023 Nonetheless, this does not mean that the effectiveness of protection measures described by the account can always be readily determined: monetary data are highly aggregated and, at best, are only available by domain (a breakdown of activities according to the nature of the pollutant is not planned). Moreover, activities usually cover a set of pollutants, whereas emissions data cover specific pollutants.
- 10024 There is no solution to this problem, except to define synthetic pollution indicators for each environmental domain. In most cases, there is no scientific basis for the aggregation of the various pollutants (even though, for example, a measurement of the contribution of different gaseous emissions to the greenhouse effect has been defined). Monetary valuation of pollution could play the role of such a synthetic indicator, nevertheless it remains controversial.

Input-output tables for characteristic activities

- 10025 As has been said (cf. § 2017) in order to simplify collection of data, the EPEA's framework relies on the use of local kind-of-activity units (local KAU), which generally correspond to units used in the collection of statistical and accounting data and constitute the basis of national accounts. The more analytical approach based on units of homogeneous production (UHP), branches and input-output tables is summarised in this section.

Presentation by branch and linkage with physical data

- 10026 One of the factors which makes the interlinking of environmental control measures and emission trends most difficult is the fact that emissions depend on the level of activity as well as on changes in the consumption of products: two recent studies⁽¹⁾ have highlighted the need to analyse not only protection measures but also all those factors which explain pollution variations. Emissions of pollutants in the air, for example, do not depend solely on the protection measures taken (desulphurisation of fuel, catalytic converters, etc.) but also on the development of the automobile stock and its use, trends in the consumption of fuel, etc., on the basis of variations in economic activity. Hence, it is necessary to describe coherently all data that has to be interlinked. To the extent that production processes, emissions of pollutants, uses of raw materials are better described in the input-output tables, it would seem preferable to describe the protection measures in this framework as well.

¹ See: A. J. de Boo : "Measuring the effectiveness of environmental control". and D. Schäfer: "The linking of monetary and physical data in SERIEE. The example of air pollution".

For a branch of activity, the following would be available:

- valuation of protection measures (ancillary activities, uses of connected and adapted products, intermediate consumption of environmental protection services, etc.),
- output,
- inputs of raw materials,
- emissions of pollutants linked with uses of inputs and technical processes.

and it would become possible to analyse the factors explaining variations in emissions of pollutants in a way that is consistent with the description of the measures.

Presentation by branch and economic analysis

10027 The studies carried out in Germany by the Federal Statistics Office⁽¹⁾ are an example of analyses which can be undertaken on the basis of the use of input-output analysis of environmental protection activities. In this context it is, in particular, possible to value, and to eliminate, double counting due to double entries of certain intermediate consumption (environmental protection services included in an indirect way in the output of environmental protection services, cf. § 2075 sq.).

Analysis of characteristic activities and uses of connected and adapted products

10028 In the EPEA simplifications are made, in particular concerning ancillary activities of specialised producers, which are not separated from their principal environmental protection activity. It should be noted that these simplifications do not strictly result from the adoption of the local KAU.

10029 The main consequence of a presentation on the basis of UHP is that classification of producers is simplified: one no longer needs to distinguish between the principal or secondary nature of characteristic activities. Classification of branches is modified in order to distinguish environmental protection branches which regroup by domain those UHP which produce specialised (non-ancillary), market or non-market environmental protection services and branches which produce adapted and connected products. All other producers are grouped by branch; they have, if any, only ancillary activities, including gross capital formation and intermediate consumption of environmental protection services and adapted and connected products.

10030 For the different branches, description of transactions linked to production and uses of environmental protection services is made according to the input-output tables, separating environmental protection related transactions.

Two input-output tables are established:

The first one, which corresponds to conventional input-output tables, provides a description of the environmental protection transactions which are not related with ancillary activities:

- description of the production of environmental protection services by the environmental protection branch(es), and imports of environmental protection services,
- description of the uses of environmental services by branches (intermediate consumption) and final users, including exports,
- description of the production of adapted and connected products,
- description of the uses of adapted and connected products,
- description of the gross capital formation of the environmental protection branches.

As necessary, labour inputs and stocks of fixed capital of the different branches are described.

¹ Cf. D. Schäfer and C. Stahmer : Input-output model for analysis of environmental protection activities (Economic Systems research, Vol. 1, N° 2, 1989)

The second input-output table describes the transactions related with ancillary activities: inputs for ancillary activities (intermediate consumption, compensation of employees, consumption of fixed capital, etc.), as well as gross capital formation for ancillary activities.

As necessary, labour inputs and stocks of fixed capital for ancillary activities are described.

Development of a recording system for eco-activities

10031 Use of the term "eco-activities" generally designates all those activities which produce characteristic services, connected products and adapted products, as well as certain products required for characteristic activities. As the description of characteristic activities is undertaken within the framework of the EPEA, interest here will be limited to activities for the production of connected and adapted products, as well as the production of specialised facilities for characteristic activities. The scope of eco-activities could, nonetheless, be expanded to include a certain number of other activities.

Three major categories of eco-activities will be distinguished, based on the following fields of interest:

- production of connected products,
- production of adapted products,
- production of facilities for characteristic activities.

Connected products

10032 For each domain a list of connected products whose uses are described in the account is established. These products may consist of:

- catalytic converters, adjustment of carburation services in the air domain,
- bin liners and assimilated products (rolling trash bins, containers, etc.) in the waste domain,
- septic tanks and related products and services in the water domain,
- exhaust pipes, installation of exhausts, double glazing, etc. in the noise domain.

Adapted products

10033 Similarly, a list of adapted products has to be established by domain.

As an indication, adapted products may consist of:

- phosphate-free washes,
- unleaded petrol,
- desulphurised fuel,
- mercury-free batteries, cadmium-free storage batteries,
- CFC substitutes, etc.

They may also consist of adapted products that produce less waste at the scrap stage (products partially or totally recyclable: cars, etc.).

Facilities and equipment for characteristic activities

10034 It is advisable to make up a list of specialised facilities, equipment or products involved in the execution of characteristic activities. These facilities and equipments cover a vast range of products of which indicative lists are given in the different sub-accounts by domain.

They span the range from filters, gravitational separators, settling basins, pumps, reservoirs in the water protection domain to special trucks, crushers, shredders, sorters in the waste domain, to filters,

carbon adsorption, ventilators, etc. in the air domain, weatherproof membranes, absorbent materials, etc. in the other domains, measurement and analysis instruments in all domains. They may also consist of certain substitution products for the production process (in the range of clean technologies), replacement of certain catalysts or inputs dangerous to the environment.

Product destination

10035 A special difficulty arises from the fact that for certain products of prime concern, knowledge of the final destination of the product is a classification criterion: hence, filters, centrifuges, pumps and sewage pipes are not eco-activity products unless they are used for environmental protection. Insofar as the producers of the products concerned are absolutely incapable of determining the uses in environmental protection, it is necessary to set up indicative supply and use tables for these products so as to be able to trace their uses. These tables can only be created following the EPEA tables.

Analysis of eco-activities and establishment of the EPEA

10036 In the EPEA certain valuations are made on the basis of extra cost; knowledge of the subsidies granted for the output of certain products is also necessary.

10037 Adapted products as well as integrated facilities are valued at extra cost compared with equivalent normal products or reference technologies. In certain cases the determination of these extra cost is undertaken by the enterprises (non-specialised characteristic producers) themselves, by valuing that proportion of a given, cleaner facility costing more than another available but more pollutant technology. However, this is not always the case, and the problem of comparisons between different countries cannot be treated at this level. In the case of adapted products, determination of extra cost requires that possible differences in quality be taken into consideration.

10038 Knowledge of subsidies received for the output of adapted or connected products is necessary in order to value the environmental protection expenditure. These subsidies are part of the environmental protection expenditure.

10039 In the two cases, a description of the output of the subject products (adapted products, integrated facilities, etc.) is required. Given these circumstances, it would appear that an analysis of eco-activities is a necessary development of the EPEA, both for consolidating account valuations and for the accounting of a sector of activity, induced by environmental protection, and apt to play an ever-greater role in the future.

Natural resource use and management account

10040 Activities for the management of natural resources are excluded from the environmental protection field. The exclusion of activities linked to energy-saving measures, as well as the specific treatment of recycling in the EPEA, recovered products not being considered as environmental output, constitute another limitation of an approach centred on environmental protection. These activities can be analysed as natural resource management activities.

10041 As has been seen (cf. § 1037 sq.) SERIEE is not limited to recording environmental protection activities; its purpose is also to describe activities for the management and use of natural resources so as to arrive at a more comprehensive description of the transactions related to the interaction between human activity and the environment.

10042 The development of a natural resource use and management account constitutes a first step in this direction. This account is intended to describe activities for the management of certain natural resources, linking monetary data with physical data. The main provisional aspects of this account are summarised in this section.

Field of natural resource use and management

Natural resources

10043 According to the generally accepted definition, natural assets correspond to non-produced assets: water (marine and inland), air, land (soil, ecosystems, etc.), wild flora and fauna, sub-soil assets, as well as living assets produced by human activities (livestock, plants). Natural assets taken as a whole constitute the natural heritage.

10044 Natural assets give rise to natural resources, the use of which can translate into a quantitative depletion of the assets concerned, if the corresponding resource consists of a good, and/or the deterioration of their quality, if the corresponding resource constitutes a service (environmental services relevant to certain natural assets: air, etc.).

Restrictions

10045 Only those natural resources corresponding to non-produced natural assets whose use takes the form of goods, are dealt with in the natural resource use and management account. Hence, produced natural resources (livestock, plants) are excluded as well as those environmental services which result from uses of certain functions of natural assets (assimilation of pollutants, aesthetic value, etc.). The natural resources retained to illustrate the structure of the natural resource use and management account are water resources and sub-soil resources.

Management activities

10046 For the purpose of the account, management activities designate:

- research for new resources,
- withdrawals from existing resources,
- activities aimed at reducing withdrawals (recovery, recycling, policies for saving or substitutes resources),
- development and regulatory activities for certain resources (e.g. inland waters).

10047 Activities which consist in the transformation of natural resources, i.e. corresponding to their use as input for the production of another product are not described in the account; however activities aimed at lowering their consumption, whether directly or indirectly are considered.

As they are described in the environmental protection expenditure account, qualitative protection activities of natural resources, whether activities for biodiversity and landscape protection or activities aimed at preserving certain functions or the quality of the natural environment (air, water, soil and ground water are excluded from the account.

10048 The following table pinpoints the field which is described by the natural resource use and management account.

Table of activities and resources

Resources	Activities	mobilisation/exploitation withdrawals	savings/recycling/recovery
inland waters		research, harnessing, treatment, distribution, recharging, regulation	savings, recycling
natural forest resources		exploitation	
wild flora and fauna		harvesting, fishing, hunting	
raw materials		research, extraction	recycling, savings, etc.
fossil energy		research, exploitation	energy savings, development of renewable energy

Accounting framework

10049 As concerns units, groupings of units as well as transactions, the accounting framework for the natural resource use and management account adheres to the main lines of the EPEA's framework. The same applies to the definition, description and valuation of various components of the national expenditure for natural resource management.

10050 On the basis of activities involved, expenditure may be divided into two distinct parts: expenditure relevant to activities whose goal is resource exploitation (expenditure for research, withdrawals, mobilisation) and expenditure relevant to activities whose goal is withdrawal reduction (recycling, recovery, raw materials or energy savings, substitution).

Two examples of accounts are presented below which correspond to these two goals: the first for inland water mobilisation and the second for recycling and savings activities. The corresponding frameworks may be applied to the different categories of resources.

Inland water mobilisation account

Activities

10051 Inland water management includes research, mobilisation and regulation of inland water resources. Research covers activities aimed at identifying new sources of inland water like prospecting, forage, etc.

10052 Mobilisation covers all activities aimed at abstraction, treatment and distribution of water resources for their various uses. The following can be distinguished:

- *Drinking water supply*: investment outlays for water abstraction (protection of abstraction perimeters, pumping stations, etc.), processing of drinking water, pressure build-up, storage and distribution, expenditure for major maintenance. Operating expenses: operating cost of production facilities, energy, purchase of treatment and distribution products, metering, billing, etc,
- *Irrigation*: all mobilisation activities corresponding to agricultural and animal breeding uses: ground water abstraction, construction of dams, catchments for surface flows, etc., including the operation of irrigation systems,
- *Industrial water*: all mobilisation activities corresponding to industrial uses of water; uses for cooling of power plants and industrial installations are included.

10053 Another distinction may be based on the conditions in which water mobilisation is carried out: a distinction can then be made between "collective" intake systems, distribution systems for the supply of a set of users which are operated, monitored, etc. by local governments (or by enterprises running concessions, etc.) and individual systems in which mobilisation is undertaken for the exclusive benefit of one (or several) user(s), for its (their) own needs, which can be likened to ancillary activities.

10054 Water regulation covers all other activities involved in the transit of water from its "natural" status to that of "controlled" water status: fitting out of rivers, especially for flood defence, construction and maintenance of waterways, water engineering and dams. Dams for the production of electricity are not considered.

10055 Recharging activities may consist of land improvement, development of vegetal cover in order to increase water infiltration and recharge phreatic water bodies. In so far as they are not accounted for in protection of soil against erosion, corresponding transactions have to be recorded in the inland water management account.

10056 Savings policies include all measures aimed at saving water, whether for household, industrial, service or agricultural uses. They may take the form of investments (irrigation systems, industrial or household facilities to reduce water consumption, recycle water, etc.) or the use of products adapted for lower water consumption (specially adapted washing machines, etc.). These activities are described in a specific recycling and saving account.

Adapted and connected products

10057 Adapted products are those products which allow for the saving of water. Thus their uses are not recorded in the inland water mobilisation account but in the water saving and recovery account. Connected products may be exemplified by water meters.

Units and groupings of units

10058 Characteristic producers are the units which execute characteristic water mobilisation activities: research, mobilisation, distribution, regulation, etc.

10059 Specialised producers execute characteristic activities as their principal activity. They may be identified by referral to the NACE Rev. 1. For the most part, these are producers which pertain to the following position:

- Class 41.00: Intake, treatment and distribution of water,
- Definition: intake, treatment and distribution of drinking, industrial and irrigation water. This position also includes desalination of marine water, which must be excluded from inland water management. It does not include the operation of irrigation systems for agriculture (classified under 01.4).

10060 Non-specialised producers execute management activities as secondary or ancillary to a non-characteristic principal activity. They may consist of farmers, industrial firms undertaking abstractions for their own use, etc.

10061 Groupings of units are formed in like fashion to those of the EPEA. Specialised producers are grouped together in an inland water mobilisation industry, other producers being grouped by industry, according to their principal non-characteristic activity in the NACE Rev. 1.

Account

Mobilisation expenditure

10062 This is defined as the sum of:

- uses by resident units of water research, mobilisation and distribution services, either as intermediate consumption by non-specialised and non-characteristic producers or as final consumption by households or general government,
- gross capital formation and acquisitions less disposals of non-produced non-financial assets for characteristic activities,
- uses of connected products by households and non-characteristic producers,
- specific transfers for water mobilisation,

which are financed by resident units.

Uses, output and financing are treated in similar fashion to corresponding transactions in the EPEA.

10063 Direct double counting must be eliminated, i.e. intermediate consumption of characteristic or connected products by specialised producers e.g. market intermediate consumption of services for water prospecting by producers of the class 41.00 is not to be recorded in the national expenditure for inland water mobilisation.

Linkage with physical data

10064 This may take place at several levels:

- research and recharging expenditure can be linked to the gross increase in proven reserves,
- mobilisation expenditure (intake, treatment, distribution) can be linked to uses (water consumption according to types of supply).

10065 The inland water mobilisation account allows for the description of all transactions linked with changes of volume in water resources. However one should take care that:

- some transactions are described in the saving and recovery account,
- water is not fully destroyed in the process of use. Only net consumption, i.e. that part of the intake of inland water which does not return to water bodies may be taken into account. It means that close linkage is to be established with a physical water resource account.

Recycling and saving account

10066 Recovery, recycling activities, as well as savings' policies of water, energy, raw materials do, in principle, reduce the net uses of natural resources. Impacts on natural resources and expenditure related to these activities and policies have to be described in order to get a comprehensive view of the interactions between economic activity and the environment.

10067 In the EPEA, although considered as characteristic activity, recycling is accounted for only for that part which corresponds to treatment and disposal of waste. Output in recycled products is not considered as environmental protection output. The same occurs with related products which result from internal recycling.

The recycling and savings account allows for the valuation of national expenditure related with recycling and savings activities.

Activities

Recycling

10068 In the NACE Rev. 1 (see 37.10 and 37.20) recycling is defined for metal and non-metal waste and scrap as:

"Processing of metal waste and scrap and of metal articles (resp. non-metal waste and scrap and of non-metal articles) whether or not used, into a form feasible to be transformed into 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.

This class excludes:

- manufacture of new material from waste and scrap (cf. 27 to 36),
- wholesale in waste and scrap including collecting, sorting, packing, dealing, etc. without an industrial process (cf. 51.57),
- wholesale or retail sale trade in second hand goods (cf. 51 and 52.50),
- treatment of food, beverages' and tobacco waste (cf. 15 and 16),
- production of new materials or products from waste and scrap such as spinning of yarn from garnetted stock or making pulp from waste paper or retreading tyres should be classified in the appropriate class of manufacturing,
- processing of depleted thorium or uranium (cf. 23.30).

Savings

10069 Savings activities are always executed as ancillary: they consist of modifications in the production process for the purpose of reducing the use of certain inputs (materials, energy). Output is valued by costs of production, i.e. intermediate consumption, compensation of employees, other taxes less subsidies on production and fixed capital consumption which correspond to the measure of savings.

10070 Recycling and savings are intimately linked. The only difference is that recycling gives rise to an output (classified as related product in the EPEA) when savings does not. In the case of internal recycling, output is not explicitly valued and therefore does not appear as a transaction in the national accounts framework and has to be valued by costs of production or by the market price of equivalent product.

Substitution

10071 For some natural resources, activities which consist of the substitution of non-renewable resources by renewable resources (cf. development of renewable energy) may be analysed as savings activity. They have to be included in the recycling and savings account.

National expenditure for recycling and savings

10072 The definition of national expenditure for recycling and savings is identical to that for environmental protection. Among the various components of national expenditure, special mention must be made of the following items:

Uses of recycling and savings output

10073 Uses are intermediate consumption of producing units of the national economy. When they consist of market recycled products, uses are recorded in the national accounts framework. When they consist of internally recycled products and savings, they are valued by cost of production and are intermediate consumption of the unit which executes the corresponding characteristic activity.

Uses of adapted and connected products

10074 Savings by households may consist of uses of adapted products. Adapted products are e.g. household appliances adapted in order to consume less energy, water, etc.

Connected products are e.g. double glazed windows (when they do not correspond to noise and vibration abatement) or more generally heat insulation. They are classified as gross fixed capital formation of housing industry, although financed by households in many cases.

Gross capital formation for recycling and savings

10075 In the EPEA, recycling units are considered as characteristic non-specialised (secondary) producers. Therefore in the case of market producers no gross capital formation is accounted for in the national expenditure. As a consequence, whole gross capital formation of market recycling units is to be accounted for in the national expenditure for recycling and savings. When it may be distinguished, gross capital formation for recycling activities executed as ancillary is to be accounted for. When it may not be distinguished, it is accounted for in the EPEA.

Specific transfers

10076 A certain number of recycling activities benefit from either direct or indirect subsidies: (cf. §20xx). Subsidies (and other transfers) for savings and substitution activities, when they lower purchasers' prices, are to be accounted for as a component of national expenditure (specific transfers). Insofar as they constitute expenditure whose end purpose is environmental protection, these transfers by general government already appear in the national expenditure for environmental protection. It therefore follows that they should not be accounted for again in the recycling and savings account.

Boundary with the environmental protection expenditure account

10077 National expenditure for environmental protection excludes related products, which are not considered as environmental output. Value of related products (in particular of recycled products) is deducted from cost of production, in the case of activities executed as ancillary and of global output in the case of specialised activities. On the other hand, "savings" which result from environmental protection activities are not deducted from environmental output and are part of national expenditure, even if they are deducted in the calculation of environment-related financial burden. Finally, as has been seen, subsidies for recycling activities, either executed as ancillary or executed as specialised, are accounted for in national expenditure.

Therefore:

- value of related products which result from environmental protection activities must be recorded in recycling and savings account, as component of the national expenditure,
- as concerns savings, only those activities whose explicit purpose is savings, are to be included in the recycling and savings account,
- subsidies for recycling which enter in national expenditure for environmental protection are not to be recorded in national expenditure for recycling and savings.

Financing

10078 Financing of national expenditure for recycling and savings deserves specific considerations. In a first approach, financing is treated in the same way as financing of national expenditure for environmental protection. Users finance their uses and eventually benefit from transfers. Net financing of national expenditure may be calculated for the various institutional sectors.

10079 However, from the units' and environmental point of view, analysis is a little more complex. From the units' point of view, as uses correspond to products they actually use or to the cost of their savings activity, "net" financing should be considered. Net financing is equal to the difference between the value at market price of products equivalent to the recovered or the saved products. As recovered products are already valued at market prices, it corresponds to the difference between the cost of the savings or substitution activities and the value of the savings or substituted products at market prices.

10080 From an environmental point of view, whether recycling and savings activities are to be classified as environmentally friendly activities has to be discussed. It is not true in all cases that recycling, savings and substitution result in a reduction in uses of non-produced natural resources. Recycling, savings and substitution activities are to be analysed in a detailed way before one can conclude that they result in savings of natural resources. Eco-balances are in particular to be drawn: recycling of metal scrap leads to a direct reduction of uses of ores, but also leads to an increase of the uses of other products (intermediate consumption, fixed assets, etc.).

10081 Generally speaking one should specify which recycling or savings activities are related with such or such natural resources. Energy saving has different environmental impact if it bears on energy from renewable or non-renewable origin. Paper recycling has positive effects on uses of wood and forests natural resources but may increase uses of other products and natural resources.

10082 Close linkage with physical natural resource accounts has therefore to be established prior to any conclusion about the environmental effects of recycling, savings and substitution expenditure.

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