ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

THE ENVIRONMENTAL GOODS & SERVICES INDUSTRY

MANUAL FOR DATA COLLECTION AND ANALYSIS

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT
STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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Manuel de collecte et d'analyse des données

FOREWORD

In the context of globalisation, technological change, and new political priorities, policy makers have expressed a strong interest in the environmental goods and services industry. This is widely seen as a new growth sector, generating wealth and creating jobs as well as playing a major role in the transition of economies towards sustainable development.

OECD interest in the environment industry arose initially as part of the Industry Committee activity on Environmental Policy and Industrial Competitiveness. A first report was prepared in 1992 to describe the status of this industry, market developments and the impact of environmental policies.[1] Interest in the environment industry was re-affirmed by the Industry Committee in 1994, and in subsequent work on new growth industries. A new report on the environment industry received wide recognition and showed a clear need for continued analysis and improved data on the industry.[2]

In its Communication on "Industrial Competitiveness and Protection of the Environment", the European Commission stressed that "the significance of the environmental goods and services industry as a fast-expanding industrial market can no longer be denied, even though considerable doubt surrounds its exact level of development".[3] A more recent Communication from the Commission on Environment and Employment emphasises the employment effects of environmental policy and the positive link between sustainable development and employment.[4] It recognises that the development of a strong environmental goods and services industry can make a major contribution to enabling enterprises to better integrate cleaner technologies and environmental practices in production and more generally improve environmental performance.

This policy interest has raised a number of questions on different aspects of the environment industry. These include: what is the potential for growth and employment creation, what has been the record in exporting environmental technologies, is there progress in research and development for cleaner products and processes, can we measure the impact on industrial competitiveness due to the application of cleaner technologies, and how can environmental and economic policy be modified to encourage and support growth, job creation and trade in the environment industry? Answering these questions poses statistical and methodological difficulties related to problems of industry delimitation and data availability.

In response to such questions, a first meeting was organised in Washington in 1994, supported by the US government (US EPA and Department of Commerce), to help collect more comprehensive information to enable a clearer definition and classification of the environment industry, and provide a foundation for more firmly based policy analysis.[5] As a follow-up to the Washington meeting, the OECD, in collaboration with Eurostat (the Statistical Office of the European Communities), organised an Informal Working Group (see Annex 8 for participants) to work towards definition and classification of the environmental goods and services industry.

The OECD/Eurostat Informal Working Group on the Environment Industry developed a common definition and classification of the environment industry, in order to improve the collection of consistent information on production, employment, trade, investment and R&D. It gathered experts from OECD countries who collect and analyse data on the environmental goods and services industry as part of their work at national ministries for economics or industry, national statistical offices, or public and private research institutes.

At its first meeting in Luxembourg in April 1995, the OECD/Eurostat Informal Working Group agreed on an interim definition and classification of the environment industry which was published in 1996.[6] The

definition and classification were tested during 1996 and 1997 by collecting new data and re-organising available data in OECD countries. In particular, the United States, Canada, the Commission of the European Communities and France used this classification to design and carry out new surveys and studies on the environment industry. The interim definition and classification was refined and improved on the basis of this new work by the OECD/Eurostat Informal Working Group at its second meeting in Luxembourg in May 1997.

The results of this work have been used in the drafting of the present manual, the need for which was expressed during the first Luxembourg meeting in 1995. The manual was prepared under the joint aegis of the OECD and Eurostat. It provides a set of flexible guidelines that can be used to produce comprehensive and comparable data on the environment industry. Governments, researchers and consultants are encouraged to use it as a reference for their future initiatives and work.

Special thanks are due to all the experts who contributed their time and resources to this first edition of the *Environmental Goods and Services Industry Manual*. Special thanks also go to all the colleagues in OECD for their comments and contributions. The work was organised by Mr G. Vickery and Ms M. Iarrera of the OECD Industry Division, and by Mr A. Steurer of Eurostat. The manual is published on the joint responsibility of the Secretary-General of the OECD and the Director General of Eurostat.

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EUROSTAT

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Chapter I

OBJECTIVES AND SCOPE OF THE MANUAL

1. Preamble

Many studies have attempted to quantify the impact of the environmental goods and services industry on economic growth. Identifying this industry is not straightforward because enterprises engaged in many different industrial activities are involved in producing environmental goods and services. Some of these are new firms specialising in this area, while others operate in traditional industries with low specialisation in the environment. Some firms produce environmental services for their own use; others, which used to do so, now outsource this activity. Only if all environment-protection-related activities can be identified, *i.e.* those by specialist firms, those by non-specialist firms in other industries, and those produced by firms for their own internal use, can we begin to speak of an "environmental protection industry" with some precision, as we do for, say, the iron and steel industry. Further, because many of the products used for environmental protection are multi-purpose, it is impossible to identify a set of products as being exclusively and exhaustively used for environmental protection. This means that it is neither possible to point to an "environmental protection industry" or to environmental protection products exclusively and exhaustively within the standard international classification of industrial activities (International Standard Industrial Classification, ISIC) or products (Central Product Classification, CPC), nor to use standard statistical collections based entirely on existing classifications to measure the industry. New techniques have to be developed in order to identify as closely as possible enterprises, activities and products involved in the environment industry.

There is considerable interest in dealing with these difficulties and disparities in order to make available data that is broadly comparable across countries. The OECD/Eurostat Informal Working Group on the Environment Industry met several times between 1994 and 1997 to share experiences and harmonise views on the environmental goods and services industry. An interim definition and classification of the environmental goods and services industry was published in 1996.[1] The interim report proposed an OECD-wide definition and classification and identified a set of "core" environmental goods and services activities.

The definition and classification were subsequently tested to verify their feasibility. The United States, Canada, the Commission of the European Communities and France used the interim definition and classification to collect new data on environmental goods and services but with somewhat different approaches and methods. The United States, Canada and France undertook direct surveys of the environmental goods and services industry, while the European Commission adopted a combined approach which gathered and matched information from different sources (*e.g.* direct survey, environmental expenditure) on the basis of the UN System for Integrated Environmental and Economic Accounting (SEEA).

The experience gained through the implementation of these new data surveys was used to modify and improve the definition and classification and to provide a set of guidelines on best practices and methods for data collection on the environmental goods and services industry. The results form the basis of this first edition of the *Environmental Goods and Services Industry Manual*. This manual was extensively discussed, both internally by the OECD/Eurostat Informal Working Group on the Environment Industry and externally with various Departments of the OECD (the Science, Technology and Industry Directorate, the Statistics Directorate, the Environment Directorate), Eurostat and the UN Statistics Division.

Chapter I specifies the objectives and scope of the *Environmental Goods and Services Industry Manual*. Chapter II describes the general concepts, definition and classification of the environment industry, while Chapter III presents a general framework for the collection of data, indicates the relative strengths and weaknesses of each method and approach, and recommends best methods for analysis. Chapter IV describes methods and approaches for data collection and analysis. Chapter V discusses outstanding issues. Annex 1 provides a detailed description of the environmental goods and services industry classification. Annex 2 shows links between environmental goods and Harmonized Commodity Description and Coding System (HS) commodity codes for international trade. Annexes 3, 4, 5 and 6 illustrate the practical experience gained in OECD countries in using standard classification systems to define and measure the environment industry. Annex 7 presents an example of a more detailed breakdown of the environment industry and Annex 8 gives the composition of the OECD/Eurostat Informal Working Group on the Environment Industry.

2. Objectives and scope

This manual aims to serve as a set of guidelines to assist in developing new data collection and studies and to enable more rigorous and improved cross-country comparison of work in this area. It proposes a definition and classification of the environmental goods and services industry, describes methods for data collection and recommends best methods and approaches for analysis.

The definition and classification aim to be as complete, flexible and operational as possible in order to measure the environment industry as it currently stands, and to allow for future structural changes, such as shifts from end-of-pipe to cleaner technologies or the development of new environmental services.

The methods and approaches recommended in this manual have been assessed by statisticians, researchers and consultants on the basis of current best practices in OECD countries. National statistical offices and researchers are provided with a toolbox that allows flexible adaptation to specific national situations in terms of the predominant policy interests, data availability, research budgets and structure of the industry.

3. Possible future revisions

In drafting this manual for data collection and analysis of the environmental goods and services industry, the OECD/Eurostat Informal Working Group recognised that it constitutes "work in progress", as the statistical assessment of the environmental goods and services industry is complex, and available data are limited, incomplete and not always comparable across countries. Furthermore, accounting for certain classes of environmental goods and services, such as cleaner technologies and products, remains difficult and/or laborious. In future, more appropriate solutions may be found for these classes based on the experience gained in data collection. For example, the implementation of new classifications of industrial activities and products (*e.g.* the North American Industry Classification System, the UN Central Product Classification) is proceeding, and results are not yet fully available in all countries. Moreover, important new data collection exercises on the environmental goods and services industry have been undertaken or are planned in a number of countries (*e.g.* France, Germany). This work will also help to clarify outstanding issues such as those identified in Chapter V.

The OECD/Eurostat Informal Working Group considers it important to produce this *Environmental Goods and Services Industry Manual* at this point in time so as to provide a solid, although necessarily incomplete, reference point for future work. The manual will be revised if there is sufficient practical experience to show that the definition, classification or methodologies have become out of date or are not operational. For example, if further development and improvement of environmental statistics enable a more systematic and efficient definition, classification and collection of data on cleaner technologies, processes and products, then the OECD/Eurostat Informal Working Group will initiate a revision process.

Chapter II

GENERAL CONCEPTS

1. Definition of the environment industry

After considering various definitions of the environment industry, the OECD/Eurostat Informal Working Group agreed on the following definition:

> *The environmental goods and services industry consists of activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems.*
>
> *This includes cleaner technologies, products and services that reduce environmental risk and minimise pollution and resource use.*

For cleaner technologies, products and services, despite their importance, there is currently no agreed methodology which allows their contribution to be measured in a satisfactory way.

It is not possible to exclusively or exhaustively identify environmental goods and services. Many goods which may be used for environmental protection, for example pumps, may also be used for quite different activities, and some goods which at first sight may seem unconnected with the environment may in certain applications be so used.

Information on the environmental goods and services industry should be presented in a way that allows a breakdown into principal, secondary and ancillary activities, and private and public activities where possible and practical. This breakdown is useful for the following reasons.

Principal, secondary and ancillary activities: The firms that are of interest in identifying the environmental goods and services industry are those which produce significant amounts of products deemed to be actually or potentially useful for environmental protection. This is a variation on usual practice in national accounting whereby firms are allocated to industries according to the principal (main) product. Relatively few firms are so specialised that they produce only a single product, and those that are tend to be very small. Larger firms almost always produce one or more secondary products. If we measure the activity of all firms whose principal product is environmental, we may include non-environmental secondary products and exclude environmental secondary production from non-environmental firms. To minimise the exclusion of the latter, it is possible to be more inclusive in the definition of the "industry" by specifying "significant" production rather than main production of environmental products.

In addition to principal and secondary products, most firms also produce ancillary services, the output of which is not intended for use outside the enterprise. An ancillary activity is undertaken within an enterprise to create the conditions within which the principal and secondary activities can be carried out (*e.g.* record-keeping, purchasing of material and equipment, hiring, training, managing and paying employees, cleaning and maintenance of buildings and other structures, etc.). An ancillary activity may grow to the point that it has the capacity to provide services outside the enterprise. For example, a waste management unit may develop in-house capabilities for which there is outside demand. When an ancillary activity starts to provide services to outsiders, that part of the activity which produces output for sale has to be treated as secondary rather than ancillary.[2]

In the same way, an enterprise may have to choose between undertaking ancillary activities which provide supporting services for its principal or secondary activities or purchasing such services on the market from a specialist service producer. In this case, if ancillary activities are not separately considered,

institutional changes, which lead to the outsourcing of ancillary activities, may be interpreted as growth rather than as a substitution of internal (ancillary) activities by external (market) transactions. There is some evidence of a trend towards outsourcing of previously ancillary environmental activities or vice versa as a result of economic forces, including the introduction of more stringent environmental regulations. Therefore, it is suggested that, wherever possible, separate information on ancillary activities be provided.

Private and public activities: Ownership structures in the environmental goods and services industry differ widely across countries. This is particularly true for the provision of environmental services. For example, public shares of municipal waste management range from some 25% in Spain and France, to 85% in countries such as Denmark and Portugal. Similarly, the public sector share of municipal wastewater management ranges from 15% of the market in the United Kingdom to 95% in Germany (Drouet, 1997*a*).

There is evidence of a trend towards privatisation, either through increased subcontracting to private institutions or through full privatisation of environmental activities. If data collection and analysis cover only private activities and ownership, then changes resulting from privatisation (or contracting out) of activities that were previously carried out in the public sector could lead to an overestimation of the environmental goods and services industry private sector growth rate, and render national studies less comparable. Distinctions between private and public ownership, and measurement of both, provide the information necessary to avoid such mis-interpretation.

As a general conclusion, where the above recommendations cannot be applied in full, it is suggested that studies and analytical results clearly label the types of activities that are described (private, public, etc.), and furnish some indicators for the trends in privatisation or outsourcing in order to ensure correct interpretation of the data.

2. Classification of the environment industry

A general framework

In classifying the environmental goods and services industry, the OECD/Eurostat Informal Working Group underlined that the major concern is to provide a system which is accurate and useful, and which can be adapted to future needs. This industry is forecast to experience substantial structural changes, which include concentration, privatisation, a shift away from the production of end-of-pipe equipment to the invention of new, integrated and cleaner technologies, and a move to totally new activities (*e.g.* environmental services). To achieve a flexible classification system which will capture such changes, the environmental goods and services industry is classified according to the matrix shown in Table 1. This matrix combines general categories of business activities of different kinds (columns) and the related environmental goods and services activity classes (rows). It can be modified and adjusted to better reflect the structure of the environmental goods and services industry in different countries at different moments in time.

Guidelines underlying the classification

In classifying the environmental goods and services industry, activities producing environmental goods and services have been grouped on the basis of two main guidelines:

- the clear environmental purpose of goods or services supplied by the environmental goods and services industry; and
- ease of statistical assessment of these activities and products.

The first guideline distinguishes between activities or products which directly aim to protect the environment and have a clear positive impact on environmental protection, and those which are carried out for other reasons but which can also be used to protect, or are beneficial to, the environment. This guideline is particularly useful in identifying multi-purpose products (*e.g.* pumps, and products such as more energy-efficient cars), or activities and products provided by highly diversified enterprises. The second guideline provides a practical and cost-effective approach to data collection. The collection of

Table 1. **Mapping environment activities**

Business activities	Production of equipment and specific materials	Provision of services	Construction and installation of facilities	.....
Environmental goods and services classes				
Pollution management group				
Air pollution control				
Wastewater management				
Solid waste management				
Remediation/clean-up of soil and water				
Noise/vibration abatement				
Monitoring, analysis, assessment				
Cleaner technologies and products group				
Resource management group				

Note: This matrix is used to allocate business activities carried out by the environmental goods and services industry to environment classes. The environmental goods and services industry is assessed by filling the cells to indicate where satisfactory definitions and reliable data are available. This process can be repeated to adjust the classification to structural changes in the industry. The matrix is designed to allow comprehensive identification of environmental goods and services industry classes. Not all cells in the matrix can be satisfactorily filled due to limitations in the current state of knowledge and data collection possibilities. In addition, not all the cells of the matrix are considered to be of sufficient quantitative importance to justify major investment in data collection and research.

information and the international comparability of data should be time- and resource-efficient. Therefore, if the assessment of a particular class of environmental goods or services is likely to produce imprecise or ambiguous results and is resource-intensive, then it may be more convenient to neglect it for the time being (*e.g.* cleaner technologies and products).

In accordance with these guidelines, the environmental goods and services industry has been divided into three main groups: a "Pollution management" group; a "Cleaner technologies and products" group; and a "Resource management" group.

The "Pollution management" group comprises goods and services that are clearly supplied for an *environmental purpose* only, that have a significant impact in reducing polluting emissions and that are *easily statistically identifiable*.

The "Cleaner technologies and products" group comprises goods and services which reduce or eliminate negative environmental impacts, but which are often supplied for other than environmental purposes and for which statistical assessment remains disputed, difficult or expensive. The classification and collection of data for the cleaner technologies and products group is still in the development stage.

The "Resource management" group comprises goods and services which may be associated with environmental protection, although their prime purpose is not environmental protection (*e.g.* energy saving and management, renewable energy plants or indoor air pollution control). This group will most often be an optional addition to collection of data, and its inclusion will depend on policy interest and statistical feasibility. The classification and collection of data for the resource management group is still in the development stage.

To ensure international comparability it is most important to collect and present data in a way which allows identification of individual parts of the industry, especially with respect to the borderlines between "Pollution management", "Cleaner technologies and products" and "Resource management".

The "Pollution management" group represents the core of the environmental goods and services industry, as all activities have as their main aim to protect the environment and data are easily collected. "Cleaner technologies and products" and "Resource management" are also significant areas and it is believed that their importance will increase in the future (see *e.g.* IVA 1996, OECD, 1996*a*). However, these latter two areas suffer from identification, measurement or agreement problems, with the result that there is little comparability between existing data, which have usually been collected on the basis of different definitions and different groupings of activities.

The classification

The environmental goods and services industry is classified according to the economic activity undertaken. Each broad class of activities is described in detail in Annex 1. The basic structure is as follows:

– *Level 1* distinguishes the three main groups: A. Pollution management; B. Cleaner technologies and products; C. Resource management.

– *Level 2* distinguishes the main categories of environmental protection business activities: production of equipment and specific materials, provision of services, construction and installation.

– *Level 3* comprises the main classes of environmental protection activities: air pollution control, wastewater management, solid waste management, remediation and clean-up of soil and water, noise and vibration abatement.

The OECD/Eurostat Informal Working Group favoured the above system of classification as it better reflects the structure of enterprises supplying environmental goods and services. The starting point for this work is an adaptation of the Classification of Environmental Protection Activities (CEPA) in the SERIEE.[3]

A. POLLUTION MANAGEMENT group

Production of equipment and specific materials for:

1. Air pollution control.
2. Wastewater management.
3. Solid waste management:
   - 3.1. Hazardous waste collection, treatment and disposal;
   - 3.2. Waste collection, treatment and disposal;
   - 3.3. Waste recovery and recycling (excludes manufacture of new materials or products from waste and scrap).
4. Remediation and clean-up of soil, surface water and groundwater.
5. Noise and vibration abatement.
6. Environmental monitoring, analysis and assessment.
7. Other.

Provision of services for:

8. Air pollution control.
9. Wastewater management.
10. Solid waste management:
    - 10.1. Hazardous waste collection, treatment and disposal;
    - 10.2. Waste collection, treatment and disposal;
    - 10.3. Waste recovery and recycling (excludes manufacture of new materials or products from waste and scrap).
11. Remediation and clean-up of soil, surface water and groundwater.
12. Noise and vibration abatement.
13. Environmental R&D.
14. Environmental contracting and engineering.
15. Analytical services, data collection, analysis and assessment.
16. Education, training, information.
17. Other.

Construction and installation for:

18. Air pollution control.
19. Wastewater management.
20. Solid waste management:
    20.1. Hazardous waste collection, treatment and disposal;
    20.2. Waste collection, treatment and disposal;
    20.3. Waste recovery and recycling (excludes manufacture of new materials or products from waste and scrap).
21. Remediation and clean-up of soil, surface water and groundwater.
22. Noise and vibration abatement.
23. Environmental monitoring, analysis and assessment.
24. Other.

B. CLEANER TECHNOLOGIES AND PRODUCTS group

Production of equipment, technology, specific materials or services for:

1. Cleaner/resource-efficient technologies and processes.
2. Cleaner/resource-efficient products.

C. RESOURCE MANAGEMENT group

Note: For this group, activities aimed at the production of environmental goods and services and related construction are grouped together for convenience. However, it is suggested that, wherever possible, information on these items be separately collected and presented.

Production of equipment, technology and specific materials, provision of services, and construction and installation for:

1. Indoor air pollution control.
2. Water supply.
3. Recycled materials (manufacture of new materials or products from waste or scrap, separately identified as recycled).
4. Renewable energy plant.
5. Heat/energy saving and management.
6. Sustainable agriculture and fisheries.
7. Sustainable forestry.
8. Natural risk management.
9. Eco-tourism.
10. Other (*e.g.* nature conservation, habitats and biodiversity).

Chapter III

A SYSTEM FOR DATA COLLECTION AND ANALYSIS

1. The general framework

Data for industrial activities are generally collected on the basis of national or international standard classifications. In the case of the environment industry, information and data cut across standard classifications of economic activities, making usual statistical assessments difficult, if not impossible.

An assessment of the environment industry requires the implementation or combination of alternative methods. As different methods have different data coverage, benefits and costs, the OECD/Eurostat Informal Working Group on the Environment Industry recommends that those collecting data on the environment goods and services industry:

- Clearly identify the aims of the enquiry and economic variables which best fulfil information needs. As no single method ensures – at low cost – data for the whole environmental goods and services industry for all economic variables, it is recommended that the objectives and information needs be clearly analysed and stated before choosing the most appropriate methods for data collection and analysis.
- Identify the best method or combination of methods for data collection and analysis according to the aims and information needs, desired coverage of the industry and cost effectiveness.

Identifying the *aims* of the enquiry and the optimal set of *economic variables* requires careful consideration of the policy questions which the enquiry will have to address. For example, if policy makers are interested in understanding the environmental goods and services industry's contribution to economic growth, the aim of the enquiry will be to acquire knowledge about the relative impact of this industry on the economy as a whole, and annual growth rates for the industry (for turnover, value added, employment, etc.), will be the most appropriate economic variables (see Table 2).

In general, information should be collected at least for the following standard economic variables to enable basic analysis of the environment industry, as far as possible broken down by environmental protection activity (air pollution control, wastewater management, solid waste management, etc.) and business activity (production of equipment and specific materials, provision of services, construction and installation):

- turnover;
- employment (if possible by skill level or occupational classification);
- investment;
- exports;
- R&D.

For a full analysis of the environmental goods and services industry, the following further information, obtained from other sources or by other methods, would be particularly helpful:

- innovation (from innovation surveys);
- patents (national or international patent statistics);
- state aid for industry promotion and exports (from government sources);
- mergers and acquisitions (information may be obtained from structural statistics, or from specialised consultants and financial analysts).

Table 2. **Correspondence between policy questions and economic variables**

Policy questions	Variables/ indicators
Environmental goods and services industry contribution to economic growth	⇒ Annual growth in turnover, value added, employment, etc.
Environmental goods and services industry production and employment	⇒ Turnover, value added, employment and type of jobs
Environmental goods and services industry contribution to international trade	⇒ Exports, imports, international direct investment, licensing agreements
Environmental goods and services industry contribution to regional, structural strategies	⇒ Turnover, value added, employment, etc., by region or industry structure
Interaction between R&D policy and environmental technology development	⇒ Environmental R&D as share of total R&D; new patents for environmental technology
Cost of environmental services	⇒ Price per unit of environmental services (*e.g.* $/tonne of treated waste)
Barriers to international competition in the provision of environmental goods and services	⇒ Share of the market served by local suppliers or monopoly suppliers
Ability of environmental goods and services industry activities to meet environmental protection goals	⇒ Environmental industry activities linked to environment indicators
Environmental goods and services industry contribution to sustainable development	⇒ Preventive activities' (*e.g.* cleaner technologies and products) share of total environment industry output
Environmental goods and services industry and innovation	⇒ Environmental goods and services industry R&D and investment expenditure, non-economic data, *e.g.* patent counts
Ownership, concentration and structure of the environmental goods and services industry	⇒ Number and size of producers by ownership (domestic/foreign, public/private), mergers and acquisitions

Source: Based on Drouet (1997*a*).

Having identified aims and economic variables, it is crucial to choose the method which will provide all (or most) of the required information. The OECD/Eurostat Informal Working Group on the Environment Industry suggests alternative methods of four different kinds: s*upply-side approach; demand-side approach; integrated supply and demand approach*; *other methods.*

The *supply-side approach* is characterised by the collection of information on the supply of goods and services for environment protection, principally by means of targeted surveys of environmental goods and services industry producers. *The demand-side approach* is characterised by the collection of information on the demand for goods and services for environment protection in the form of data on environment protection expenditure. The *integrated supply and demand approach* combines information available on both the supply and demand sides and attempts to reconcile this information in a consistent accounting framework.

Historically, the supply-side approach has been used by statistics-gathering bodies within governments to collect information on manufacturing enterprises (often collected by government Industry Departments); and on environmental services (often collected by government Environment Departments). Statistical offices have tended to use the demand-side approach and have only recently started to launch more comprehensive supply-side surveys (*e.g.* Canada, France, Germany, the United States). Outside government, business associations frequently survey their members in manufacturing or services.

In this chapter, these approaches and methods will be described and analysed, indicating data coverage, advantages and disadvantages of each, in order to help collectors of data on the environmental goods and services industry choose the best mix of methods and approaches.

2. Evaluating methods for data collection and analysis

To identify the best method or combination of methods for data collection, it is suggested that the methods be evaluated on the basis of the following criteria: *magnitude of business activities* which constitute this industry*; data coverage and collection efficiency* (extent and level of detail of information needed for the analysis of the environment industry, and the relative costs in terms of resources and time to collect these data); *economic variables and data quality* (each method has its strengths and weaknesses in delivering information on specific variables – see below for details).

Magnitude of business activities. It is recommended that the structure of the environmental goods and services industry and the relative weight of each business activity be taken into consideration in the choice of the appropriate method to be used. Table 3 shows OECD average relative weights of business activities of the environmental goods and services industry. Equipment manufacturing and provision of services together constitute some 70-80% of the environment industry. Methods which provide comprehensive data for equipment manufacturing and provision of services will give a better idea of the size and structure of the industry as a whole than will methods which only cover engineering and research and development, since the latter represent only a small fraction of the industry.

Table 3. **Typical structure of the environmental goods and services industry in OECD countries, by business activity**

Environmental goods and services industry business activities	Share of the total environment industry
Equipment manufacturing	25-35%
Provision of services	40-50%
Research and development	2-4%
Engineering services	5-10%
Construction and installation of facilities	15-25%

Note: Shares are based either on value added or employment. These indicative estimates are derived from the results of environmental goods and services industry surveys and studies in OECD countries.
Source: Drouet, 1997*a*.

Data coverage and collection efficiency. To select the most appropriate method, it is recommended that the effectiveness of each method be evaluated in terms of data coverage. Each method will provide a different level of coverage for different business activities. Table 4 assesses each method with regard to data coverage for different business activities. The rankings are based on experience gained across OECD countries and on the amount and quality of data already available from other statistics (*e.g.* pollution control expenditure statistics).

Table 4. **Coverage of environmental goods and services industry business activities using different methods**

Business activities	Supply-side survey	Standard statistics	Trade association data	Demand-side data	Physical data combined with financial ratios	Combining supply and demand side approaches
Equipment manufacturing	A	C/D	B/C	B	B/D	B
Provision of services	A/B[a]	B/C	B/C	B	B	A
Research and development	B	C	E	C	E	A
Engineering services	A	C	B/C	B/C	E	A
Construction and installation of facilities	A	B/C	C	B	B/D	A

a) Marketed services are well covered, but public sector service provision and in-house services may be difficult to cover.
Key: A: Good coverage.
B: Reasonable coverage.
C: Method applicable for providing sub-activity data, but not sufficient to cover the entire activity.
D: Not sufficient, needs further development.
E: Not normally applicable.
Source: OECD, based on national surveys and research results.

In order to make best use of Table 4, it should be borne in mind that the methods differ in their ability to cover private and public, and primary, secondary and ancillary activities. For example, supply-side surveys are best suited to covering private and public enterprises producing environmental goods and services, and are less powerful when it comes to ancillary activities and some government activities. Demand-side data based on environmental expenditure statistics, on the other hand, often provide better information on secondary, ancillary and some government activities, whereas data on the private environmental goods and services supply industry are only covered indirectly (for details see Chapter IV).

The third approach, which combines supply- and demand-side data, is not an independent data collection method in itself. It is instead a modelling approach which merges data from other methods.

Economic variables and data quality. The different statistical approaches and methods are also evaluated according to the main economic variables: turnover (defined as the value of the goods and services that a company/enterprise has sold during a period of time), value added, employment, exports and imports, number and size of enetrprises, etc. Table 5 shows an evaluation of each method with regard to data quality for each variable. As data quality only refers to the level of detail provided by each method, Table 5 should be read in combination with Table 4 to gain a more comprehensive picture of the strengths and weaknesses of the different methods.

While the combination of supply- and demand-side information increases the coverage of environmental goods and services industry classes (*i.e.* it is to some extent additive, see Table 4), the quality of the data is not necessarily improved. Consistency and reliability of data increase for broad categories, but at the expense of the level of detail.

Table 5. **Quality of environmental goods and services industry variables using different methods**

Variables	Supply-side survey	Standard statistics	Trade association data	Demand-side data	Physical data combined with financial ratios	Combining supply and demand side approaches
Turnover	1	2	2	2	3	1
Value added	3	3	4	4	4	3
Employment	1	2	2	2	4	3
Investment	1	1	2	2	3	3
Exports[a]	1	3	2	4	4	3
Research and development[b]	1	3	2	2	4	4
Number and size of enterprises	2	1	2	4	4	4

a) Imports of environmental goods and services are in general very difficult to measure.
b) Research and development activities of environmental goods and services providers. They may also include non-environmental research and development.
Key: 1: Good quality, detailed and reliable data.
2: Reasonable quality, some weaknesses in level of detail or reliability.
3: Estimates or modelling results. Reliable at aggregate level, generally weak or unreliable at disaggregated level.
4: Insufficient quality/variable not covered.
Source: OECD, based on national surveys and research results.

3. Some suggestions

Specific supply-side survey

As indicated in Tables 4 and 5, *a comprehensive supply-side survey* is the best method as far as data coverage and quality are concerned. Work by the OECD/Eurostat Informal Working Group on the Environment Industry suggests that supply-side surveys are indispensable to provide comprehensive information on the environmental goods and services industry. By using a specific survey, it is possible to provide detailed information covering most relevant economic variables (*e.g.* turnover, employment and exports by environmental class, by size class of enterprise and with reference to standard industrial classifications, R&D) for most environmental goods and services industry classes. Direct surveys will also provide reliable information on public and private R&D.

However, specific surveys present some inconveniences. For example, they do not capture all turnover (*e.g.* secondary and ancillary activities) and employment effects of environment protection activities. They more easily survey information for turnover and labour employed in the production of goods and services when these are marketed. They are less effective in measuring values for the same variables when activities are non-market, ancillary or multi-purpose.

Furthermore, double counting is a problem specific to comprehensive surveys with respect to turnover estimates. For example, if filter cloths and complete filters are both included in the list of environmental goods, the same filter cloths may appear twice. This problem is particularly severe in the field of waste management as it is characterised by complex relationships among public and private waste collectors, specialised treatment operators, recycling firms, etc. Also, survey results often include information relating to secondary, non-environmental activities. Even if it is possible to exclude this output, it may be difficult to separate out the labour and other costs according to whether they are connected to the environmental or the non-environmental output.

Although specific surveys of environmental goods and services enterprises deliver the largest amount of information, they are time- and resource-intensive. A comprehensive supply-side survey may cost several hundred thousand dollars and may take one to two years to design and conduct. *When comprehensive supply-side surveys are not feasible because of time or resource constraints, it is recommended that other methods be used, following the general suggestions in Tables 4 and 5, depending on the information available at country level and the aim of the enquiry.*

Standard statistics

Data for some parts of the environmental goods and services industry can be obtained by using available industrial or product classifications, although information will still be limited. For example, standard statistics for industrial activities provide data for some of the main parts of environmental services. In the case of Europe (*e.g.* the Netherlands), this method has been used to provide information on general environmental services operations, by using data from NACE Rev. 1, Divisions 37, 5157 and 90 (see Annex 4). Information on general environmental services can also be obtained through the International Standard Industrial Classification (ISIC Rev. 3), Divisions 37 and 90.

When a specific supply survey is to be carried out, it is suggested that a detailed table be built establishing correspondences between the enterprises surveyed and the categories of the national classification or International Standard Industrial Classification (ISIC). This can be done by creating a link between the code for each enterprise and the activity to which it belongs in the standard classification system. In such a way, some information can be derived. For example, value added can be evaluated by using existing data collected according to standard classifications. This table will also prove useful in designing the population for future surveys.

Data classified by standard trade statistical codes (*e.g.* HS commodity codes) provide a first-round measure of trade in environmental goods (see Annex 2 for more detail, services are not included). However, coverage by standard trade codes is very limited and results in a grossly underestimated total trade volume. It is estimated that the information derived from selected trade codes identified solely as environmental goods represents only about 20% of total international trade flows for environmental goods. This is because the majority of the environmental industry goods are multi-purpose products (*e.g.* filters, pumps, control equipment; see, for example, some goods included in Annex 2), and data for trade in environmental services are not provided, because services are not included in the HS commodity code system.

Data from trade associations or specialised business associations

Trade associations are a further source of information on the environment industry. They regularly publish data on their members. This usually covers a particular class or sub-class of the industry – private or municipal waste management, urban wastewater collection and treatment, recycling firms, equipment providers, etc. Either turnover and employment data or physical parameters, and in some cases value

added, are usually reported. In general, these detailed data may complete existing data on the environment industry, but they are insufficient to provide a wider picture of the whole industry.

The demand-side approach

The demand-side approach can help to provide and improve data on the environment protection industry. By using demand-side information (principally statistics on environment protection expenditures, see the European System for the Collection of Economic Information on the Environment – SERIEE,[4] for more detail), it is possible to estimate supply-side data for broad parts of the industry. Data on expenditures for pollution abatement and control can be manipulated by applying engineering estimates of typical cost structures, *e.g.* by estimating the share of construction and installation in total environmental investment expenditure to extract information on the environmental goods and services industry. These ratios can then be applied at the level of the main sub-classes – wastewater treatment plants, sewer systems, solid waste treatment facilities, etc.

This approach ensures consistency and provides information on most economic variables for the industry as a whole. It allows assessment of secondary and ancillary activities; avoids the problem of having to identify and estimate environmental shares of multi-purpose goods; and eliminates double counting. However, interpretation of the results is subject to the assumptions implicit in the estimations and for this reason, the data may be inaccurate.

This approach may be used to obtain data on employment. To do so, expenditure has to be transformed first into domestic production and then into employment. The estimation of domestic production (as opposed to domestic consumption) poses difficulties in the calculation of exports and imports. The second step requires information on labour productivity, which implies the need to disaggregate production by sector. Average productivity for broad industry aggregations may be used as an approximation for the environment industry (see also Blazejczak and Edler, 1997). This approach is a useful adjunct to supply-side measurement to cross-check the information collected and is an important source of data for assessing parts of the industry that are otherwise difficult to capture (*e.g.* secondary and ancillary activities).

Combining supply- and demand-side approaches

An integrated approach, using both supply- and demand-side data, will combine the strengths and reduce the weaknesses of the two approaches taken separately. Combining supply- and demand-side data makes it possible to provide a more consistent picture of the total turnover and employment in the environment industry. Moreover, this integrated approach may help in assessing the turnover and employment effects of cleaner technologies as well as the indirect effects, by providing a sound basis for estimates (see Pasurka and Steurer, 1995). See Chapter IV for more detail.

Chapter IV

PRACTICAL APPROACHES AND METHODS FOR DATA COLLECTION AND ANALYSIS OF THE ENVIRONMENT INDUSTRY

1. Supply-side approach

Specific environmental goods and services industry surveys

In designing and implementing supply-side surveys of the environmental goods and services industry, the following issues should be addressed: definition and classification of the industry; population and sample design; questionnaire; costs *versus* coverage; correspondence between environmental goods and services industry definitions and classification and those of standard statistics.

Definition and classification: Specific surveys on manufacturing and services suppliers are usually compiled on the basis of a recognised definition and classification. In the case of the environmental goods and services industry, the standard statistics do not contain a comprehensive recognised definition and classification, *therefore it is recommended that the definition and classification of the environmental goods and services industry presented in Chapter II be used.* If a modified version of the classification is used, it is essential to specify the detailed list of goods and services taken into consideration in order to enable comparisons with other surveys and data sources.

Population and sample design: In general, the population for surveys is built by choosing the divisions of standard classifications which constitute an industrial sector, and then using statistical office registers of businesses and organisations to identify the establishments. In the case of the environmental goods and services industry, the universe is unknown (a complete list of suppliers does not exist). Standard classifications provide very few divisions (ISIC Rev. 3 Divisions 37 and 90) which regroup environmental goods and services enterprises, while most are classified under different divisions (*e.g.* chemicals, equipment manufacturing) as this industry is a cross-cutting one.

Therefore, it will be necessary to constitute a survey population. In doing so, it is important to ensure a good coverage of the universe: manufacturing, services and construction enterprises; public and private enterprises; small, medium and large enterprises; other relevant public or private organisations. At this stage, it is critical to ensure that both public and private suppliers are included in the survey population and to be as inclusive as possible. Experience shows that building the survey population requires considerable effort.

One way of constituting the universe is to select divisions from standard classifications which may include environmental goods and services producers, and to analyse each division at a more detailed level to verify whether environmental goods and services enterprises are effectively included. This can be facilitated by using statistical office registers of businesses and organisations; catalogues, registers and lists from specialised industry associations as well as lists of contacts from environment trade shows and fairs and other sources (*e.g.* surveys of consulting engineering, scientific and technical services, waste management industry, wholesale trade survey for scrap materials). It is suggested that all divisions that contain a sufficiently large number of establishments producing environmental goods and services be included. It would also be possible to run a special filtering survey to see how many of the original sample is involved in the production of environmental goods and services.

Alternatively, the universe can be constituted by selecting products which have an environmental use and relating them to existing product categories. Subsequently, these can be related to lists of enterprises or establishments producing such goods and services. Although this method does produce good results, the fact that enterprises may change their product lines over time can create problems in identifying environmental producers.

Another way of proceeding is to directly identify environmental producers through specialised registers and catalogues of suppliers. Where a comprehensive register exists, this can be used (*e.g.* environmental goods and services enterprises directory). For example, standard statistics for industrial activities, which usually already have a list of producers (*e.g.* ISIC Rev. 3/NACE Rev. 1 Division 90), include some parts of the environment industry.

Specific problems will arise in constituting the population for the survey of environmental goods and services. Some producers may be difficult to identify. For example, in the manufacturing sector, enterprises producing filters for environmental purposes may not be identifiable as part of the environment industry since filters are not used only to protect the environment, and enterprises in the trucking industries that provide waste collection and hazardous material transportation services may be classified along with enterprises that transport non-waste material.

Similarly, in the *services* sector, enterprises providing or specialising in environmental management and consulting are classified among enterprises providing other management services such as human resources, information systems, economic or traffic consulting. The treatment of enterprises providing environmental engineering, architectural, or land survey services is even more complicated. These enterprises, which are classified in engineering, architectural and surveying service industries, may be exclusively environmental, exclusively non-environmental or may provide a combination of services.

Construction projects for environmental purposes present the same identification problems. Construction enterprises may be involved in any combination of environmental or non-environmental projects that may change from year to year. Consequently, it is important to consider both large and small enterprises in the relevant industries as potentially constructing projects for environmental use.

As for any other survey, once the population is established, the sample will be specified according to needs.

Questionnaire: Experience shows that the longer the questionnaire, the lower the response rate. It is recommended that specific surveys collect, at a minimum, data on three economic variables: turnover (by environmental class); employment (by number employed); and exports. Any additional information requirements should be weighed in terms of survey cost and the likelihood of lower response rates.

Part of the questionnaire must be dedicated to a careful explanation of the reasons for and aims of the survey, together with instructions on how to compile the answers to avoid inappropriate responses. The questionnaire should include at least one filtering question to ensure a clear distinction between enterprises that satisfy the definition for inclusion in the industry and those that do not. This will avoid a situation in which businesses that do not provide environmental goods and services are inadvertently included in the population, or that environmental goods and services producers declare that they do not provide environmental goods and services, when in fact they do. Thus, problems with the reporting and analysis of results, in particular for the grossing up procedures, will be avoided.

This inconvenience can be reduced by setting out, at the beginning of the questionnaire, the reasons why enterprises have received the form, and how to respond if they have no environmental activity (*e.g.* by asking them to specify their activities). In some cases, respondents may provide both non-environmental and environmental goods and services. It is essential in these cases to ask respondents to identify and report that portion of the value of products (or sales) which they recognise as being environmental, and to specify how the allocation is made.

Costs versus coverage: When deciding on the questionnaire and the survey sample, those collecting data need to consider the cost of operating the questionnaire and collecting responses. This is particularly pertinent when choosing between a census of the universe of *suppliers*, or a sample survey, and when choosing between an interview-based and a postal survey.

Correspondence with standard statistics: Once the universe and the population for the survey have been established, it is recommended that, wherever possible, the correspondences with standard statistics be established (*e.g.* enterprises are normally classified with a code number which links them to the main standard industrial classification). This will improve the quality of the survey and facilitate analysis and further surveys.

In future, correspondence with standard statistical classifications may be more easily established as some national classifications are being revised to include separate items for parts of the environment industry. This is the case for ISIC Rev. 3 and NACE Rev. 1 (see Table 6). It is also the case for the North American Industry Classification System implemented for the statistical year 1997, which includes disaggregated classification levels for the environment industry. For example, firms which primarily construct water, sewer and pipeline projects are classified separately from enterprises constructing other projects (see Annex 3 for details).

Table 6. **ISIC categories which identify environmental protection activities**[a]

ISIC Code	Category
37	*Recycling*
41[b]	*Collection, purification and distribution of water*
51	*Wholesale trade and commission trade, except of motor vehicles and motorcycles*
5149 (part of)	Wholesale of other intermediate products, waste and scrap
73 (part of)	*Research and development*
74	*Other business activities*
7421 (part of)	Architectural and engineering activities and related technical consultancy
75	*Public administration and defence; compulsory social security*
7512 (part of)	Regulation of the activities of agencies that provide health care, education, cultural services and other social services, excluding social security
90	*Sewage and refuse disposal, sanitation and similar activities*

a) This list is not exhaustive. Environmental protection activities may also be part of other ISIC divisions and classes.
b) Part of the Resource Management group.
Source: Drawn from ISIC Rev. 3.

In conclusion, when collecting data on the basis of a supply-side survey, it is recommended that the following issues be borne in mind:

a) A detailed classification and a detailed list of unique goods and services should be specified on the basis of the definition and the classification (for an example of a detailed breakdown of the industry, see Annex 7).

b) A universe and a practical survey population should be established. This phase, although time-consuming, is crucial as a complete list of all suppliers of environmental goods and services is not readily available; the majority of the larger enterprises producing environmental goods and services are not specialised; and many enterprises are unable to specify whether their products are used for environmental or other purposes (*e.g.* filters and pumps). Since the statistical office's register of businesses and organisations is unlikely to be a very useful source of information in itself, other sources must be used, such as industry association lists, government lists, catalogues of environmental product suppliers, etc. *The sample should be as representative as possible* of the structure of the environment industry, *i.e.* it should include private and public enterprises, small, medium and large enterprises, etc.

c) Collection units (enterprises, establishments, business units) should be specified, for example following suggestions presented in the International Standard Industrial Classification of all Economic Activities (ISIC Rev. 3).

d) The surveys should collect, at a minimum, data on three economic variables: turnover (by environment class); employment (by number employed); and exports.

e) The questionnaire should include a full explanation of the reasons for and aims of the survey, as well as instructions on how to compile answers to avoid inappropriate responses.

f) An evaluation of costs against coverage should be carried out.

g) Wherever possible, correspondences between the environmental goods and services industry definitions and related detailed classifications and existing detailed industry and commodity classifications should be made (see next section).

Data collected or classified in existing standard statistical classifications

Useful, although limited, information on the environmental goods and services industry can be obtained through existing statistical data. The major problem with this approach is that existing production and trade classifications do not separately identify all the items classified in the environment industry (*e.g.* production of equipment for pollution control and monitoring). Moreover, establishments or enterprises are classified according to their principal activity, which does not usually allow identification of units which produce environmental goods and services as their secondary activities (*e.g.* large enterprises with a low degree of specialisation in environmental products).

Some divisions of the International Standard Industrial Classification of all Economic Activities, Third Revision (ISIC Rev. 3) separately identify parts of the environment industry. Division 37 (Recycling) and Division 90 (Sewage and refuse disposal, sanitation and similar activities) identify some environmental protection services. Other environmental protection activities are separately identified in ISIC Rev. 3, but only as parts of divisions or classes containing other activities. These include: in Division 51 (Wholesale trade and commission trade, except of motor vehicles and motorcycles), part of Class 5149 (Wholesale of other intermediate products, waste and scrap); part of Division 73 (Research and development); in Division 74 (Other business activities), part of Class 7421 (Architectural and engineering activities and related technical consultancy); and in Division 75 (Public administration and defence; compulsory social security), part of Class 7512 (Regulation of the activities of agencies that provide health care, education, cultural services and other social services, excluding social security) (see Table 6).

*The General Industrial Classification of Economic Activities within the European Communities (*NACE Rev. 1) shows separately the same parts of the environmental goods and services industry as are covered in ISIC Rev. 3. Along with other countries, Statistics Netherlands has gained experience with these and other NACE Rev. 1 standard headings in clarifying the classification of the most important activities carried out by environmental producers. It has also developed a more detailed breakdown of NACE 37 and 90 to allow deeper analysis of this industry structure and provide a reasonably comprehensive picture of environmental services. A fuller description of the detailed breakdown developed by Statistics Netherlands is presented in Annex 4.

In future revisions of standard classification systems, it is suggested that a clear specification of environmental goods and services be considered. For example, the North American Industry Classification System (NAICS) explicitly considers a number of environmental utility and service activities as separate items (see Annex 3). Regrouping the data collected in each of these divisions would enable a large part of the environmental goods and services industry to be easily identified and measured.

The Central Product Classification (CPC)[5] provides a detailed list of products from which environmental services can be identified (see Table 7). This can help to clarify part of the coverage of the classification outlined in Chapter II above. Some services are clearly always environment-related, *e.g.* services for sewage treatment. However, a firm engaged in, say, snow removal services, may at other times of the year undertake quite different activities, possibly in transport or construction.

The Harmonized Commodity Description and Coding System (HS) for international trade[6] enables the identification of codes related to environmental *goods* only (see Annex 2 for a list of these codes and further details). The advantage of using these codes lies in the international comparability of the data, while disadvan-

Table 7. **CPC categories which identify environmental protection services**

CPC Code	Category
94110	Sewage treatment services
94120	Tank emptying and cleaning services
94211	Non-hazardous waste collection services
94212	Non-hazardous waste treatment and disposal services
94221	Hazardous waste collection services
94222	Hazardous waste treatment and disposal services
94310	Sweeping and snow removal services
94390	Other sanitation services
94900	Other environmental protection services

Source: Drawn from United Nations (1998), *Central Product Classification (CPC) Version 1.0*, New York.

tages concern the limited coverage of purely environmental codes (of the order of only 20% of the total trade in environmental goods), the fact that services are excluded, and the fact that many of the identified goods are also used for purposes other than environmental protection.

Estimations using standard statistical classifications

Other methods used to evaluate the size of the environmental goods and services industry are based on estimated coefficients. Technical experts/engineers indicate the share of output of industrial activities related to the production of environmental goods and services, on the basis of the environmental demand features of the national economy. These coefficients are subsequently applied to selected classes in standard statistical classifications.

Alternatively, environmental protection activities can be identified by cross-classifying divisions of standard industrial statistical classifications (*e.g.* ISIC) by their main activity and by the category related to environmental activities. For example, treatment of wastewater in the textile industry will be identified under the industry code for "Manufacture of textiles" and, by aggregation, it is possible to obtain an estimation of the total for all activities. This approach can be used to account for ancillary environmental protection activities.

By establishing a correspondence between producers of environmental goods and services and producers listed in standard statistics, it is possible to estimate the share of total suppliers producing environmental goods and services. For example, the results of a survey show that *X*% of industrial equipment suppliers produce goods and services with an environmental purpose. This share can then be applied to estimate the number of suppliers and turnover of environmental goods and services in this sector. Of course, this method is very approximate and does not allow for possible changes in the structure of the environmental protection industry (see Annex 5 for results for France and Annex 6 for Germany).

2. Demand-side approach

One of the major differences between supply and demand estimates involves their consideration of principal, secondary and ancillary products. Supply-side estimates should include all production from enterprises for which environmental goods and services form the principal product. As explained in Chapter II, it is suggested that supply-side estimates also include enterprises for which the production of environmental protection goods and services is significant, even if these are not the principal products. Only exceptionally will all environmental protection goods and services be covered this way and there will almost always be some goods and services produced in small quantities by enterprises which fall outside the scope of the supply-side enquiry. There is also the risk that production data may contain information on non-environmental protection goods and services. This may happen inadvertently or because the enterprise is simply unable to distinguish between the two. This problem will arise in particular in the case of multi-purpose products or when the supplier is unaware of the purpose for which his products are purchased.

In contrast, demand-side approaches will pick up all environmental protection goods and services expenditure irrespective of the source and will exclude the production of non-environmental goods and services even when this comes from principal producers of environmental goods and services. On the other hand, although it may be fairly straightforward to measure the amount of money spent on environmental protection, demand-side approaches may be unable to precisely identify the products concerned.

For both supply- and demand-side estimates, measuring ancillary activity may present problems in practice. Theoretically, such activities should be included in both measures. An example of a case in which the demand-side estimate may exceed the supply-side estimate is that of an enterprise which does not supply any environmental protection goods and services for sale but nevertheless has a significant amount of ancillary production of environmental protection goods and services. For these reasons, it is desirable to separate the use and production of ancillary services from transactions involving the sale and purchase of environmental protection goods and services.

The demand-side approach provides a view of the environmental goods and services industry through data on expenditure for pollution abatement and control and other expenditures related to environmental protection. In many countries, standard statistical systems have been better developed on the demand side, so that extensive data on environmental expenditure are already available. This approach is based on a comprehensive national accounting system for environmental demand (see OECD, 1993).

The United Nations has proposed the System for Integrated Environmental and Economic Accounting (SEEA) as a satellite system closely related to the core of the System of National Accounts (SNA). This system is designed to measure environmental impacts on the whole economy (see UN Systems of National Accounts).

The SEEA comprises four parts. The first describes production and consumption activities and accounting of non-financial assets, which also includes information on changes in the stocks of natural assets. This part is constituted from the general SNA Input-Output table, where environmental activities are separately identified from the rest of the economy.

The second part describes the physical relationship between the natural environment and the producing sectors of the economy. The third evaluates the economic costs of the actual or potential deterioration of the environmental and natural resource assets associated with economic activities. This exercise requires a monetary evaluation of natural resources.

The fourth part contains information derived by extending the boundary to incorporate the economic functions of the natural environment (*i.e.* inclusion of the economic value of the service provided by wetlands in mitigating floods). Information on the environmental goods and services industry is obtained by disaggregating the environmental and non-environmental components of economic activities within the Input-Output framework.

The separation of the SNA general Input-Output table into environmental and non-environmental activities depends on a large number of assumptions. Nevertheless, this approach is a very useful adjunct to supply-side measurement in crosschecking the information gathered, and an important source of data for assessing parts of the industry which are otherwise difficult to capture or resolve (*e.g.* internal activities, multi-purpose products).

The European System for the Collection of Economic Information on the Environment (SERIEE) has proposed an accounting system for environmental expenditure: the Environmental Protection Expenditure Account (EPEA). This constitutes an application at the European level of the SNA proposal for satellite environmental accounts and analysis. Implementation of this system is also being considered in other OECD Member countries.

The EPEA system is used to calculate national environmental expenditure, and to analyse the finance structure (how and by whom expenditures are financed) and the output of environmental protection activities. The methodology applied varies depending on the sectors being investigated: public,

private (industrial and commercial) or household. Detailed methods for the collection of demand-side data in each of these areas are described below.

Public sector

All OECD countries have well-developed systems of public accounts data. These consist of a set of definitions, units and classifications to obtain consistent data for inputs to national accounts. Considerable effort is devoted to classifying the transactions of government organisations by purpose. This existing source is a valuable one for investigating public expenditure on environmental protection and is well established in a number of countries. The classification based on the purpose approach does not, however, have many categories that could be entirely included in environment protection, and many transactions are effectively hidden under grouped codes.

In the new UN Classification of the Functions of Government (COFOG), Division 5 is dedicated to environmental expenditure, using the same breakdown as in the European SERIEE CEPA classification. This classification poses practical problems in identifying expenditure on environmental protection, because it may appear as a relatively minor item in the expenditure of administrative bodies. For example, the public authorities responsible for agriculture may have a programme to monitor the environmental impact of chemical pesticides, but this may not be easily identified as environmental expenditure.

Annual reports of government institutions can also be used to obtain environmental expenditure data. These provide useful information, which can be reorganised to produce reasonable estimates for public sector expenditure on the environment.

Private (industrial and commercial) sectors

Comprehensive information is being collected in many countries on capital and current expenditures for pollution abatement and control of industrial and commercial businesses. The data are obtained through specific surveys or through appending additional questions to existing surveys. For example, additional filtering questions can be used in existing capital expenditure surveys to provide a better understanding of the purpose of the expenditure and to collect specific data on pollution abatement and control expenditures. An alternative approach is to add questions on environmental expenditure to surveys designed for a different purpose, although this may be hampered by the lack of explicit environmental information in most company accounting systems.

The major conceptual issue to be resolved is the identification of the categories that should be included in capital expenditure on pollution abatement and control. The “end-of-pipe” category is easily identifiable, while “integrated” equipment is not. To overcome this identification problem, respondents may be requested to include expenditure only if the major reason for the expenditure is related to the environment (*e.g.* if the acquisition of the new item is required by environmental regulations). Other approaches include asking the respondent to provide details on each major item and then having a qualified engineer in the statistical office decide what proportion of the expenditure should be counted as environmental protection.

Household sector

Information on household expenditure is usually obtained through sample surveys. This kind of survey is very demanding since respondents are asked to monitor all expenditures in considerable detail over a given period of time. In the case of environmental expenditures, this kind of survey would be a valuable source of data if it were possible to clearly classify the purchase of goods and services that protect the environment. An alternative approach for obtaining environmental expenditure by households is to survey sales from environmental manufacturers and/or seek information from retailers. The increased use of bar codes and scanners to record sales has opened the possibility of obtaining information on specific product lines. However, in both approaches, the problem of identifying cleaner products has to be dealt with.

Household activities usually involve the purchase of environmental goods and services for final consumption. They are mainly included in final demand (*e.g.* automobile catalytic converters, expenditure associated with the repair and maintenance of septic tanks). Once demand-side environmental activities have been identified and measured, they need to be integrated with the available supply-side information. This requires identification of the relevant transactions between economic actors.

3. Combining supply- and demand-side approaches

Reconciling supply- and demand-side estimates for economic production is an important and integral part of the *System of National Accounts* (SNA).[7] One of the SNA handbooks covers the application of supply and use balancing for environmental issues in some detail: *Integrated Environmental and Economic Accounting* (SEEA) (UN Studies in Methods Series F, No. 1, New York, 1993). The SEEA covers many aspects of environmental accounting, including the development of accounts for specific environmental assets in physical terms as well as attaching monetary values to these assets. Of particular interest in the present context, is the elaboration of a supply and use table, which specifically identifies environmental protection goods and services.

The first step is to create separate supply and demand tables as shown in Figure 1. Here, we distinguish four types of environmental products; those which are ancillary; those which consist of equipment, technology and specific materials; services; and construction and installation. All other products are grouped together as non-environmental products. For ancillary activities (in *italics*) the entries in the two tables are theoretically identical. For the other items, it is first necessary to enter the allocations obtained from the separate supply and demand sources and then to decide how to reconcile the numbers such that the row totals for each table correspond, element by element. The demand-side information described above will provide guidance on government and household demand as well as on capital formation and exports. In reconciling the figures, expert judgement will be needed to adjust the original data based on information about the relative reliability of the various elements. The compilation of such a table resembles a police enquiry in that information from disparate sources is called upon to verify (or amend) the initial information. However, the end product should be robust and able to stand up to external, possibly sceptical, enquiry.

By integrating supply-side information with expenditure/demand for environmental goods and services, it is possible to obtain a general and aggregate picture of the environment industry, although it may be rather weak on detail and require further detailed investigations.

The integrated demand/supply approach can be developed at a deeper level of detail by using data on environmental protection expenditure and integrating the data available on the supply side together with engineering data and case studies for both supply and demand (see also Pasurka and Steurer, 1995). The results obtained through the use of engineering modelling data are more complete and balanced, but require more time and work. The strength of this approach derives from the use of Input-Output tables and techniques. It allows data gaps on the supply side to be filled to a considerable extent. Overall, this approach can provide a complete picture of the industry including the impact of cleaner technologies and the importance of the secondary activities of enterprises.

Some guidance on alternative data sources which may be used is given below.

4. Other methods

When such economic data are not available information on turnover can be estimated by combining physical output data (*e.g.* tonnes of waste or m^3 of wastewater) with average price ratios. This approach can be applied only for the provision of services category and to some extent to equipment (*e.g.* based on data on newly installed treatment capacities) and the results will generally be very approximate.

Other information sources can be used to improve the quality of data on the environment industry. For instance, in the case of R&D, information can be obtained by using data on research outputs –

Figure 1. **Supply and demand framework**

	Supply of environmental and other products					
	Environmental producers			Other activities	Imports	Total supply
	Pollution management group	Cleaner technologies and products group	Resource management group			
Environmental products – *Ancillary* – Equipment and specific materials – Services – Construction and installation Non-environmental products						

	Demand for environmental and other products								
	Intermediate consumption				Final demand				
	Pollution management group	Cleaner technologies and products group	Resource management group	Other activities	Government	Capital formation	Households	Exports	Total demand
Environmental products – *Ancillary* – Equipment and specific materials – Services – Construction and installation Non-environmental products									

e.g. based on scientific citation indexes or on patent registers. Information on *state aid* for industry promotion and exports and *mergers and acquisitions* will have to be extracted or estimated from a variety of other surveys or databases (see Chapter III).

In the preceding sections, brief mention was made of obtaining information on the environmental goods and services industry by extraction and manipulation of data from existing statistical collections or by adding specific questions to existing data collection exercises. Some countries have obtained information about specific environmental services by including additional questions in other data surveys. For example, a survey on the legal services industry could ask respondents to split income by source and to include environmental law as a separate category. This kind of approach is reasonable for a quick, low-cost investigation of part of the environment industry, but it does not provide a comprehensive view of the whole industry within a common framework and common reference period.

Other possible sources of statistical information are organisations that routinely collect environmental information as part of their usual activities. For example, environment protection agencies usually collect data as part of their monitoring and regulation programmes. Government organisations responsible for employment and training policy may obtain data from businesses through various environmental-employment-generation programmes. Further information may be obtained from databases on research and from development projects for waste management and pollution control.

Trade associations regularly issue information on parts of the industry, and some associations regularly publish data on their members. Often, such data are highly detailed on physical parameters (*e.g.* m^3 of treated wastewater, number of waste collection trucks, etc.), although in some cases economic data are also available (number of suppliers, turnover, employment). However, trade association data are usually narrowly class-specific.

Estimates for value added and R&D can be derived by applying ratios to turnover figures. Such ratios can be derived by using general enterprise surveys for manufacturing services, and construction activities, but the results obtained will be approximate.

Chapter V

REMAINING ISSUES: PROGRESS AND APPROACHES

The approaches and methods proposed in this manual can provide comprehensive information on the environmental goods and services industry. But they leave a number of outstanding unresolved issues:

– dual-use and multi-purpose products;

– cleaner technologies and products;

– international trade.

1. Dual-use and multi-purpose products

Dual-use and multi-purpose products are those products that can also be used for non-environmental purposes (*e.g.* filters, pumps, and pipes). These products have been estimated to account for a considerable share of sales of environmental equipment and goods.

In principle, a reliable answer to the problem of multi-purpose products can be obtained by surveying the final user. Environmental suppliers and investors are not always able to assess that part of the sales of the product that is for environmental protection.

In order to gain a more accurate picture of dual-use and multi-purpose products, some studies have tried to match the results from supply- and demand-side approaches. The use of an Input-Output framework makes it possible to evaluate the total environmental goods and services industry, while avoiding double counting and mis-measurement (Pasurka and Steurer, 1995).

2. Cleaner technologies and products

Clear definition, identification and easy measurement of integrated or cleaner technologies and products have proved difficult despite their importance, for example, for sustainable development. Cleaner technologies and products are determined with reference to "standard" technologies and products. In a dynamic perspective, the cleaner technologies and products of today will become the "standard" technologies and products of tomorrow. Following this approach requires very detailed information. Moreover, the question of the proportion of, for example, turnover in cleaner technologies and products that should be attributed to the environmental protection industry (*e.g.* cleaner cars) remains open.

However, the slowdown in the growth of the classical end-of-pipe equipment industry and the interest in a more integrated regulatory approach to environmental protection suggest the increasing importance of cleaner technologies and products.

The OECD/Eurostat Informal Working Group on the Environment Industry has identified a number of methods which can be used to account for cleaner technologies and products. It is important to consider that, although these approaches are relatively comprehensive and consistent with the aim of defining and assessing cleaner technologies and products, they are either limited or still at an experimental stage.

1. Measurement of *R&D, innovation and engineering efforts* to improve environmental performance of technologies, processes and products. This would focus on measuring R&D and related innovation and engineering costs. R&D, innovation and engineering costs are not always possible to

obtain, particularly in the business sector. Nevertheless, some R&D surveys do already capture these values, and respondents indicate – in budgetary or full-time equivalent employment terms – specific environmental research, innovation or engineering efforts.

2. Measurement of *efforts* to improve environmental performance by measuring the incremental cost of cleaner technologies and products. This is the SERIEE approach, which considers "cleaner" technologies and products, that, from an expenditure point of view, are *more costly* than the equivalent less-clean alternative products. Only the extra costs are considered as environmental protection expenditure. This requires comparing the price of the clean product with that of the superseded item. However, from a supply-side perspective, technologies which are less polluting could also be less costly.
3. *Creation of a list of cleaner technologies and products*. This approach consists of creating a comprehensive list of dedicated cleaner technologies, processes and products. For example, the Dutch Ministry of Finance has developed a list of cleaner technologies which is up-dated each year, to implement a tax-incentive system for cleaner production investment. This could be complemented with an *Eco-label approach* based on labelling procedures, once these are complete and effective. However, the eco-label approach is currently impracticable for many reasons (*e.g.* slow product identification, difficulties in defining unambiguous criteria and methodologies for the labelling procedure, under-representation of SME products). *Similarly, "leading market edges" could be measured*. This approach attempts to measure for each product group that part which is considered as the "leading green edge" of the market, based on current standards. For example, in the field of construction, the market share of low-energy houses could be estimated.
4. *Physical assessment*. This approach consists of measuring and evaluating reductions in pollutant emissions and waste generation due to cleaner technologies, and placing an economic value on these reductions (*e.g.* savings in disposal costs).

3. International trade

International trade in environmental products is not easy to measure. The OECD/Eurostat Informal Working Group studied various approaches. These approaches are limited and do not allow a comprehensive picture of trade in environmental products.

Specific supply-side surveys provide the best and most comprehensive information on *exports* of goods and services, but available data are limited in accuracy and detail. For example, information is provided as a share of total environmental turnover, with a very limited breakdown by main destination.

The analysis of trade codes based on standard foreign trade statistics provides useful indicators of the direction and change in magnitude of imports and exports by country of origin and destination (see Annex 2, includes some multi-purpose products). However, this approach suffers from various limitations. First, flows of services are not covered. Second, goods trade flows may be underestimated because only a few traded goods codes can be separately identified as solely for environmental purposes. Data for Austria and Germany suggest that the analysis of environmentally dedicated trade codes underestimates total environmental goods trade by a factor of five.

The two approaches taken together will provide useful information. However, information is still missing on some variables, such as trade in cleaner technologies and products, and multi-purpose products, as well as information on other important aspects of globalisation such as foreign direct investment, international payments for patents and other intellectual property rights for the use of environmental equipment, etc.

Further research on each of these issues is required.

Annex 1

EXPLANATORY NOTES ON THE CLASSIFICATION OF THE ENVIRONMENTAL GOODS AND SERVICES INDUSTRY

A. The "POLLUTION MANAGEMENT" group

Environmental equipment and specific materials

Air pollution control

This class includes any activity that produces equipment or specific materials for the treatment and/or removal of exhaust gases and particulate matter from both stationary and mobile sources. It includes air-handling equipment, dust collectors, precipitators, filters, catalytic converters, chemical treatment and recovery systems, specialised stacks, incinerators, scrubbers, odour control equipment, environmentally less-damaging specialised fuels.

Wastewater management

This class includes any activity that produces equipment or specific materials for the collection, treatment and transport of wastewater and cooling water. It includes pipes, pumps, valves, aeration equipment, gravity sedimentation equipment, chemical treatment and recovery equipment, biological recovery systems, oil/water separation systems, screens/strainers, sewage treatment equipment, wastewater reuse equipment, water purification equipment and other water handling systems.

Solid waste management

This class includes any activity that produces equipment or specific materials for the collection, treatment, transport, disposal and recovery of hazardous and non-hazardous solid waste. It includes waste storage and treatment equipment (thermal, biological, chemical), waste collection equipment, waste disposal equipment, waste handling equipment, waste separation and sorting equipment, recovery equipment, recycling equipment. It also includes equipment for outdoor sweeping and watering of streets, paths, parking lots, etc. It includes equipment, technology or specific materials for the treatment of low-level nuclear waste. It excludes materials for the treatment of high-level nuclear waste. Recycling activities exclude production of equipment or specific materials for the manufacture or production of new materials or products from waste or scrap and subsequent use of these materials or products.

Remediation and clean-up of soil, surface water and groundwater

This class includes any activity that produces equipment or specific materials to reduce the quantity of polluting materials in soil and water, including surface water, groundwater and seawater. It includes absorbents, chemicals and bioremediators for cleaning up, as well as cleaning-up systems either *in situ* or in appropriate installations.

Noise and vibration abatement

This class includes any activity that produces equipment or specific materials to reduce or eliminate the emission and propagation of noise and vibration, both at source and dispersed. It includes mufflers/silencers, noise deadening material, noise control equipment and systems vibration control equipment and systems.

Environmental monitoring, analysis and assessment

This class includes any activity that produces equipment or specific materials for the sampling, measurement, and subsequent recording, analysis and assessment of various characteristics of environmental media. It includes measuring and monitoring equipment, sampling systems, data acquisition equipment, other instruments or machines for measurement. Environmental information systems, analytical software, specific safety and personal protection for environmental purposes are included.

Other

This class includes any activity that produces equipment or specific materials to measure, prevent, limit or correct environmental damage to air, water and soil, as well as problems related to waste, noise and eco-systems, not included in any other class. These activities should be separately specified and listed.

Environmental services

Air pollution control

This class includes any activity that designs, manages systems or provides other services for the treatment and/or removal of exhaust gases and particulate matter from both stationary and mobile sources.

Wastewater management

This class includes any activity that designs, operates systems or provides other services for the collection, treatment and transport of wastewater and cooling water. It includes design, management or other services for sewage treatment systems, wastewater reuse systems, and water handling systems.

Solid waste management

This class includes any activity that designs, operates systems or provides other services for the collection, treatment, management, transport, storage and recovery of hazardous and non-hazardous solid waste. It includes design, management or other services for waste handling (collection, transport, separation, sorting and disposal), operation of sites, recycling (including collection of waste and scrap), operation of recycling plants. It includes services for outdoor sweeping and watering of streets, paths, parking lots, etc. Services for the treatment of low-level nuclear waste are included. It excludes services for the treatment of high-level nuclear waste. It excludes services for the manufacture of new materials or products from waste or scrap and the subsequent use of these materials or products.

Remediation and clean-up of soil, surface water and groundwater

This class includes any activity that designs, manages systems or provides other services to reduce the quantity of polluting materials in soil and water, including surface water, groundwater and seawater. It includes cleaning-up systems either *in situ* or in appropriate installations, emergency response and spills clean-up systems. Treatment of water and dredging residues are included.

Noise and vibration abatement

This class includes any activity that designs, manages systems or provides other services to reduce or eliminate the emission of noise and vibration, both at source and dispersed. It includes design, management or other services for acoustic and soundproof screens and street covering.

Environmental R&D

This class includes any systematic and creative activity concerned with the generation, advancement, dissemination and application of scientific and technological knowledge to reduce or eliminate emissions in all environmental media and to improve environmental quality. It includes non-technological research to improve knowledge on ecosystems and the impact of human activities on the environment.

Environmental contracting and engineering

This class includes any activity that investigates feasibility, designs and manages environmental projects not included elsewhere. It includes multidisciplinary environmental contracting and engineering. Environmental management consulting, other environmental consulting services and environmental audit services are included.

Analytical services, data collection, analysis and assessment

This class includes any activity that designs, manages systems or provides other services to sample, measure and record various characteristics of environmental media. It includes monitoring sites, operating both singly and in networks, and covering one or more environmental medium. Health, safety, toxicology studies and analytical laboratory services are included. Weather stations are excluded.

Education, training, information

This class includes any activity that provides environmental education or training or disseminates environmental information and which is executed by specialised institutions or other specialised suppliers. It includes education, training and information management for the general public, and specific environmental workplace education and training. The activities of the general educational system are excluded.

Other

This class includes any activity that provides services to measure, prevent, limit or correct environmental damage to air, water and soil, as well as problems related to waste, noise and eco-systems, not included in any other class (*e.g.* general public administration, if it provides specific environmental services not elsewhere classified). These activities should be separately specified and listed.

Construction and installation

This class includes any activity for the construction and installation of facilities for: air pollution control; wastewater management; solid waste management; remediation and clean-up of soil, surface water and groundwater; noise and vibration abatement; environmental monitoring, analysis and assessment; other environmental facilities.

B. The "CLEANER TECHNOLOGIES AND PRODUCTS" group

This group includes any activity which continuously improves, reduces or eliminates the environmental impact of technologies, processes or products.

Cleaner/resource-efficient technologies and processes

Cleaner and resource-efficient technologies which decrease material inputs, reduce energy consumption, recover valuable by-products, reduce emissions, minimise waste disposal problems, or some combination of these.

Cleaner/resource-efficient products

Cleaner or resource-efficient products which decrease material inputs, improve product quality, reduce energy consumption, minimise waste disposal problems, reduce emission during use, or some combination of these.

C. The "RESOURCE MANAGEMENT" group

Note: In the case of the "Resource management" group, activities aimed at the production of environmental goods and services and related construction are grouped together for convenience. However, it is suggested that, wherever possible, information on these items be separately collected and presented under separate headings for equipment, services and construction.

Indoor air pollution control

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for the treatment and renewal of indoor air to remove pollutants. It excludes air-conditioning.

Water supply

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for water supply and delivery systems, both publicly and privately owned. It includes activities aiming to collect, purify and distribute potable water to household, industrial, commercial or other users.

Recycled materials

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for manufacturing new materials or products, separately identified as recycled, from waste or scrap.

Renewable energy plant

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for the generation, collection or transmission of energy from renewable sources, including solar, wind, tidal, geothermal or biomass sources.

Heat/energy saving and management

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services to reduce heat and energy use or minimise heat and energy loss (*e.g.* co-generation). It includes equipment, technology or specific materials to reduce climate change.

Sustainable agriculture and fisheries

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for systems which reduce the negative environmental impact of agriculture and fishery activities. It includes biotechnology applied to agriculture and fishery activities.

Sustainable forestry

This class includes any activity that produces equipment, technology or specific materials, designs, constructs or installs, manages or provides other services for programmes and projects for reforestation and forest management on a long-term sustainable basis.

Natural risk management

This class includes any activity that produces equipment, technology, or specific materials, designs, constructs or installs, manages or provides other services for systems to prevent or reduce the impact of natural disasters (storms, floods, volcanic eruptions, etc.).

Eco-tourism

This class includes any activity that designs, constructs, installs, manages or provides other services for tourism that involves protection and management of natural and cultural heritage, or education and interpretation of the natural environment, and that does not damage or degrade the natural environment.

Other

This class includes any activity that measures, prevents, limits or corrects environmental damage to air, water and soil, as well as problems related to waste, noise and eco-systems, which is not included in any other class (*e.g.* nature conservation, habitats and biodiversity). These activities should be separately specified and listed.

NOTE: THE FOLLOWING ANNEXES 2-7 SHOULD NOT BE CONSIDERED AS RECOMMENDATIONS, BUT AS ILLUSTRATIVE EXAMPLES ONLY

Annex 2

ENVIRONMENTAL GOODS: ILLUSTRATIVE CATEGORIES WITH HARMONIZED COMMODITY DESCRIPTION AND CODING SYSTEM (HS) COMMODITY CODES

Note: **The list is not exhaustive; not all environmental goods are covered. Some environmental goods have no equivalent HS commodity code. Some HS commodity codes include goods which may not be environmental goods.**

A. POLLUTION MANAGEMENT group

1.	**Air pollution control**	HS code
1.1	*Air-handling equipment*	
	Vacuum pumps	841410
	Compressors of a kind used in refrigerating equipment	841430
	Air compressors mounted on a wheeled chassis for towing	841440
	Other air or gas compressors or hoods	841480
	Parts for air or gas compressors, fans or hoods	841490
1.2	*Catalytic converters*	
	Filtering or purifying machinery and apparatus for gases	842139
	Parts for filtering or purifying machinery	842199
1.3	*Chemical recovery systems*	
	Limestone flux	252100
	Slaked (hydrated) lime	252220
	Magnesium hydroxide and peroxide	281610
	Activated earths	
	Filtering or purifying machinery and apparatus for gases*	842139
	Parts for filtering or purifying machinery*	842199
1.4	*Dust collectors*	
	Filtering or purifying machinery and apparatus for gases*	842139
	Parts for filtering or purifying machinery*	842199
1.5	*Separators, precipitators*	
	Other glass fibre products	701990
	Machinery for liquefying air or other gases	841960
	Other machinery. for treatment of materials by change of temperature	841989
	Filtering or purifying machinery and apparatus for gases*	842139
	Parts for filtering or purifying machinery*	842199
1.6	*Incinerators, scrubbers*	
	Other furnaces, ovens, incinerators, non-electric	841780
	Filtering or purifying machinery and apparatus for gases*	842139
	Parts for filtering or purifying machinery*	842199
	Industrial or laboratory electric resistance furnaces	851410
	Industrial or laboratory induction or dielectric furnaces	851420
	Other industrial or laboratory electric furnaces and ovens	851430
	Parts, industrial or laboratory electric furnaces	851490
1.7	*Odour control equipment*	
	Parts for sprayers for powders or liquids	842490

A. POLLUTION MANAGEMENT group *(cont.)*

2. Wastewater management	HS code
2.1 Aeration systems	
Compressors of a kind used in refrigerating equipment *	841430
Air compressors mounted on a wheeled chassis for towing *	841440
Other air or gas compressors or hoods*	841480
Parts for air or gas compressors, fans or hoods*	841490
2.2 Chemical recovery systems	
Limestone flux*	252100
Slaked (hydrated) lime*	252220
Chlorine	280110
Anhydrous ammonia	281410
Sodium hydroxide solid	281511
Sodium hydroxide in aqueous solution	281512
Magnesium hydroxide and peroxide*	281610
Activated earths*	
Aluminium hydroxide	281830
Manganese dioxide	282010
Manganese oxides (other)	282090
Lead monoxide	282410
Sodium sulphites	283210
Other sulphites	283220
Phosphinates or phosphonates	283510
Phosphates of triammonium	283521
Phosphates of mono or disodium	283522
Phosphates of trisodium	283523
Phosphates of potassium	283524
Calcium hydrogenorthophosphate	283525
Other phosphates of calcium	283526
Other phosphates (excl. polyphosphates)	283529
Activated carbon	380210
Water filtering or purifying machinery and apparatus	842121
Other machinery for purifying liquids	842129
Parts for filtering or purifying machinery*	842199
2.3 Biological recovery systems	
2.4 Gravity sedimentation systems	
Flocculating agents	
2.5 Oil/water separation systems	
Other centrifuges	842119
Parts of centrifuges	842191
Water filtering or purifying machinery and apparatus*	842121
Other machinery for purifying liquids*	842129
Parts for filtering or purifying machinery*	842199
2.6 Screens, strainers	
Other articles of plastic	392690
Water filtering or purifying machinery and apparatus*	842121
Other machinery for purifying liquids*	842129
Parts for filtering or purifying machinery*	842199
2.7 Sewage treatment	
Flocculating agents	
Woven pile and chenille fabrics of other textile materials	580190
Tanks, vats, etc. > 300 l	730900
Tanks, drums, etc. > 50 l < 300 l	731010
Cans < 50 l, closed by soldering or crimping	731021
Other cans < 50 l	731029
Hydraulic turbines	841000
	841011
	841012
	841013
Parts for hydraulic turbines	841090
Other furnaces, ovens, incinerators, non-electric*	841780
Weighing machines capacity < 30 kg	842381

A. POLLUTION MANAGEMENT group *(cont.)*

	Weighing machines capacity > 30 kg < 5 000 kg	842382
	Other weighing machines	842389
	Parts for sprayers for powders or liquids*	842490
	Industrial or laboratory electric resistance furnaces*	851410
	Industrial or laboratory induction or dielectric furnaces*	851420
	Other industrial or laboratory electric furnaces and ovens*	851430
	Parts, industrial or laboratory electric furnaces*	851490
2.8	*Water pollution control, wastewater reuse equipment*	
2.9	*Water handling goods and equipment*	
	Cast articles of cast iron	732510
	Root control equipment	
	Positive displacement pumps, hand operated	841320
	Other reciprocating positive displacement pumps	841350
	Other rotary positive displacement pumps	841360
	Other centrifugal pumps	841370
	Other pumps	841381
	Valves, pressure reducing	848110
	Valves, check	848130
	Valves, safety	848140
	Other taps, cocks, valves, etc.	848180
	Instruments for measuring the flow or level of liquids	902610
	Instruments for measuring or checking pressure	902620

3.	**Solid waste management**	HS code
3.1	*Hazardous waste storage and treatment equipment*	
	Other articles of cement, concrete	681099
	Other articles of lead	780600
	Other electric space heating and soil heating apparatus	851629
	Lasers	901320
	Vitrification equipment	
3.2	*Waste collection equipment*	
	Household or toilet articles of plastic	392490
	Brooms, hand	960310
	Brushes as parts of machines, appliances	960350
	Mechanical floor sweepers	960390
	Trash bin liners (plastic)	
3.3	*Waste disposal equipment*	
	Compactors	
	Refuse disposal vehicles	
	Polypropylene sheeting, etc.	392020
3.4	*Waste handling equipment*	
3.5	*Waste separation equipment*	
	Magnetic separators	
3.6	*Recycling equipment*	
	Magnetic separators*	
	Machinery to clean, dry bottles, etc.	842220
	Other mixing or kneading machines for earth, stone, sand, etc.	847439
	Other machines for mixing/grinding, etc.	847982
	Other machines, nes, having individual functions	847989
	Tire-shredding machinery	
3.7	*Incineration equipment*	
	Other furnaces, ovens, incinerators, non-electric*	841780
	Parts of furnaces, non-electric	841790
	Industrial or laboratory electric resistance furnaces*	851410
	Industrial or laboratory induction or dielectric furnaces*	851420
	Other industrial or laboratory electric furnaces and ovens*	851430
	Parts, industrial or laboratory electric furnaces*	851490

A. POLLUTION MANAGEMENT group *(cont.)*

4. Remediation and clean-up of soil and water	HS code
4.1 Absorbents	
4.2 Cleaning-up	
Other electric space heating and soil heating apparatus*	851629
Lasers*	901320
Vitrification equipment*	
4.3 Water treatment equipment	
Surface active chemicals (not finished detergents)	
Oil spillage clean-up equipment	
Other electrical machines and apparatus with one function	854389

5. Noise and vibration abatement	HS code
5.1 Mufflers, silencers	
Parts for spark-ignition internal combustion piston engines	840991
Parts for diesel or semi-diesel engines	840999
Silencers and exhaust pipes, motor vehicles	870892
5.2 Noise deadening material	
5.3 Vibration control systems	
5.4 Highway barriers	

6. Environmental monitoring, analysis and assessment	HS code
6.1 Measuring and monitoring equipment	
Thermometers, pyrometers, liquid filled	902511
Other thermometers, pyrometers	902519
Hydrometers, barometers, hygrometers, etc.	902580
Other instruments for measuring liquids or gases	902680
Parts of instruments for measuring, checking liquids or gases	902690
Instruments for analysing gas or smoke	902710
Chromatographs, etc.	902720
Spectrometers, etc.	902730
Exposure meters	902740
Other instruments using optical radiation	902750
Other instruments for physical or chemical analysis	902780
Parts for instruments, incl. microtomes	902790
Ionising radiation measuring or detecting instruments	903010
Other optical instruments	903149
Other measuring or checking instruments	903180
Manostats	903220
Hydraulic/pneumatic automatic regulating, controlling instruments	903281
Other automatic regulating, controlling instruments	903289
Auto emissions testers	
Noise measuring equipment	
6.2 Sampling systems	
6.3 Process and control equipment	
Thermostats	903210
Electrical process control equipment	
On board monitoring/control	
6.4 Data acquisition equipment	
6.5 Other instruments, machines	

B. CLEANER TECHNOLOGIES AND PRODUCTS group

1. Cleaner/resource-efficient technologies and processes	HS code
Electrochemical apparatus/plant	
Extended cooking (pulp)	
Oxygen delignification	
Ultrasonic cleaning	
Fluidised bed combustion	

B. CLEANER TECHNOLOGIES AND PRODUCTS group *(cont.)*

2. **Cleaner/resource-efficient products**	HS code
CFC substitutes	
Hydrogen peroxide	
Peat replacements (*e.g.* bark)	284700
Water-based adhesives	
Paints and varnishes, in aqueous medium, acrylic or vinyl	320910
Other paints and varnishes, in aqueous medium	320990
Double hulled oil tankers	
Low-noise compressors	

C. RESOURCE MANAGEMENT group

1. **Indoor air pollution control**	HS code

2. **Water supply**	HS code
2.1 Potable water treatment	
2.2 Water purification systems	
Chlorine*	280110
2.3 Potable water supply and distribution	
Waters, including natural or artificial mineral water	220100
Distilled and conductivity water	285100
Ion exchangers (polymer)	391400

3. **Recycled materials**	HS code
3.1 Recycled paper	
3.2 Other recycled products	

4. **Renewable energy plant**	HS code
4.1 Solar	
Instantaneous gas water heaters	841911
Other instantaneous or storage water heaters, non-electric	841919
Photosensitive semiconductor devices, including solar cells	854140
4.2 Wind	
Windmills	
Wind turbines	
4.3 Tidal	
4.4 Geothermal	
4.5 Other	
Methanol	290511
Ethanol	220700
Hydroelectric plant	

5. **Heat/energy saving and management**	HS code
Catalysts	381500
Multiple walled insulating units of glass	700800
Other glass fibre products*	701990
Heat exchange units	841950
Parts for heat exchange equipment	841990
Heat pumps	
District heating plant	
Waste heat boilers	
Burners, fuel other than oil or gas	
Fluorescent lamps, hot cathode	853931
Electric cars	
Fuel cells	
Gas supply, production and calibrating meters	902810
Liquid supply, production and calibrating meters	902820
Thermostats*	903210

C. RESOURCE MANAGEMENT group *(cont.)*

6. Sustainable agriculture and fisheries	HS code
7. Sustainable forestry	HS code
8. Natural risk management	HS code
Satellite imaging Seismic instruments	
9. Eco-tourism	HS code
10. Other	HS code

* Indicates that the HS code appears previously in a different sub-class.

Source: OECD, drawing on detailed breakdown presented in Annex 7. HS commodity codes are drawn from World Customs Organization (1996), *Harmonized Commodity Description and Coding System*, Explanatory notes, Second edition, Brussels. See also presentation and discussion in OECD (1999), COM/TD/ENV(98)37/FINAL.

Annex 3

ENVIRONMENTAL ACTIVITIES IN THE NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (NAICS)

The North American Industry Classification System (NAICS) provides common industry definitions for Canada, Mexico and the United States. It was jointly developed by the US Economic Classification Policy Committee, Statistics Canada, and Mexico's *Instituto Nacional de Estadística, Geografía e Informática* to better compare economic and financial statistics and ensure that such statistics keep pace with the changing economy. The NAICS replaces the three countries' separate systems with a uniform classification system. Within this classification it is possible to identify some classes which are clearly related to the environment industry, and some new environment classes have been added.

22.	**Utilities**
22.13	Water, sewage and other systems
22.13.1	Water supply and irrigation systems
22.13.2	Sewage treatment facilities
22.13.3	Steam and air-conditioning supply
23.	**Construction**
23.49	Other heavy construction
23.49.1	Water, sewer, and pipeline construction
31-33.	**Manufacturing**
33.34	Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing
33.34.1	Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing
33.34.11	Air purification equipment manufacturing
54.	**Professional, scientific, and technical services**
54.16	Management, scientific, and technical consulting services
54.16.2	Environmental consulting services (new)
56.	**Administrative and support and waste management and remediation services (new)**
56.2	Waste management and remediation services
56.21	Waste collection
56.22	Waste treatment and disposal
56.29	Remediation and other waste management services
71.	**Arts, entertainment, and recreation**
71.2	Museums, historical sites, and similar institutions
71.21.9	Nature parks and other similar institutions
81.	**Other services (except public administration)**
81.33	Social advocacy organisations
81.33.12	Environment, conservation and wildlife organisations (new)
92.	**Public administration**
92.4	Administration of environmental quality programmes

Source: *1997 U.S. NAICS Codes and Titles*, July 1998, at http://www.census.gov/epcd/nalcs/naicscod.txt.

Annex 4

NACE REV. 1 CODES RELATED TO THE ENVIRONMENT INDUSTRY: THE NETHERLANDS

In implementing NACE Rev. 1 at national level, Statistics Netherlands encountered a number of definitional problems relating to NACE Rev. 1 headings 37, 51.57 and 90, as well as to other NACE activities. The following list was developed to clarify and explain the classification of the most important activities carried out by specialised environmental producers.

14.	**Other mining and quarrying**		
	14.50	Other mining and quarrying n.e.c.	This class includes treatment of melting slag for reuse (for example in the form of granulates) regardless of its final destination. The heading 37.20 includes this activity as input for sandblasting and construction works.
15.	**Manufacture of food products and beverages**		
	15.7	Manufacture of prepared animal feeds	Headings 15.71 and 15.72 also include treatment of slaughter waste to produce animal feeds.
17.	**Manufacture of textiles**		
	17.11	Preparation and spinning of cotton-type fibres	In this class manufacturing of polishing cloths or cleaning rags from textile waste is also included.
21.	**Manufacture of paper and paper products**		
	21.11	Manufacture of pulp	This class includes activities related to manufacture of pulp from waste paper and shredding of waste paper.
23.	**Manufacture of coke, refined petroleum products and nuclear fuel**		
	23.20	Manufacture of refined petroleum products	
		23.20.2 Manufacture of oil-based lubricating oils or greases including from waste or used oil.	If manufacturing of oils or greases from waste oil is carried out in combination with collection of waste oil, these will be classified under this item. If enterprises only collect used oil, these will be classified in 90.00.2.
24.	**Manufacture of chemicals and chemical products**		
	24.16	Manufacture of plastics in primary forms	This class does not include any recycling activities. Reclaiming, processing of plastic waste (cleaning, melting, grinding) is in principle classified within the heading 37.20, while pure manufacturing of plastic products is 25.24. When enterprises carry out both activities, it is suggested to follow the remarks developed for heading 37.20.
	24.64	Manufacture of photographic chemical material	Processing of waste from photographic industry such as fixer solution or photographic film and paper containing silver is classified under 37.20.
25.	**Manufacture of rubber and plastic products**		
	25.12	Recovering, retreading and rebuilding of rubber tyres	Enterprises only reclaiming rubber are classified as part of 37.20.

25.24	Manufacture of other plastic products	This class also includes enterprises engaged in the production of new plastic products from plastic waste (*e.g.* bottles, pickets or flowerpots). If this activity is carried out in combination with a recuperation process such as cleaning, melting, grinding resulting in granulates, it will be included in 37.20.
27.	**Manufacture of basic metals**	
27.4	Manufacture of basic precious and non-ferrous metals	New recycling techniques have been specifically developed to reuse non-ferrous metals from waste; for example reclaiming cobalt from spent industrial catalysts or reclaiming precious metals by means of electrolytic refining. It is suggested that these activities be classified under 37.10.
35.	**Manufacture of other transport equipment**	
35.11	Building and repairing of ships and boats	Includes ship dismantling.
37.	**Recycling**	
37.10	(Preparation prior to) Recycling of metal waste and scrap	This class includes processing of metal waste and scrap into secondary raw material fit for further processing. Typically waste and scrap, either sorted or unsorted, needs to be processed before being used as an intermediate good in another industrial process. Mechanical or chemical processes usually used are: – Shredding of metal waste, end of life vehicles, etc. – Reclaiming metals from cables by grinding. – Reclaiming non-ferrous metals from metal waste by means of a process other than electrolysis. **This class does not include:** – Manufacture of new metals or new metal products from secondary metal raw materials (these activities classified under 27 or 28). – Recycling of non-ferrous metals from metal waste by means of electrolysis (classified under 27.4). – Reclaiming non-ferrous metals from waste other than metal waste such as photographic or hazardous waste (classified under 37.20). – Wholesale in waste and scrap including mechanical treatment which does not lead to secondary raw materials, such as cutting, pressing or other methods to reduce the volume (classified under 51.57.2). – Dismantling, demolition of machinery, computers, etc. (included in 51.57.2). – Car dismantling sites including wholesale trade in second-hand spare parts (included in 51.57.1). – Pre-recycling of non-metallic waste and waste materials (included in 37.20).
37.20	(Preparation prior to) Recycling of non-metal waste and scrap	– This class includes processing of non-metallic waste and scrap and of non-metal articles into secondary raw material fit for further processing. Waste and scrap, either sorted or unsorted, needs to be processed before being used as an intermediate good in another industrial process. Typical activities are: – Processing (cleaning, melting, grinding) of plastic or rubber waste to granulates. Only when these activities are carried out in combination with final good production, and the sales of recycled products represent more than 80% (for example, recycled plastic bottles or rubber tiles) are they to be classified, in respectively, 25.24 or 25.13. This practical rule will help in the case of enterprises which "do" the whole recycling chain (collection, processing, producing granulates and producing end products). Despite the fact that a large part of their output consists of end products, their classification remains NACE 37.

		– Treatment of slag and fly ashes resulting in granulates used for replacement of gravel or in road constructions. – Mechanical crushing and grinding of waste from the construction and demolition of buildings (including wood), asphalt. – Processing of melting slag to blasting grit. – Processing of used cooking oils and fats to secondary raw materials for pet foods or feeds for farm animals. – Crushing, cleaning and sorting of glass. – Shredding paper, also in combination with destruction of archives. – If this activity is carried out in combination with collection, storage and dealing (as is mostly the case), it is to be classified under 51.57.3. – Reclaiming materials (also metals) from hazardous waste. – Refining of and making fit for reuse chemical baths and liquids, also when containing dissolved metals. – Reclaiming metals from photographic waste, for example, fixer solution or photographic films and paper. **This class does not include:** – Treatment of slaughter waste to produce animal feed (included in 15.7) – Production of new products from secondary raw material such as spinning of yarn from stock (included in 17.1), making pulp from waste paper (included in 21.11) or recovering/retreading tyres (included in 25.12). – Recycling of waste oil and grease (included in 23.20.2). – Wholesale in non-metallic waste and scrap including collecting, sorting, packing, dealing, etc., without an industrial process (included in 51.57.3). – Collection of household and industrial waste (included in 90.00.2). – Composting of waste (included in 90.00.3). – Treatment of manure (slurry) (included in 90.00.3). – Incineration, dumping, burying, etc., of waste (included in 90.00.3).
45. Construction		
		This class includes: – Construction of sewer systems (45.21.3). – Clearing, de-blocking of sewers (45.33.1). – Demolition and wrecking of buildings and other structures (45.11.1).
51. Wholesale trade and commission trade, except of motor vehicles and motorcycles		
51.42	Wholesale of clothing and footwear	This class includes (51.42.1) sorting of and dealing in used clothes.
51.57	Wholesale of waste and scrap	It also includes dismantling of end-of-life vehicles (dismantling of cars; wholesale of car wrecks; sale of parts from car wrecks to private persons and professional users). This class does not include dismantling of cars by means of a mechanical process such as shredding (included in 37.10).
	51.57.2 Wholesale of metal waste and scrap	This class includes: – Wholesale (purchase and sale) of ferrous and non-ferrous metal waste and scrap. – Collection of ferrous and non-ferrous metal waste. – Treatment of ferrous and non-ferrous metal waste without a mechanical or chemical process. – Demolition or dismantling of machinery, cranes, computers, etc.

		This class does not include: – Treatment of non-ferrous metal waste by means of electrolysis (included in 27.4). – Ship dismantling (included in 35.11). – Treatment of metal waste by means of a mechanical process (included in 37.10). – Demolition and wrecking of buildings and other constructions (included in 45.11.1). – Dismantling of cars (included in 51.57.1). – Wholesale of non-metallic waste and scrap and materials (included in 51.57.3).
	51.57.3 Wholesale of non-metal waste and scrap	This class includes wholesale (purchase and sale) of non-metallic waste and scrap and materials such as used tyres, glass, construction, paper, cardboard, textile, wood waste, etc.; collection, sorting, pressing of paper, rags, sawdust, etc. **This class does not include:** – Treatment of slaughter waste to produce animal feeds (included in 15.7). – Treatment of used non-ferrous materials and waste by means of a mechanical or chemical process (included in 37.20). – Collection and repair of used furniture, household goods, clothes; sale to private persons, often in so-called recycling shops (included in 52.50). – Collection of household and industrial waste (included in 90.00.2). – Treatment of waste by means of dumping, incineration, drying, etc. – Composting of organic, kitchen and garden waste (included in 90.00.3).
52. Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods		
52.50	Retail sale of second-hand goods in stores	52.50.2 and 52.50.3 include collection and repair of used furniture, household goods, clothes; so-called recycling shops; and dismantling of furniture, etc., for the reuse of parts.
60. Land transport; transport via pipelines		
60.24	Freight transport by road	60.24.2 includes transport of waste and waste materials collected by third parties. The responsibility for the (final) treatment of this waste is mostly not part of the services offered by transport firms. This is shown by the fact that the disposer pays the waste management location separately for waste treatment. Examples are (bulk) transport of waste from transhipment locations to final treatment locations. Transport of manure, sludge or polluted soil is also classified here. **This class does not include:** Waste transport as an inseparable part of waste collection activities carried out by specialised enterprises (classified under 90.00.2).
71. Renting of machinery and equipment without operator and of personal and household goods		
		Includes renting of waste containers and similar. **This class does not include:** Renting waste containers to waste disposers as part of waste collection (classified in 90.00.2).
74. Other business activities		
		Includes maintenance and cleaning activities on behalf of petrochemical installations, for example cleaning of pipelines. The waste/wastewater collected during these activities is not treated by firms themselves but by waste treatment firms (included in 90.00.3).

90. Sewage and refuse disposal, sanitation and similar activities

90.00.1 Collection and treatment of wastewater

This class includes:
- Maintenance and cleaning of sewers.
- Emptying of septic tanks and cesspools/cesspits.
- Emptying of sewage sinks and pits.
- Transport of wastewater to a sewage treatment plant or points of discharge.
- Treatment of wastewater by means of physical, chemical, and biological processes.

This class does not include:

- Construction of sewer systems (included in 45.21.3).
- Clearing, de-blocking of sewers (included in 45.33.1).
- Treatment of polluted ground or surface water in combination with cleaning-up of environmental pollution (included in 90.00.4).

90.00.2 Collection of waste

This class includes:

- Sweeping of streets, squares, paths, markets, public gardens, parks, etc.
- Collection of waste from households and enterprises by means of refuse bins, wheeled bins, containers, etc.

This class also includes:

- Collection of hazardous waste, used batteries, used cooking oils and fats, etc.
- Collection of used oil from shipment or garages.
- Collection of construction and demolition waste.
- Exploitation of recycling centres.

This class does not include:

- Cleaning of ditches for the benefit of agriculture (included in 01.41.2).
- Collection of waste as part of wholesale of waste (included in 51.57).
- Transport of waste without collection or treatment (included in 60.24.2).
- Industrial cleaning (included in 74.70).
- Exploitation of landfill sites (included in 90.00.3).

90.00.3 Treatment of waste

This class includes the treatment of waste by means of incineration, dumping, burying, separation, drying, neutralising, detoxification, anaerobic digestion and composting. Treatment of hospital waste, radio-active waste, used oil and grease; of polluted soil and dredged soil supplied by third parties; removal and treatment of CFCs from refrigerators, PCBs from transformers; exploitation of landfills are also included

This class does not include:

- Treatment of slaughter waste to produce animal feeds (included in 15.7).
- Treatment of metal waste without mechanical or chemical process and for sale to third parties, such as dismantling of cars, machinery or computers (included in 51.57).
- Treatment of non-metallic waste without a mechanical or chemical process and for sale to third parties, such as sorting or pressing of paper, textiles, plastics, wood waste, etc. (included in 51.57.3).
- Treatment of metal waste by a mechanical or chemical process into secondary raw materials, for example shredders (included in 37.10).
- Treatment of non-metallic waste by means of a mechanical or chemical process into secondary raw materials such as breaking or grinding of glass, used tyres, rubber into granulates (included in 37.20).

90.00.4	Cleaning up of environmental pollution	This class includes: – Clean-up of polluted soil, including underwater soil. – Clean-up of polluted ground or surface water. – Removal of asbestos. – Removal of underground oil tanks. **This class does not include:** – Treatment of wastewater (included in 90.00.1).

Source: Dietz (1997).

Annex 5

DISTRIBUTION OF THE ENVIRONMENTAL GOODS AND SERVICES INDUSTRY BY STANDARD INDUSTRIAL ACTIVITY: FRANCE, 1991

Industrial activity	Number of enterprises in the environment industry	Share of environment industry turnover in industry total (percentage)
Water distribution and urban heating	46	14.5
Manufacture of organic chemicals	21	4.0
Ventilation, heating and refrigeration materials	78	10.5
Industrial equipment, misc.	125	3.7
Construction material, other mineral products	43	6.8
Machinery for chemical, plastic and food manufacturing	53	9.1
Manufacture of paints, varnishes and glues	28	9.2
Metal, plastic and paper packaging	50	2.7
Automobiles, locomotives, railway rolling stock	46	0.4
Electrical/electronic equipment	29	2.1
Plastic products, not including packaging	20	3.9
Paperboard, not including packaging	25	1.7
Manufacture of inorganic chemicals	14	2.8
Smelting, steel pipes	3	2.9
Manufacture of fine chemicals	23	0.8
Household equipment	4	2.3
Material-handling, mining, iron and steel, engineering equipment	11	2.9
Manufacture of rubber products	31	0.4
Precision instruments	7	2.1
Petroleum refineries	11	0.1
Manufacture of textiles, non-woven	6	1.3
Total	**674**	**2.5**

Source: SESSI (1994), *Les marchés de l'environnement*, Ministère de l'Industrie, des Postes et Télécommunications et du Commerce extérieur, Edition 1994.

Annex 6

DISTRIBUTION OF THE ENVIRONMENT INDUSTRY BY STANDARD INDUSTRIAL ACTIVITY: GERMANY, 1992

Industrial activity	Value of environment industry production (million DM)	Share of environment industry production in industry total (percentage)
Non-metallic mineral products	398. 6	1.0
Foundry products	1 056.6	n.a.
Production of continuous steel forming and cold-rolling mills	391.1	1.1
Fabricated metal products, railway locomotives and rolling stock	1 375.3	3.5
Machinery	17 043.9	8.8
Vehicles	1 825.0	0.8
Electronic	7 471.0	4.6
Instruments and machinery	1 545.0	8.1
Iron, steel and metals	368.5	0.6
Chemicals	1 072.9	0.7
Ceramics	265.8	5.2
Glass		n.a.
Wood products		n.a.
Pulp and paper	179.5	0.7
Plastics	1 849.7	3.1
Rubber	406.4	2.7
Textiles	389.5	1.1

Source: Limbert, 1995.

Annex 7

AN EXAMPLE OF A MORE DETAILED BREAKDOWN OF THE ENVIRONMENT INDUSTRY[8]

A. POLLUTION MANAGEMENT Group

Production of equipment and specific materials for:

1. Air pollution control

1.1 Air-handling equipment
1.2 Catalytic converters
1.3 Chemical recovery systems
1.4 Dust collectors
1.5 Separators, precipitators
1.6 Incinerators, scrubbers
1.7 Odour control equipment

2. Wastewater management

2.1 Aeration systems
2.2 Chemical recovery systems
2.3 Biological recovery systems
2.4 Gravity sedimentation systems
2.5 Oil/water separation systems
2.6 Screens, strainers
2.7 Sewage treatment
2.8 Water pollution control, wastewater reuse equipment
2.9 Water handling goods and equipment

3. Solid waste management

3.1 Hazardous waste storage and treatment equipment
3.2 Waste collection equipment
3.3 Waste disposal equipment
3.4 Waste handling equipment
3.5 Waste separation equipment
3.6 Recycling equipment
3.7 Incineration equipment

4. Remediation and clean-up of soil and water

4.1 Absorbents
4.2 Cleaning-up
4.3 Water treatment equipment

5. Noise and vibration abatement

5.1 Mufflers, silencers
5.2 Noise deadening material
5.3 Vibration control systems
5.4 Highway barriers

6. Environmental monitoring, analysis and assessment

6.1 Measuring and monitoring equipment
6.2 Sampling systems
6.3 Process and control equipment

A. POLLUTION MANAGEMENT Group *(cont.)*

6.4 Data acquisition equipment
6.5 Other instruments, machines

7. Other

Provision of services for:

8. Air pollution control

8.1 Emission monitoring
8.2 Assessment/evaluation/planning

9. Wastewater management

9.1 Sewage treatment systems
9.2 Wastewater reuse systems
9.3 Water handling systems

10. Solid waste management

10.1 Emergency response and spills clean-up
10.2 Waste handling, collection, transport and disposal
10.3 Operation of sites
10.4 Recycling (sorting, baling, cleaning)
10.5 Operation of recycling plants (materials recovery facilities)
10.6 Hazardous waste management
10.7 Medical waste management

11. Remediation and clean-up of soil and water

11.1 Cleaning-up
11.2 Operation of water treatment facilities
11.3 Industrial services (cleaning for facilities and tanks)

12. Noise and vibration abatement

12.1 Assessment/monitoring

13. Environmental research & development

13.1 Clean processes
13.2 End-of-pipe pollution abatement control

14. Environmental contracting and engineering

14.1 Engineering design/specification/project management
14.2 Biological and ecosystem studies
14.3 Environment impact assessment, audits
14.4 Water treatment
14.5 Environmental planning
14.6 Risk and hazard assessment
14.7 Laboratory and field services
14.8 Environmental economics
14.9 Legal services (environmental law)
14.10 Environmental management

15. Analytical services, data collection, analysis and assessment

15.1 Measuring and monitoring
15.2 Sampling
15.3 Process and control
15.4 Data acquisition
15.5 Others

16. Education, training, information

16.1 Environmental education and training

A. POLLUTION MANAGEMENT Group *(cont.)*

16.2 Environmental information searching services
16.3 Environmental data managemeìnt and analysis

17. Other

Construction and installation for:

18. Air pollution control

19. *Wastewater management*

19.1 Sewer systems
19.2 Wastewater treatment plant

20. Solid waste management

20.1 Solid waste treatment, storage and disposal
20.2 Hazardous waste management
20.3 Recycling

21. Remediation and clean-up of soil and water

22. Noise and vibration abatement

22.1 Highway barriers

23. Environmental monitoring, analysis and assessment

24. Other

B. CLEANER TECHNOLOGIES AND PRODUCTS Group

Production of equipment, technology, specific materials or services for:

1. Cleaner/resource-efficient technologies and processes

1.1 Components of cleaner/resource-efficient technologies
1.2 Biotechnology

2. Cleaner/resource-efficient products

2.1 Components of cleaner/resource-efficient products

C. RESOURCE MANAGEMENT Group

Production of equipment, technology, specific materials, services, construction and installation for:

1. Indoor air pollution control

2. Water supply

2.1 Potable water treatment
2.2 Water purification systems
2.3 Potable water supply and distribution

3. Recycled materials

3.1 Recycled paper
3.2 Other recycled products

4. Renewable energy plant

4.1 Solar
4.2 Wind
4.3 Tidal

C. RESOURCE MANAGEMENT Group *(cont.)*

	4.4 Geothermal 4.5 Other
5.	*Heat/energy saving and management*
6.	*Sustainable agriculture and fisheries*
7.	*Sustainable forestry*
	7.1 Reforestation 7.2 Forest management
8.	*Natural risk management*
9.	*Eco-tourism*
10.	*Other*
	10.1 Conservation and resource management

Annex 8

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NOTES

1. OECD (1996*c*), "Interim Definition and Classification of the Environment Industry", OCDE/GD(96)117, Paris.
2. Commission of the European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and World Bank (1993), *System of National Accounts 1993*, prepared under the auspices of the Inter-Secretariat Working Group on National Accounts.
3. United Nations Economic Commission for Europe (1994), *SERIEE 1994 Version (European System for the Collection of Economic Information on the Environment)*, Luxembourg, Chapter II, Annex I. The CEPA is published separately in: United Nations Economic Commission for Europe (1994), *Single European Standard Statistical Classification of Environmental Protection Activities and Facilities*, Document CES/822, approved at the 42nd Plenary Session of the Conference of European Statisticians, Paris, 13-17 June. The CEPA is also used to illustrate "environmental protection products" in United Nations and United Nations Environmental Programme (1999), *Integrated Environmental and Economic Accounting – An Operational Manual*.
4. Note also that the Classification of Environmental Protection Activities (CEPA) in the SERIEE was the starting point for the classification adopted here.
5. The CPC constitutes a comprehensive classification of all goods and services and serves as an instrument for assembling and tabulating all kinds of statistics requiring product detail. It provides a framework for the international comparison of statistics dealing with goods, services and assets, and serves as a guide for developing or revising existing classification schemes of products in order to make them compatible with international standards. Categories are both exhaustive and mutually exclusive. Products are classified into categories based on their physical properties and their intrinsic nature, as well as the principle of industrial origin. In relation to the ISIC (the activity side of UN classifications), each sub-class of CPC (most detailed 5-digit category) consists of goods or services that are predominantly produced in a specific class or classes of ISIC Rev.3. However, "there is no intention of establishing one-to-one correspondence between CPC and ISIC", United Nations (1998), *Central Product Classification (CPC) Version 1.0*, par. 36.
6. The *Harmonized Commodity Description and Coding System (HS)* is an exhaustive nomenclature of internationally traded commodities (goods) classified according to: raw or basic material; degree of processing; use or function; or economic activities. The CPC uses the detailed subheadings of the HS as building blocks for dealing with transportable goods [United Nations (1998), *Central Product Classification (CPC) Version 1.0*, par. 3]. CPC subclasses (5-digit categories) in sections 0 to 4 constitute groupings and rearrangements of complete categories of the HS, World Customs Organization (1996).
7. Commission of the European Communities, IMF, OECD, UN, and World Bank (1993), *System of National Accounts 1993*. A detailed exposition of this process can be found in Chapter XV.
8. Statistics Canada used a similar breakdown, based on the classification presented in OECD (1996*c*), "Interim Definition and Classification of the Environment Industry", OCDE/GD(96)117, to survey the environmental goods and services industry for the year 1995. See Statistics Canada (1997), "Environment Industry, 1995, Preliminary Data". The breakdown presented here in Annex 7 has been re-organised to match the revisions to the "Interim Definition and Classification of the Environment Industry". This breakdown is also the basis for the detailed correspondence with HS codes presented in Annex 2.

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